

**BFISD 8035**

# **System 200/410 Service Manual**

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## **BFISD 8035**

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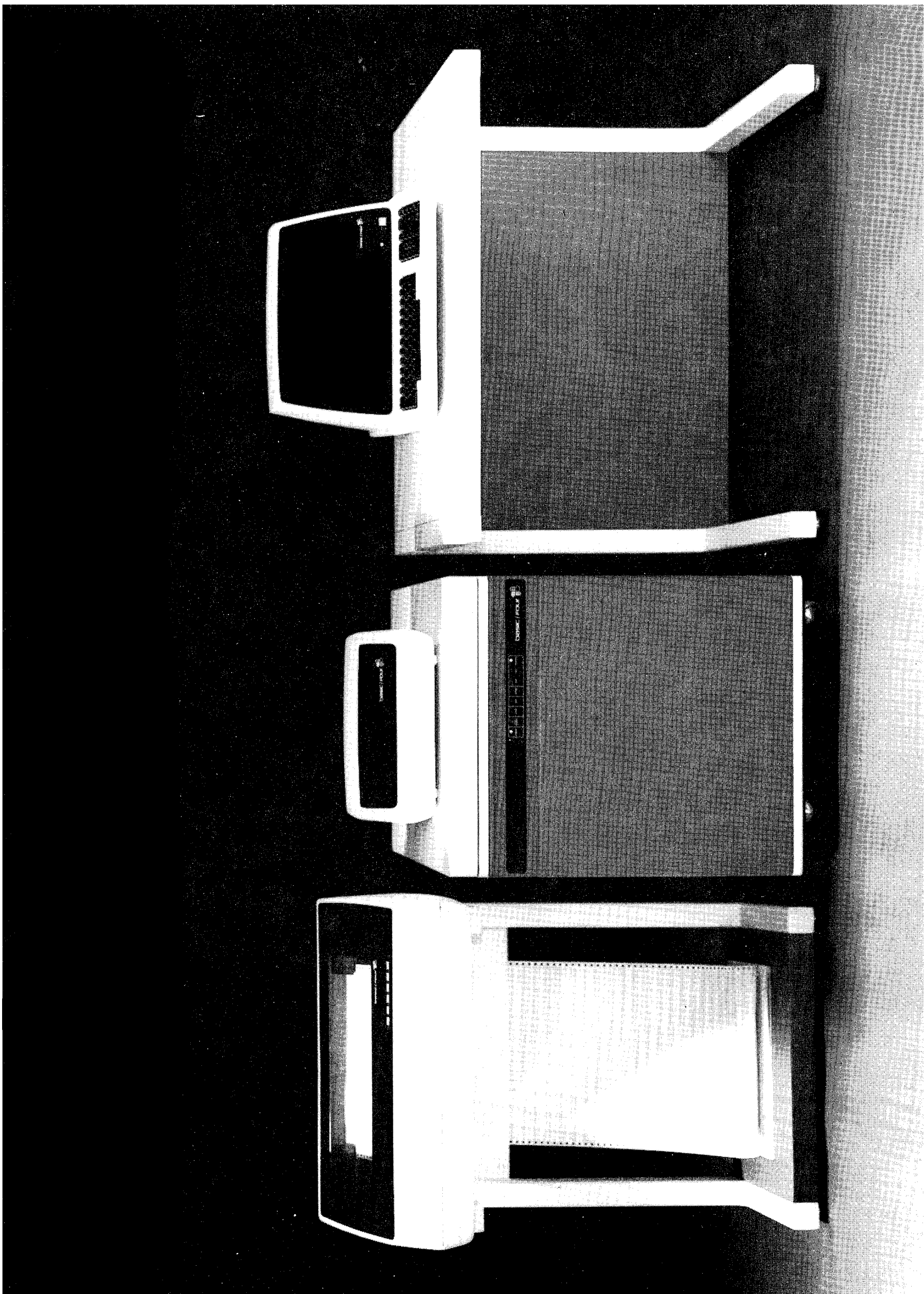
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## CHAPTER 1

### 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 (MTCDD) will not be included in this Manual. For more detailed information refer to the respective Service Manuals:

<u>BFC Document Number</u>	<u>Equipment</u>
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 (MTCDD). 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
<u>PROCESSOR/DISC DRIVE CABINET</u>	
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)
<u>VIDEO DISPLAY TERMINAL</u>	
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)
<u>MAGNETIC TAPE CARTRIDGE DRIVE (6400)</u>	
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)
<u>MATRIX PRINTER (3200)</u>	
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

System 200

VIDEO DISPLAY  
TERMINAL  
model 7250

FIXED MEDIA  
DISC DRIVE  
model 2400  
10 Megabyte

PROCESSOR  
model  
1340 or 1345

MAGNETIC  
CARTRIDGE  
TAPE DRIVE  
model 6401  
1 track

MATRIX  
PRINTER  
model 3200

System 410

VIDEO DISPLAY  
TERMINAL  
model 7250

FIXED MEDIA  
DISC DRIVE  
model 2400  
14 Megabyte

PROCESSOR  
model  
1340 or 1345

MAGNETIC  
CARTRIDGE  
TAPE DRIVE  
model 6400  
4 track

MATRIX  
PRINTER  
model 3200

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 MTCB 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
<u>PROCESSOR (1340/1345)</u>	
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 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> 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
<u>DISC DRIVE (2400)</u>	
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 $\pm$ 2.5%
Bit Transfer Rate	$7.08 \times 10^6$ bits per second
Byte Transfer Rate	$916.9 \times 10^3$ 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	$10 \times 10^{-3}$ seconds
Maximum Seek	$75 \times 10^{-3}$ seconds
Interface	Storage Module Interface using TTL compatible line drivers and receivers on all signals except clock and data.
Environmental	
Temperature	65 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> C)
Relative Humidity	40% to 60% (no condensation)



TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
<u>DISC DRIVE (2400)</u>	
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
<u>MAGNETIC TAPE CARTRIDGE DRIVE (6400)</u>	
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 x 10 <sup>3</sup> 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 x 10 <sup>6</sup> bytes (unformatted) (4 track version)
Environmental	
Temperature	65 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> C)
Relative Humidity	40% to 60% (no condensation)

TABLE 1-2. OPERATIONAL SPECIFICATIONS (continued)

Parameters	Characteristics
<u>MAGNETIC TAPE CARTRIDGE DRIVE (6400)</u>	
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)
<u>MATRIX PRINTER (3200)</u>	
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	$60 \times 10^{-3}$ 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 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> 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
<u>VIDEO DISPLAY TERMINAL (7250)</u>	
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 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> 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<sup>o</sup>F to 80<sup>o</sup>F (18<sup>o</sup>C to 27<sup>o</sup>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
<u>PROCESSOR/DISC DRIVE CABINET</u>	
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 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	9 feet (2.7 M)
Signal	N/A
<u>VIDEO DISPLAY TERMINAL (VDT)</u>	
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



TABLE 2-2. INSTALLATION SPECIFICATIONS (continued)

Parameters	Characteristics
<u>VIDEO DISPLAY TERMINAL (VDT)</u>	
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)
<u>MATRIX PRINTER</u>	
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
<u>MAGNETIC TAPE CARTRIDGE DRIVE</u>	
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 <sup>o</sup> F to 80 <sup>o</sup> F (18 <sup>o</sup> C to 27 <sup>o</sup> C)
Humidity	40% to 60% (no condensation)
Cable Lengths	
Power	10 feet (3.1 CM)
Signal	6 feet (1.8 CM)
<u>WORK TABLE/DESK (OPTIONAL)</u>	
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)
<u>200/410 SYSTEM</u>	
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), MTCB, 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 not 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:

<u>Component</u>	<u>Voltage</u>	<u>Current</u>
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.

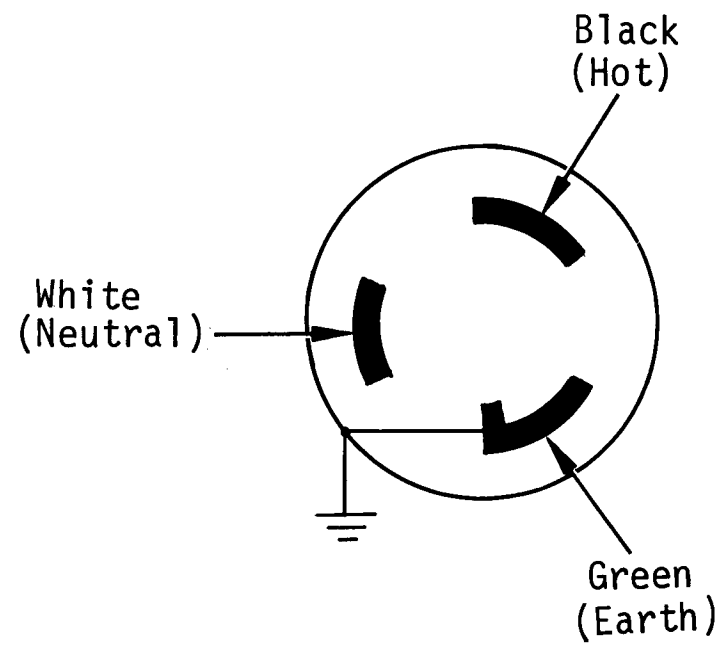


Figure 2-1. Processor/Disc Drive 110 VAC Outlet Wiring

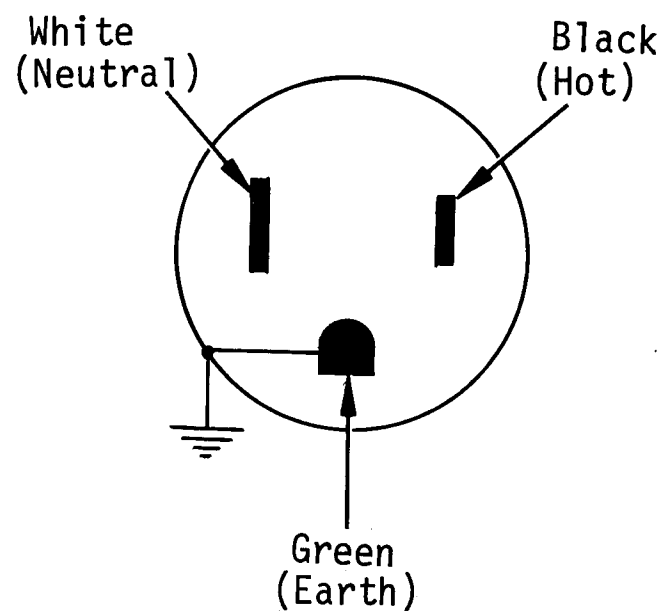


Figure 2-2. Peripheral 110 VAC Outlet Wiring

## 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

Wallerstein Company  
6301 Lincoln  
Morton Grove, Illinois

Bigelow Anti-Shock Spray

Bigelow-Sanford Inc.  
140 Madison Avenue  
New York City, New York

Carbona Stop-Shock

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 important that these locking devices are released.

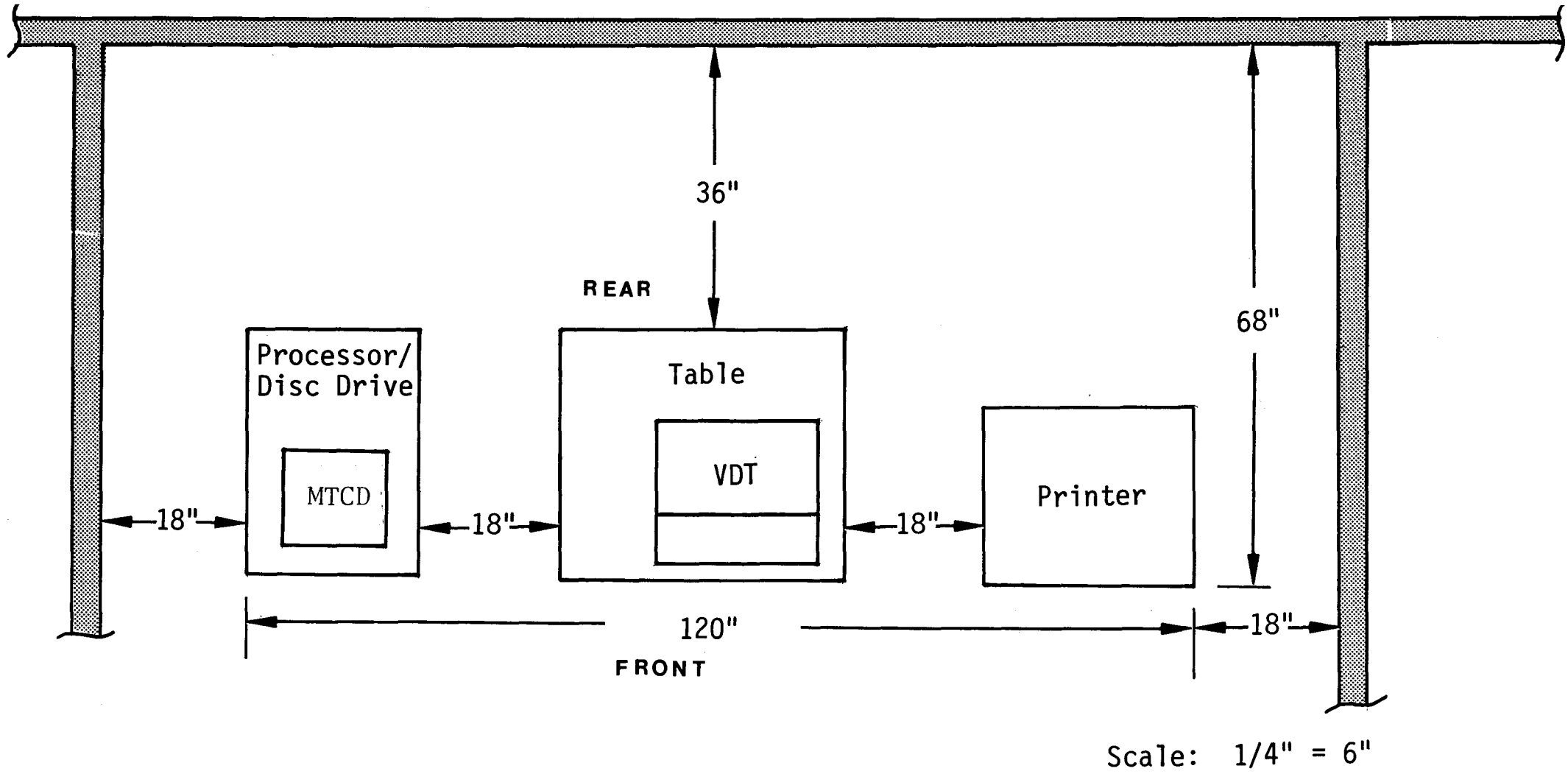


Figure 2-3. Typical System Floor Plan



### 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

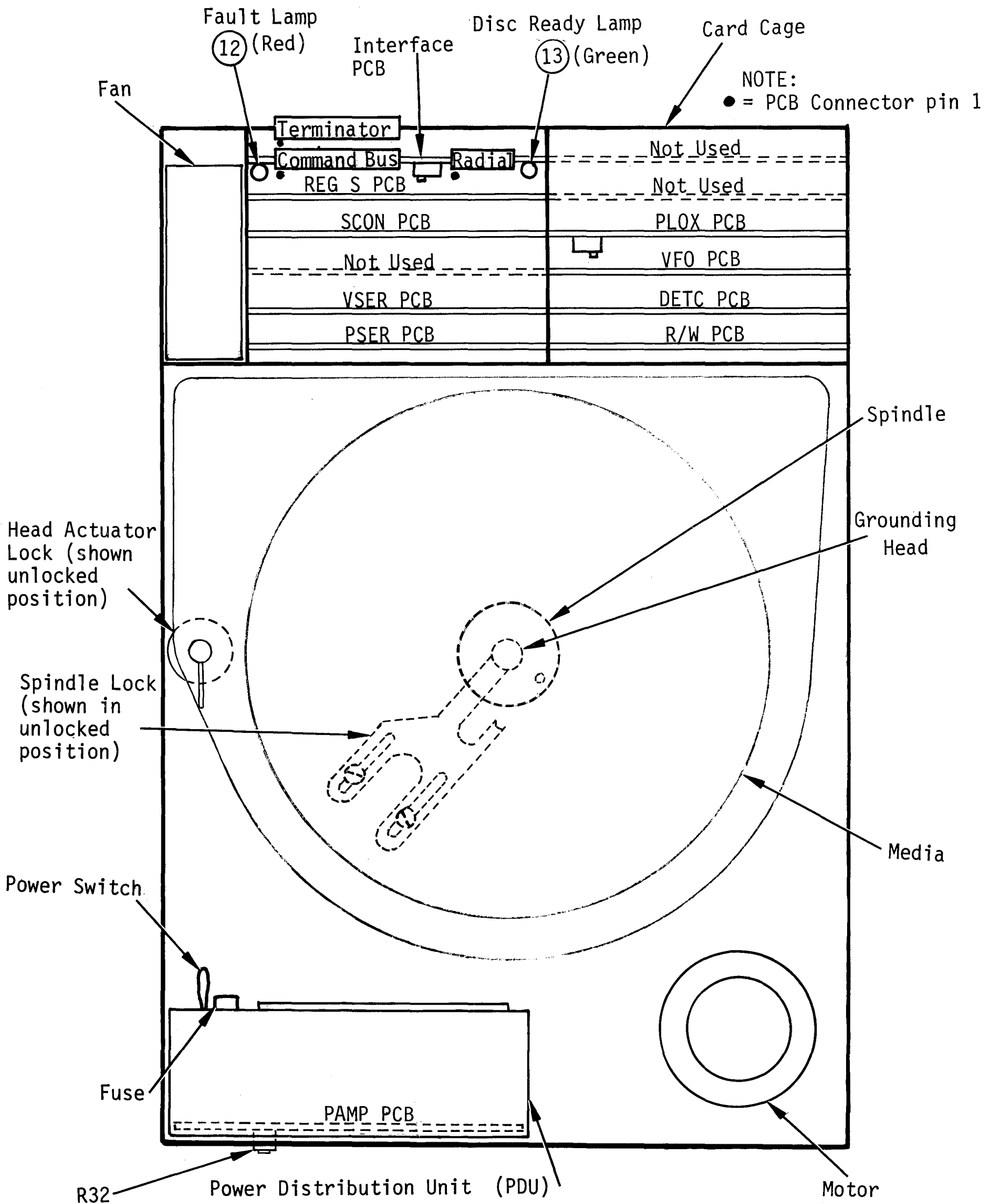
Each serial device (VDT and Remote Printer) is assigned a terminal number as specified by the operating system software. The remote printer(s) is always the last terminal.

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.

<u>PCB-Connector</u>	<u>Serial Device Assignment</u>
Accessory PCB - J2	Terminal 0
Accessory PCB - J4	Terminal 1
4- or 8-Way PCB - J0	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

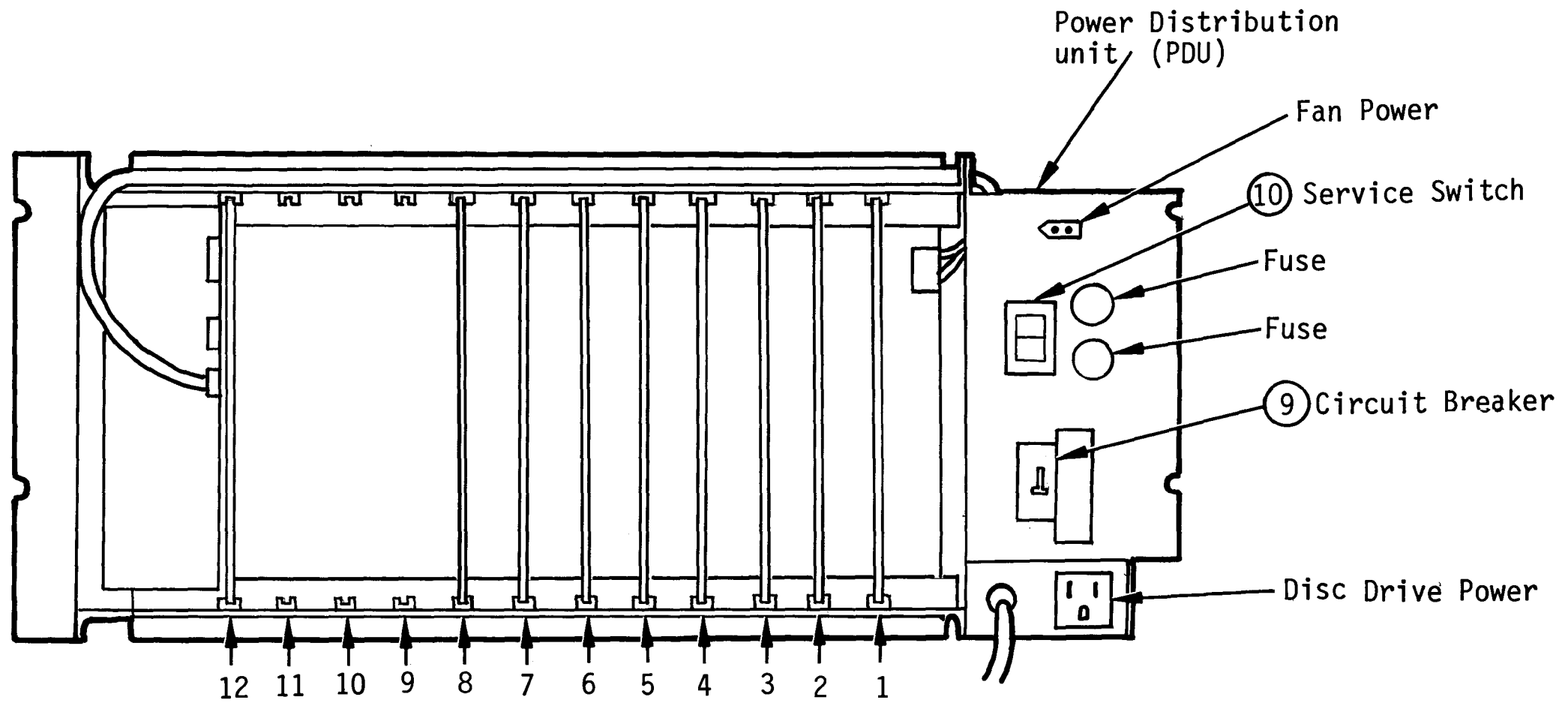
Verify that the memory select switch (S1) on each of the two memory PCB's is set so that a contiguous block of memory is addressed beginning at location 0. A chart is printed on each memory module listing the switch settings.

#### 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*   | 7 - MTCD Controller PCB*            |
| 2 - Memory PCB*            | 8 - 4- or 8-Way Controller**        |
| 3 - Memory PCB* (optional) | 9 - Communications Controller PCB** |
| 4 - CPU PCB*               | 10 - Printer Controller PCB**       |
| 5 - Accessory PCB*         | 11 - Option**                       |
| 6 - Disc Controller PCB*   | 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)

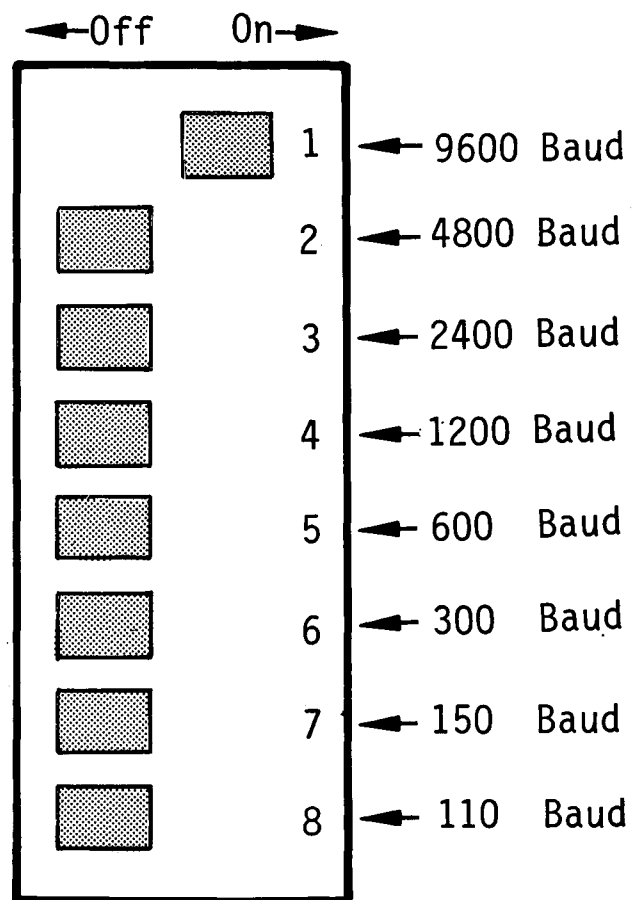


Figure 2-6. Baud Rate Switch Settings

#### 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.

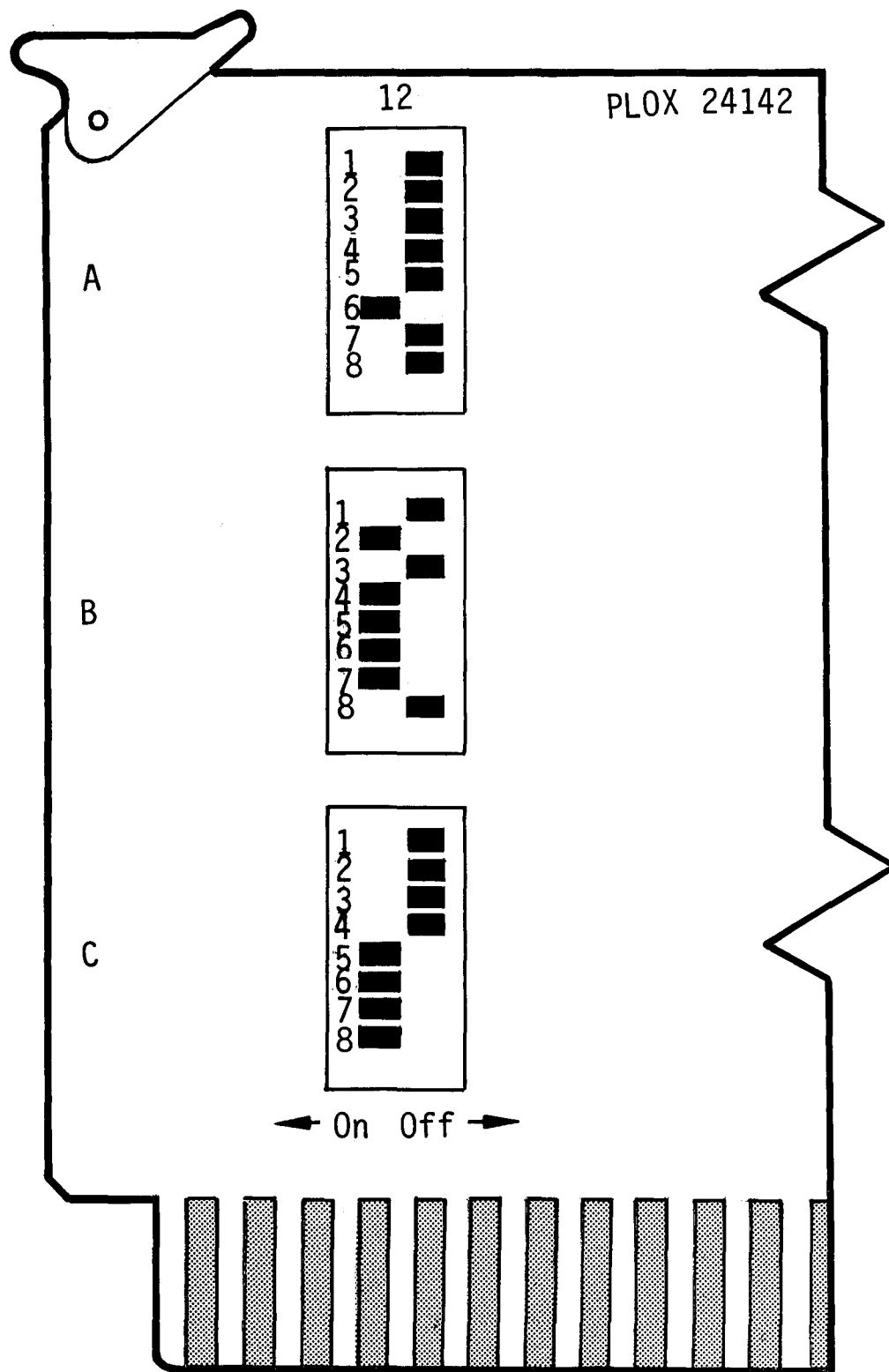


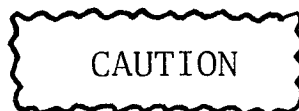
Figure 2-7. Bytes/Sector Disc Drive Sectors/Track Switch Settings, PLOX PCB

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



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).

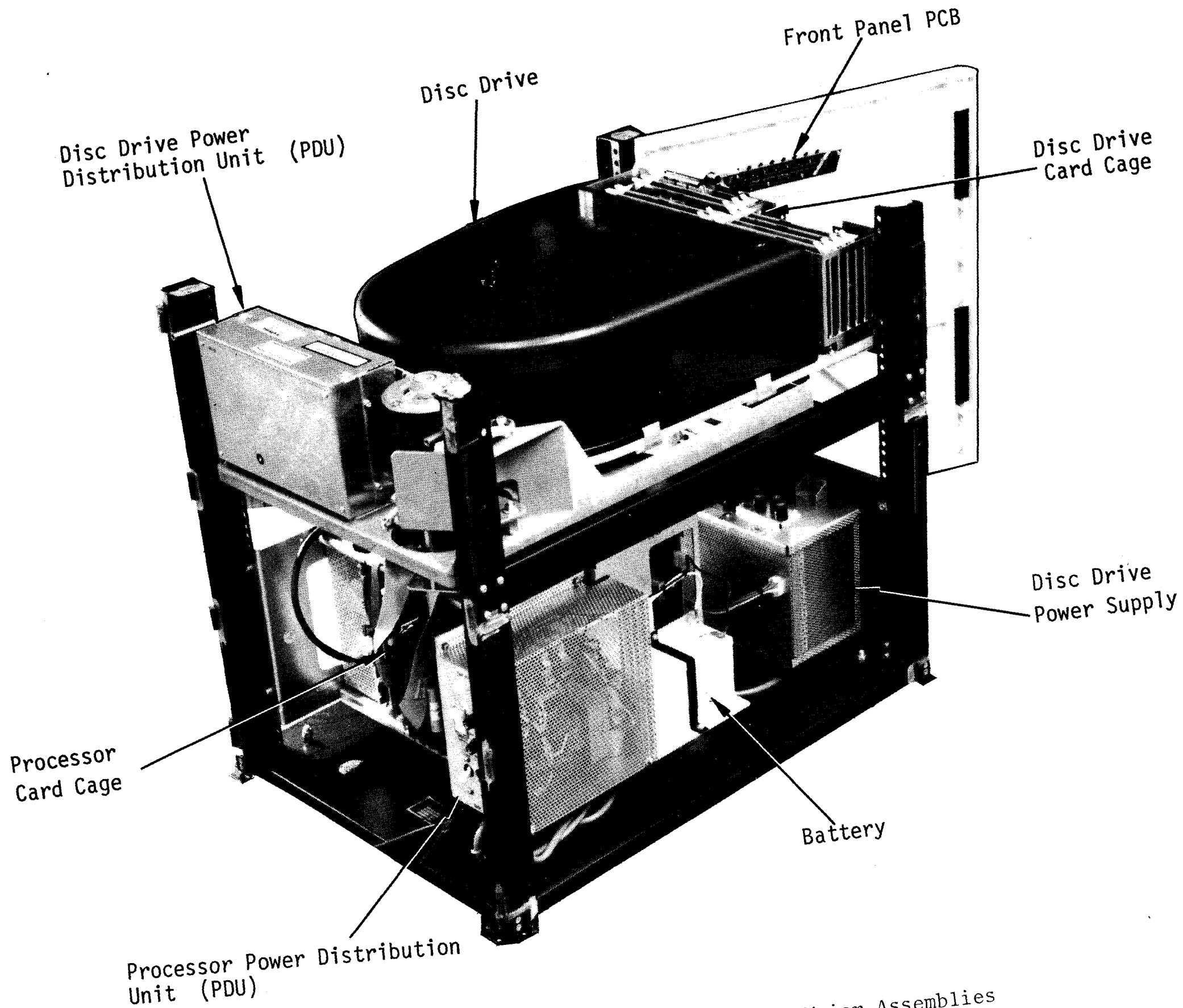
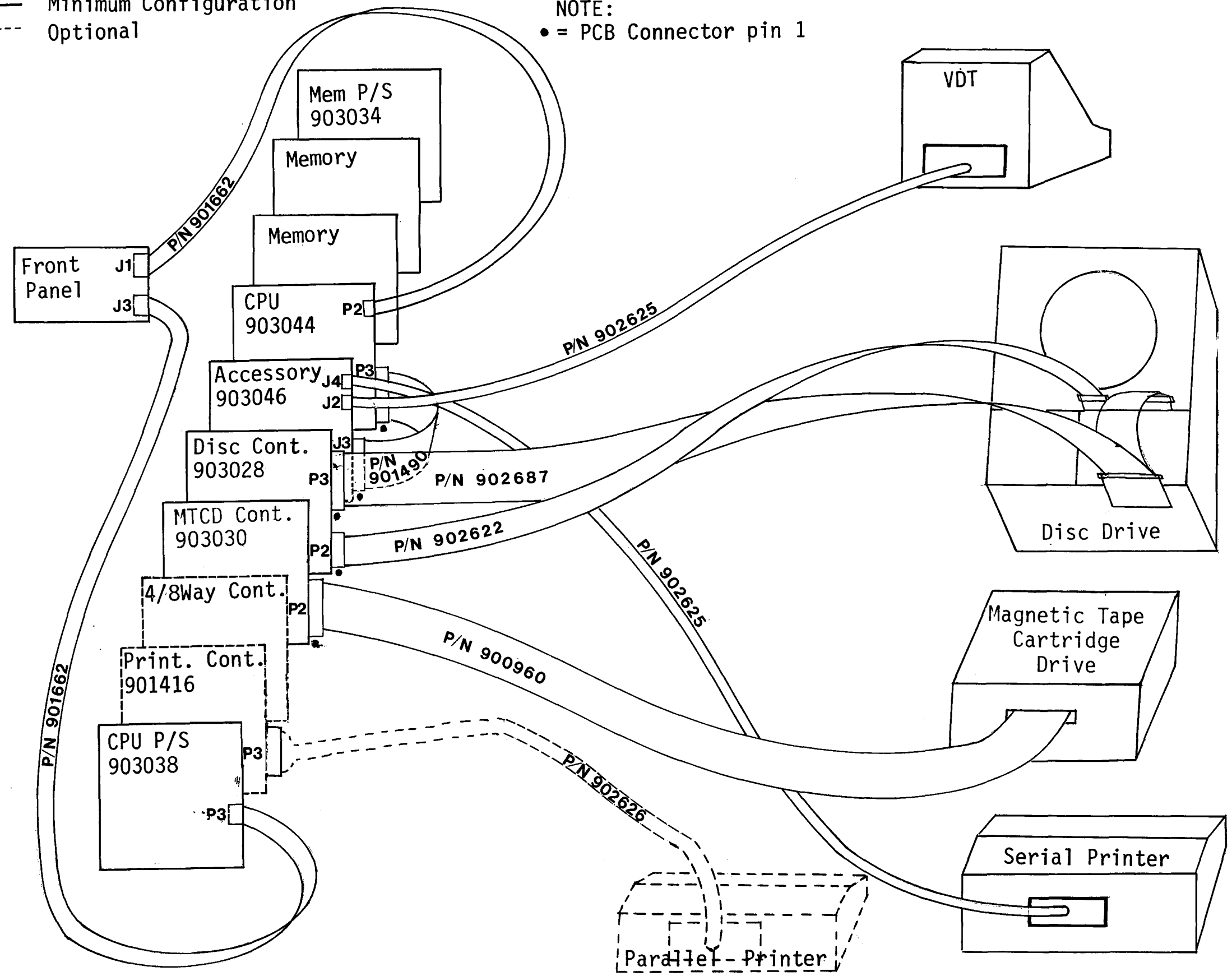


Figure 2-8. Processor/Disc Drive Cabinet, Major Assemblies



— Minimum Configuration  
 --- Optional

NOTE:  
 • = PCB Connector pin 1



2-19

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).

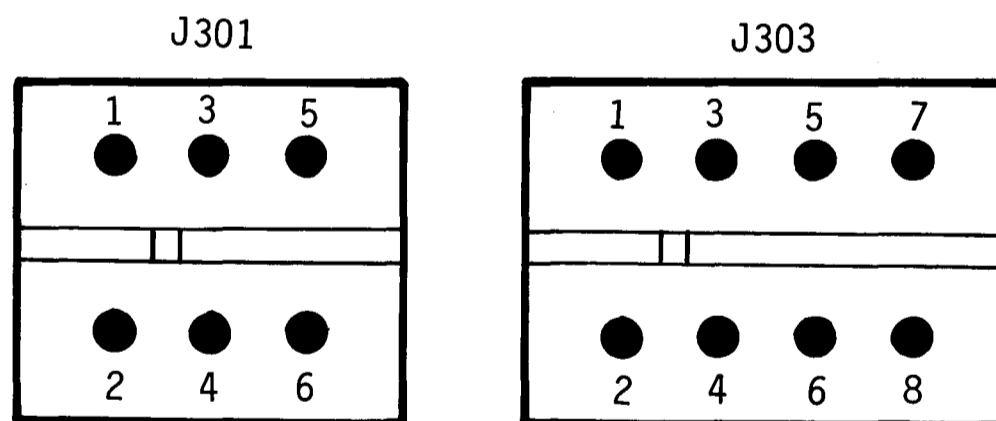


Figure 2-10. Disc Drive Power Supply Connector Pin Designations

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.



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)
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).

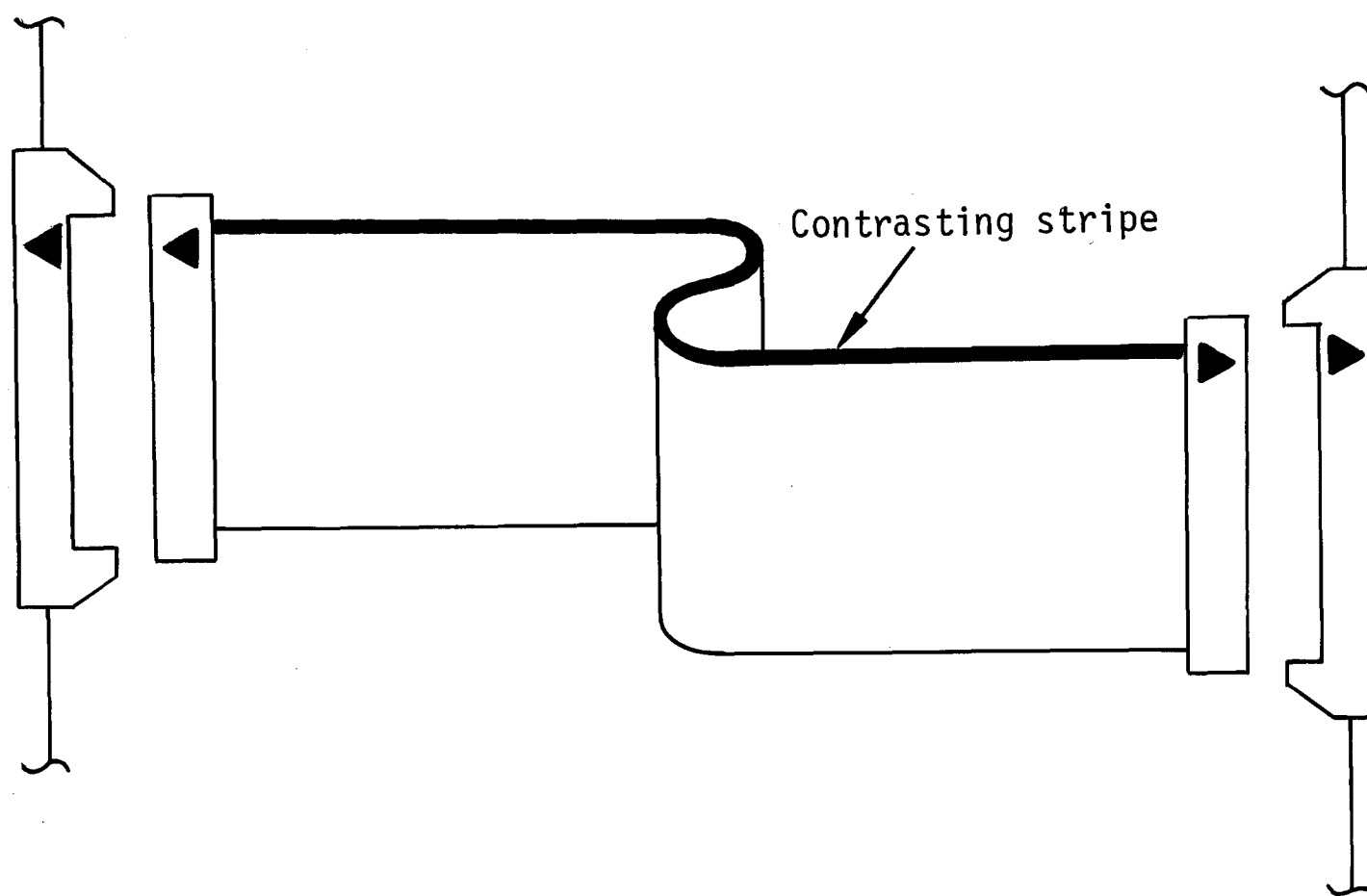


Figure 2-11. Cable to Connector Orientation

### 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 not 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  $\pm 0.5$  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)

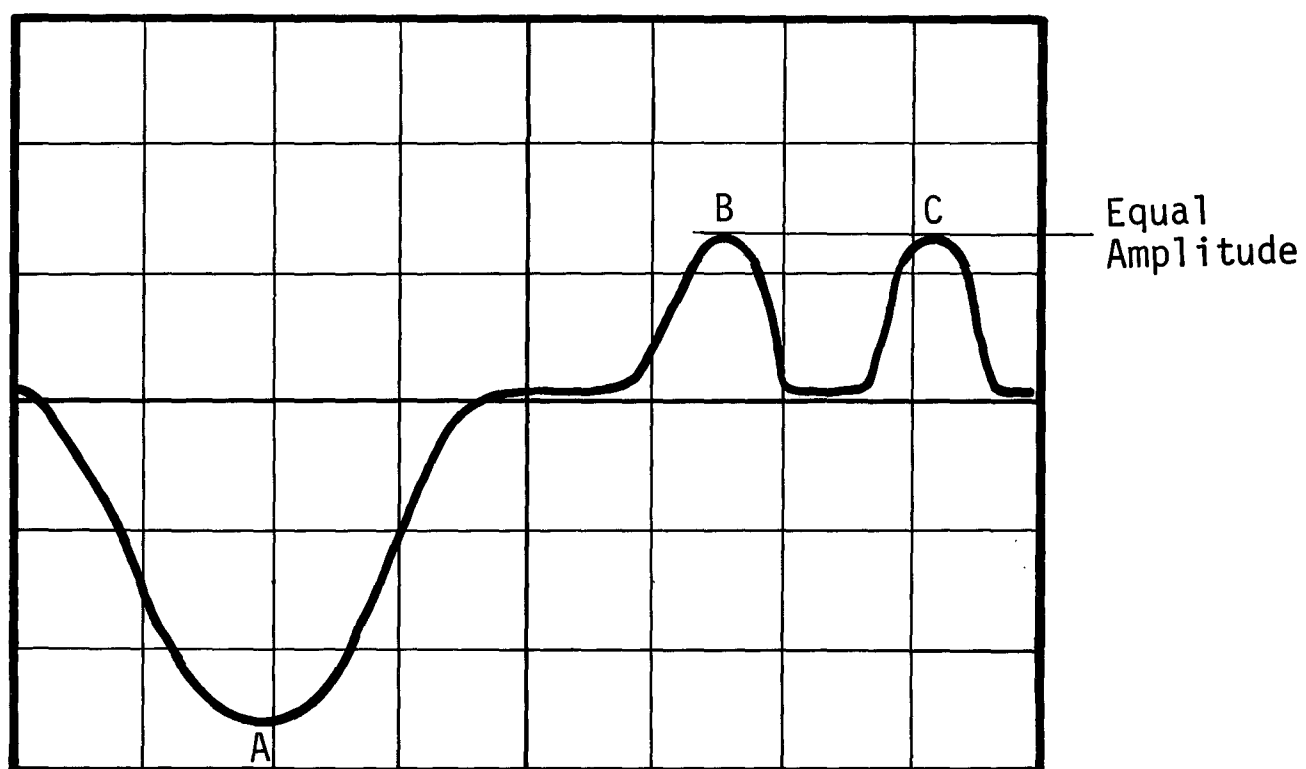


Figure 2-12. Track Following Adjustment Waveform

### 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 (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

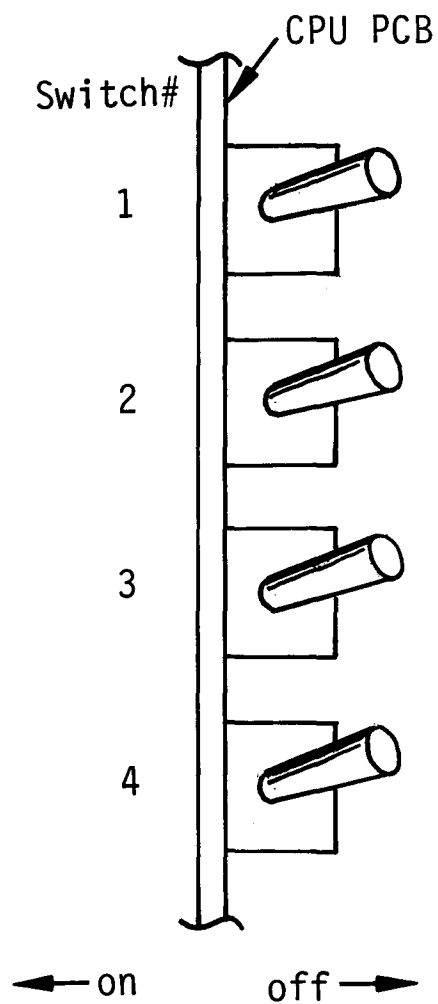
7. For System 200 without lister-compiler (32K memory) enter and run the Cylinder 000 to 105 Seek (machine level) program as follows. For systems with lister-compiler skip Step 7 and go to Step 8.
  - a. On terminal 0, set VDT mode switch (rear panel) to half (H) duplex.
  - b. Set CPU PCB sense switches 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).

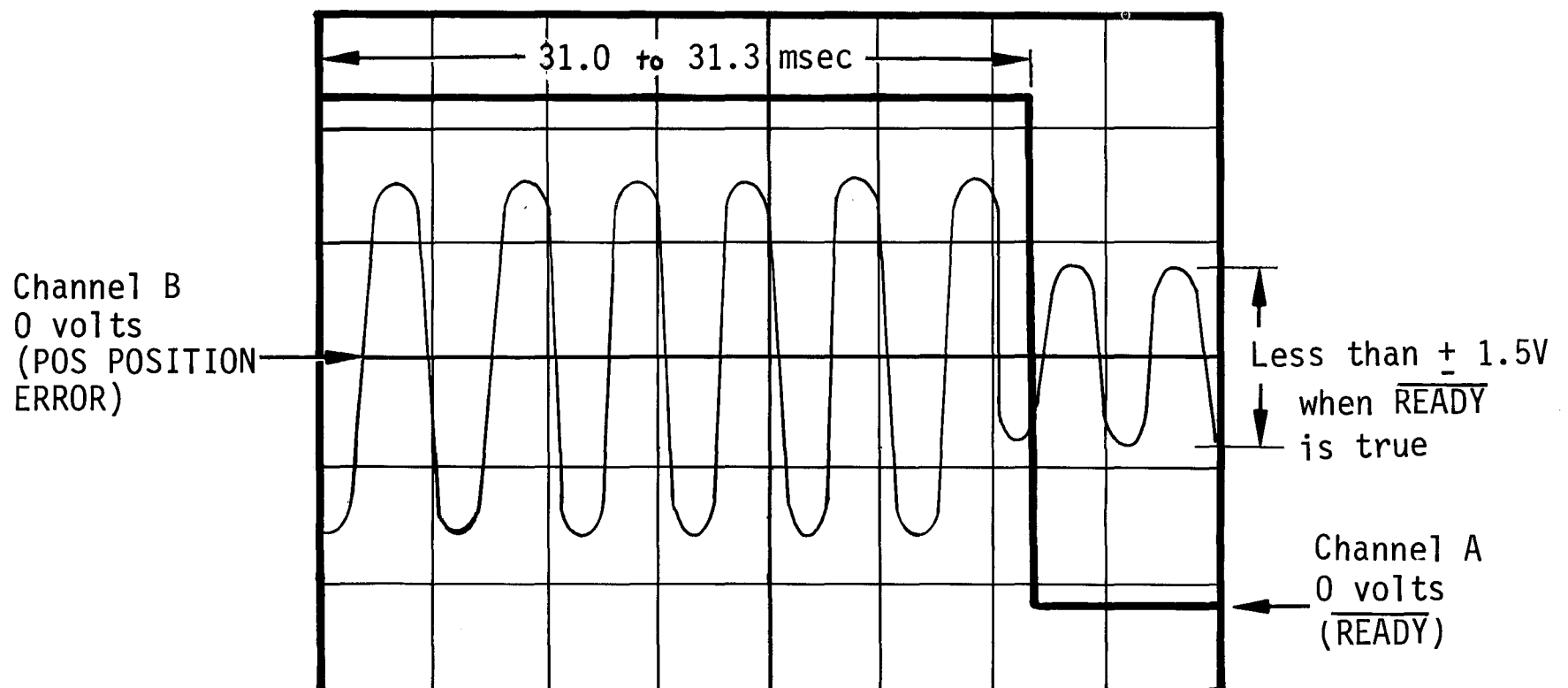


Figure 2-14. Tach Gain Adjustment Waveform

#### 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.

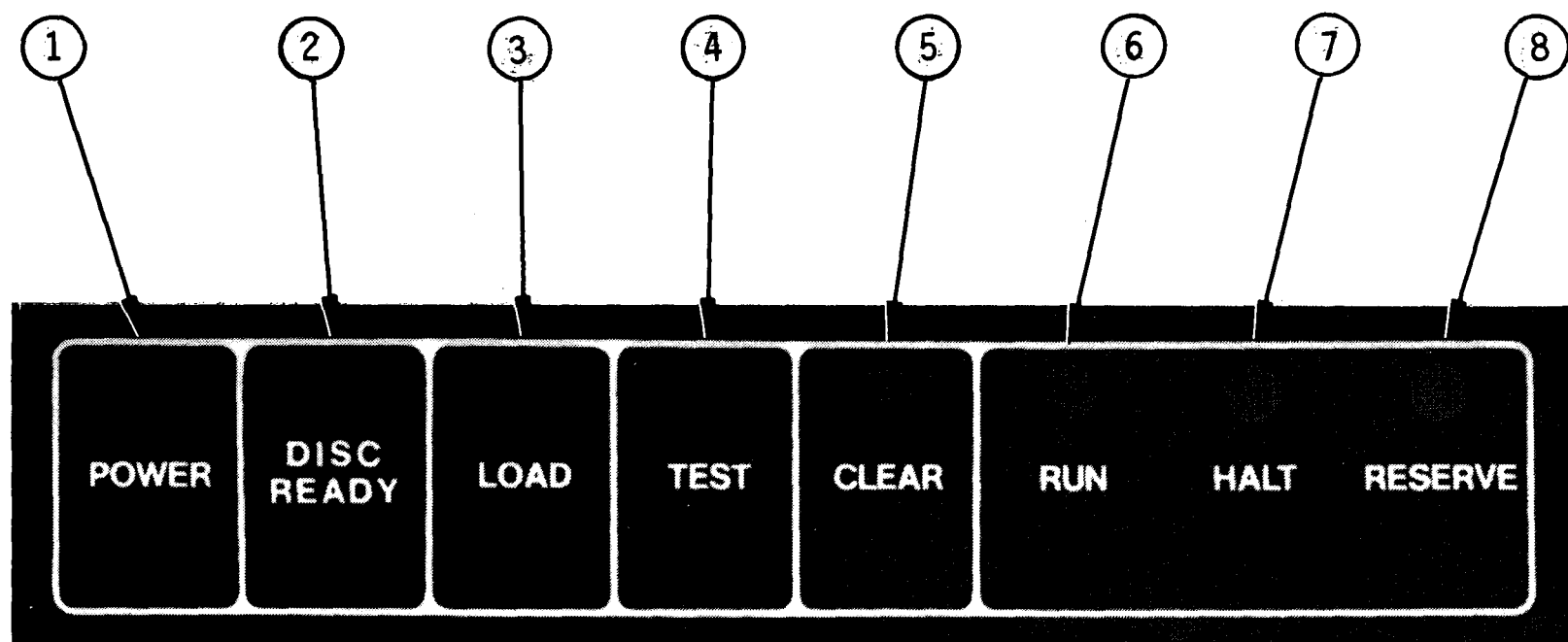


Figure 2-15. Processor Front Panel Switches/Indicators

## 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.

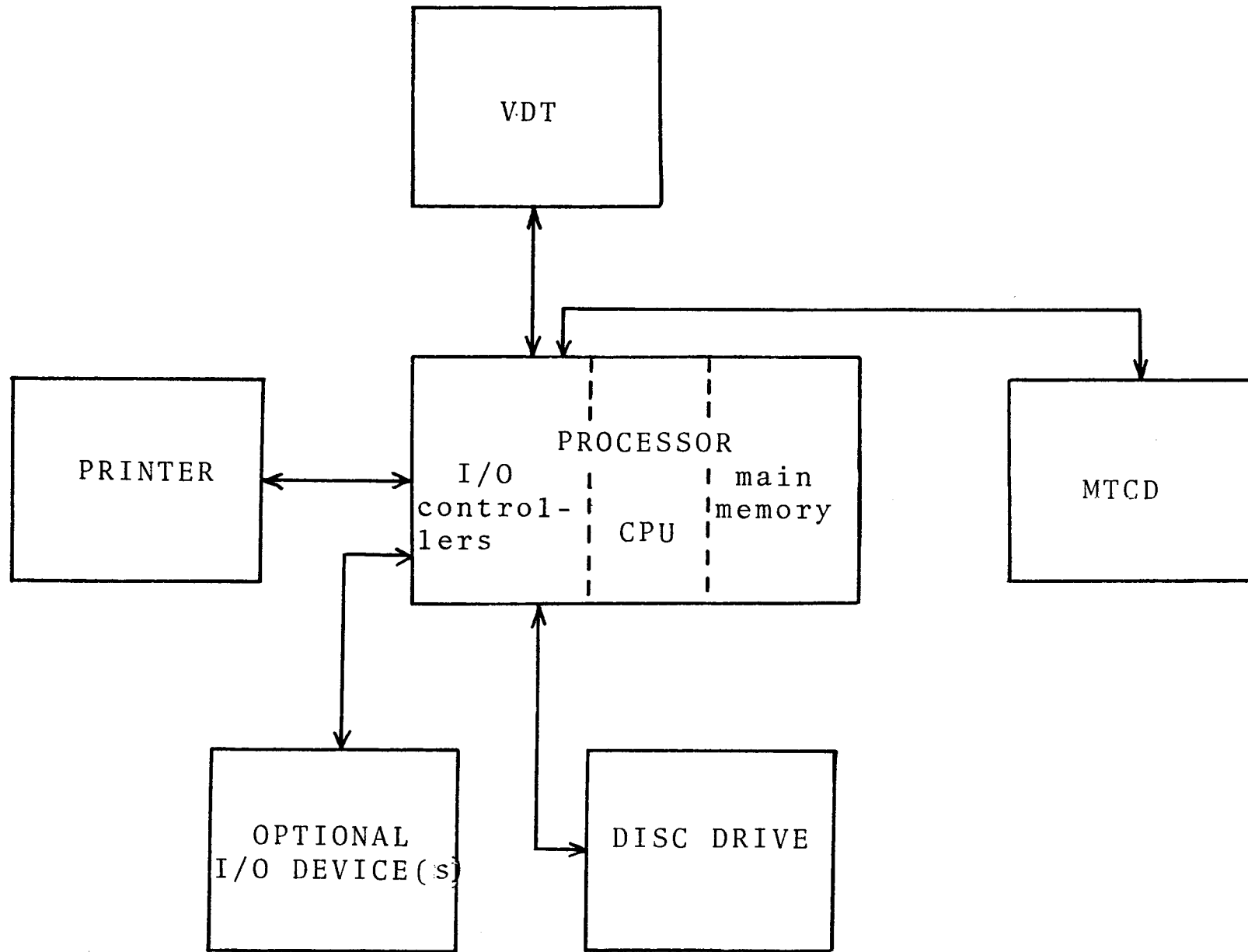


Figure 3-1. System 200/410 Functional Block Diagram



### 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 (MTCDD) provides a large off-line storage area for programs and data (see Figure 3-1). The main function of the MTCDD 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.

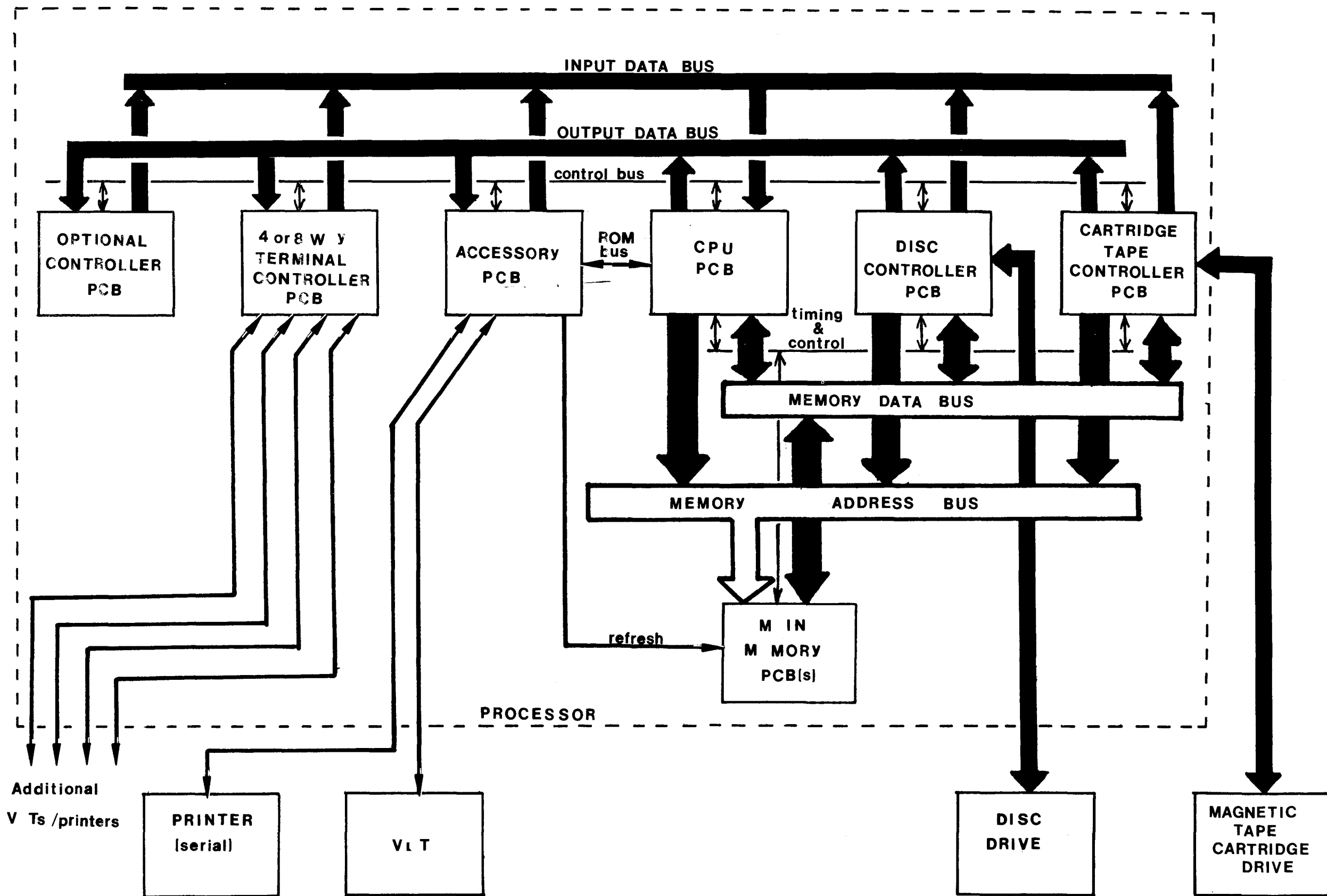


Figure 3-2. Processor Functional Block Diagram

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 Magnetic 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.

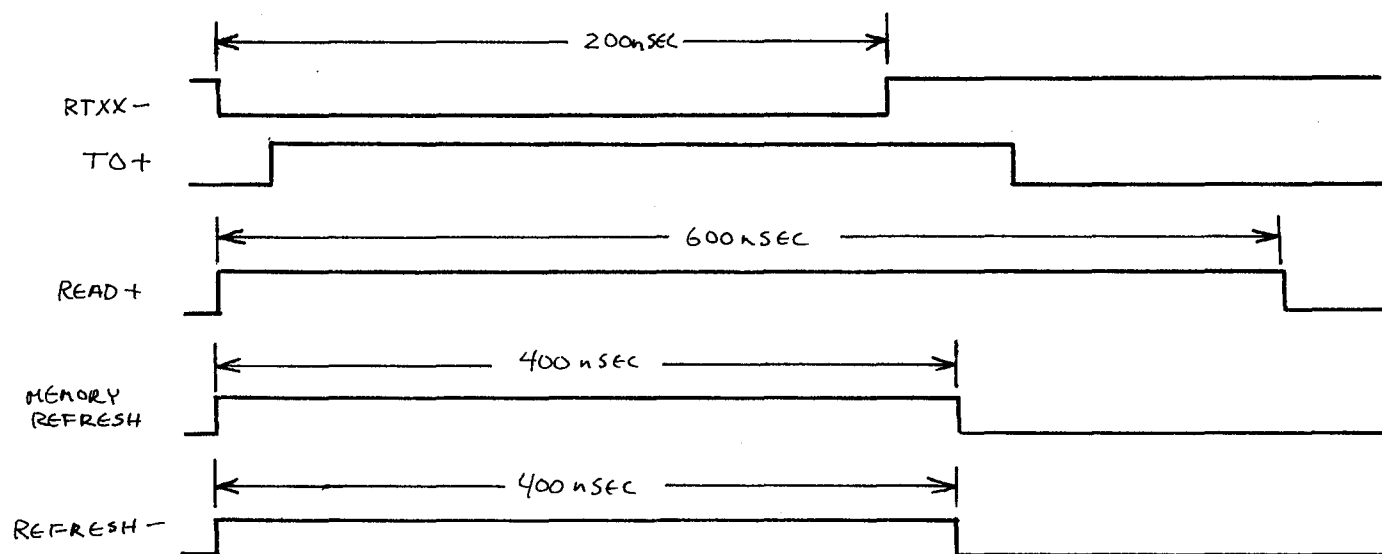
The CPU used in the System 200/410 is "micro-programmed". The main difference between the micro-programmed CPU and the more standard "fixed-instruction" CPU is in the control unit. The control unit is the part of the CPU that enables the various control signals to sequence the CPU hardware to perform a given program instruction. In the micro-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.



NOTE: TIMES INDICATED ARE MINIMUM FOR CORRECT OPERATION

Figure 3-3. Memory Refresh Cycle Timing Diagram

Main Memory is connected to the CPU, Disc Controller, and MTCB 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.

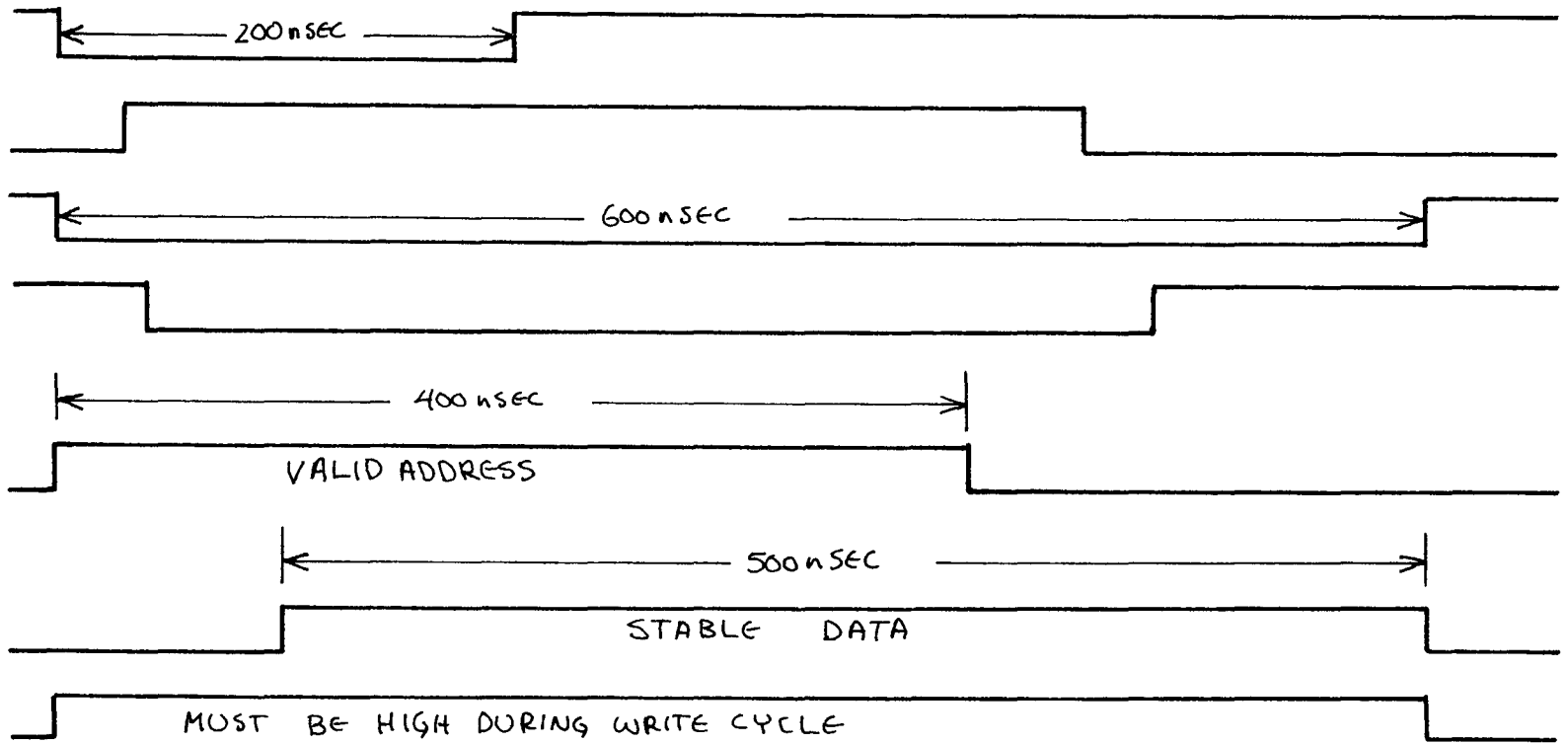
The Main Memory consists of two (2) PCBs. Each PCB stores either 8k, 16k, 32k, or 64k words (or bytes). The minimum memory requirement for the System 200 is 32k; System 410 is 40k. Maximum Main Memory size is therefore, 96k. The function of the address bits for a 64k main memory (2 - 32k modules) is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

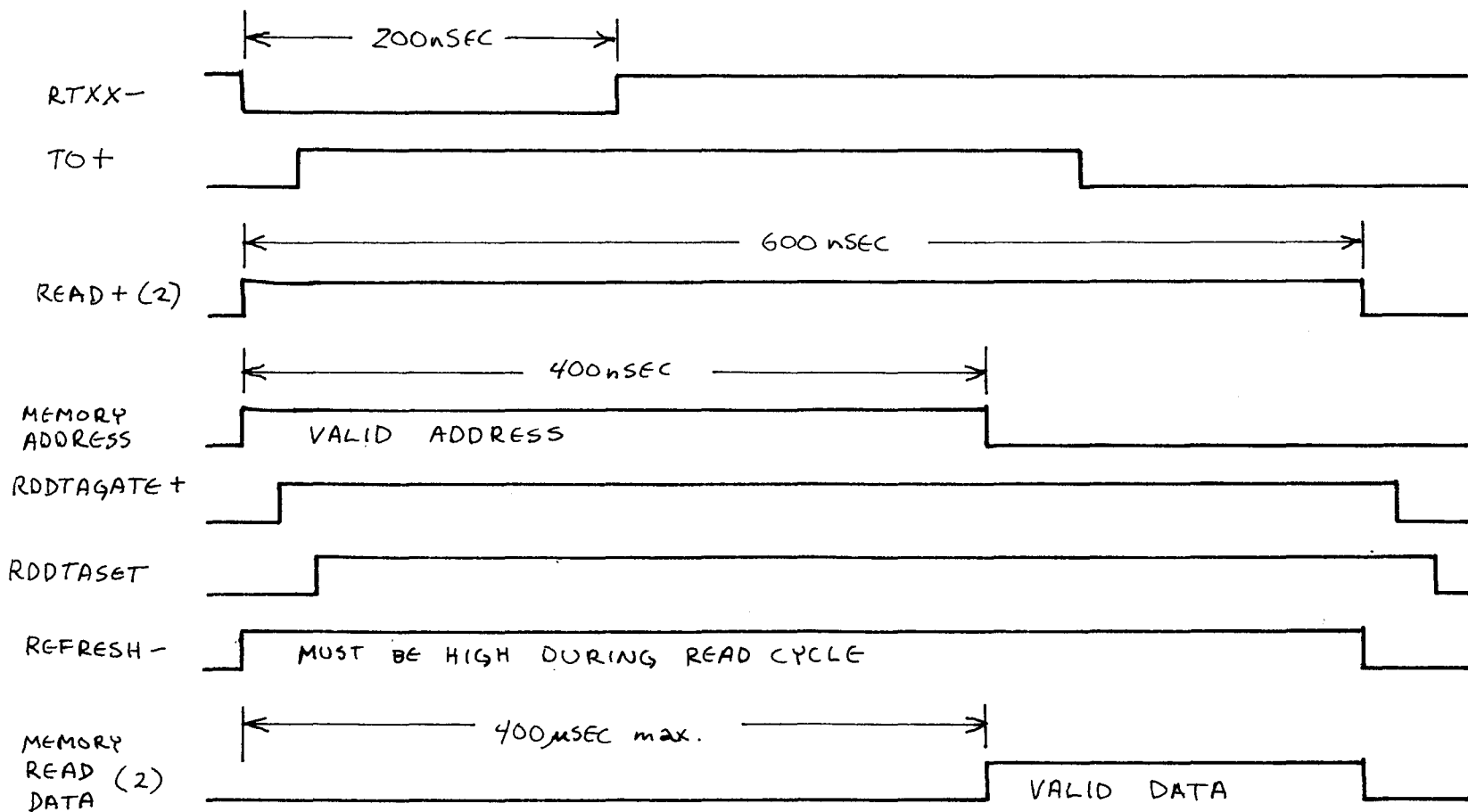
Address Bit	Function	
MA0	Chip Row Select	Select Memory Location Within Chip (4096 Locations)
MA1		
MA2		
MA3		
MA4		
MA5		
MA6	Chip Column Select	
MA7		
MA8		
MA9		
MA10		
MA11		
MA12	Select Bank of 9 Chips (8 Banks)	
MA13		
MA14		
MA15	Select Memory Module (2 Modules)	
MA16	Not Used	
MA17		

\*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 (MTCDD) (see Figure 3-2). The MTCDD 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.

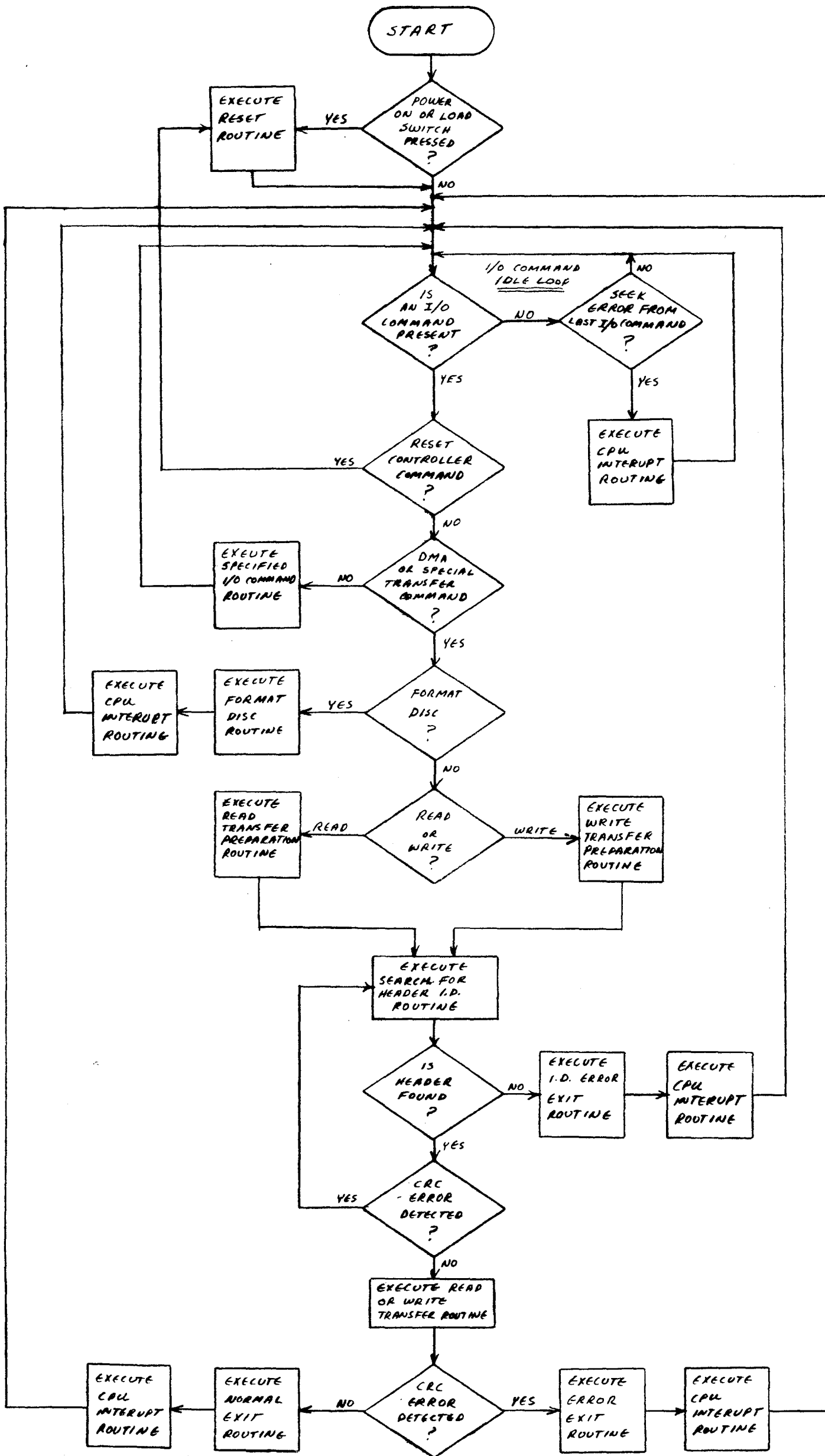
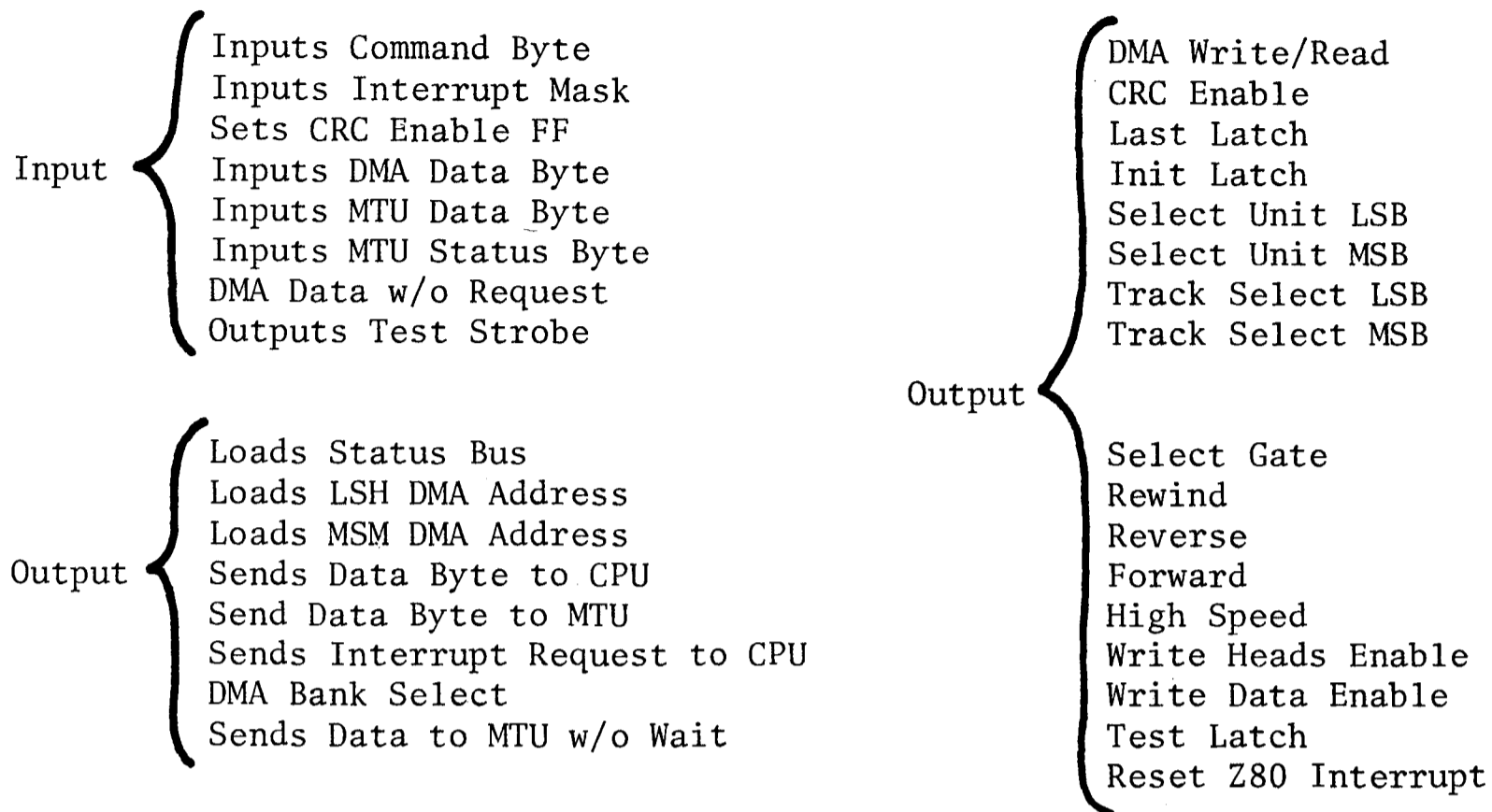


Figure 3-6. Simplified Firmware Flowchart, Disc Drive Controller

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



The MTC D 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.

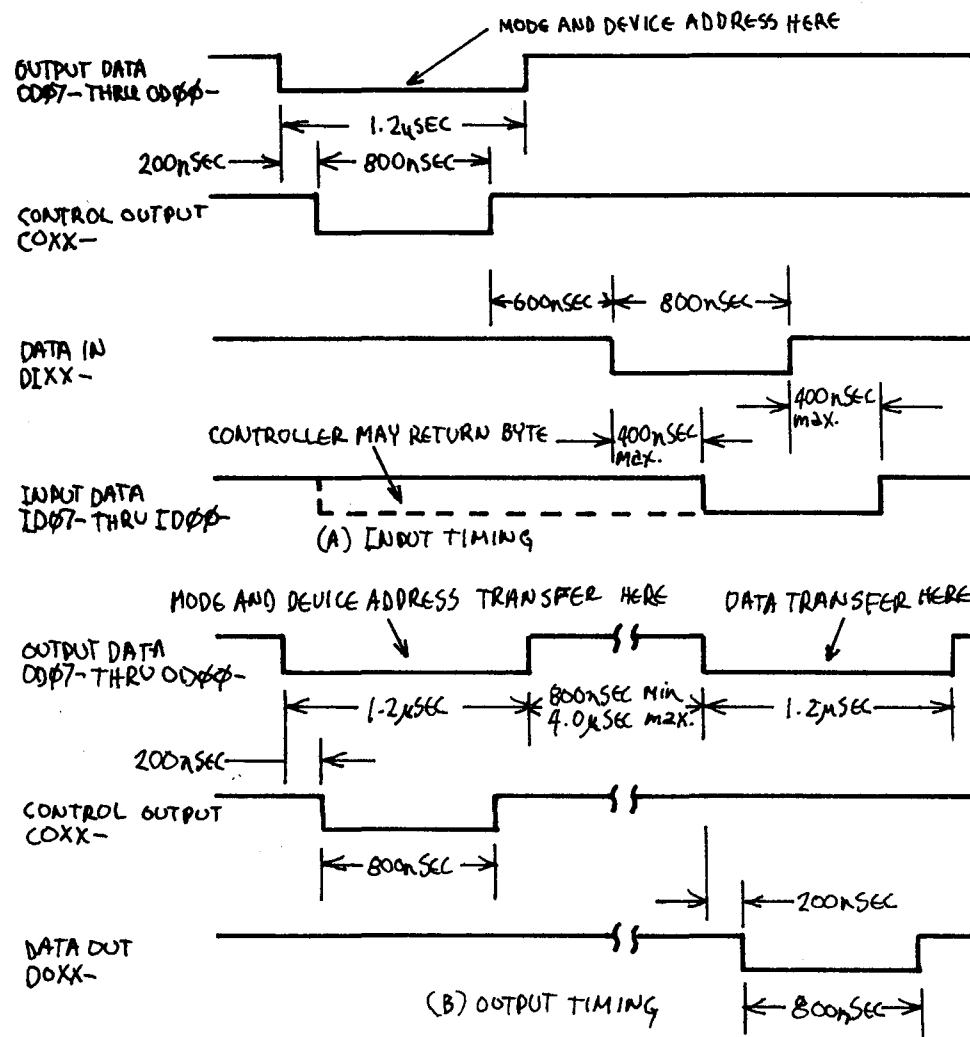


Figure 3-7. I/O Character Data Transfer Timing Diagram

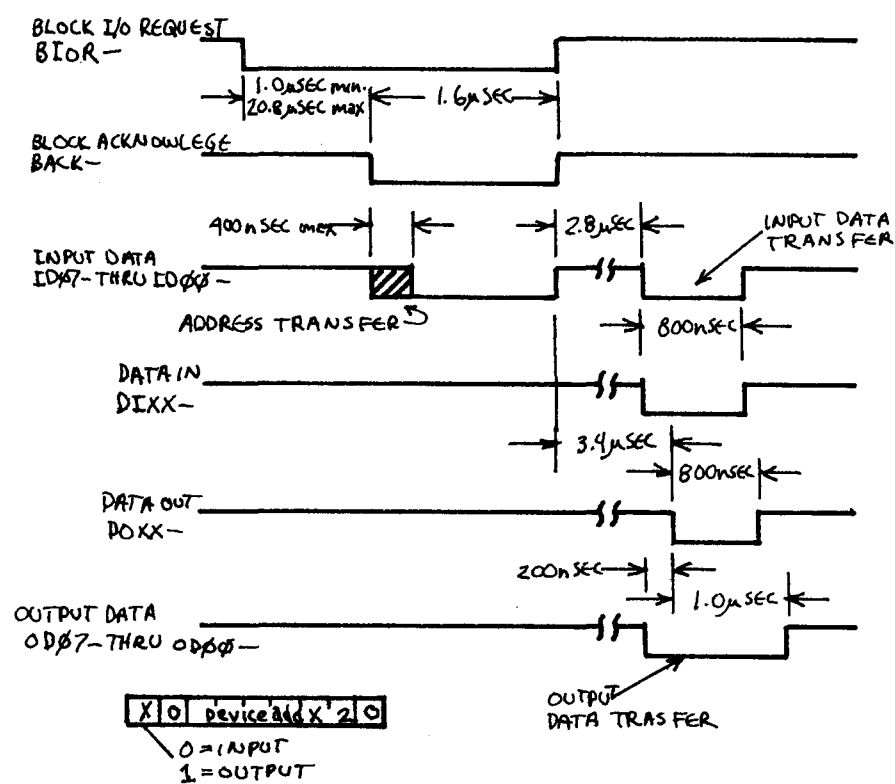


Figure 3-8. Block-of-Character I/O Timing Diagram

### 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.

BASIC INSTRUCTION

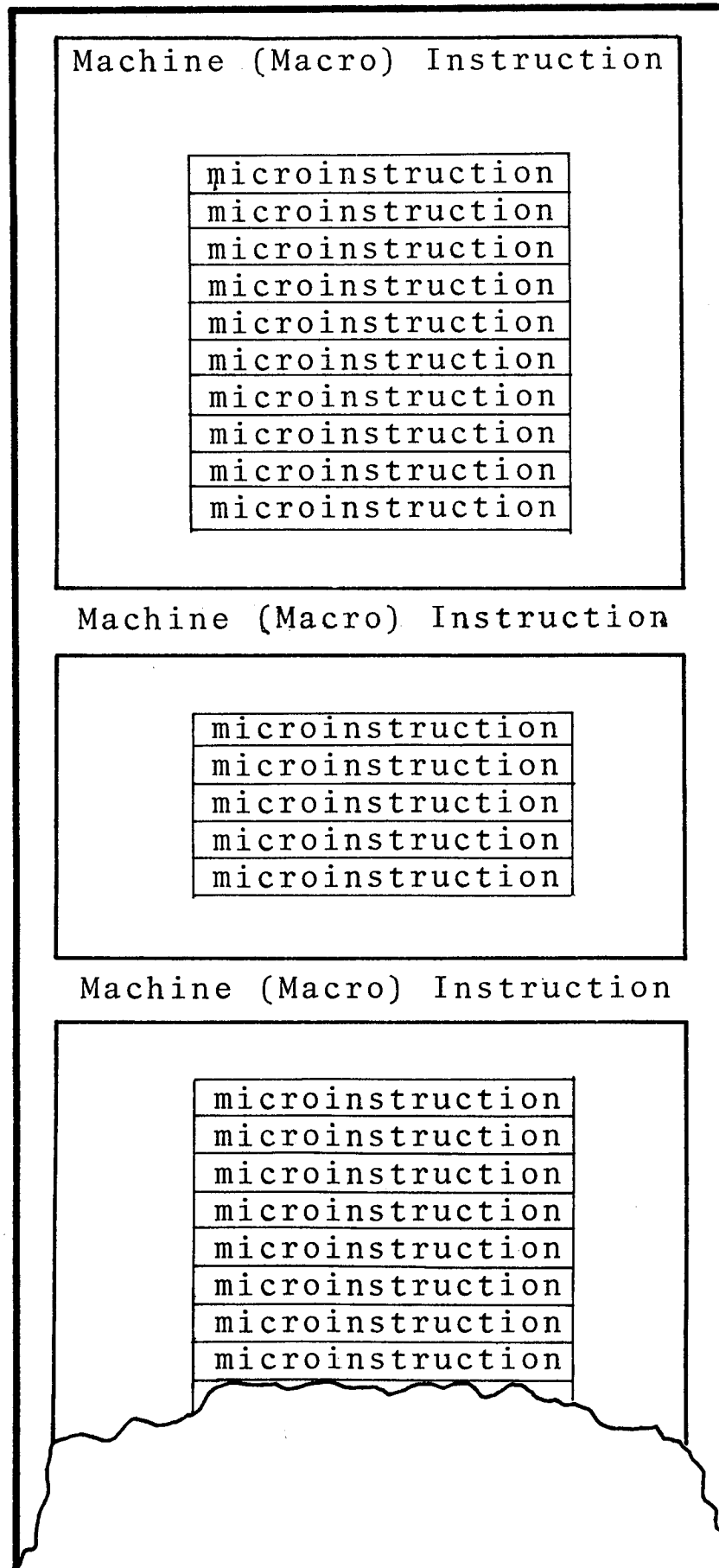


Figure 3-9. Software Language Relationship



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 MAINTENANCE 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
MTC D	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:  
  
02000487FFBFEF4F48390097D000491AFD1FF500
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 successfully.

##### 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 Verification 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.

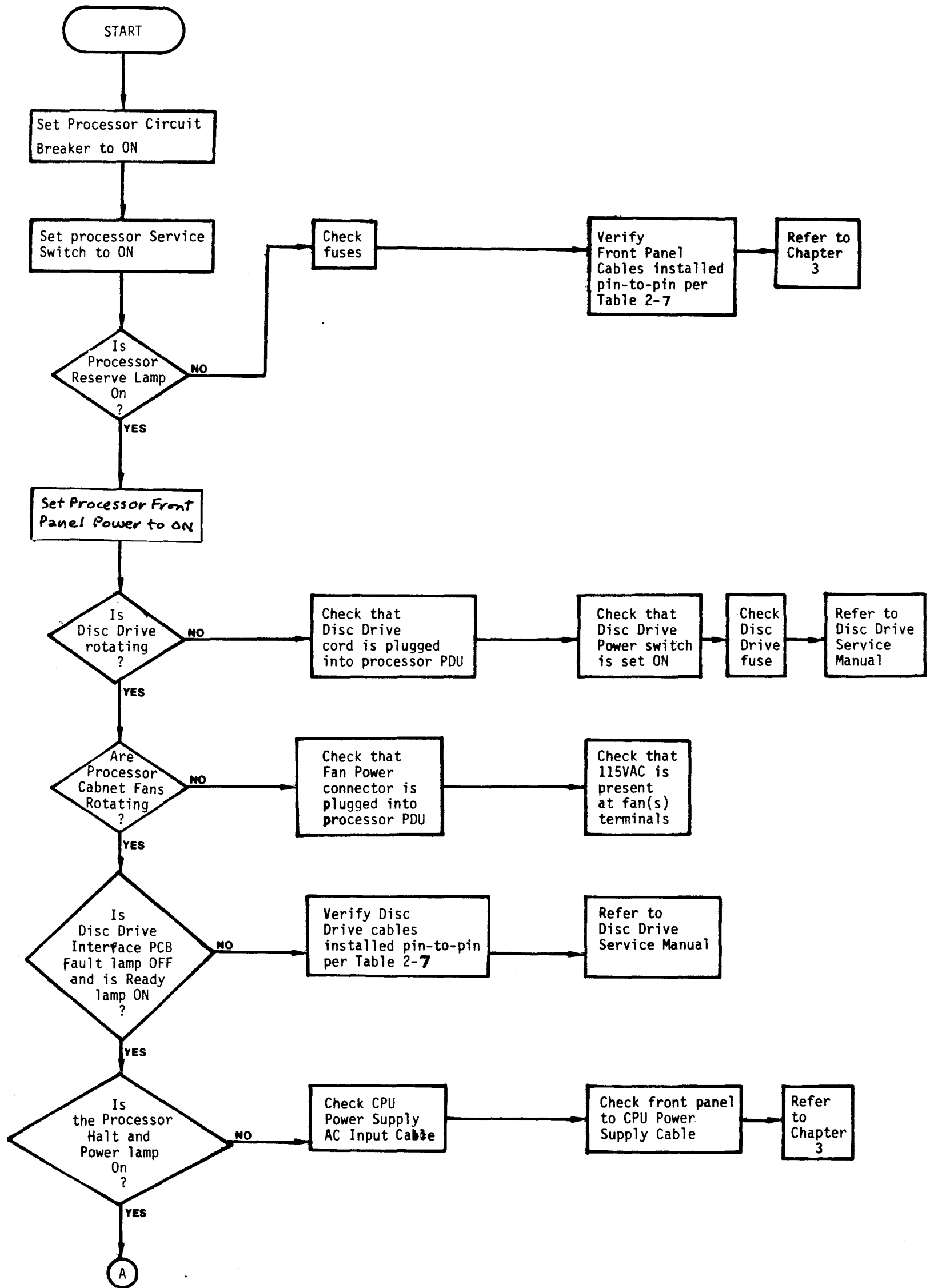
Tape Cartridge diagnostics % M11 and % M12 are selected as follows:

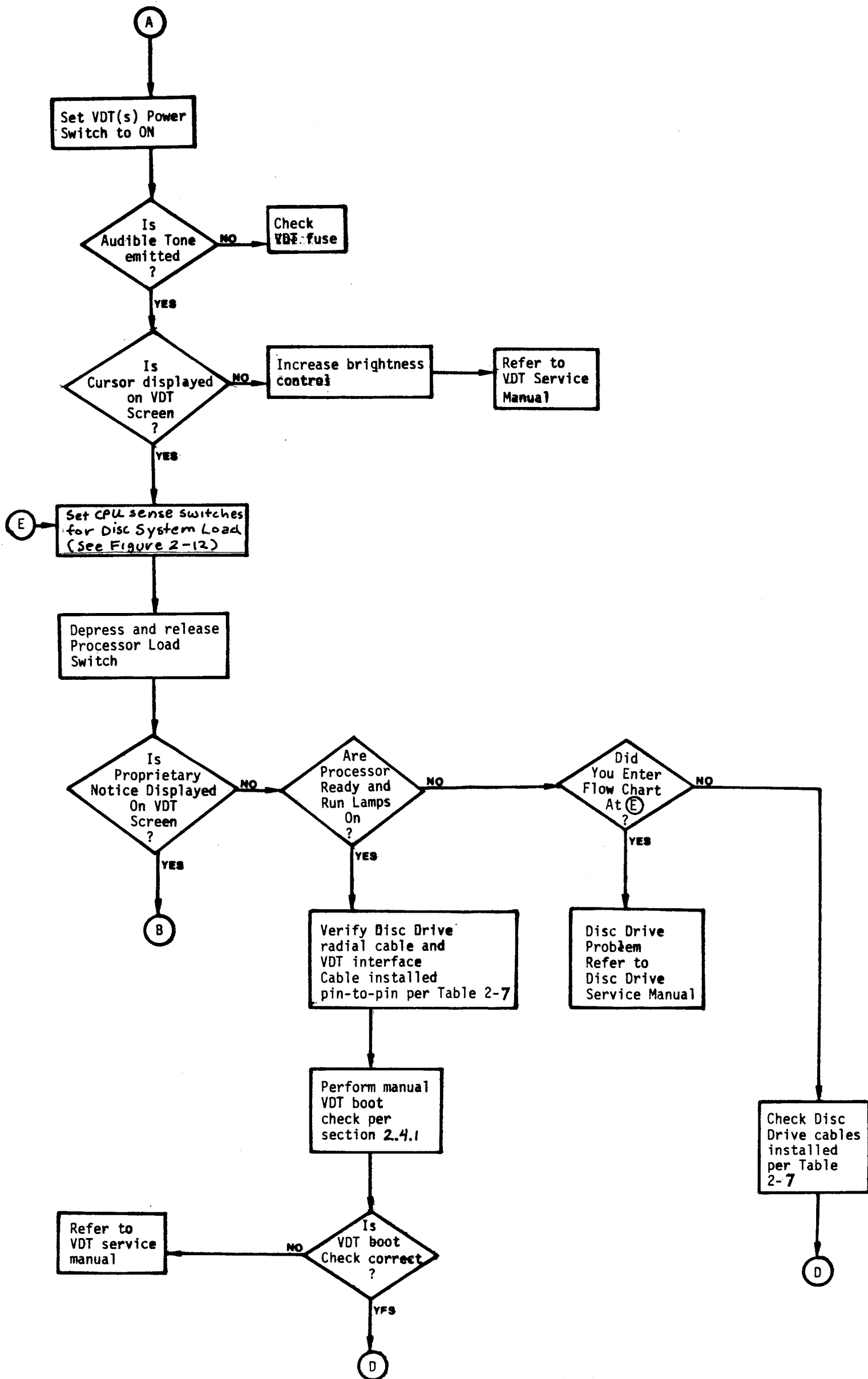
1. Set CPU sense switches for Fixed Media Disc Alternate Load (see Figure 2-12).
2. Insert scratch tape media into tape drive.
3. Press and release Processor LOAD switch.
4. The VDT will display "MAKE ENTRY TO OVERRIDE DEFAULT", within 10 seconds press the VDT space bar.
5. Type "BB11TC" followed by "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.

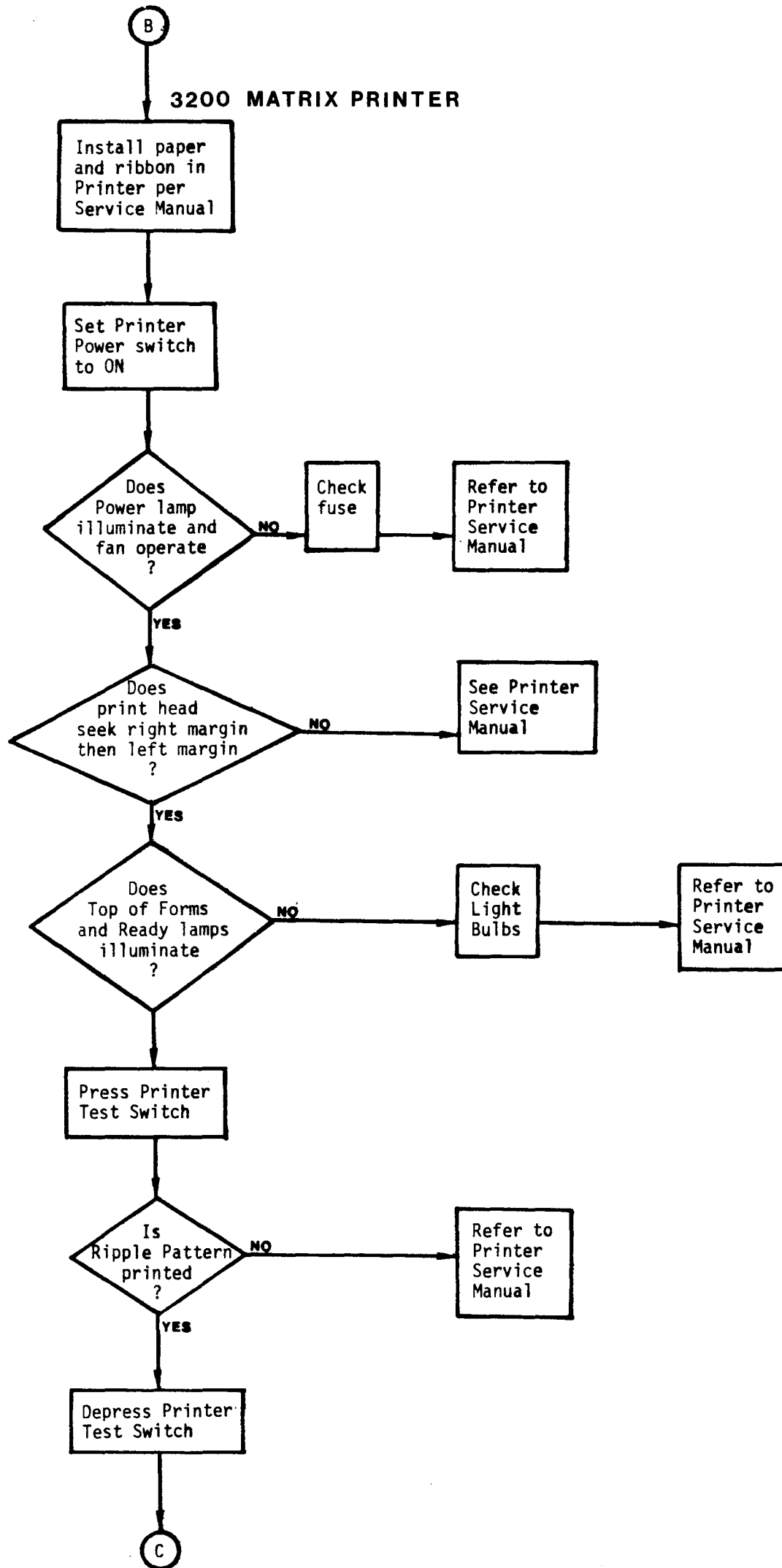
#### 4.2.3.4 System Power-Up Check

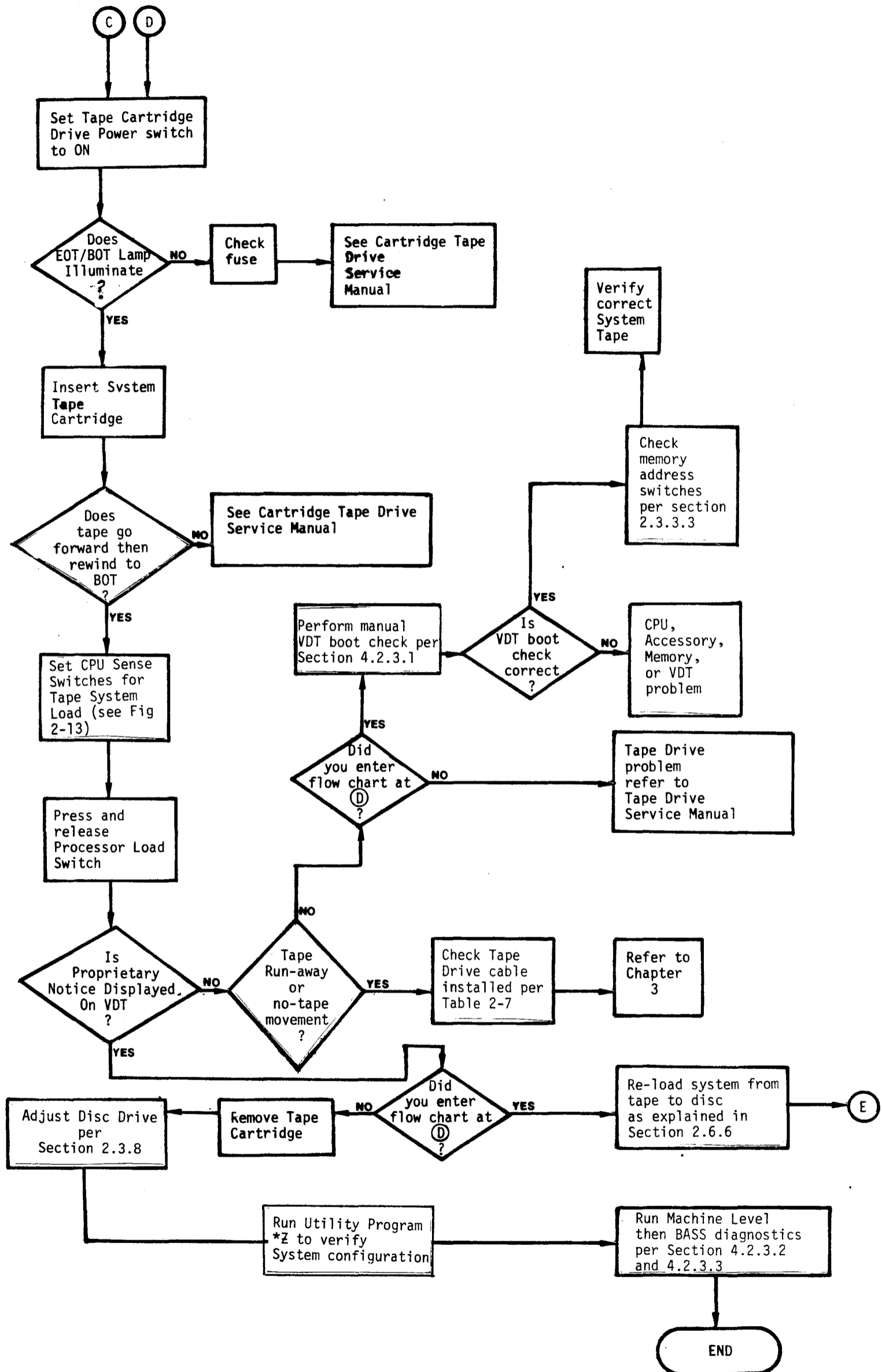
The following flowchart presents a logical approach to verifying that the system is operating properly and identifying common equipment problems.











## 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		1345/410	
				115/60	220/50	115/60	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)

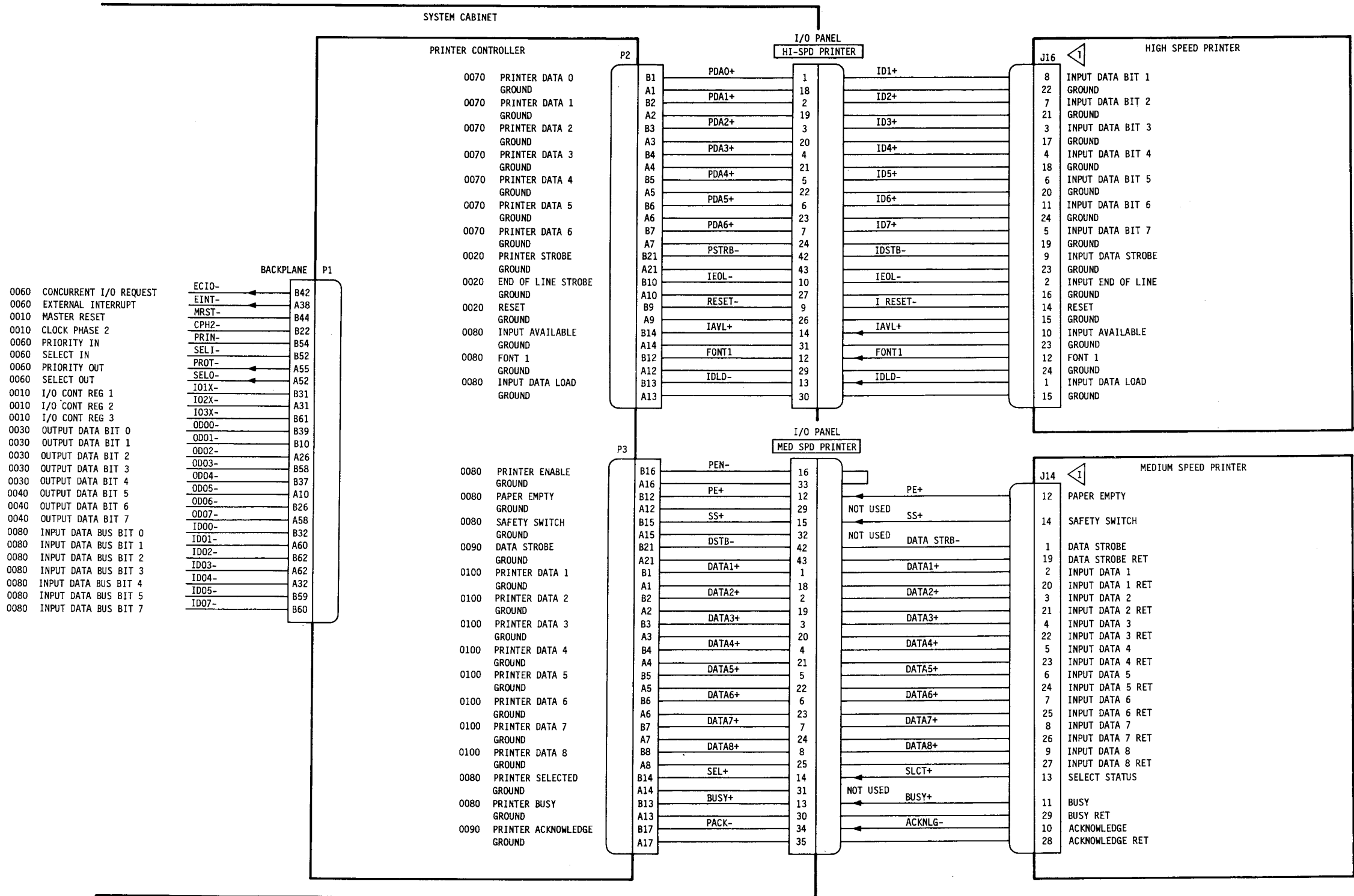
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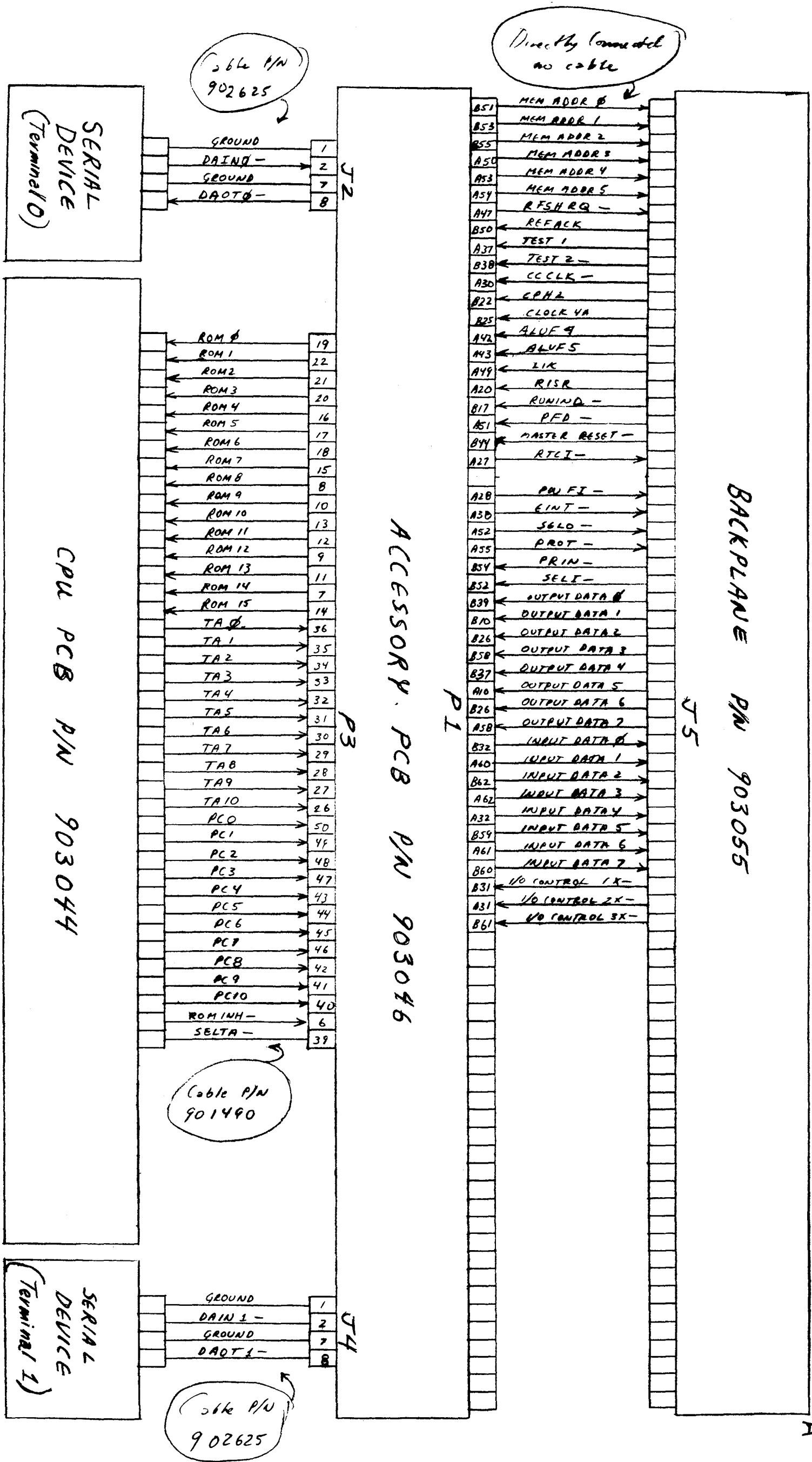
## CHAPTER 6

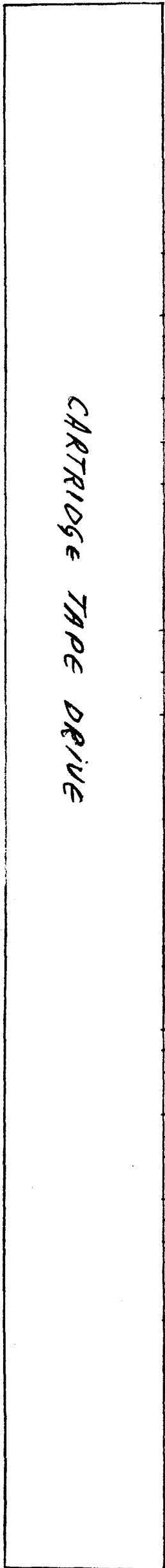
### REFERENCE DATA

Title	Drawing Number	Page Number
INTERCONNECT DIAGRAMS		
Central Processing Unit PCB (903044)	-----	2
Accessory PCB (903046)	-----	3
Fixed Disc Controller PCB (903028)	-----	4
Cartridge Tape Controller PCB (903030)	-----	5
CPU Power Supply (903038)	-----	6
Parallel Printer Controller (901416)	-----	7
SCHEMATIC DIAGRAMS		
1300 CPU PCB, Top View	903044	8-12
1300 CPU PCB, Schematic	903045	9-42
Accessory PCB, Top View	903046	43
Accessory PCB, Schematic	901434	44-65
16/32K Memory PCB, Top View	903020	66-77
16/32K Memory PCB, Schematic	903021	67-77
Fixed Disc Controller PCB, Top View	903028	78
Fixed Disc Controller PCB, Schematic	903029	79-90
Cartridge Tape Controller PCB, Top View	903030	91
Cartridge Tape Controller PCB, Schematic	903031	92-105
CPU Power Supply, Top View	903038	106
CPU Power Supply, Schematic	903039	107
Memory Power Supply PCB, Top View	903034	108
Memory Power Supply PCB, Schematic	903035	109,110
PDU, Processor, Top View (Rev B, A, AX5)	902670	111,113,115
PDU, Processor, Schematic (Rev B, A, AX5)	902670	112,114,116



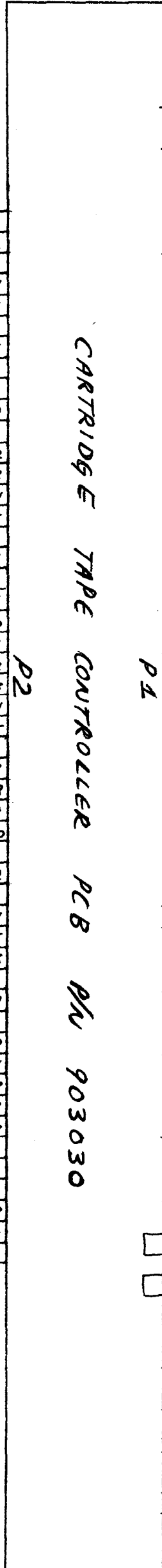
NOTE: A SEPARATE CONTROLLER IS REQUIRED FOR EACH PRINTER ALTHOUGH THE CONTROLLERS ARE IDENTICAL.





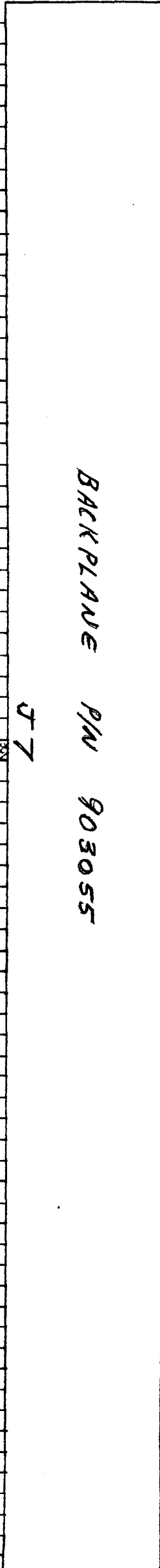
Cable P/N  
902960000

GROUND	1
SELECTED -	2
GROUND	3
READY -	4
GROUND	5
WRITE ENABLE -	6
GROUND	7
FLAG -	8
GROUND	9
LOAD POINT SENSED -	10
GROUND	11
FILE UNPROTECTED -	12
GROUND	13
BUSY -	14
GROUND	15
EARLY WARNING SENSED -	16
GROUND	17
REWIND -	18
GROUND	19
REVERSE -	20
GROUND	21
FORWARD -	22
GROUND	23
HIGH SPEED -	24
GROUND	25
WRITE ENABLE -	26
GROUND	27
UNIT SELECT 1 -	28
GROUND	29
UNIT SELECT 2 -	30
GROUND	31
UNIT SELECT 4 -	32
GROUND	33
SELECT GATE -	34
GROUND	35
READ NRZ DATA -	36
GROUND	37
READ DATA STROBE -	38
GROUND	39
DATA DETECTED -	40
GROUND	41
WRITE DATA CABLED -	42
GROUND	43
WRITE NRZ DATA -	44
GROUND	45
TRACK SELECT 2 -	46
GROUND	47
WRITE DATA STROBE -	48
GROUND	49
TRACK SELECT 1 -	50



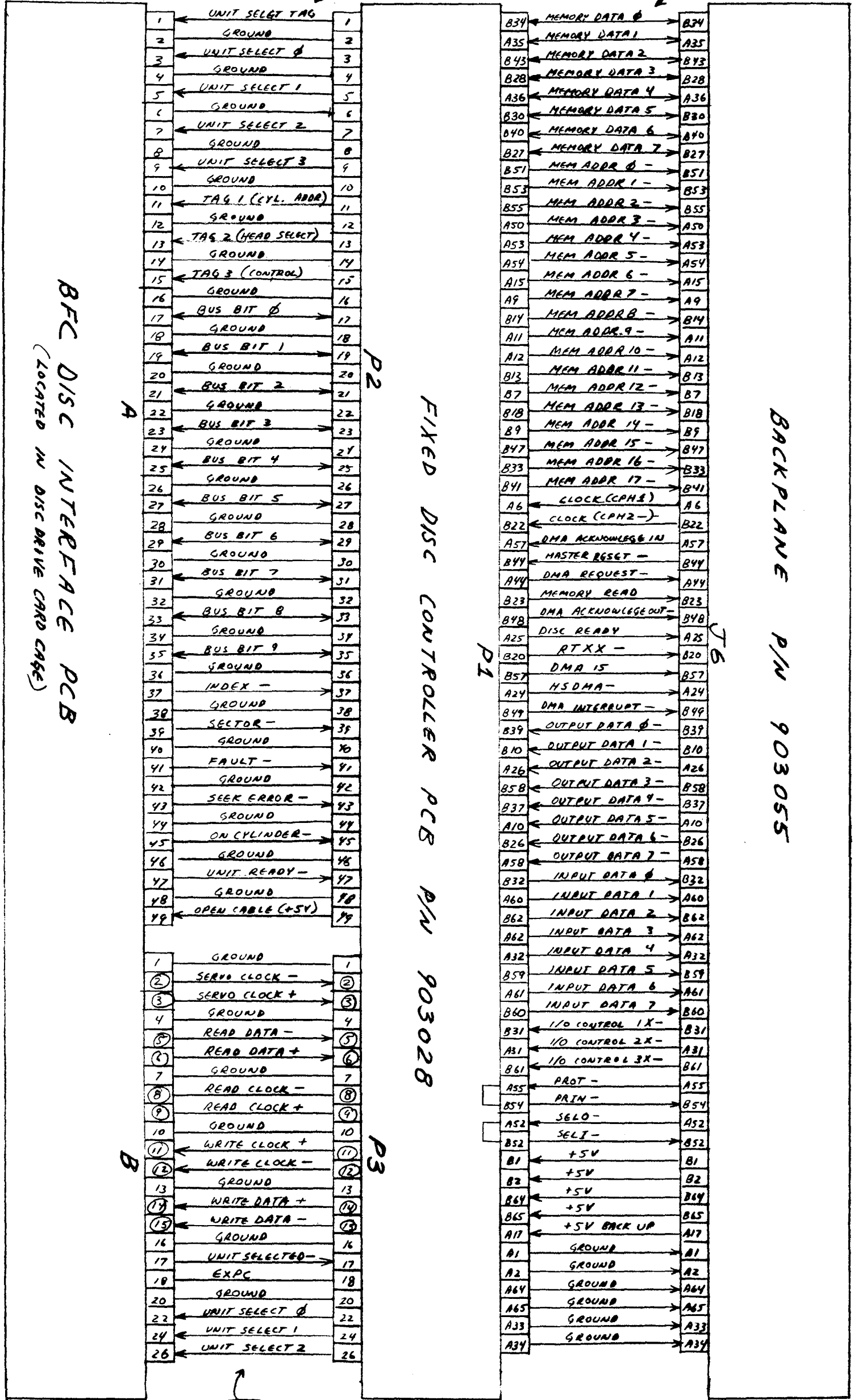
B34	MEMORY DATA 0
A35	MEMORY DATA 1
B43	MEMORY DATA 2
B28	MEMORY DATA 3
A36	MEMORY DATA 4
B30	MEMORY DATA 5
B40	MEMORY DATA 6
B27	MEMORY DATA 7
B51	MEM ADDR 0
B53	MEM ADDR 1
B55	MEM ADDR 2
A50	MEM ADDR 3
A53	MEM ADDR 4
A54	MEM ADDR 5
A15	MEM ADDR 6
A9	MEM ADDR 7
B14	MEM ADDR 8
A11	MEM ADDR 9
A12	MEM 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 (CPH 2)
B22	CLOCK (CPH 2 -)
B44	RESET -
A57	DMA ACKNOWLEDGE -
B20	RT.XX -
A34	DMA REQUEST -
B23	MEMORY READ
B48	TDMACK -
B57	DMA 15
A29	HS DMA -
A38	EINT -
B39	OUTPUT DATA 0 -
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 0
A60	INPUT DATA 1
B62	INPUT DATA 2
A62	INPUT DATA 3
A52	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	PRIM -
A52	SELO -
B52	SELI -
B1	+5V
B2	+5V
B64	+5V
B65	+5V
A1	GROUND
A2	GROUND
A64	GROUND
A65	GROUND

Directly Connected,  
no cable



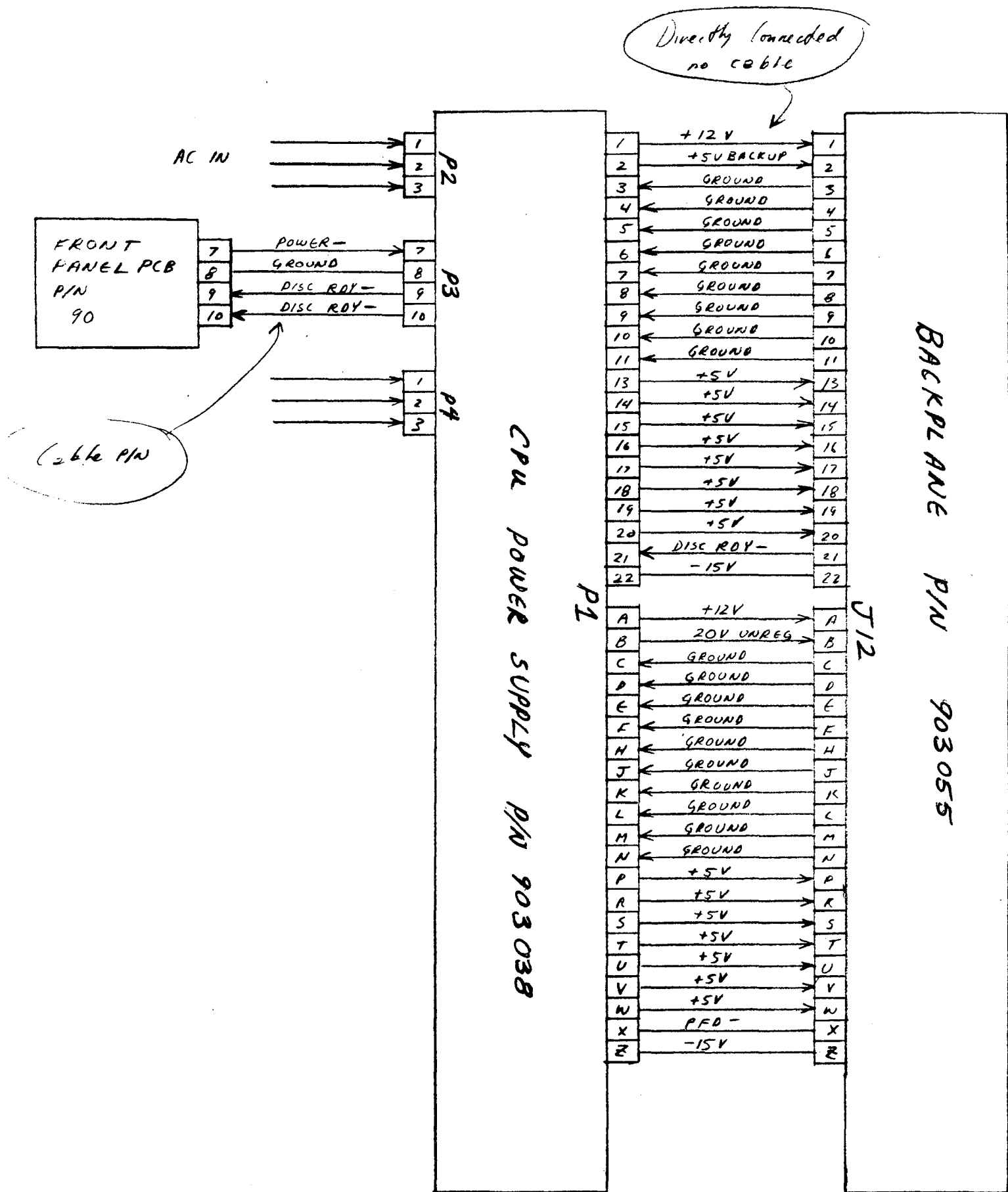
Command Bus  
Cable P/N 902687

Directly connected,  
no cable

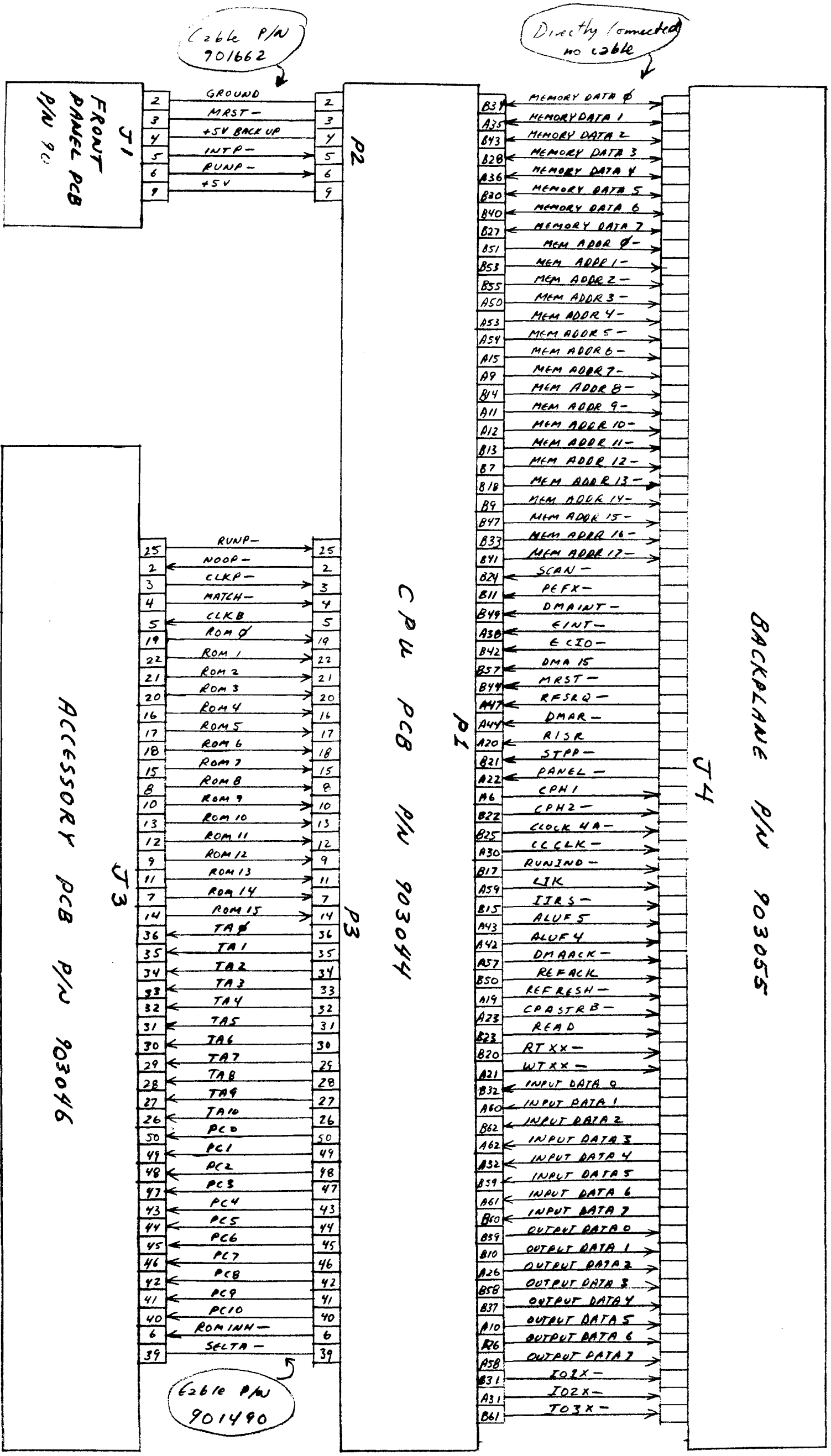


Radial Bus  
Cable P/N 902622

(X) - All signals are TTL  
except those circled  
which are differential  
signals.



DS

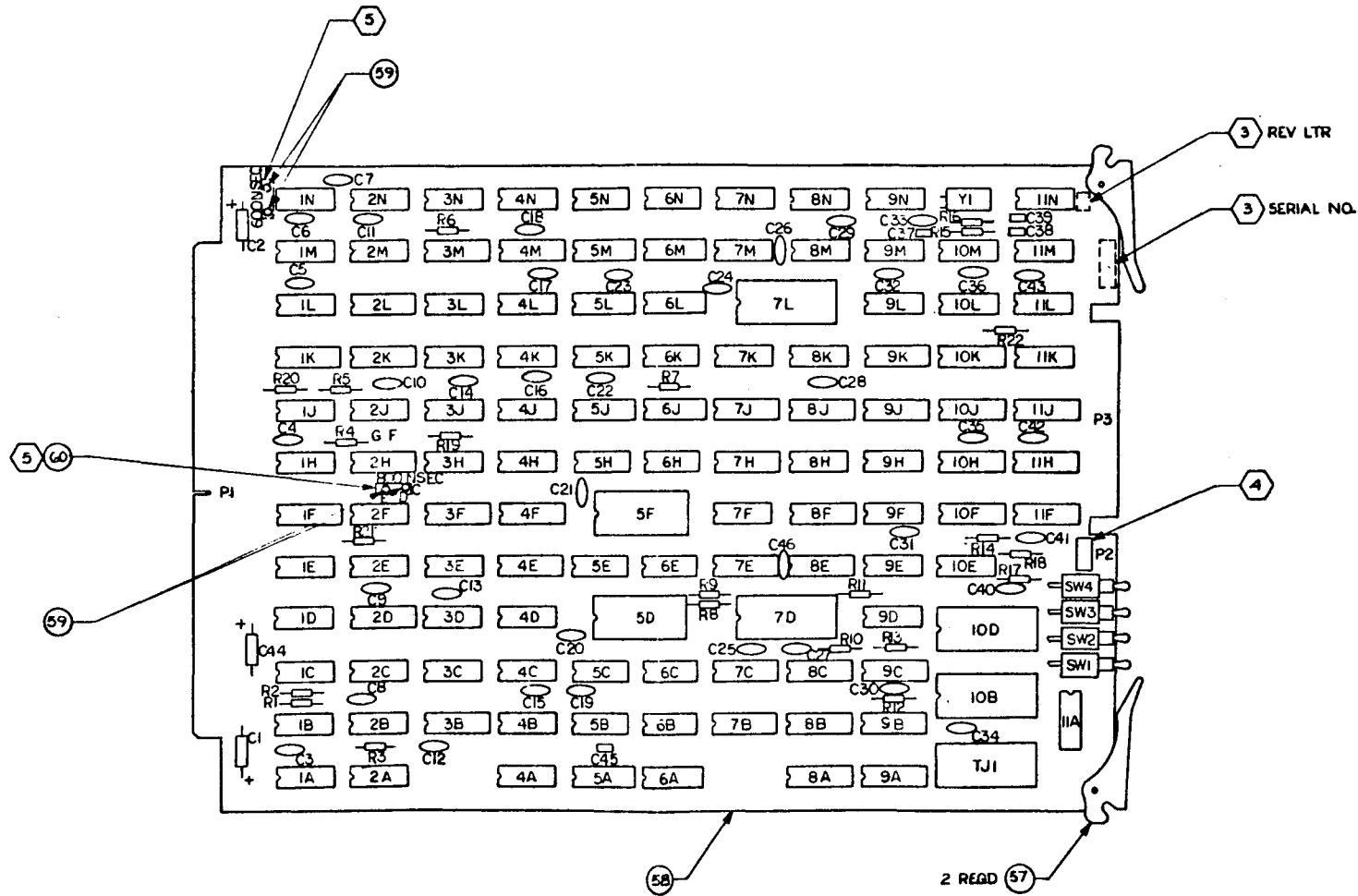


DS

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.

REV	DATE	DESCRIPTION	INITIALS	DATE
A	2/2/71	PRODUCTION RELEASE	WZ	2/2/71
A1	2/2/71	SEE ECN		
A2	2/1/71	REVISED ITEM 55 OF P/L ONLY		



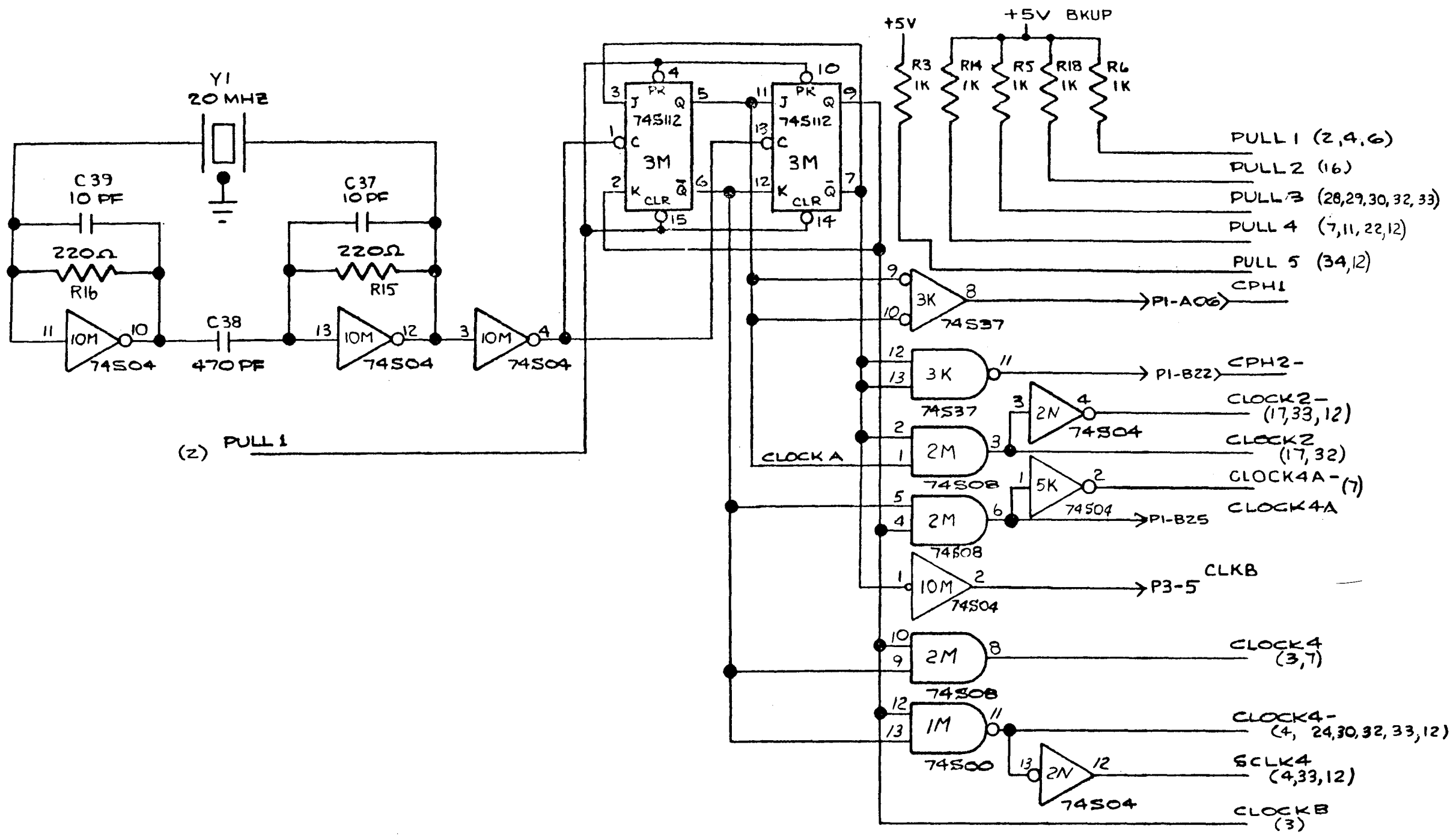
OUTSTANDING ECN'S  
3031  
3041

REWORK PER ECN 2364

RELEASED PRINT

902021		DIMENSIONS ARE IN INCHES		BASIC/FOUR CORPORATION	
902020		TOLERANCES UNLESS OTHERWISE SPECIFIED		1330 South Cloudway Street, Anaheim, California 92808	
901929		X 1.1		DRAWN	WZ
901928		XX 1.03		CHKD	WZ
901730		XXX 1.01		ENG	WZ
901729		ANGLES 1.0°		MFG	
901721		MACHINED SURFACES		APP	
901427		DO NOT SCALE DRAWING		TITLE PCB ASSY CPU 1300 SERIES	
NEXT ASSY	USED ON			REV A2	
				SCALE 2H 1 of 1	

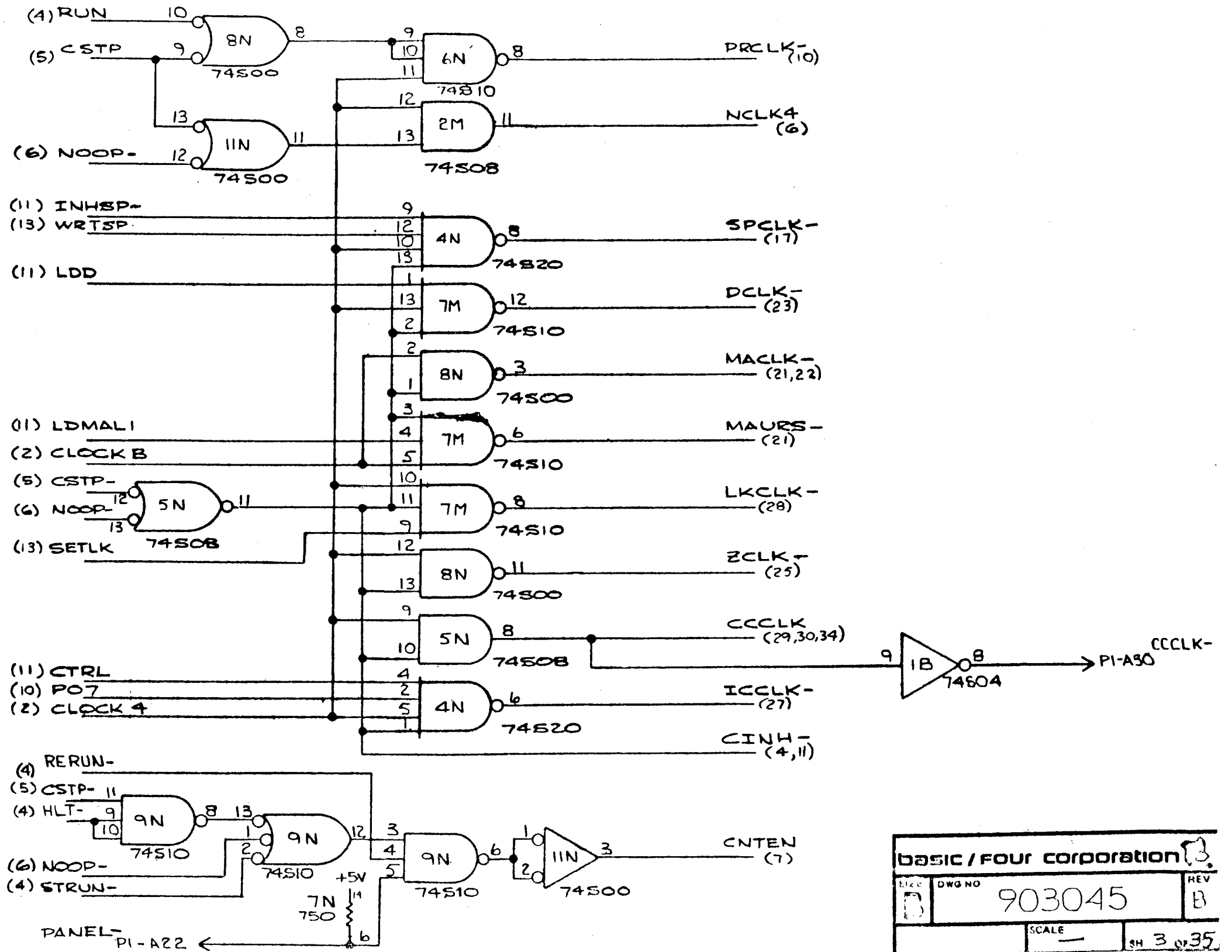




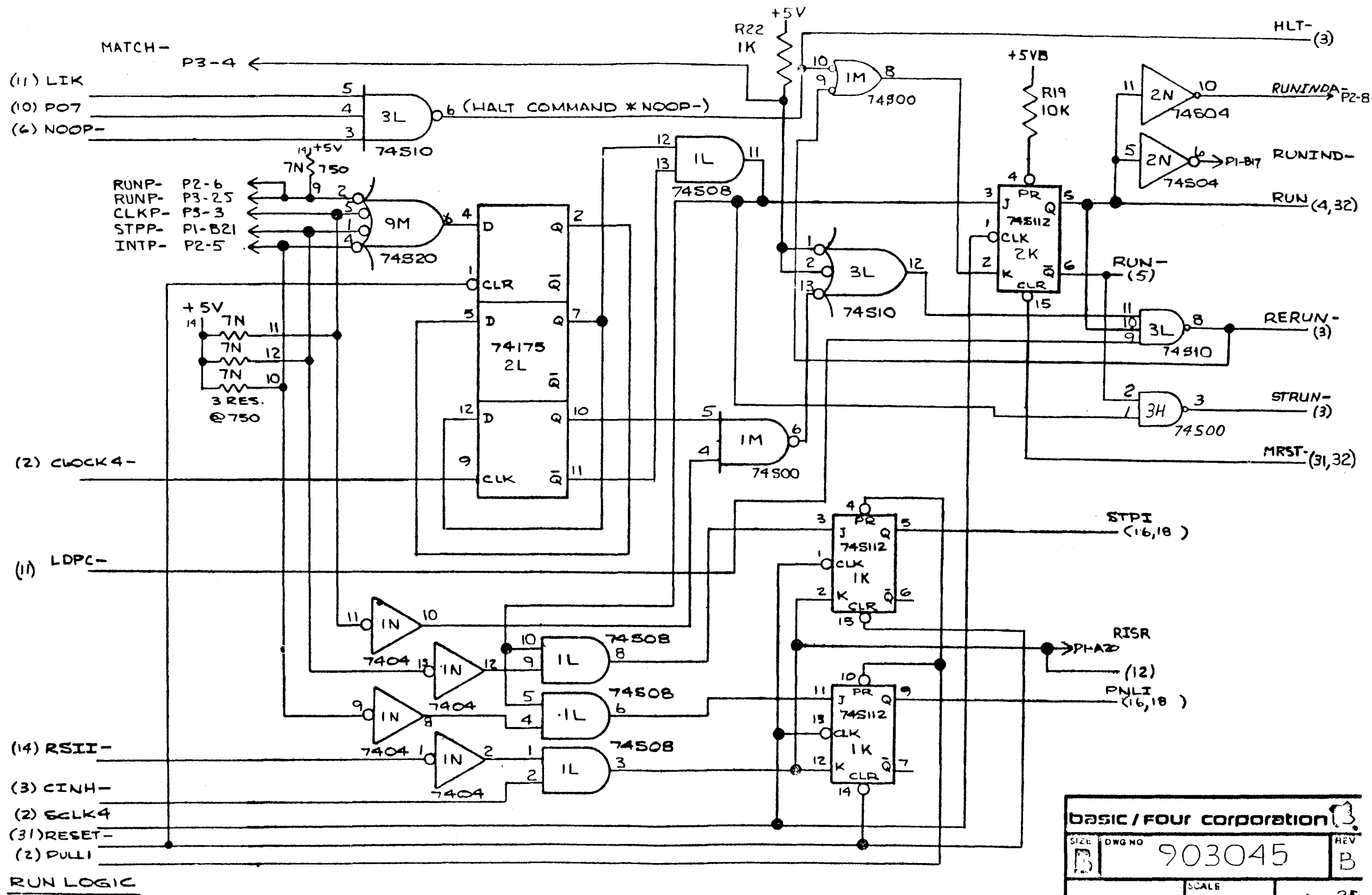
(2) PULL 1

BASIC / FOUR CORPORATION		
SIZE: <b>B</b>	DWG NO: 903045	REV: <b>B</b>
SCALE: —		SH 2 OF 3.5

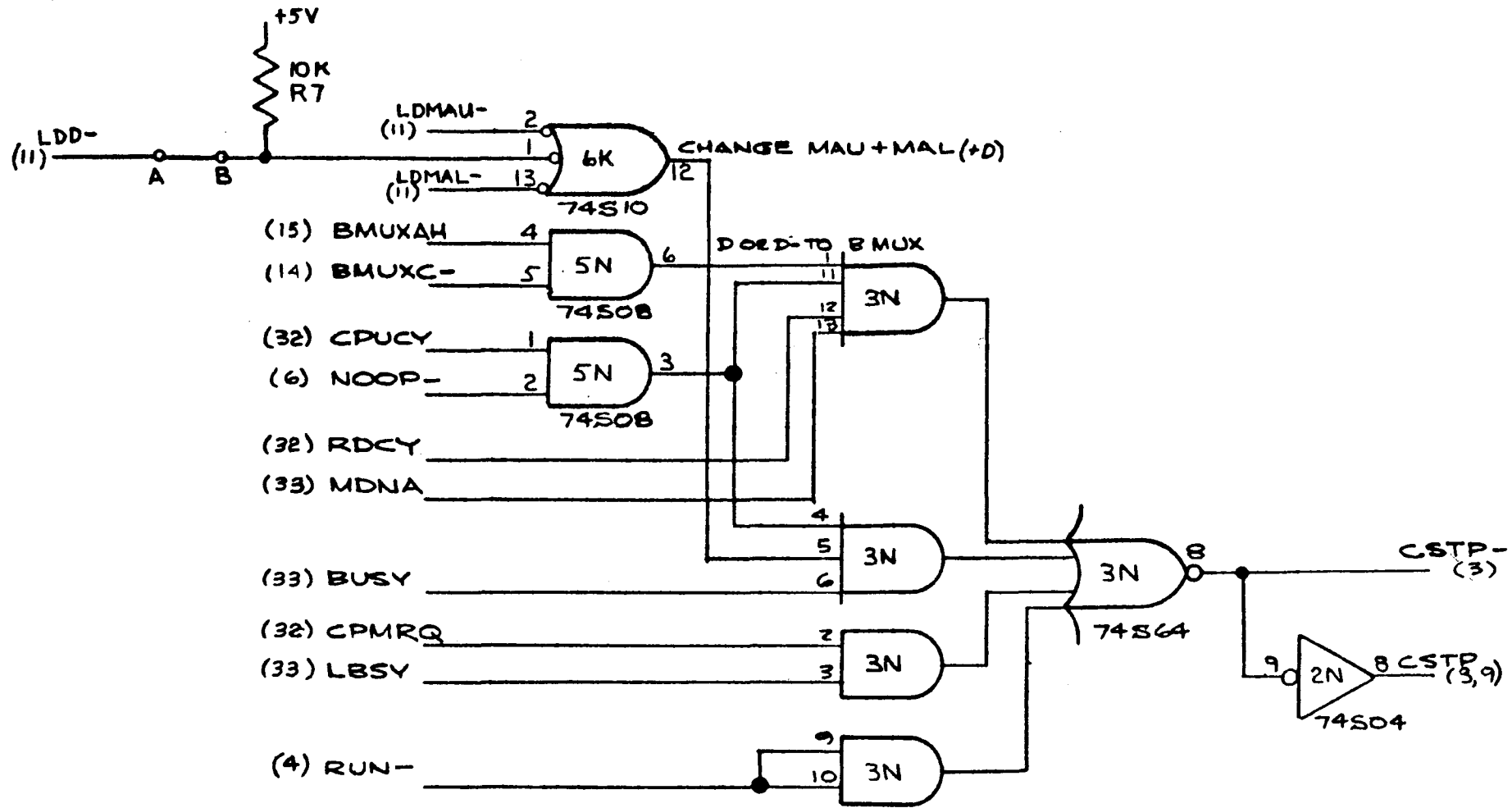
SYSTEM CLOCK



CLOCK GATES

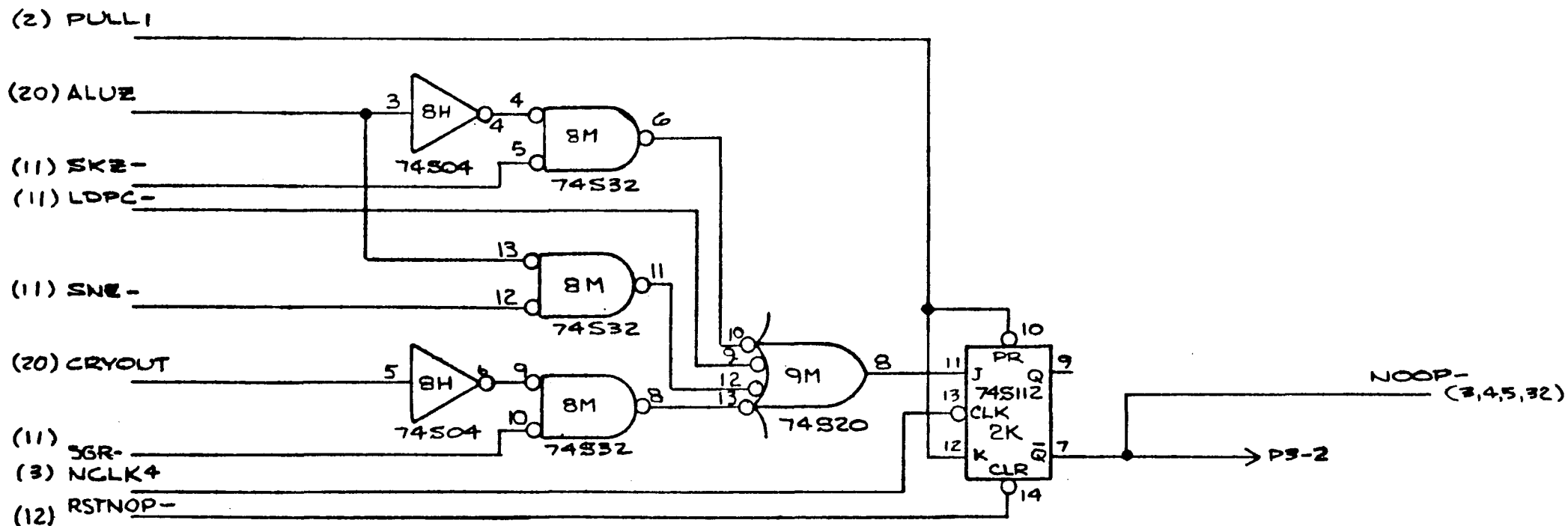


BASIC / FOUR CORPORATION		
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SCALE		SH 4 OF 35



CLOCK STOP LOGIC

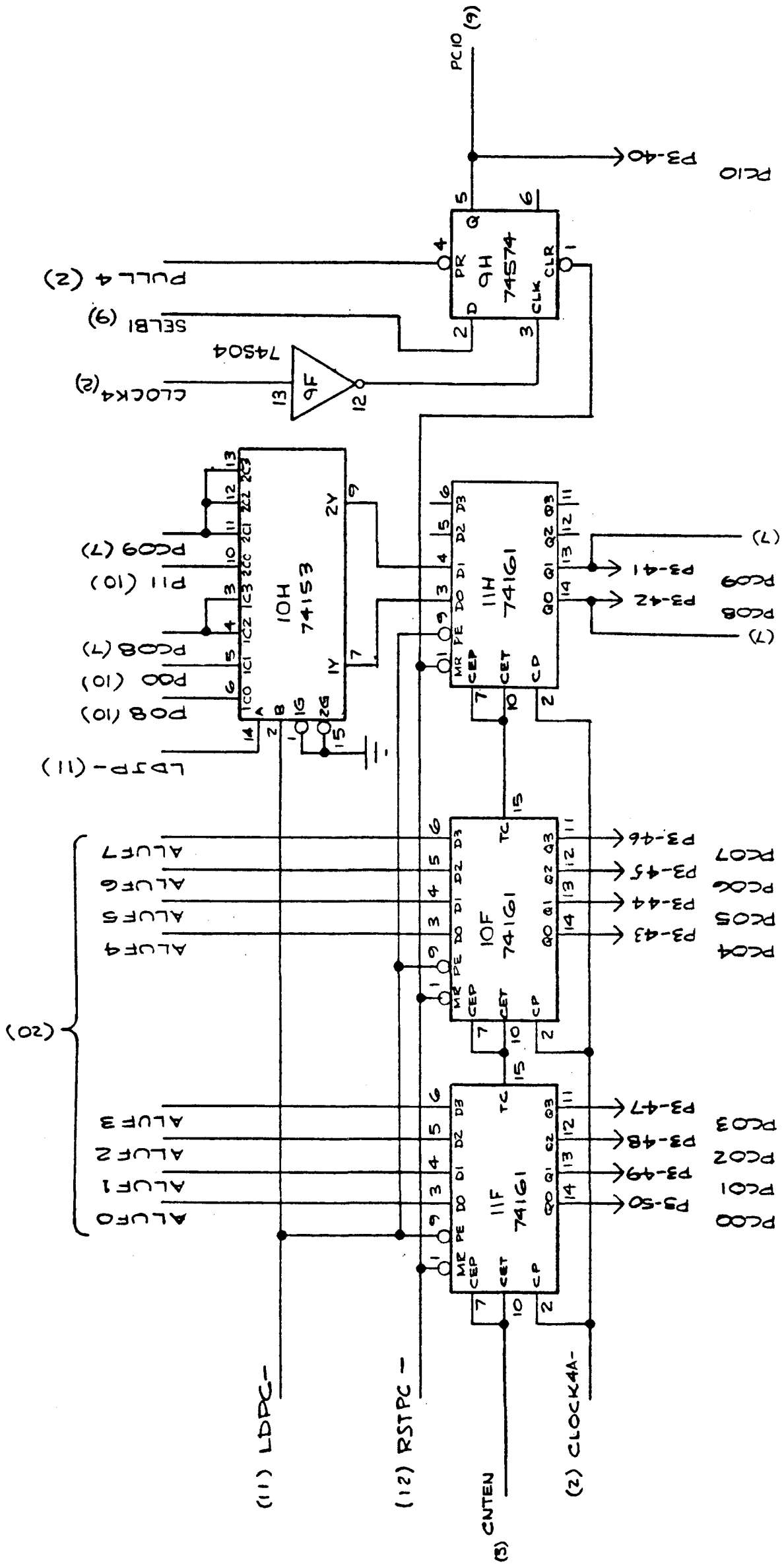
basic / four corporation			
SIZE	DWG NO	REV	
B	903045	B	
SCALE		SH 5 OF 25	



NO-OP LOGIC

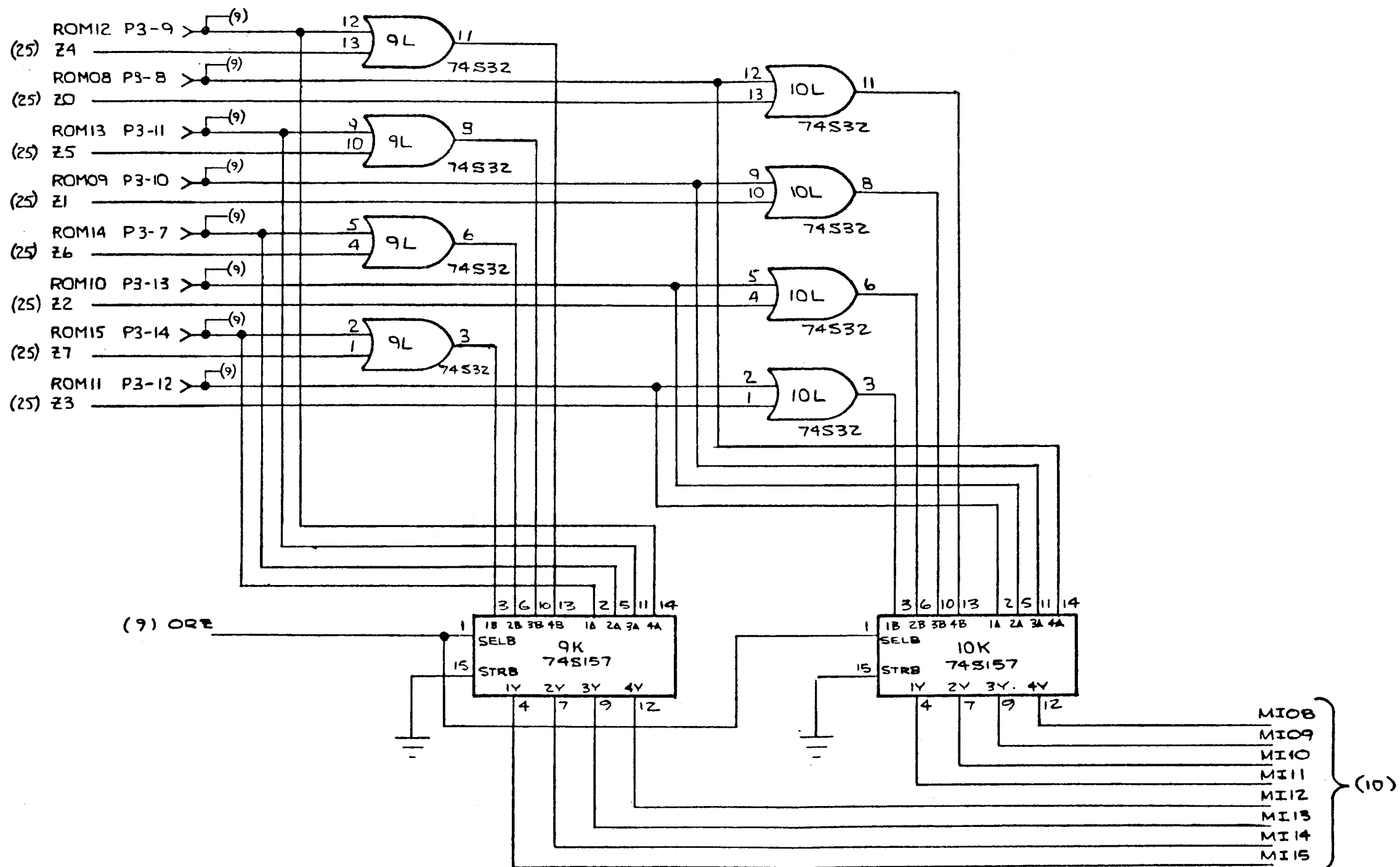
6-13

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE		SH 6 OF 35



PC REGISTER

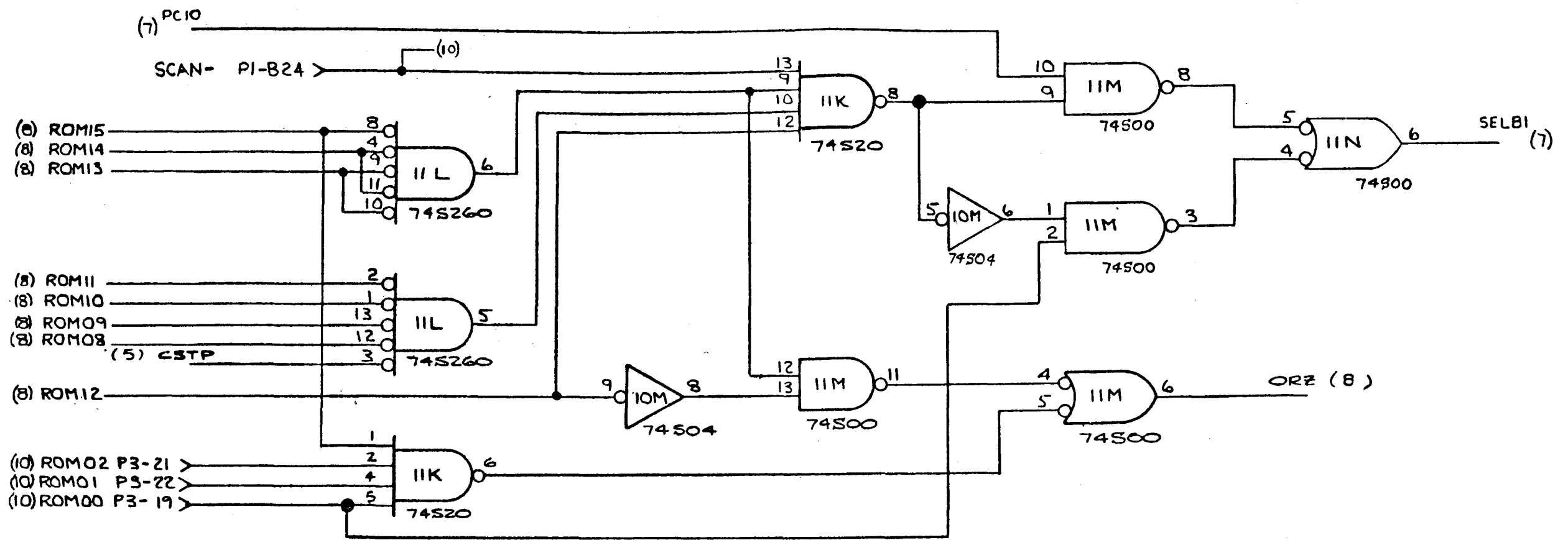
BASIC / FOUR CORPORATION	
SIZE	DWG NO
B	903045
REV	B
SCALE	SH 7 OF 35



OP CODE MUX

6-15

basic / FOUR corporation		
SIZE	DWG NO	REV
	903045	B
SCALE		SH 8 OF 35

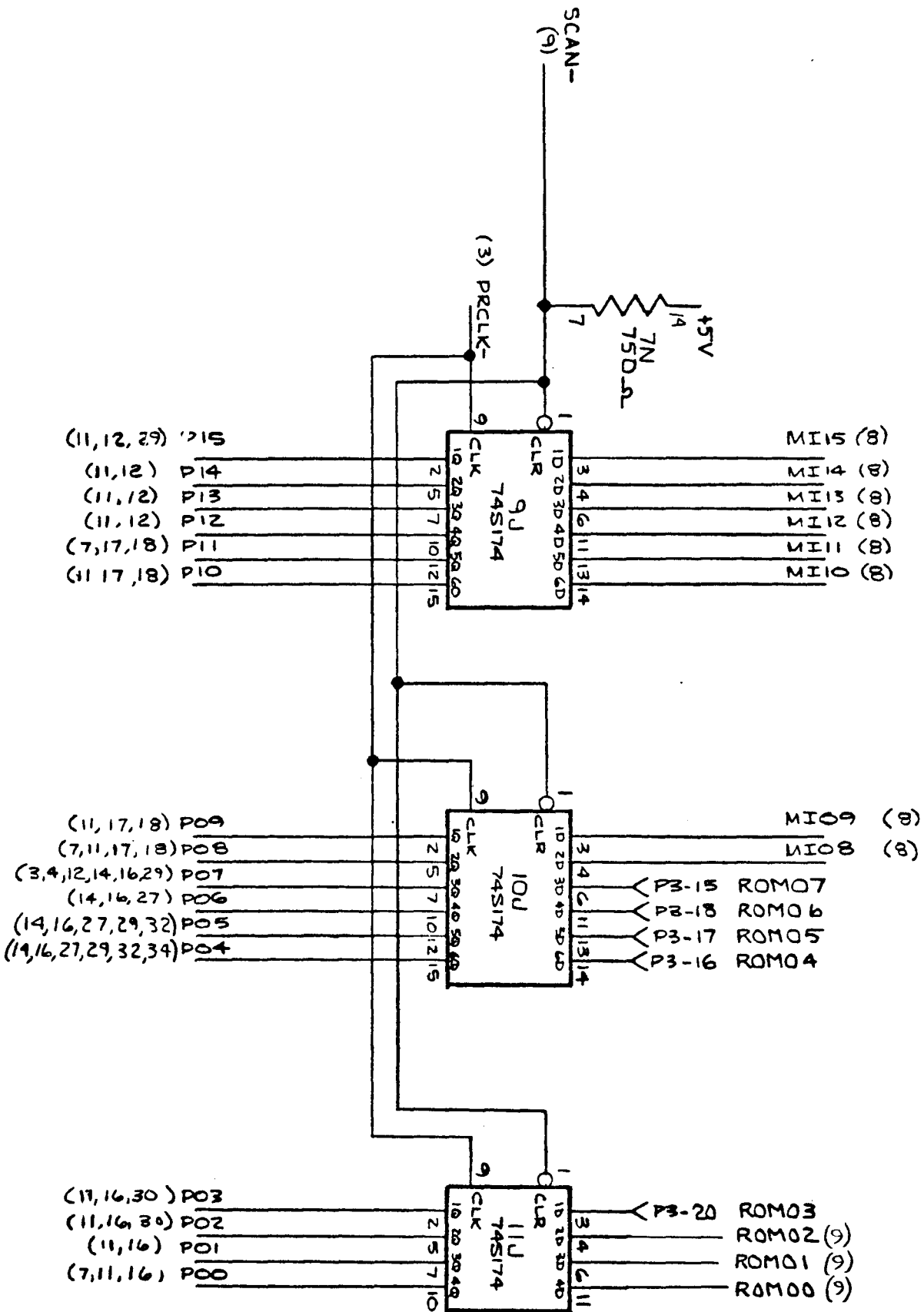


BANK SELECT AND MODIFY LOGIC

basic / four corporation			
SIZE B	DWG NO 903045	SCALE -	REV B
		SH 9 of 35	



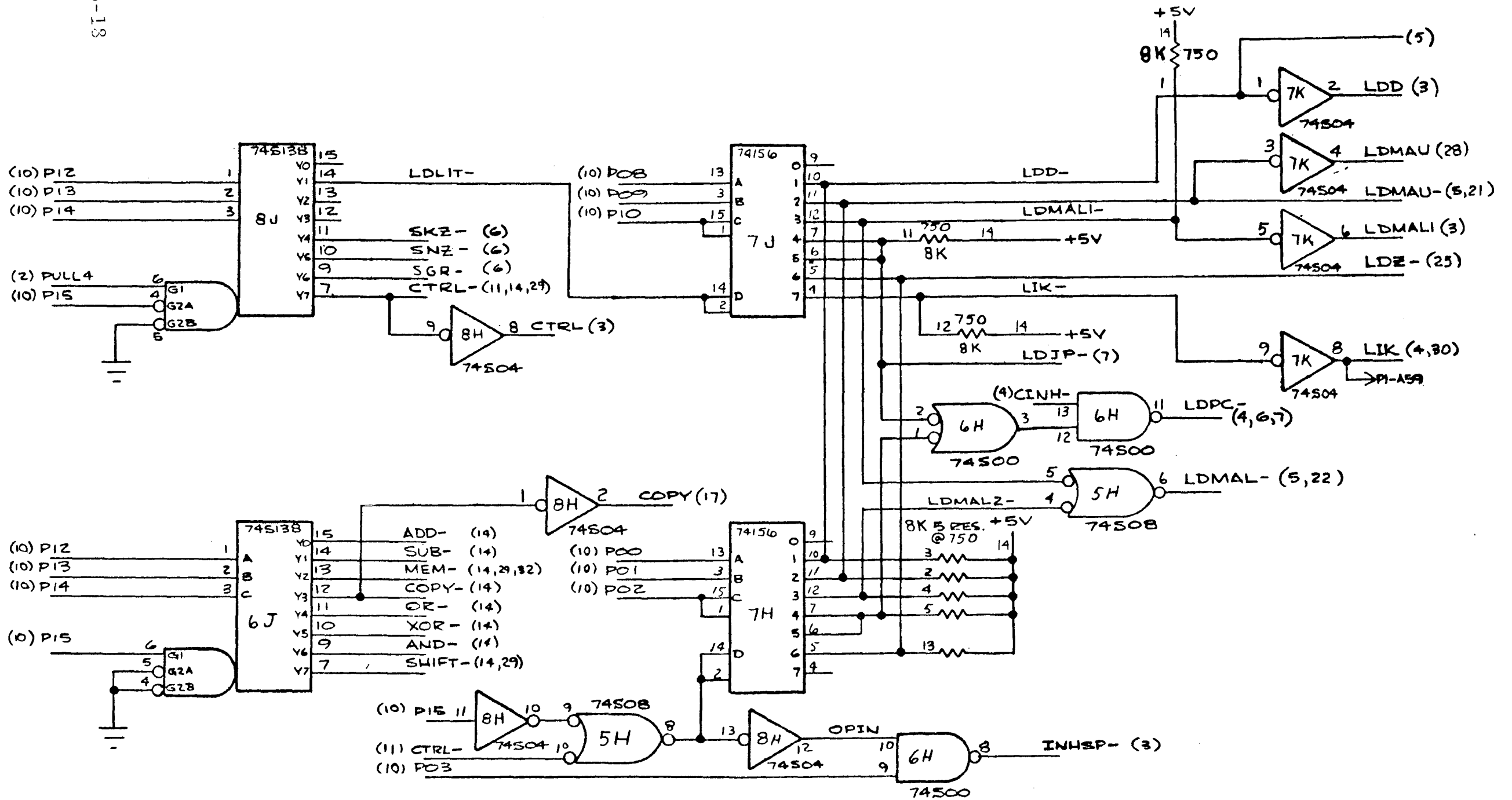
PIPELINE REGISTER



basic / four corporation

SIZE: B DWG NO: 903045 REV: B

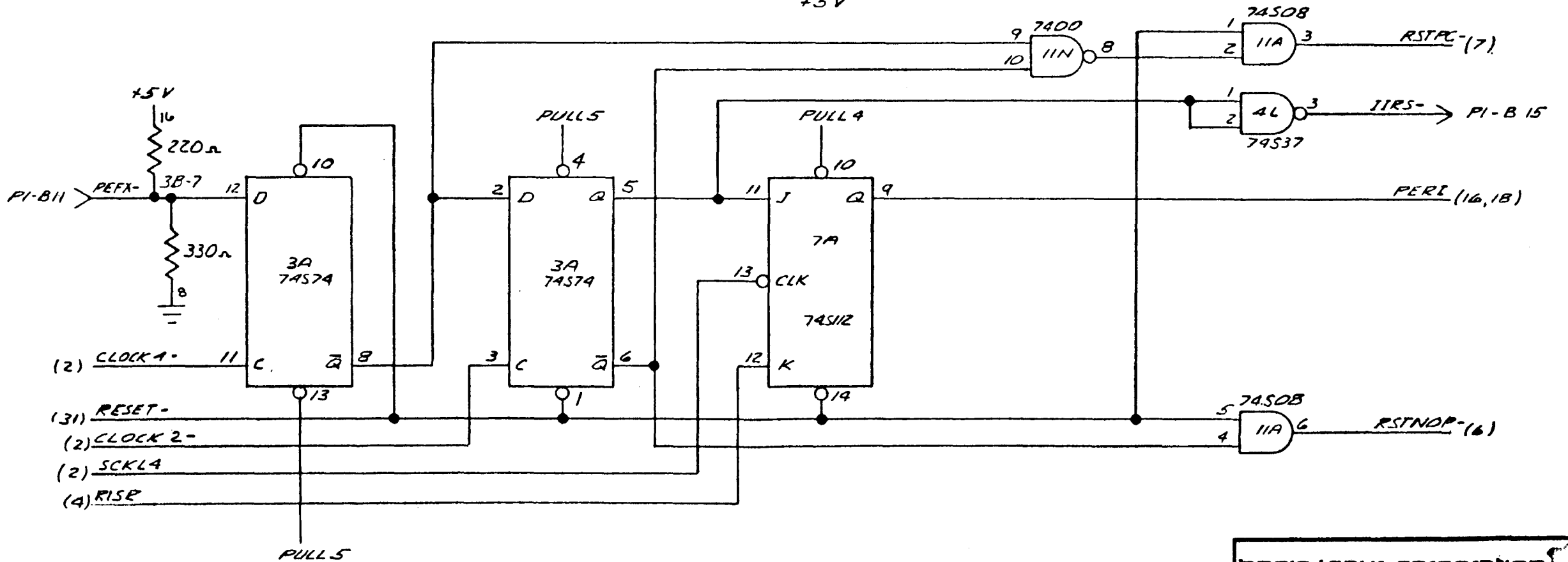
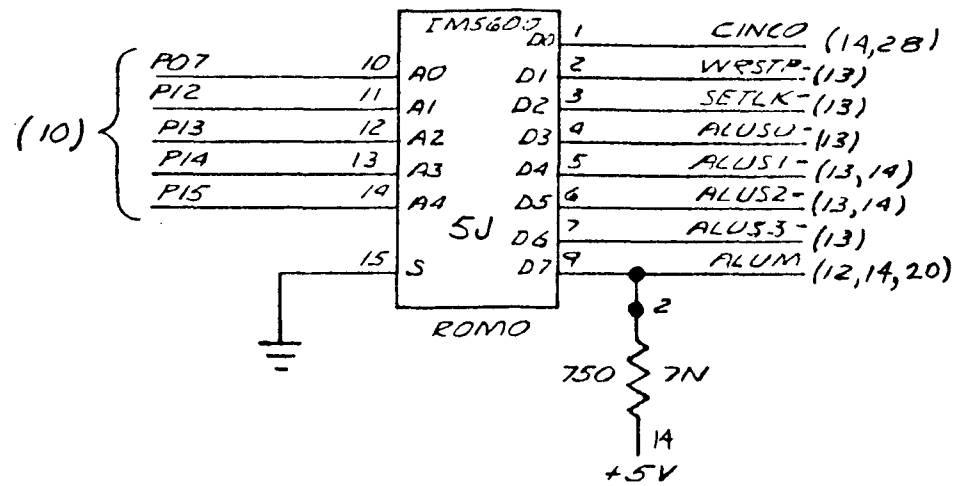
SCALE: 1/8" = 1" 10 OF 35



OP CODE DECODE

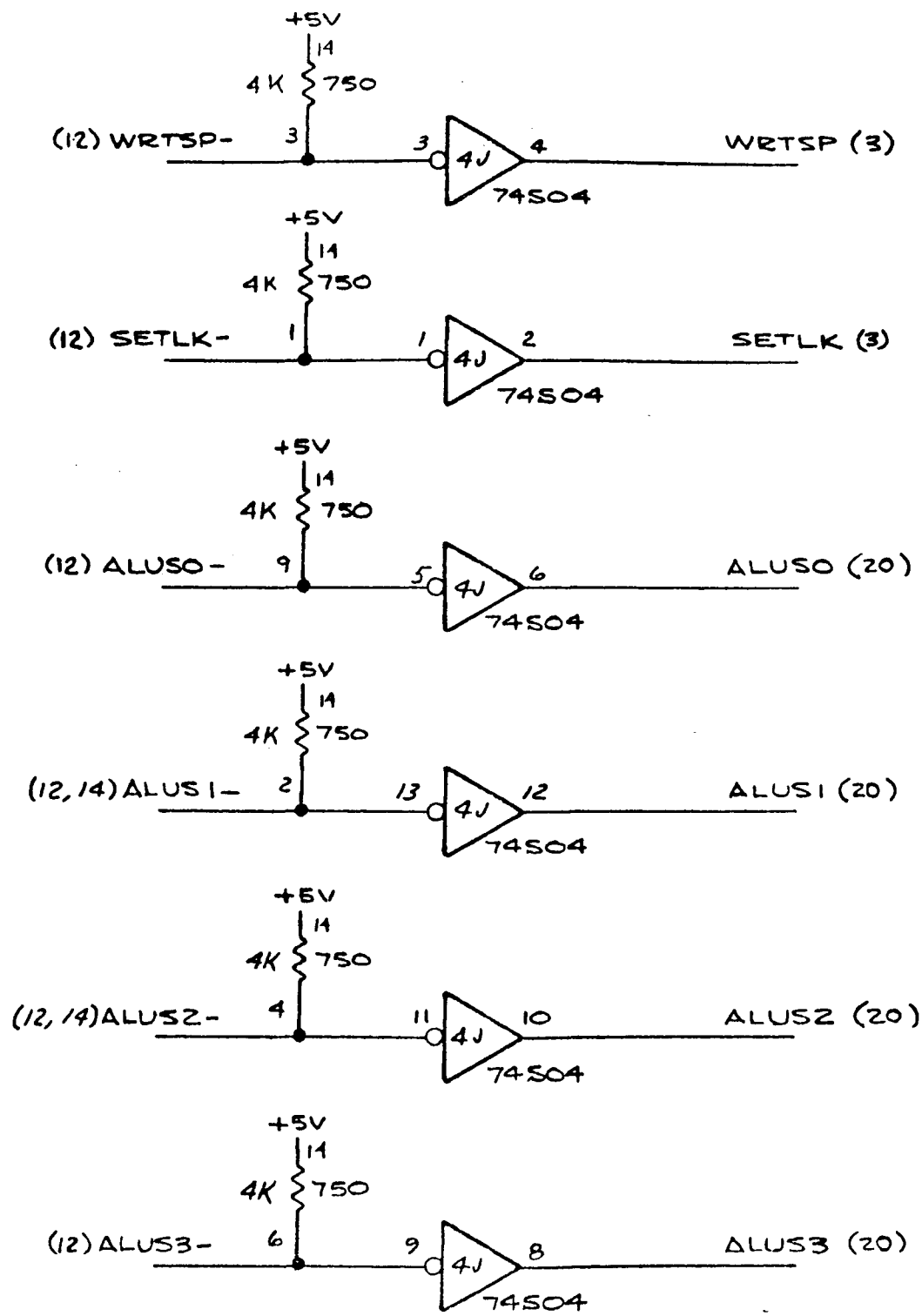
DESTINATION DECODE

basic / four corporation		
SIZE	DWG NO	REV
	903045	B
SCALE		SH 11 of 35



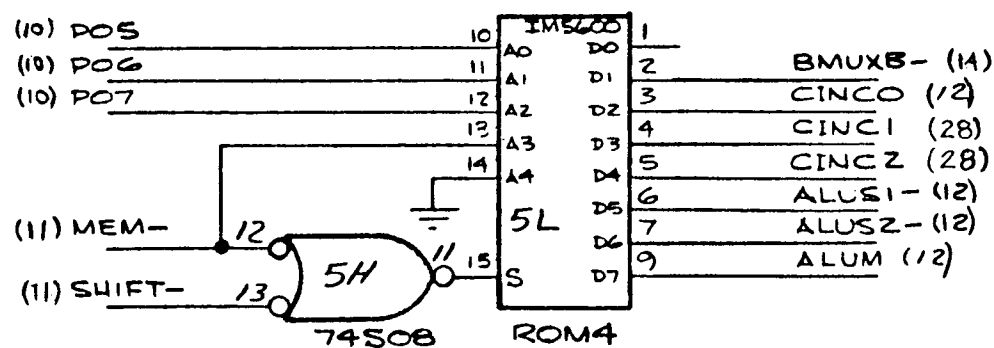
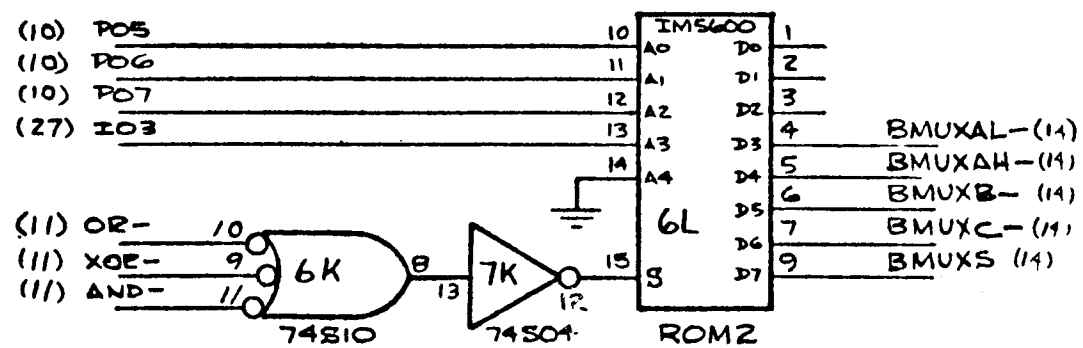
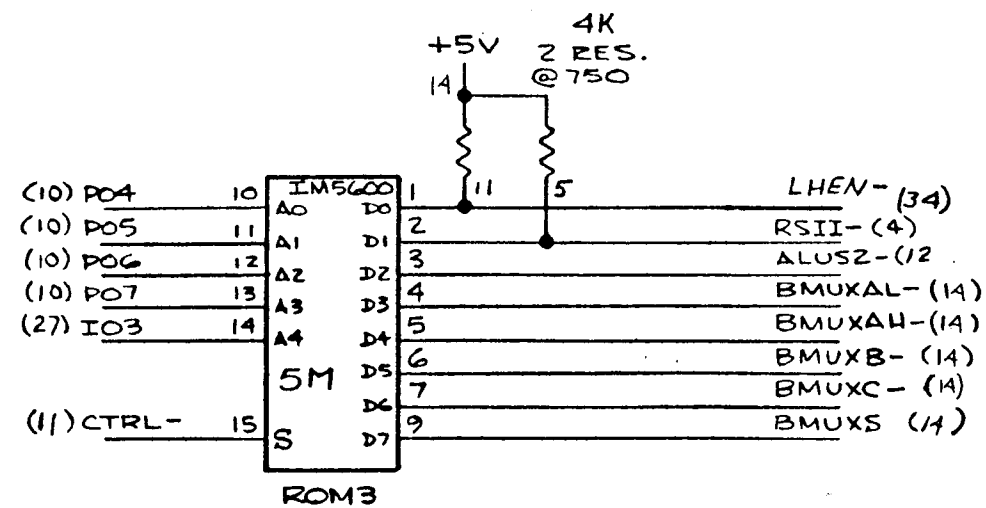
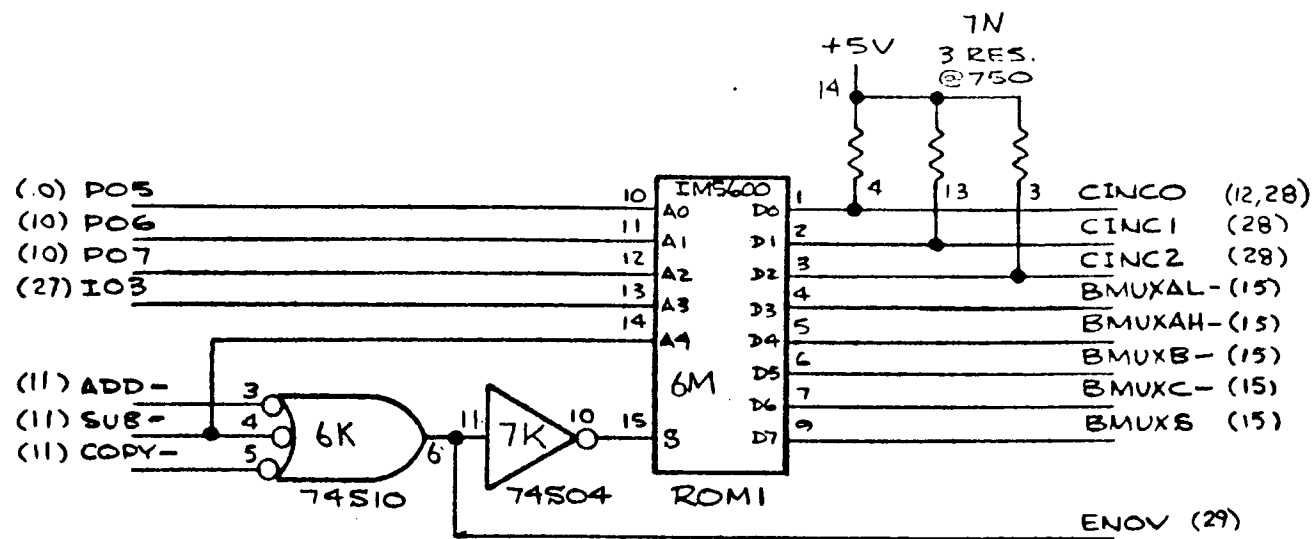
TRANSLATION ROM 0

basic / four corporation		
SIZE D	DWG NO 903045	REV B
SCALE		BY 12 OR 3.5



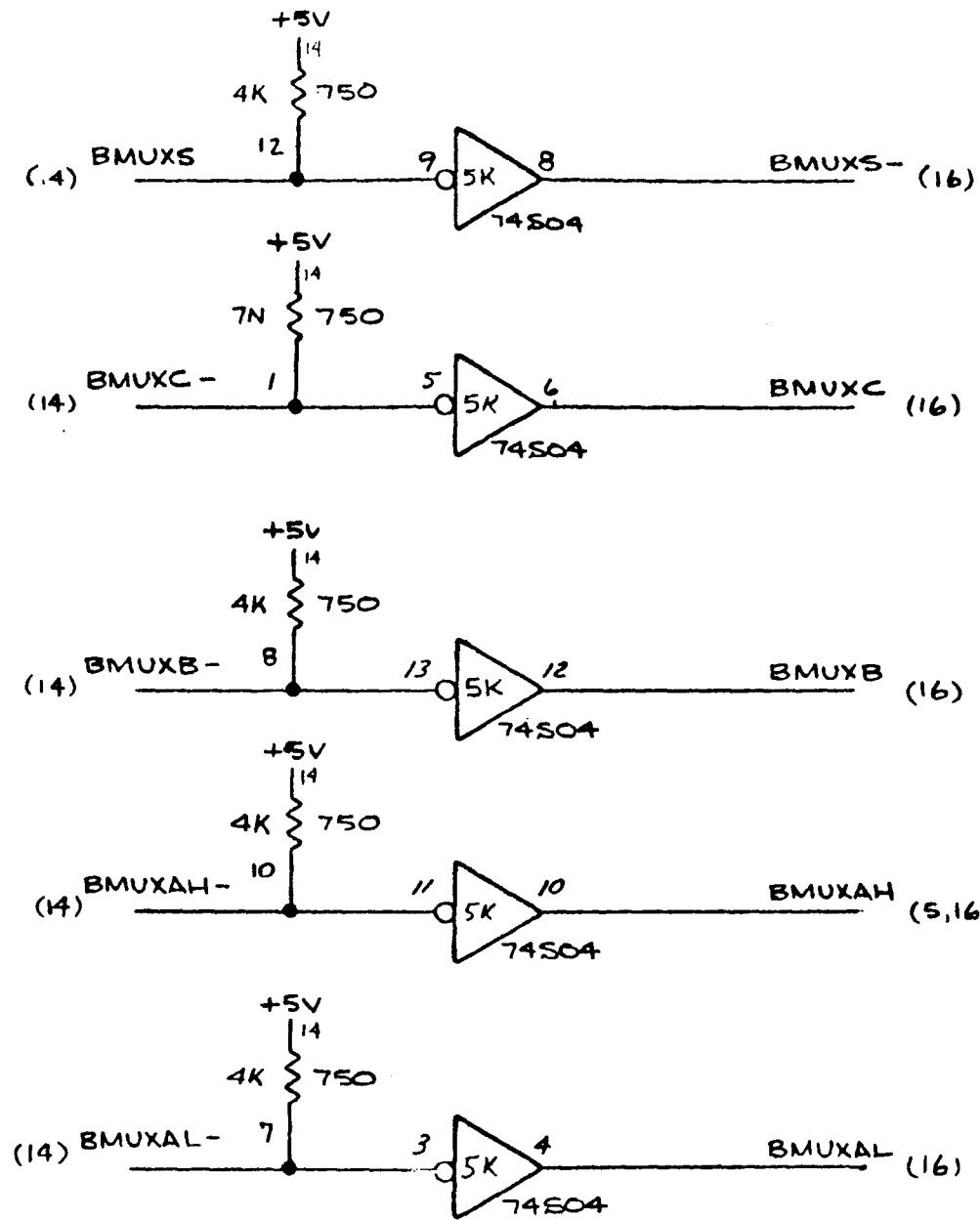
ROM O BUFFERS

basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		SH 13 OF 35



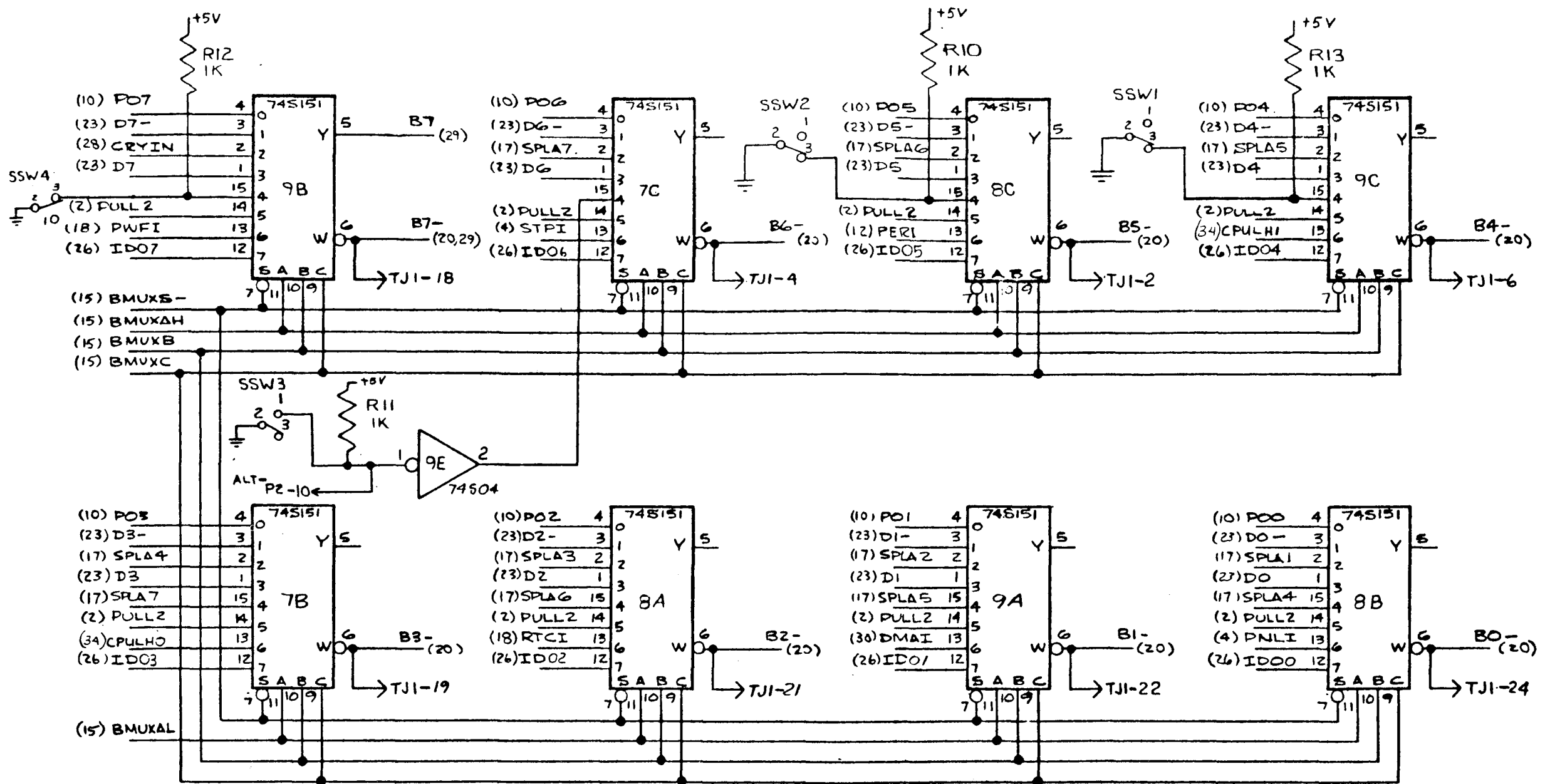
TRANSLATION ROMS 1-4

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE -		SH 14 OF 35



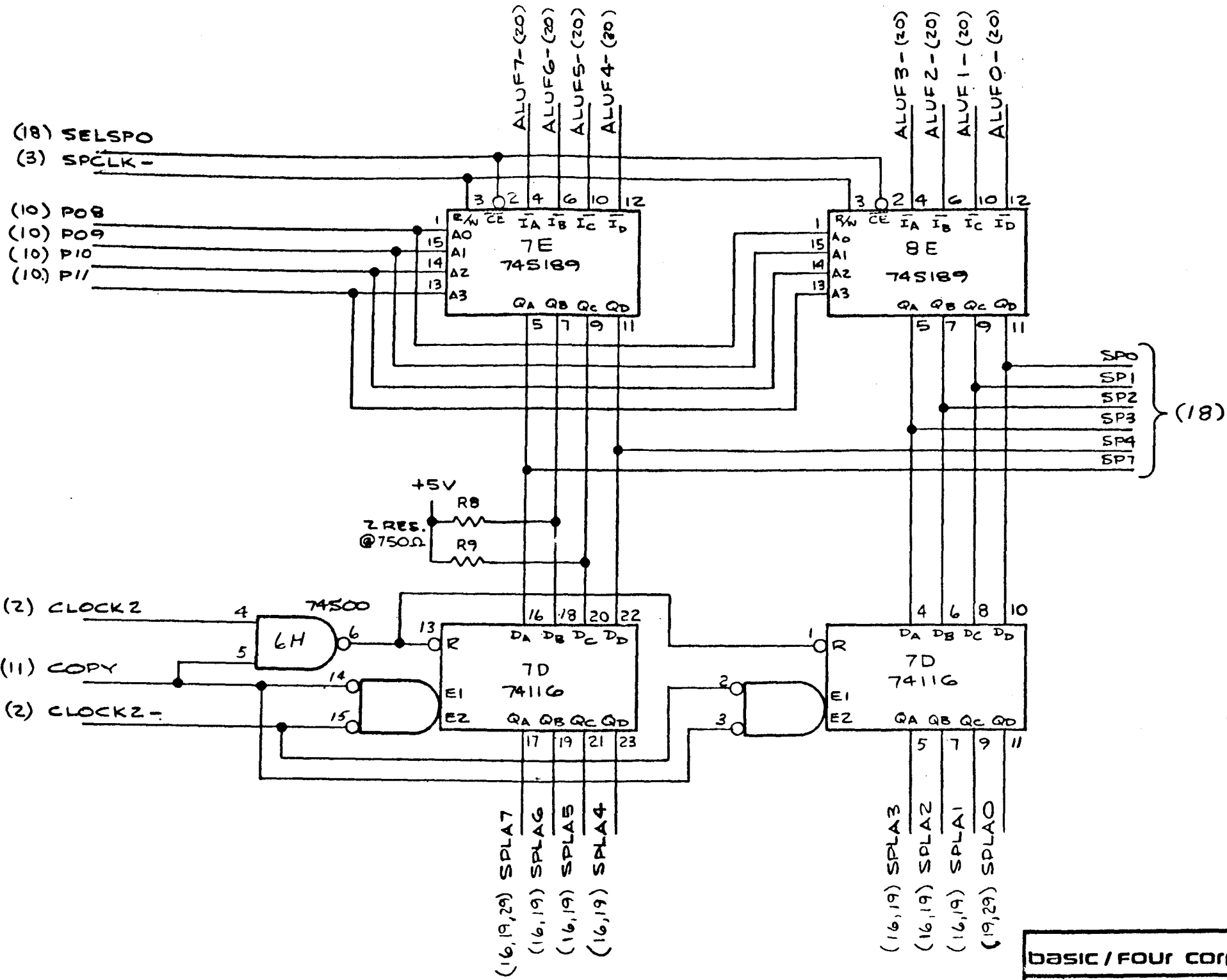
BMUX ADDRESS BUFFERS

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE -		SH 15 OF 35



B MUX

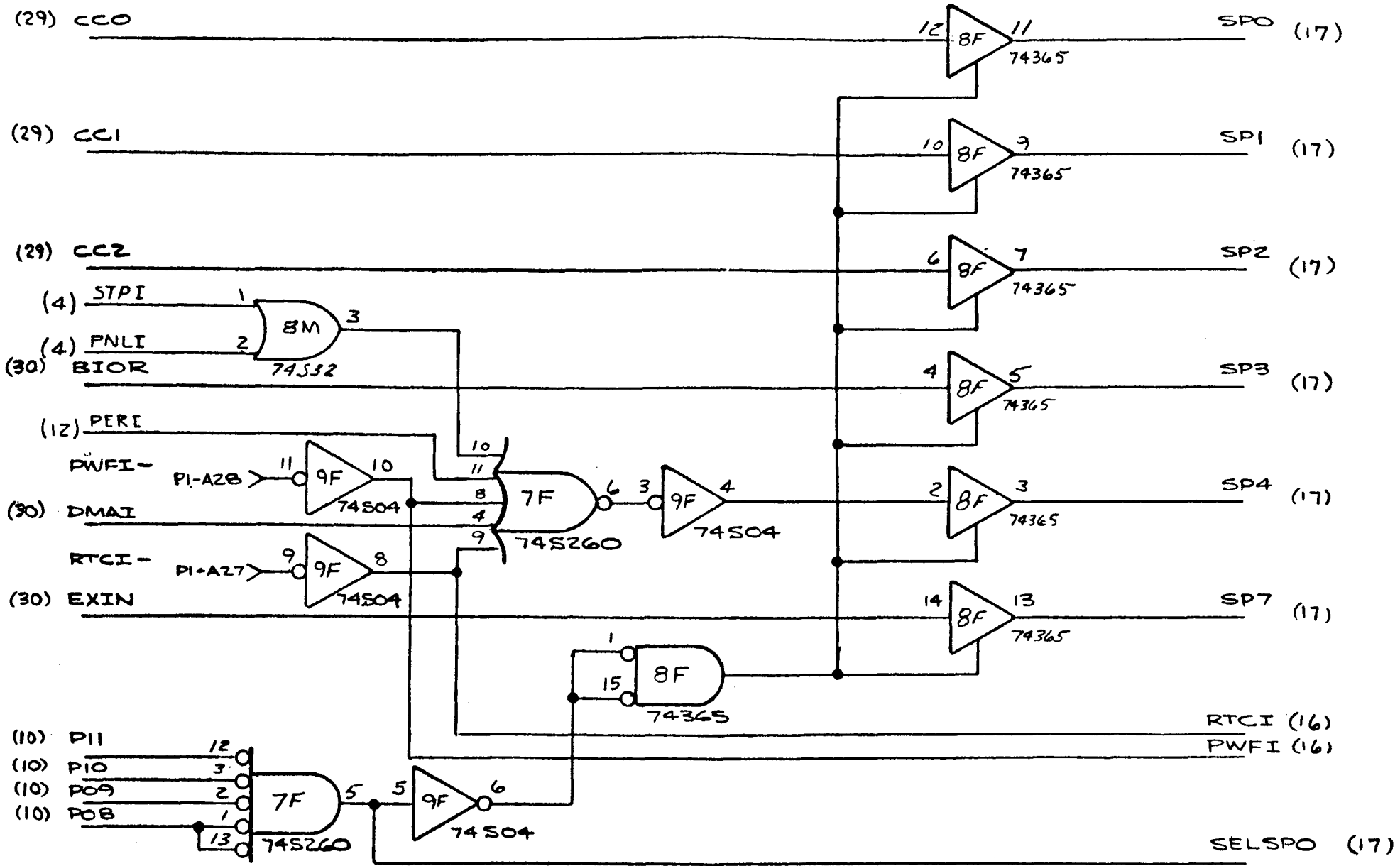
basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		16 of 35



SCRATCH PADS 1-15

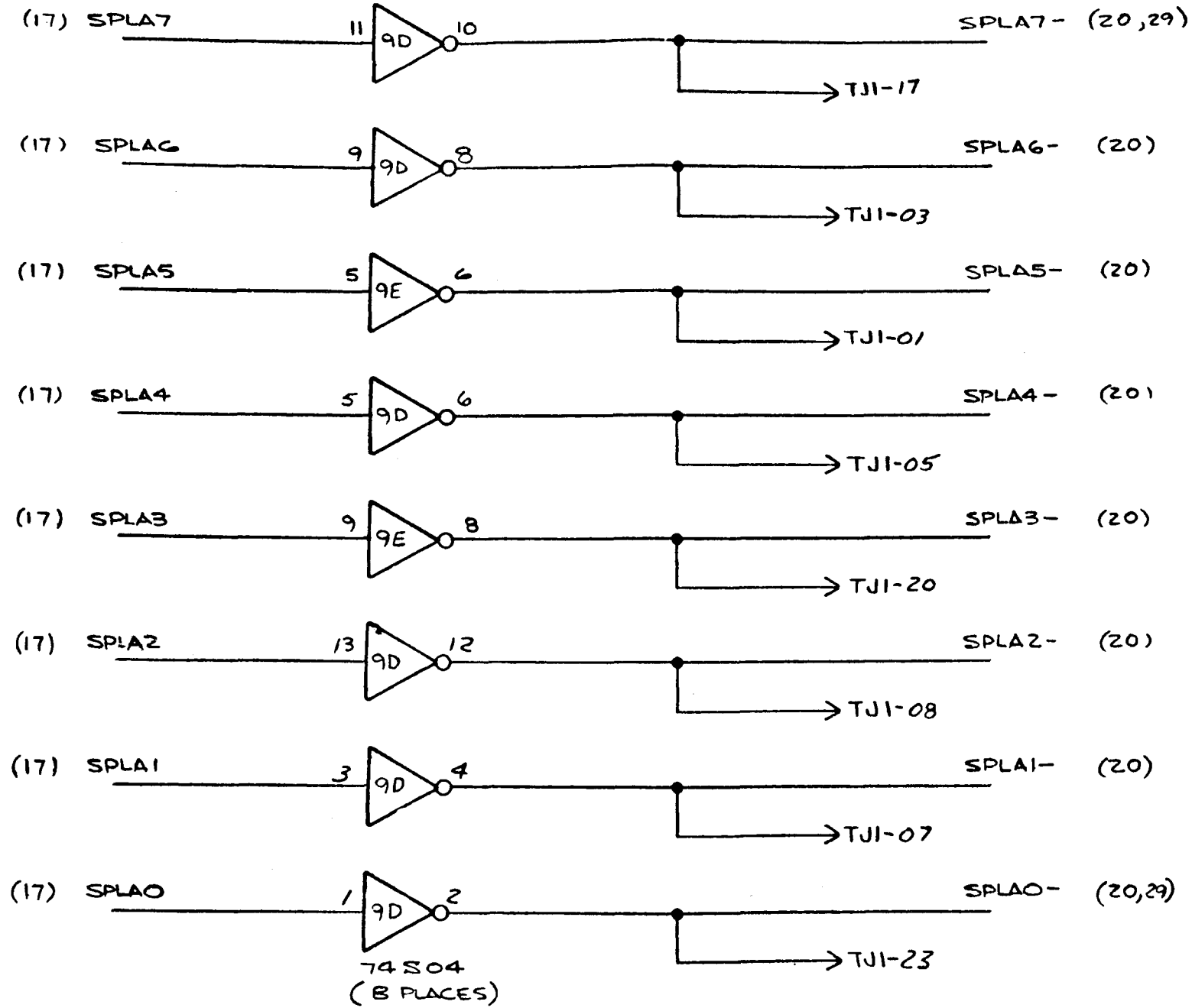
basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		SH 17 OF 35





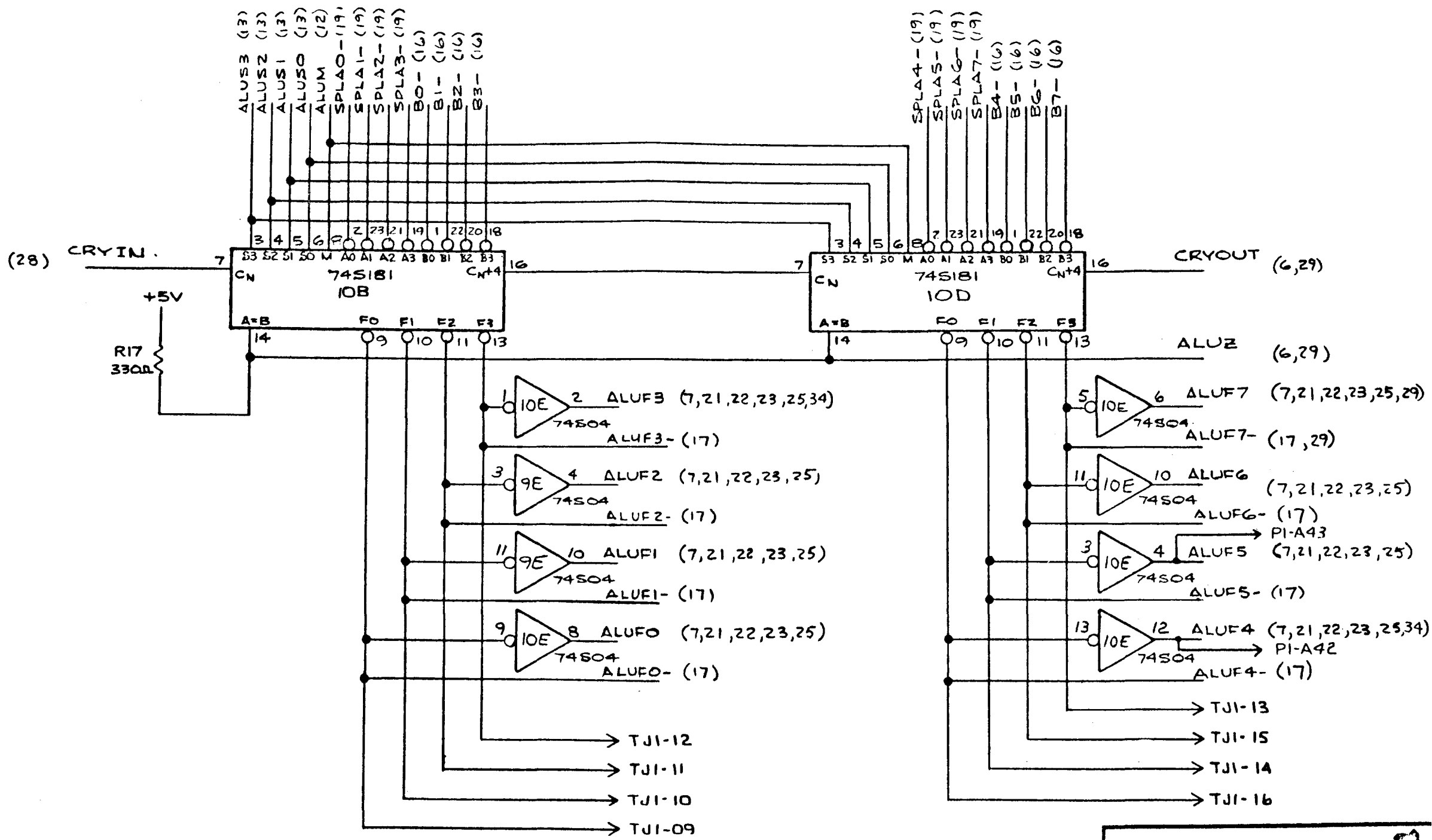
SCRATCH PAD 0

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



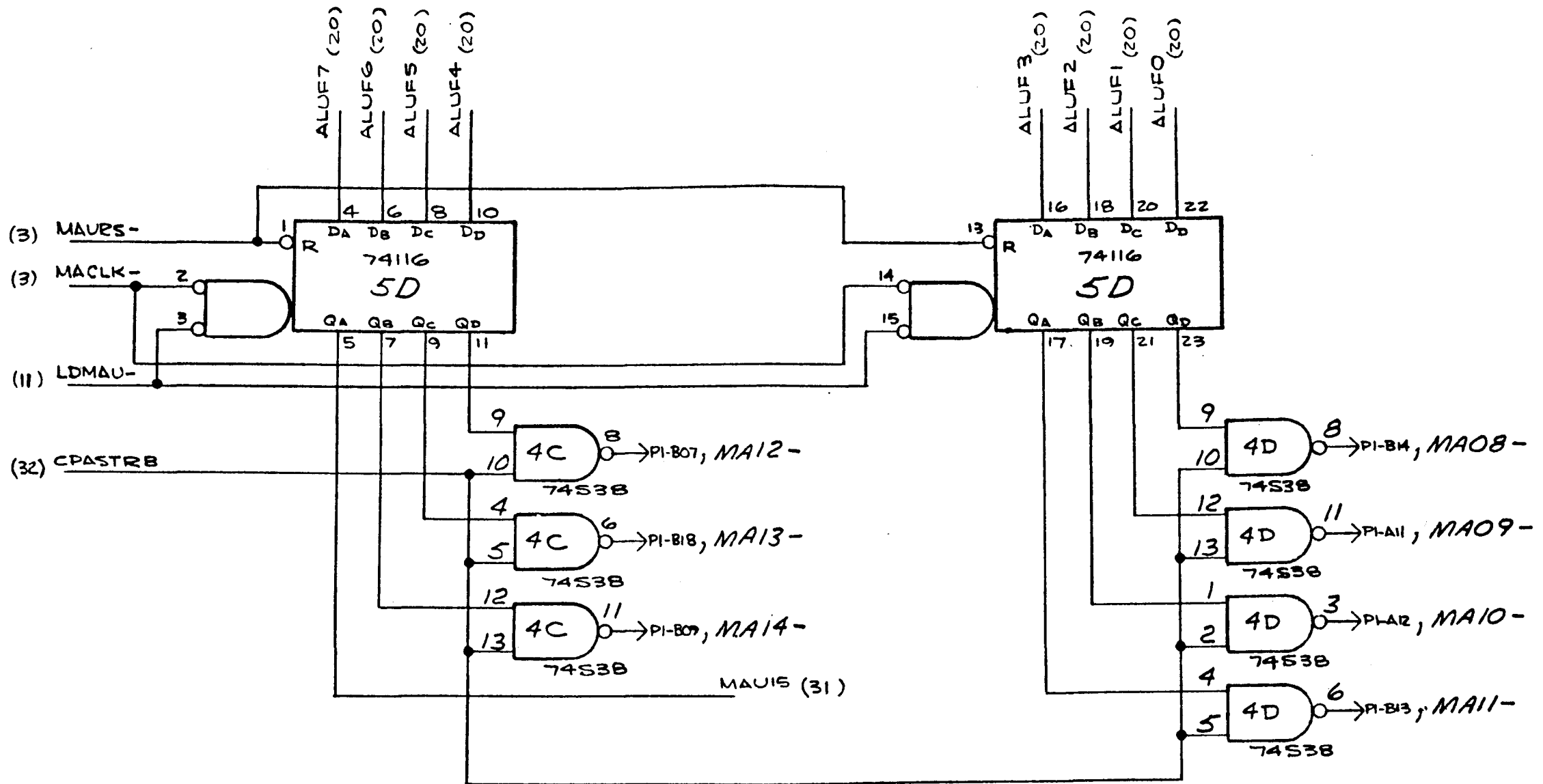
SCRATCH PAD BUFFERS

basic / FOUR corporation		
SIZE B	DWG NO 903045	REV B
SCALE -		SH 19 OF 35



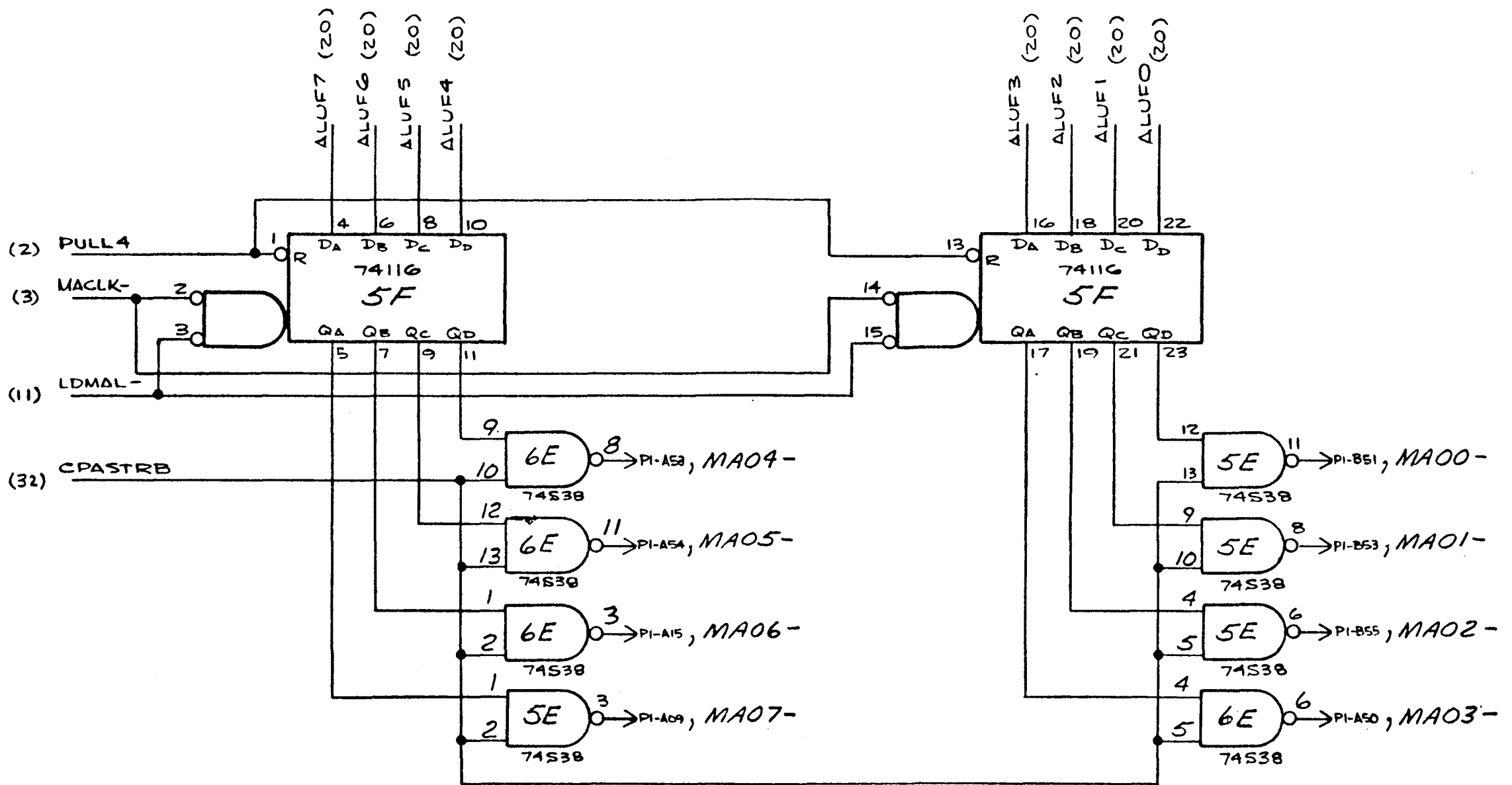
ALU

basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		SH 20 or 34



MAU REGISTER

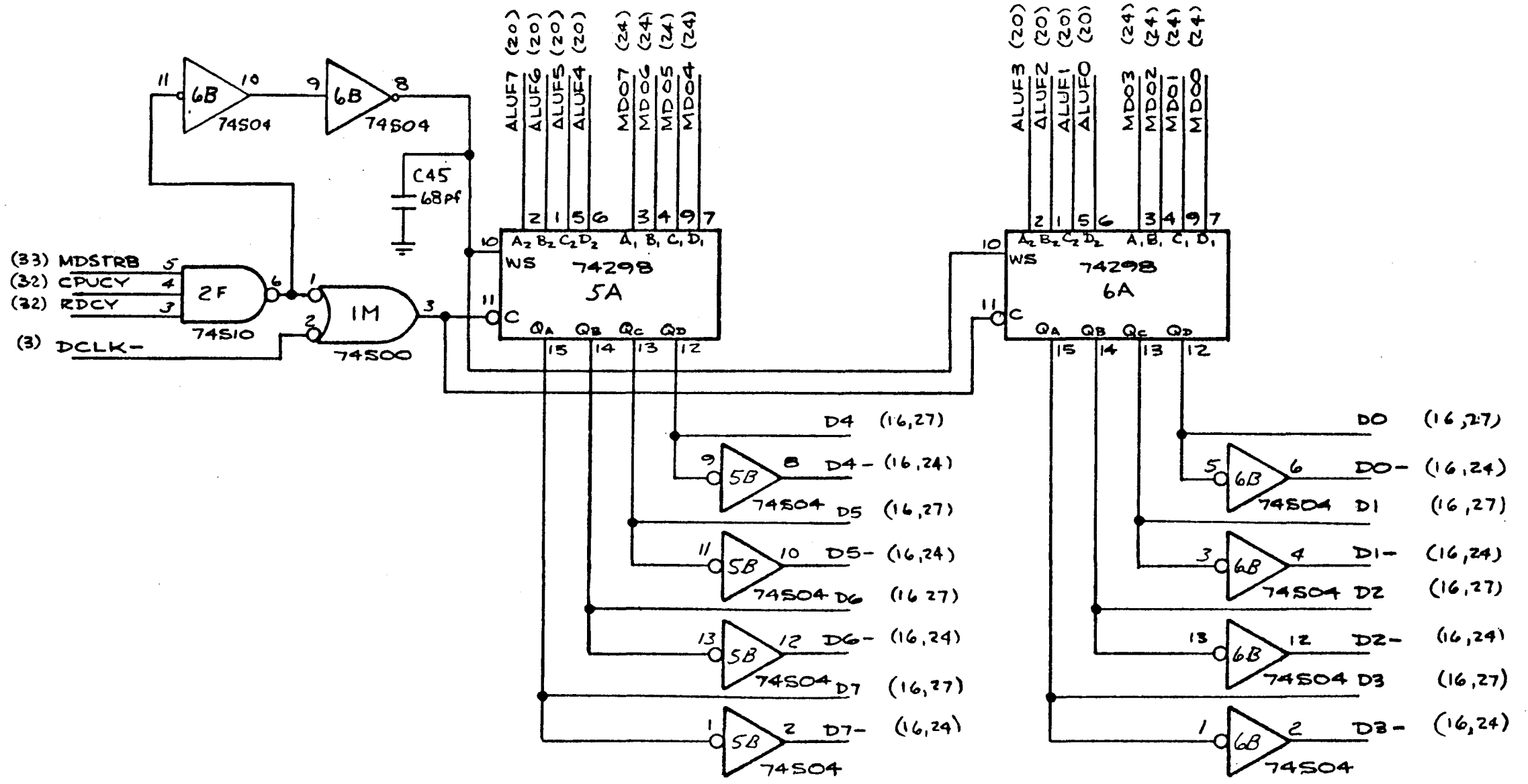
basic / four corporation		
SIZE <b>B</b>	DWG NO 903045	REV <b>B</b>
SCALE		SH 21 OF 35



MAL REGISTER

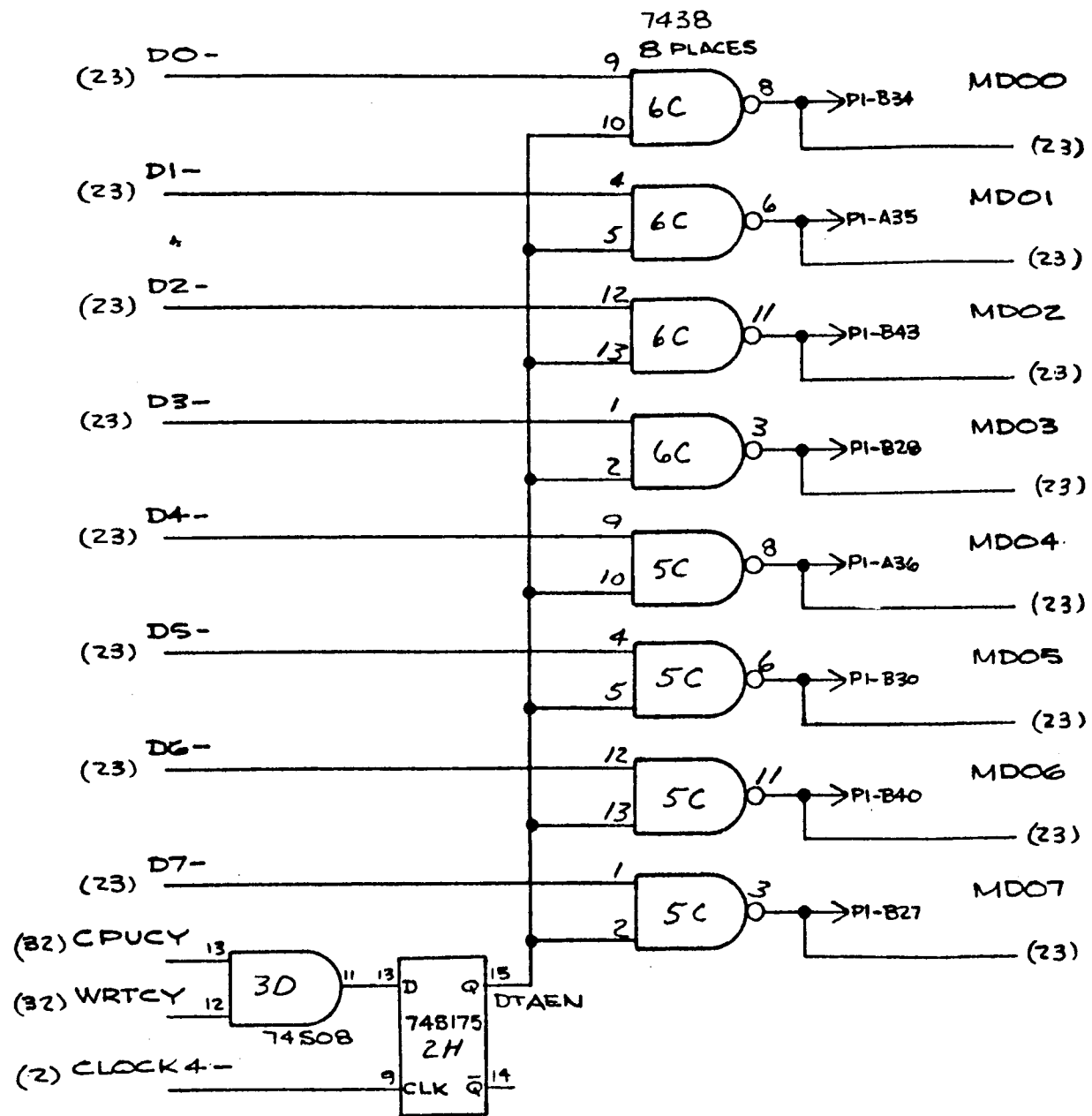
6-29

basic / four corporation		
SIZE <b>B</b>	DWG NO 903045	REV <b>B</b>
SCALE		SP 22 OF 35



D REGISTER

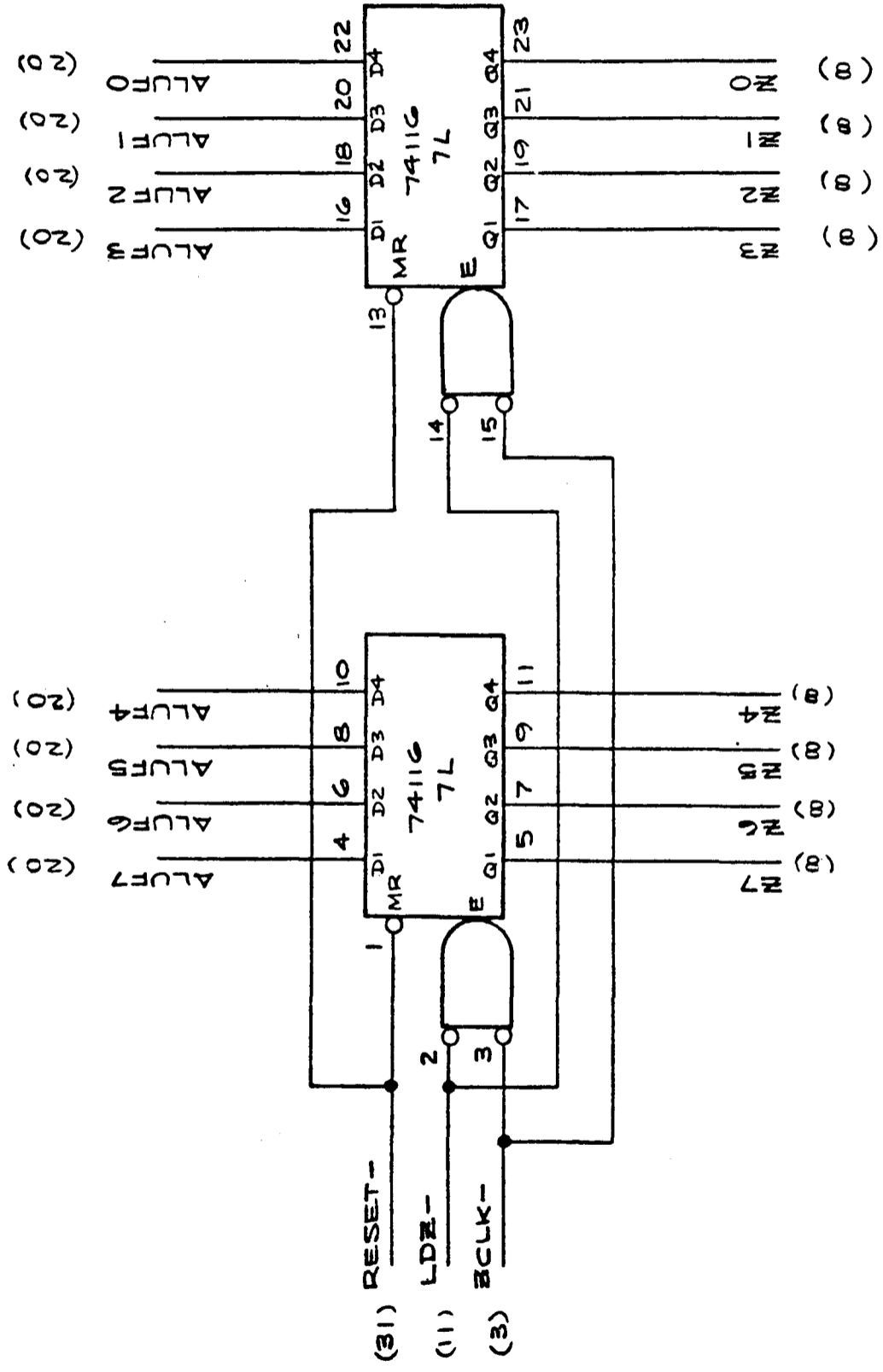
basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		SH 23 OF 35



MEMORY DATA DRIVERS

6-31

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE		PH 24 OF 55



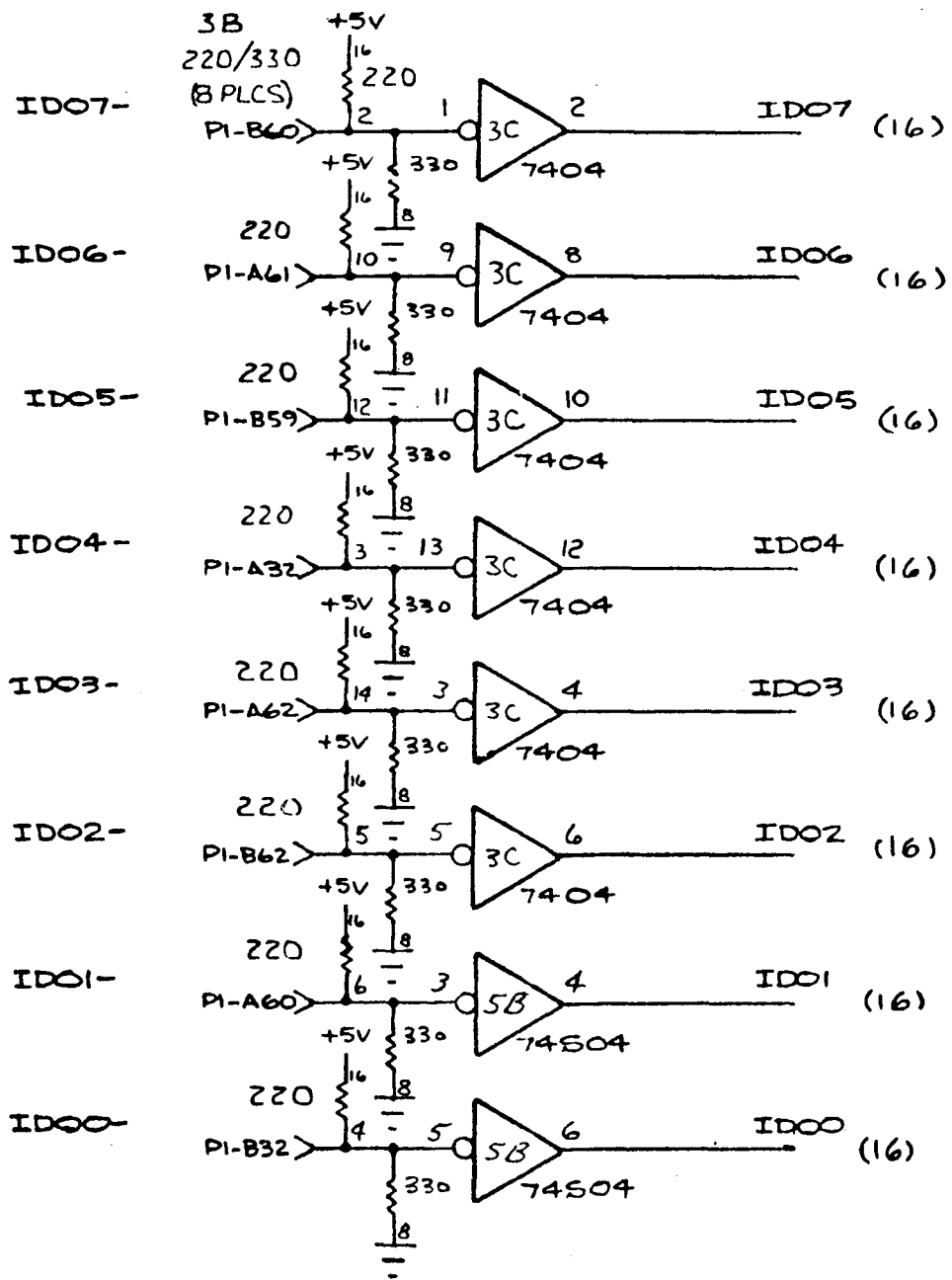
Z REGISTER

BASIC / FOUR CORPORATION

SIZE	DWG NO	REV
B	903045	B

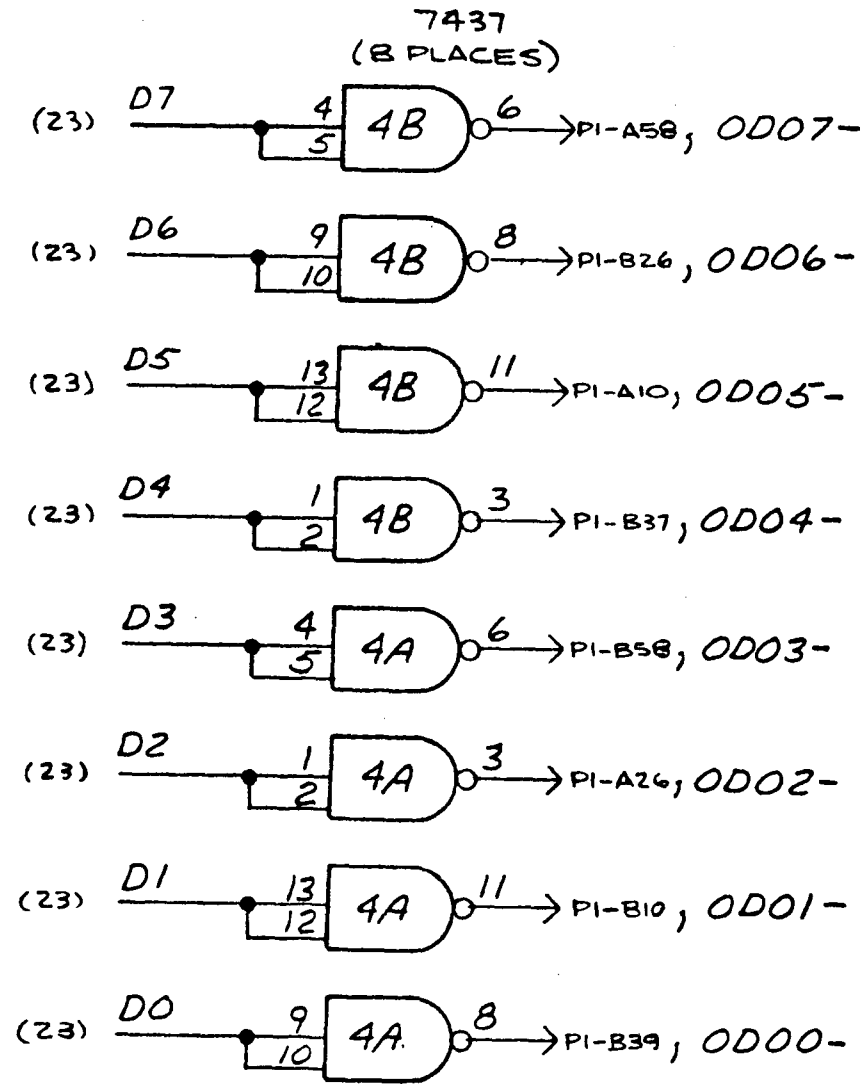
SCALE: — SH 25 01 25



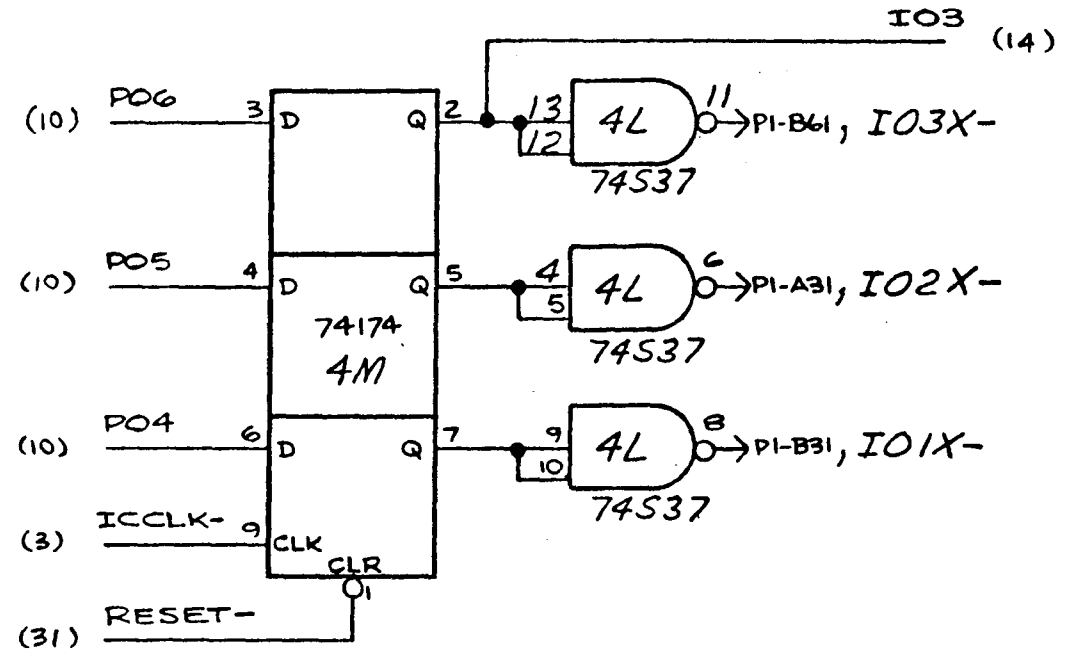


INPUT DATA BUS

basic / Four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		

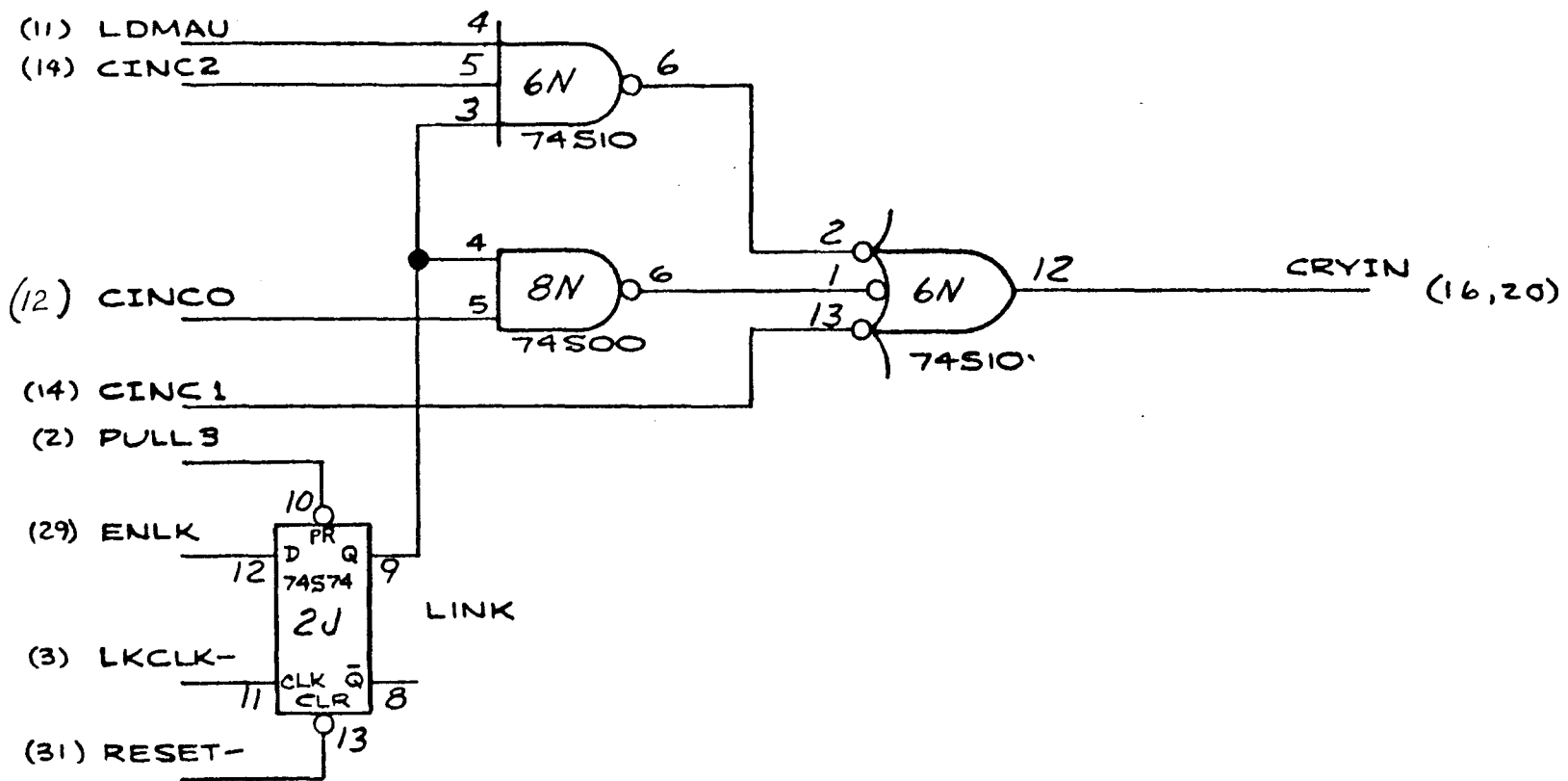


OUTPUT DATA BUS



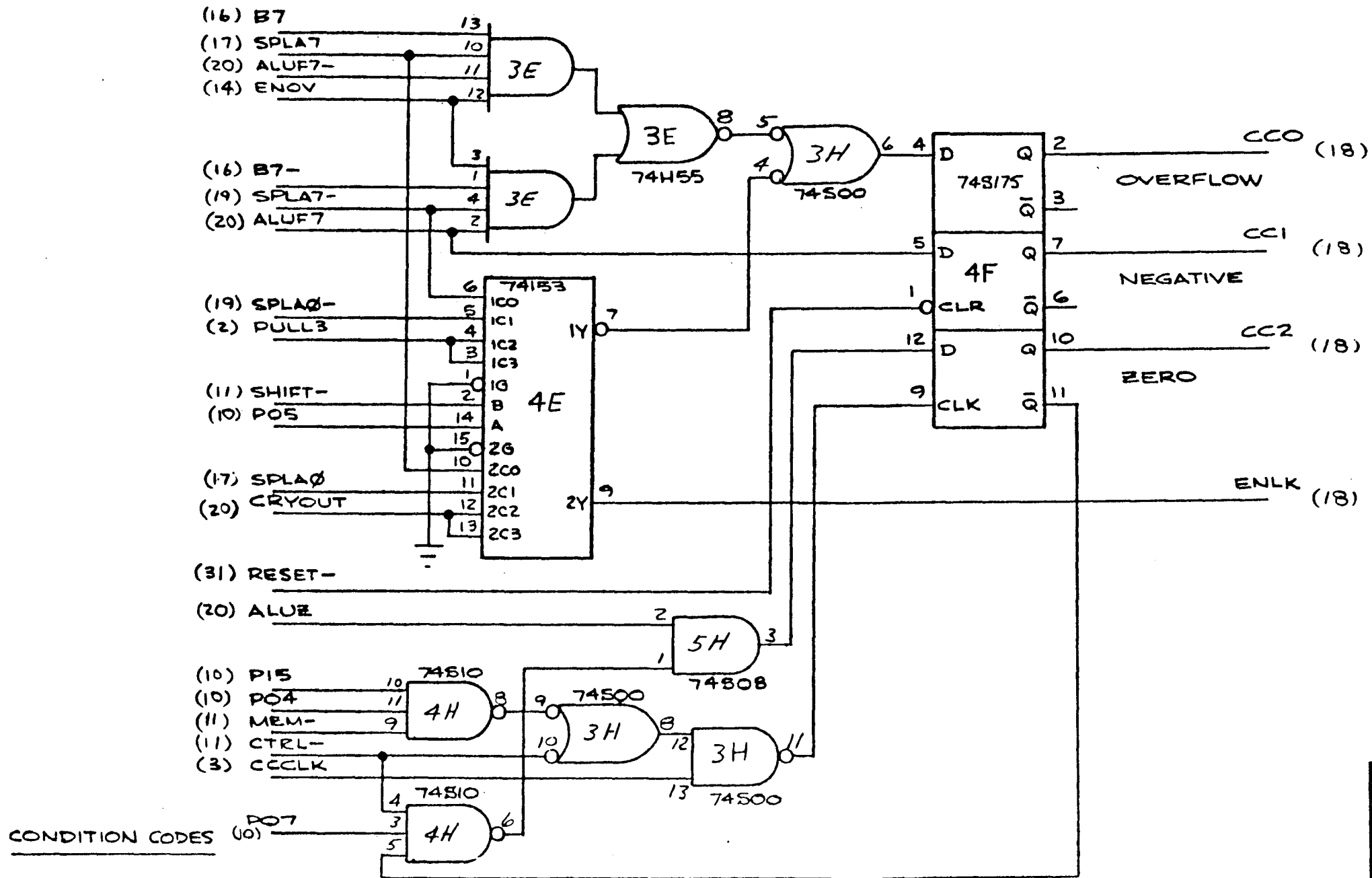
IC REGISTER

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE		SH 27 OF 35

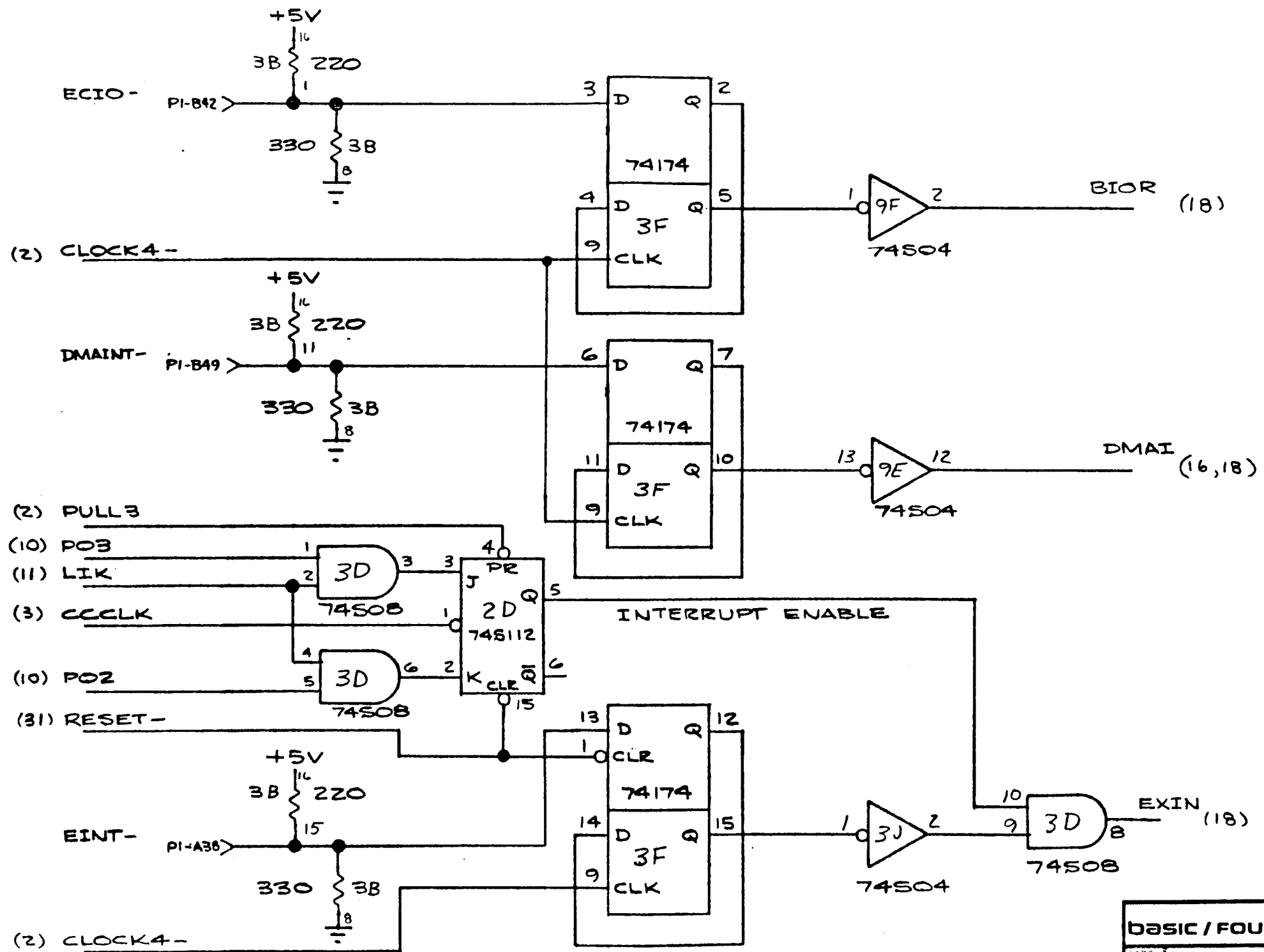


LINK AND CARRY LOGIC

basic / four corporation			
SIZE B	DWG NO 903045	SCALE -	REV B
		SH 29 OF 35	



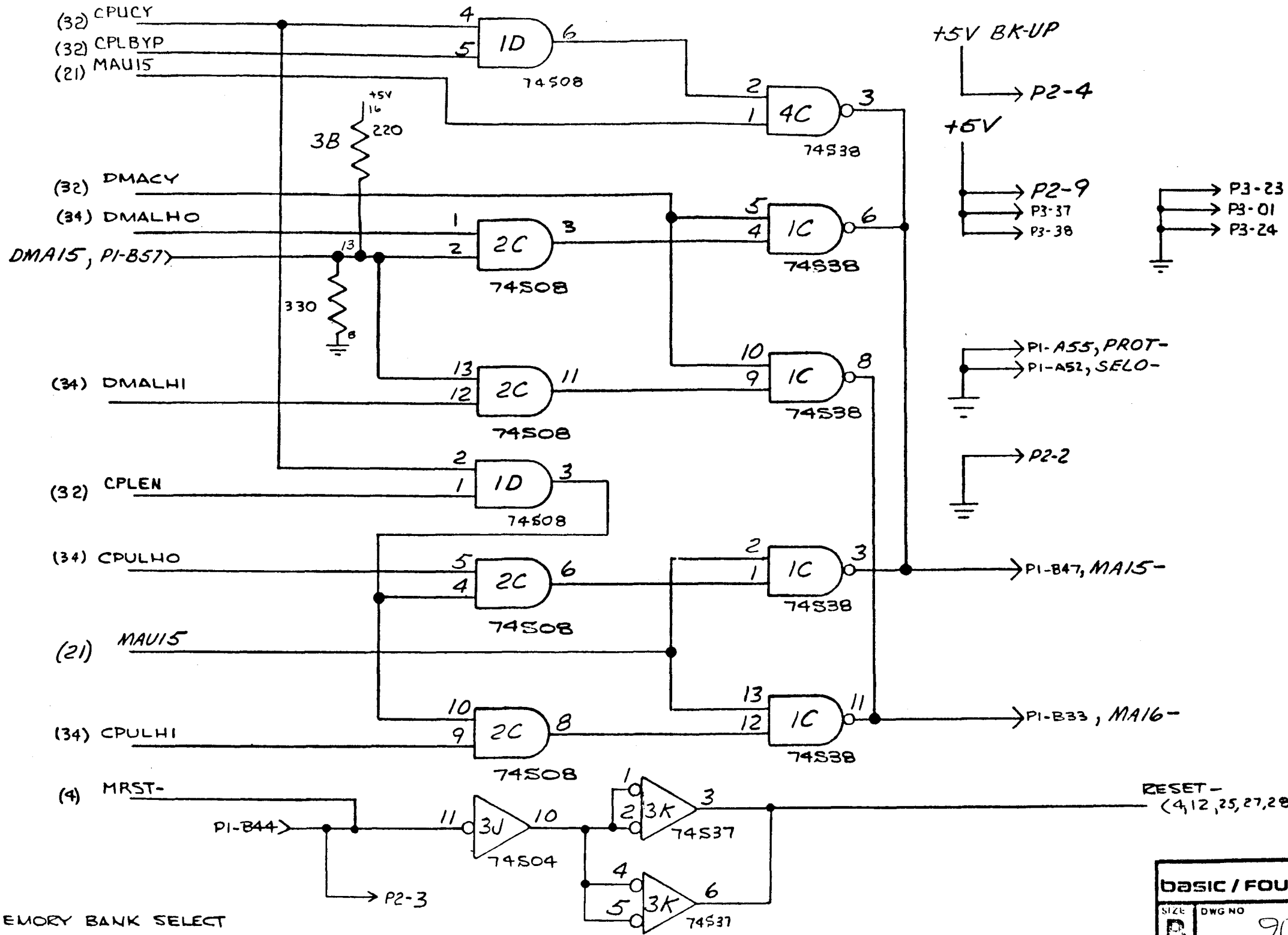
basic / four corporation		
SIZE	DWG NO	REV
B	903045	B
SCALE		SH 29 OF 35



INTERRUPT LOGIC

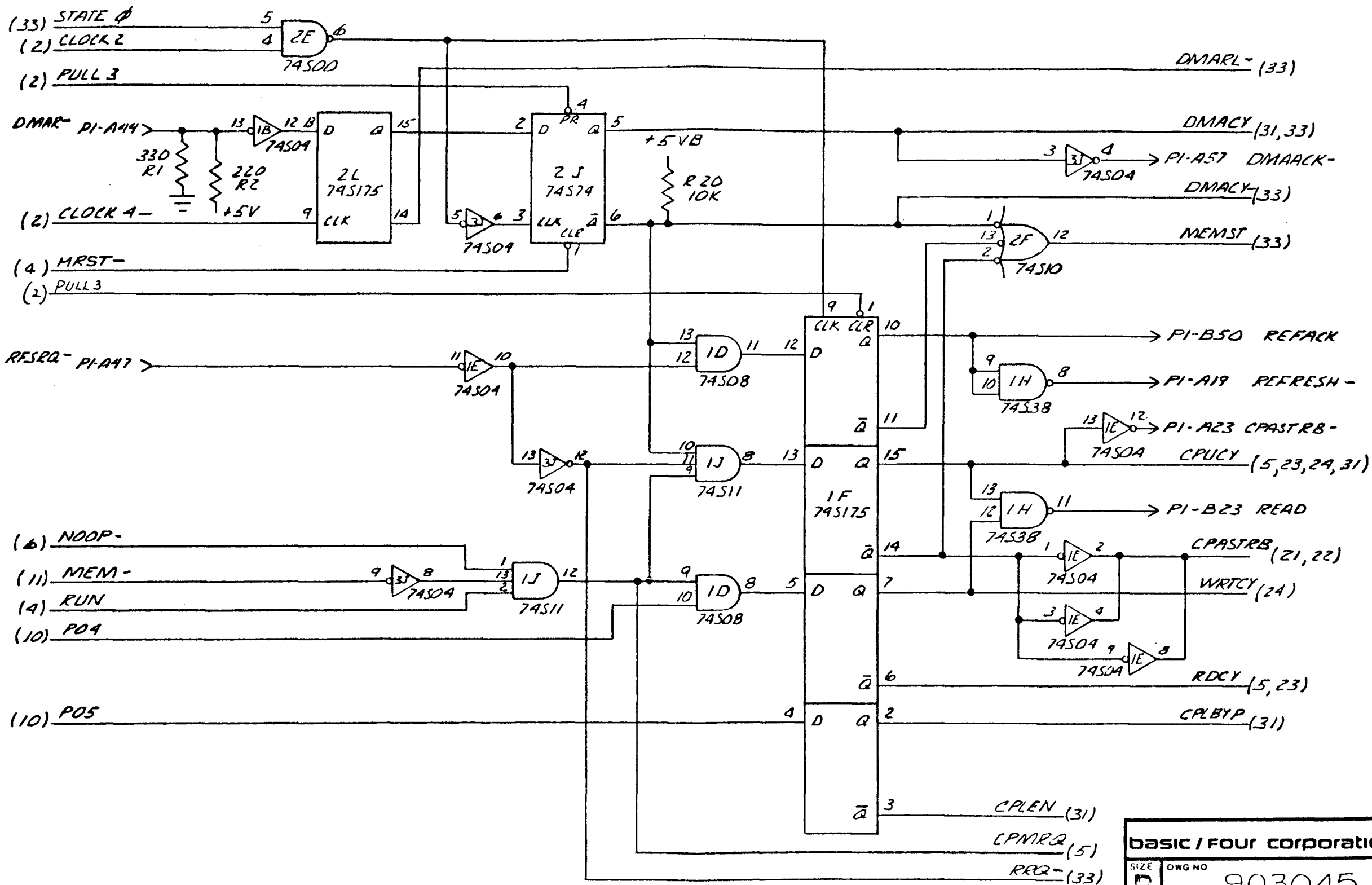
6-37

basic / four corporation		
SIZE B	DWG NO. 903045	REV B
SCALE		SH 30 OF 35



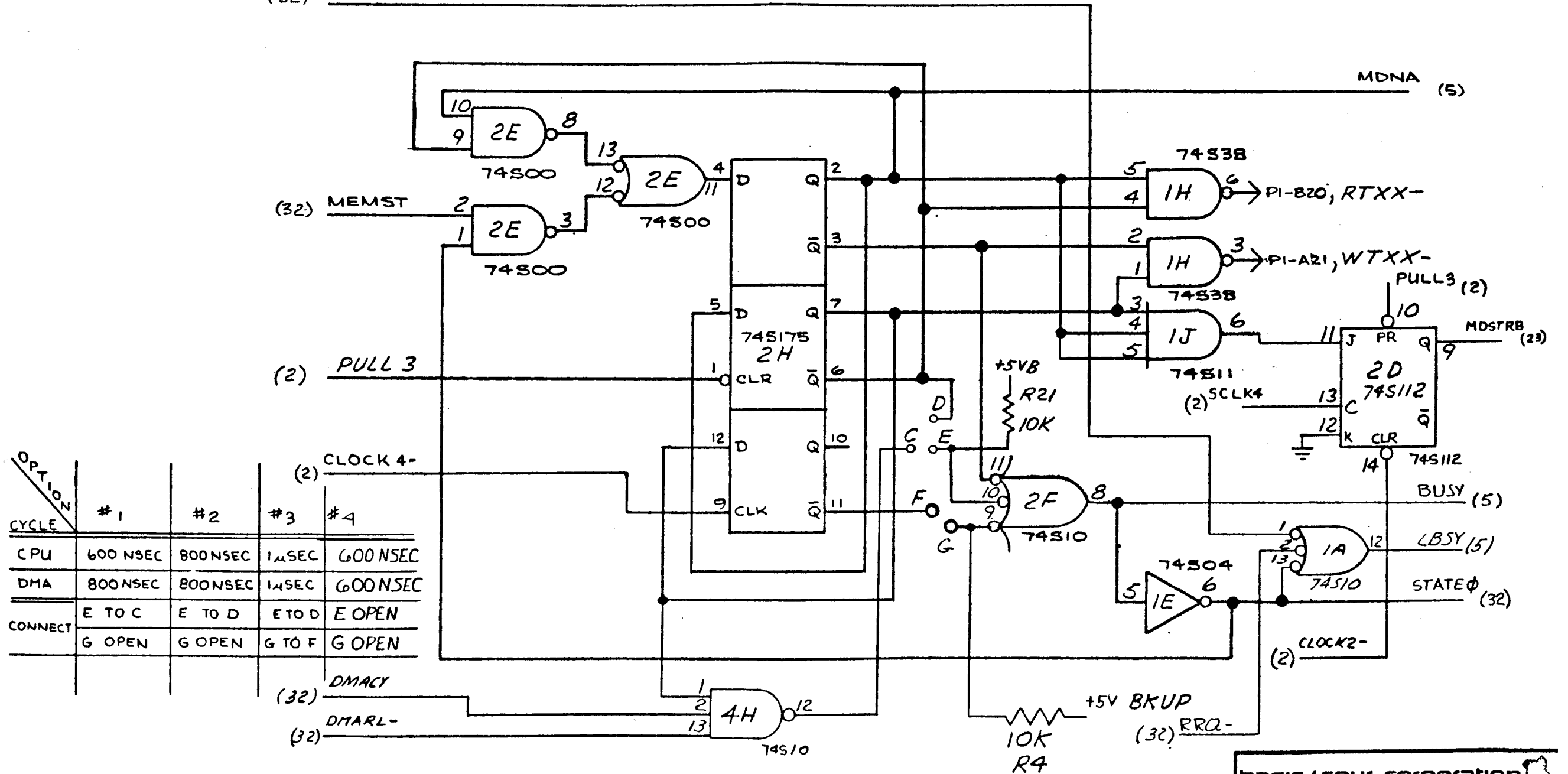
MEMORY BANK SELECT

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-22 OF 25

(32) DMACY -



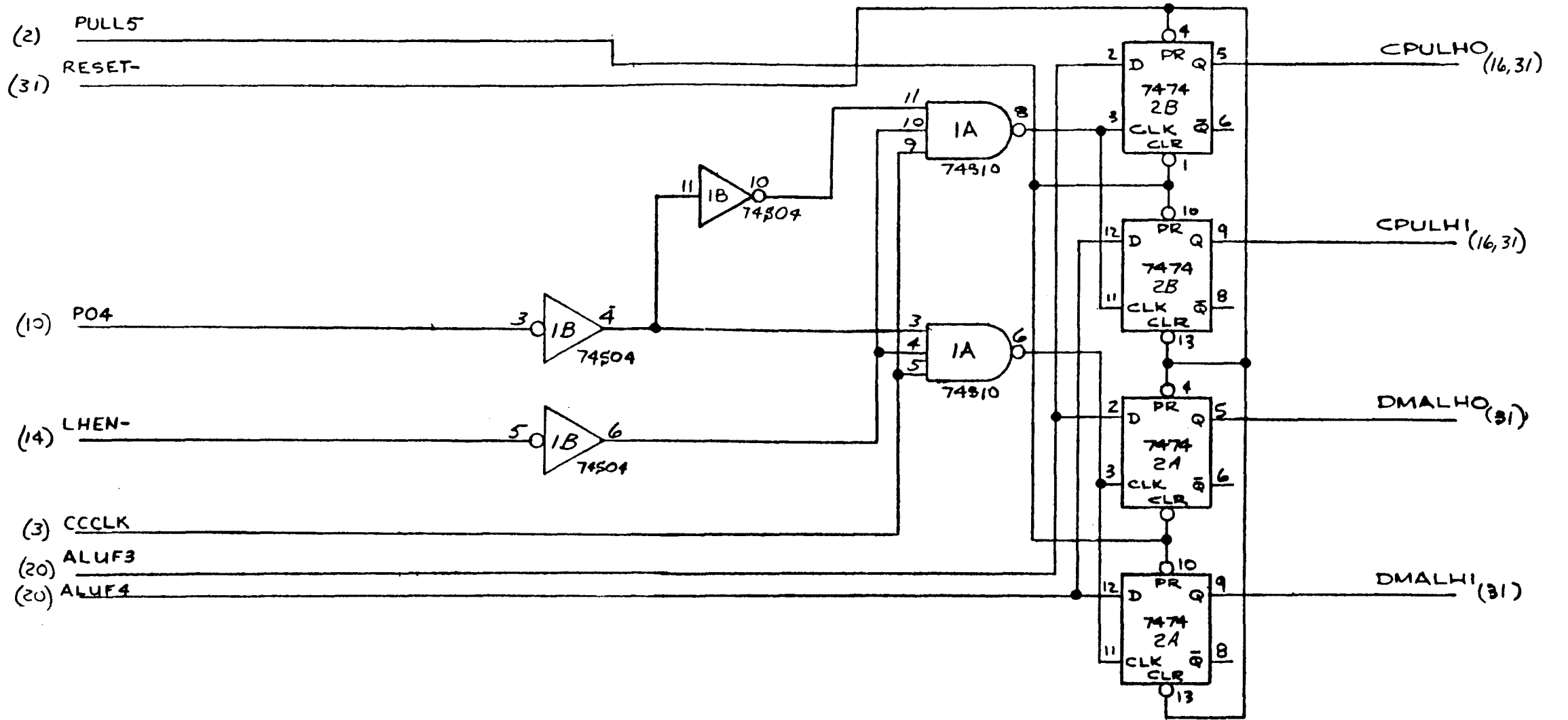
OPTION	CYCLE			
	#1	#2	#3	#4
CPU	600 NSEC	800 NSEC	1 μSEC	600 NSEC
DMA	800 NSEC	800 NSEC	1 μSEC	600 NSEC
CONNECT	E TO C	E TO D	E TO D	E OPEN
	G OPEN	G OPEN	G TO F	G OPEN

MEMORY CONTROL

basic / four corporation

SIZE	DWG NO	REV
	903045	B
SCALE		SH 33 of 35

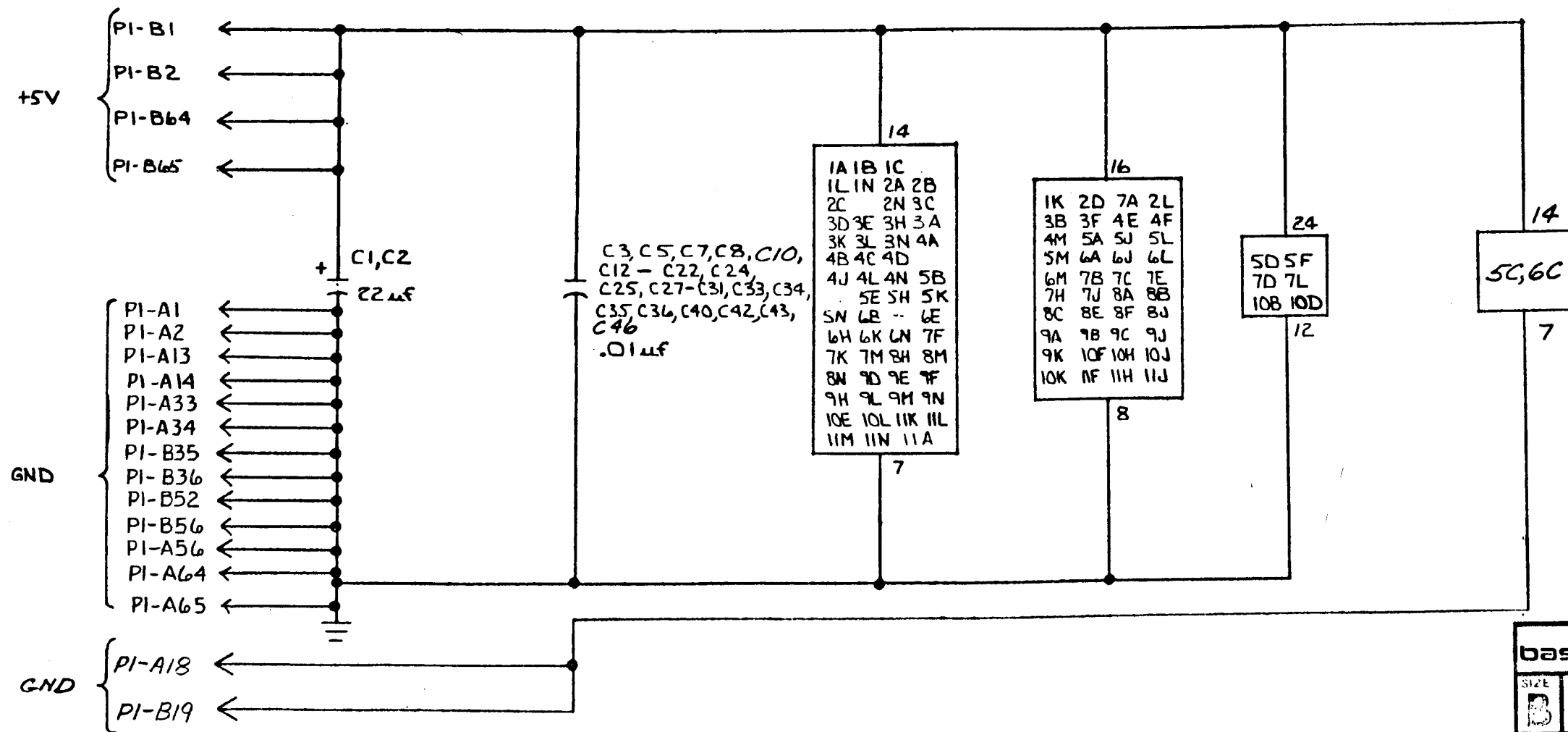
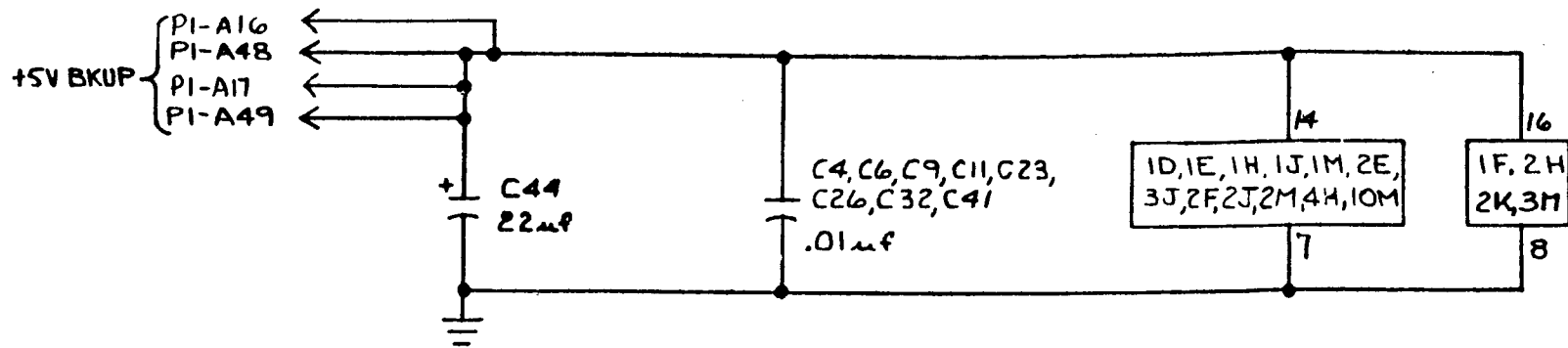




MEMORY BANK LATCHES

6-41

basic / four corporation		
SIZE B	DWG NO 903045	REV B
SCALE -		SHEET 34 OF 35



basic / Four corporation

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

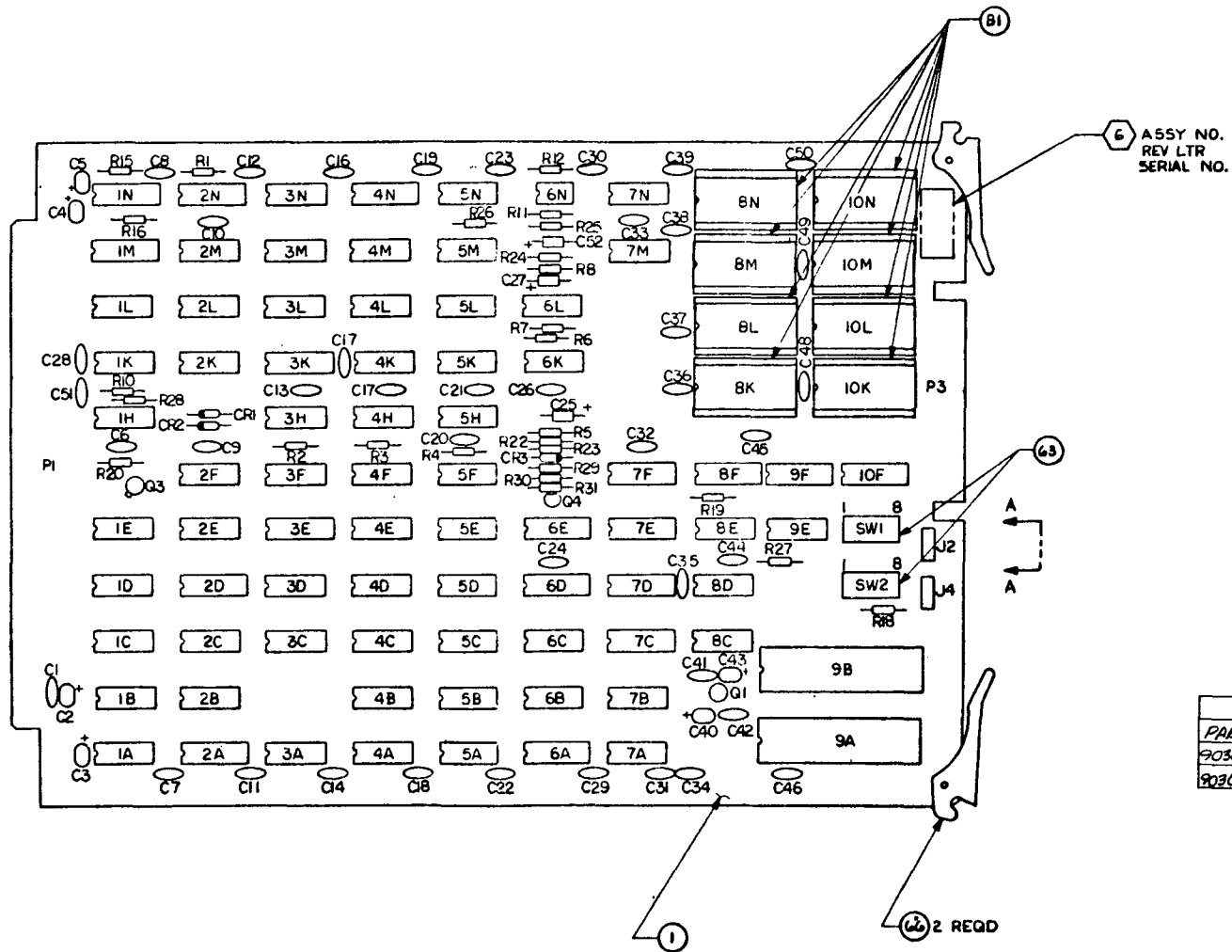
1. REF LOGIC DIAGRAM 901434, BASIC & 903150 FOR -001

2. REF BOARD DETAIL 901431

3. MARK DESIGNATION APPROXIMATELY WHERE SHOWN PER BFC SPECIFICATION 80000.

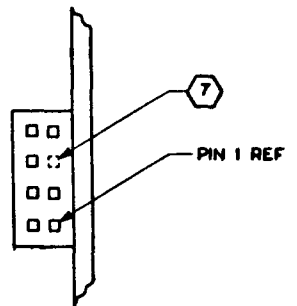
4. KEY J2 & J4 BY CLIPPING OFF PIN 5, PER VIEW A.

REV	DATE	DESCRIPTION	INITIALS	DATE
AX1	8/29	PHOTO TYPE RELEASE		8-29-77
AX2	9/15	PRE-PRODUCTION RELEASE		9-15-77
AX3	11/16	SEE ECN		11-16-77
AX4	2/15	REVISED PROMS		2-15-78
AX5	2/24	ADDED -001 VERSION		2-24-78
AX6	2/15	PL CHG ONLY		2-15-78



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

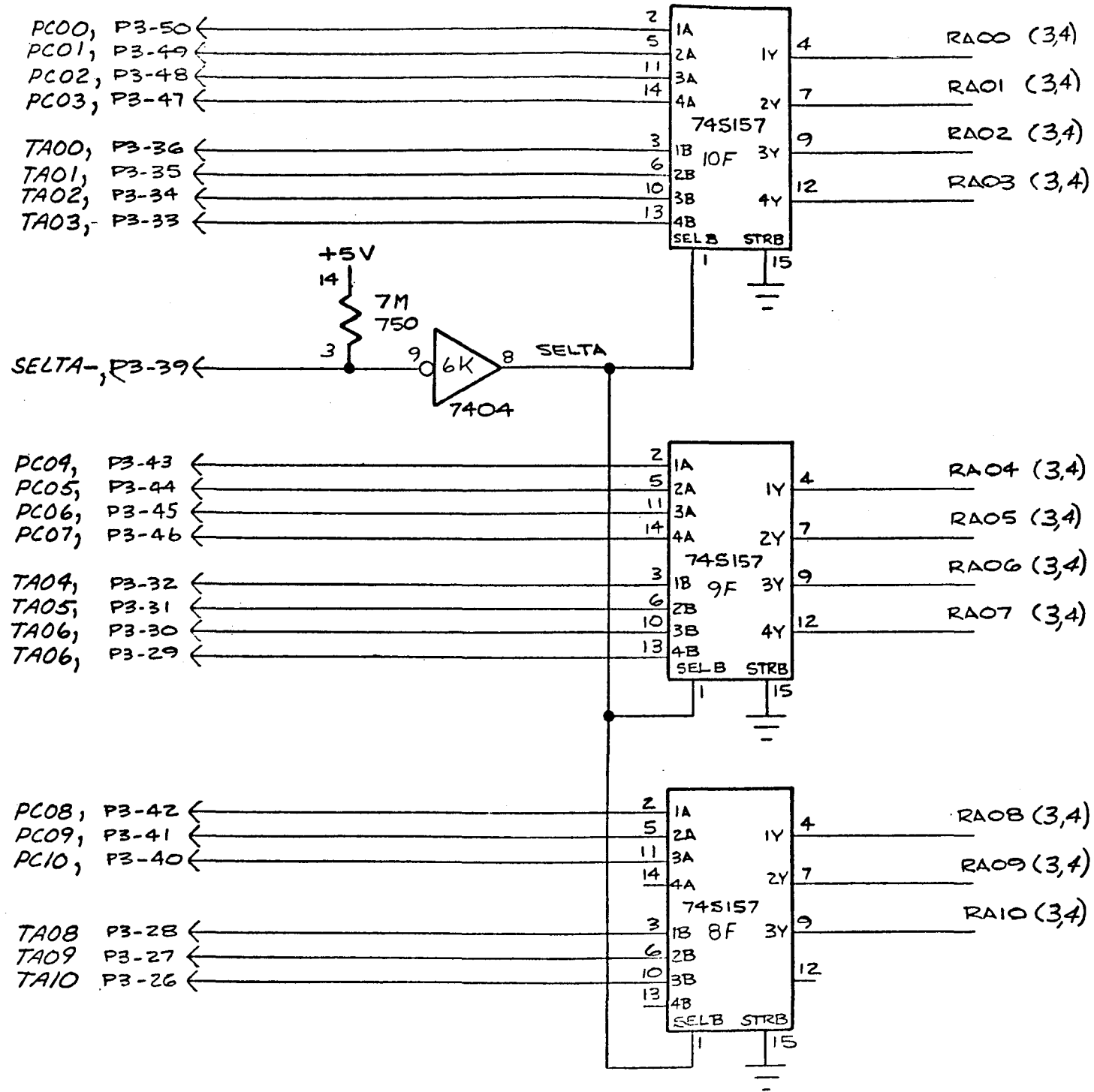
OUTSTANDING ECN'S  
3012  
3089



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

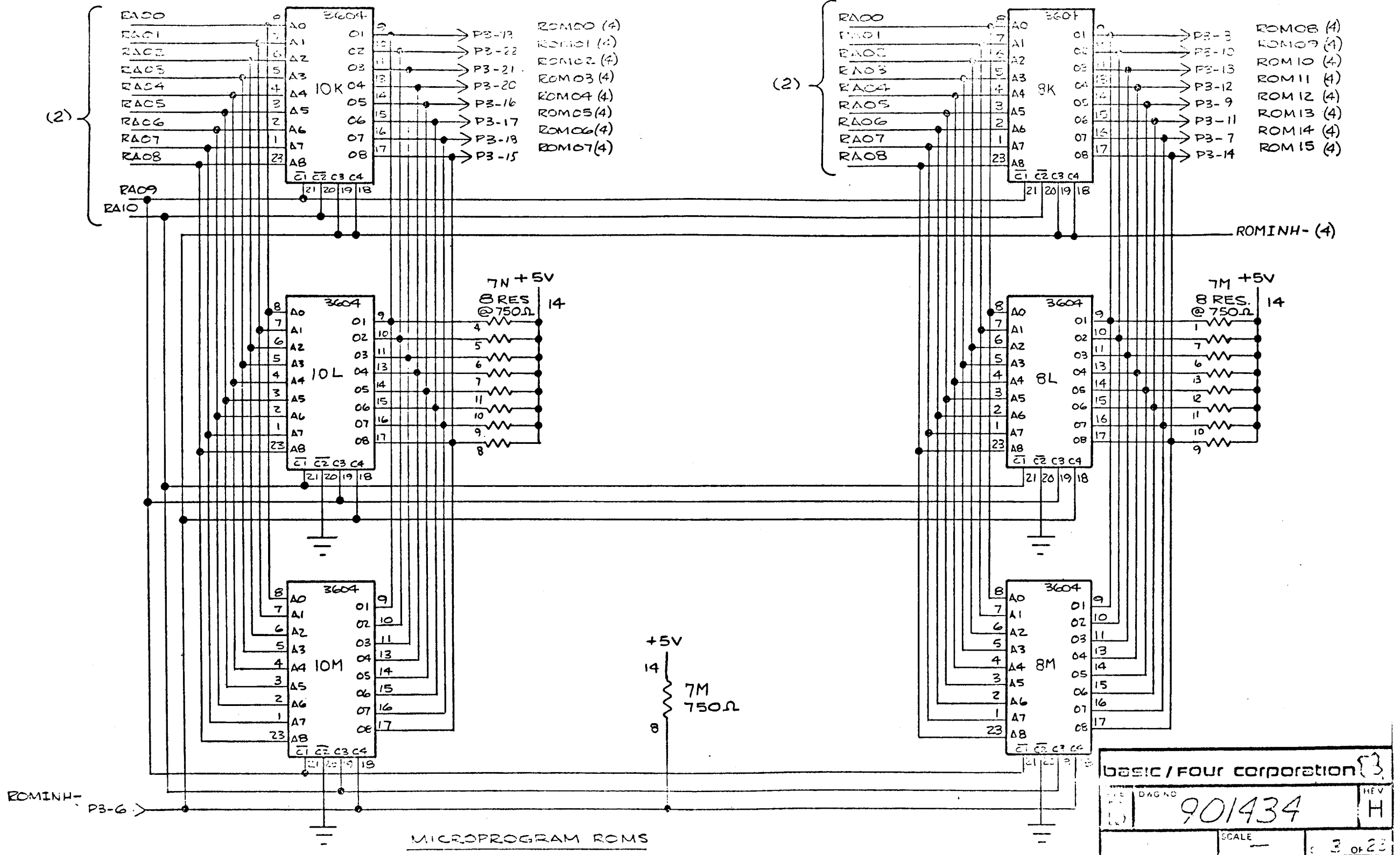
REWORK PER ECN 2461 (FOR -001 ONLY)

SEE PARTS LIST 903046		DIMENSIONS ARE IN INCHES		TOLERANCES UNLESS OTHERWISE SPECIFIED		basic / four corporation	
		X1.1		X1.0		1326 South Clarendon Street Anaheim, California 92806	
		X1.0		X1.0		TITLE PCB ASSY, ACCESSORY	
		X1.0		X1.0		BOARD, MODEL 1340 CPU	
		X1.0		X1.0		SIZE DWG NO	
		X1.0		X1.0		D 903046	
		X1.0		X1.0		REV AX6	
		X1.0		X1.0		TABULATED SCALE 1:1	
NEXT ASSY		USED ON		DO NOT SCALE DRAWING			



ROM ADDRESS MUX

basic / four corporation			3
FILE	DWG NO	REV	
	901434	H	
SCALE	SH 2 OF 23		



basic / FOUR corporation

DATE: 10/15/64

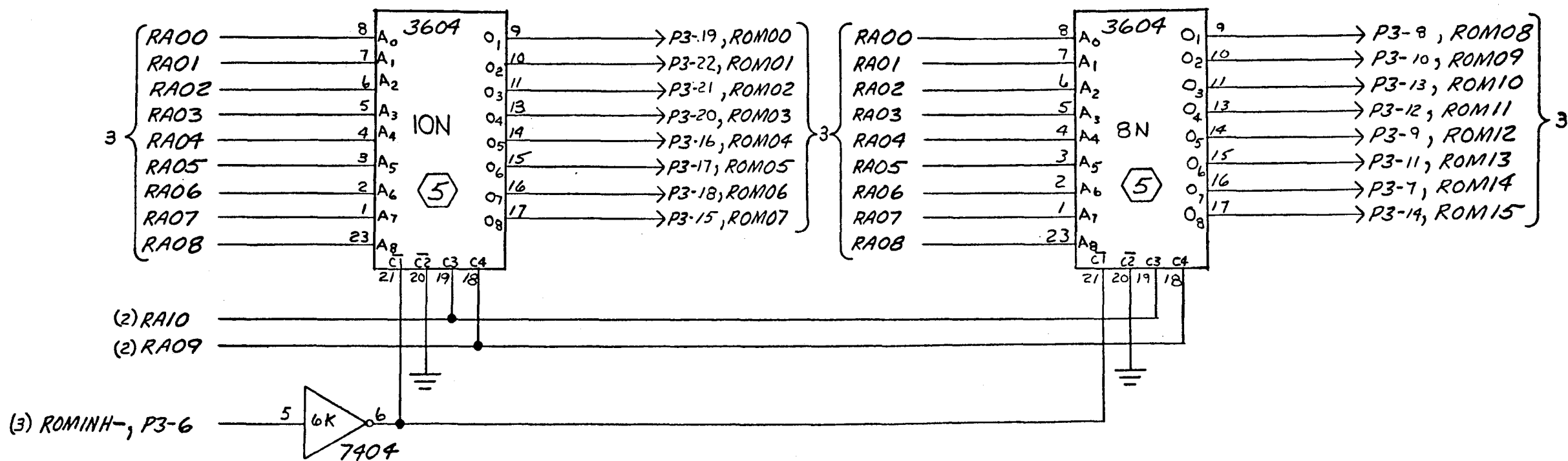
DWG NO: 901434

REV: H

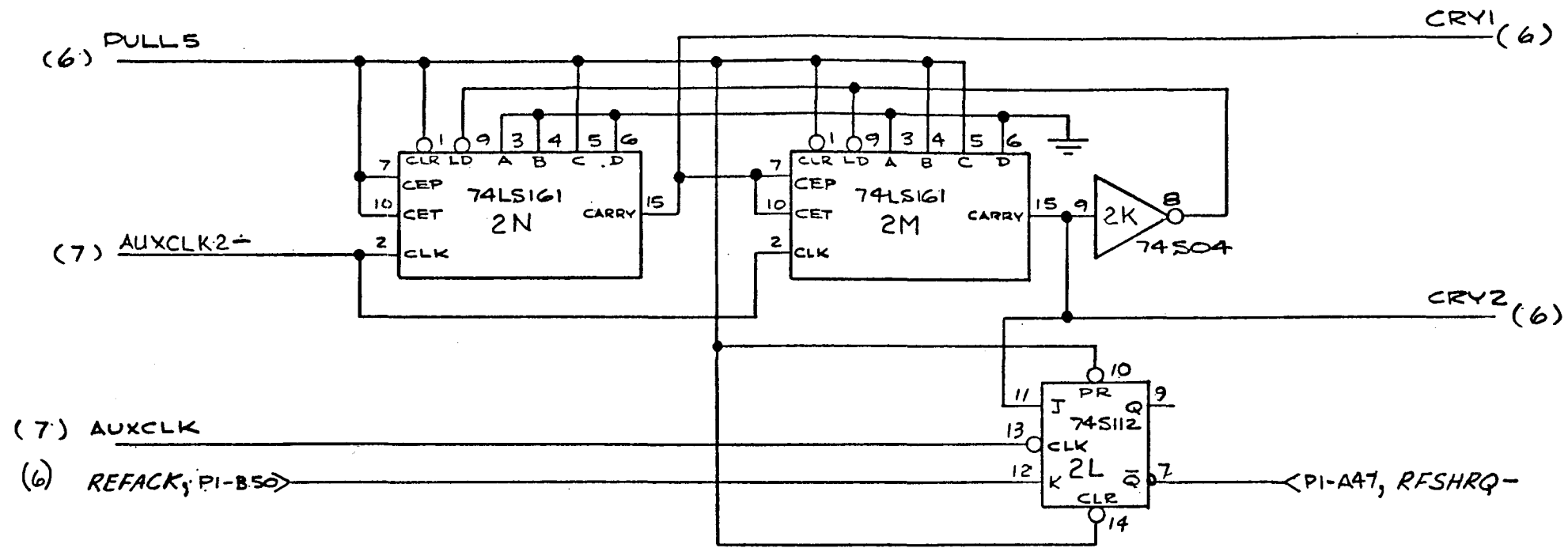
SCALE: 1

3 of 23

6-45

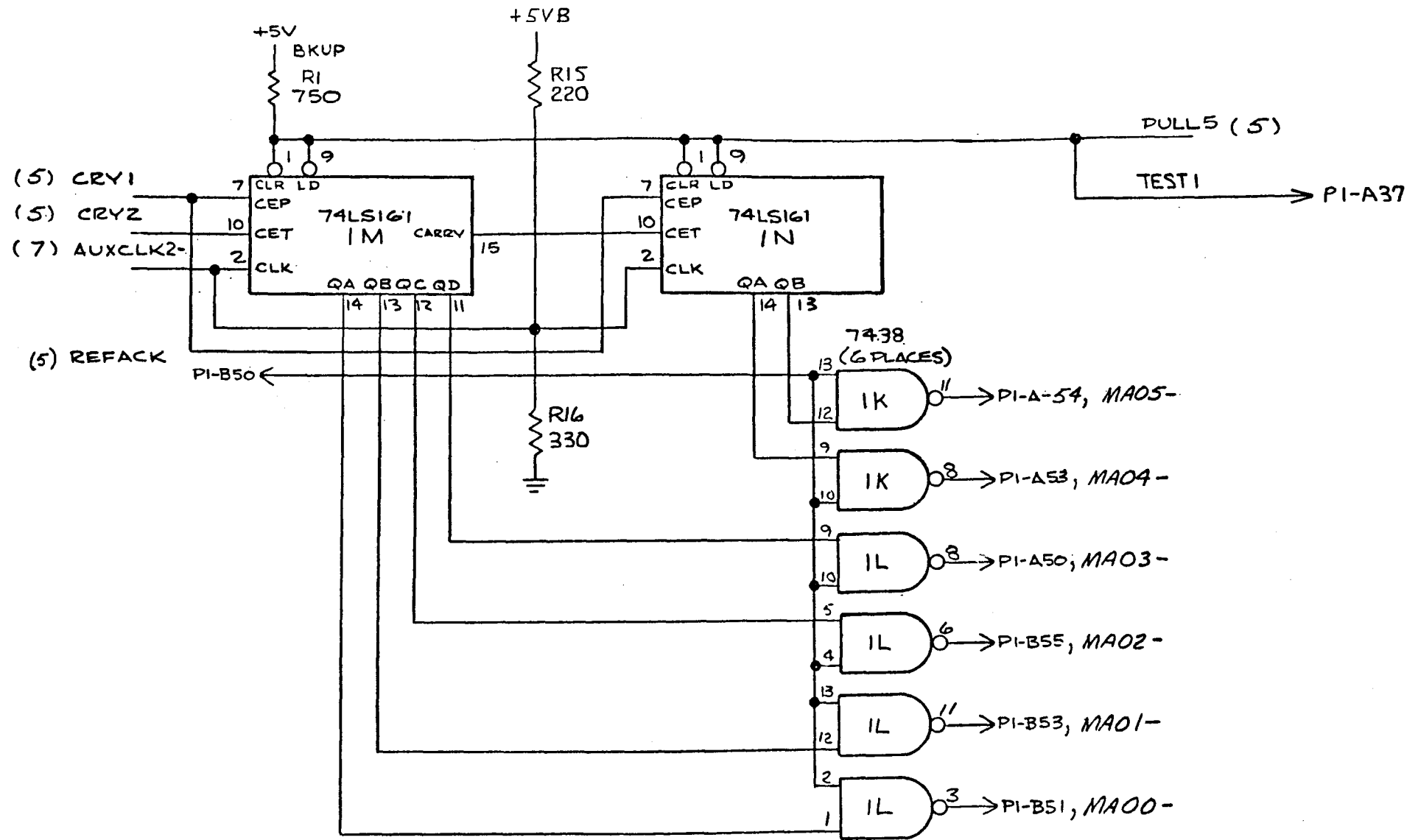


basic / four corporation		
DATE	DWG NO	REV
	901434	H
SCALE		SH 4 OF 23



REFRESH LOGIC

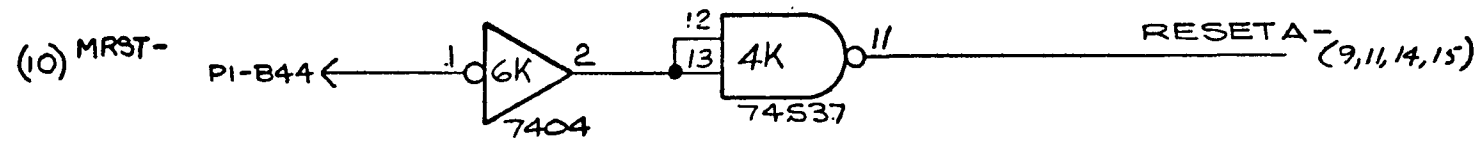
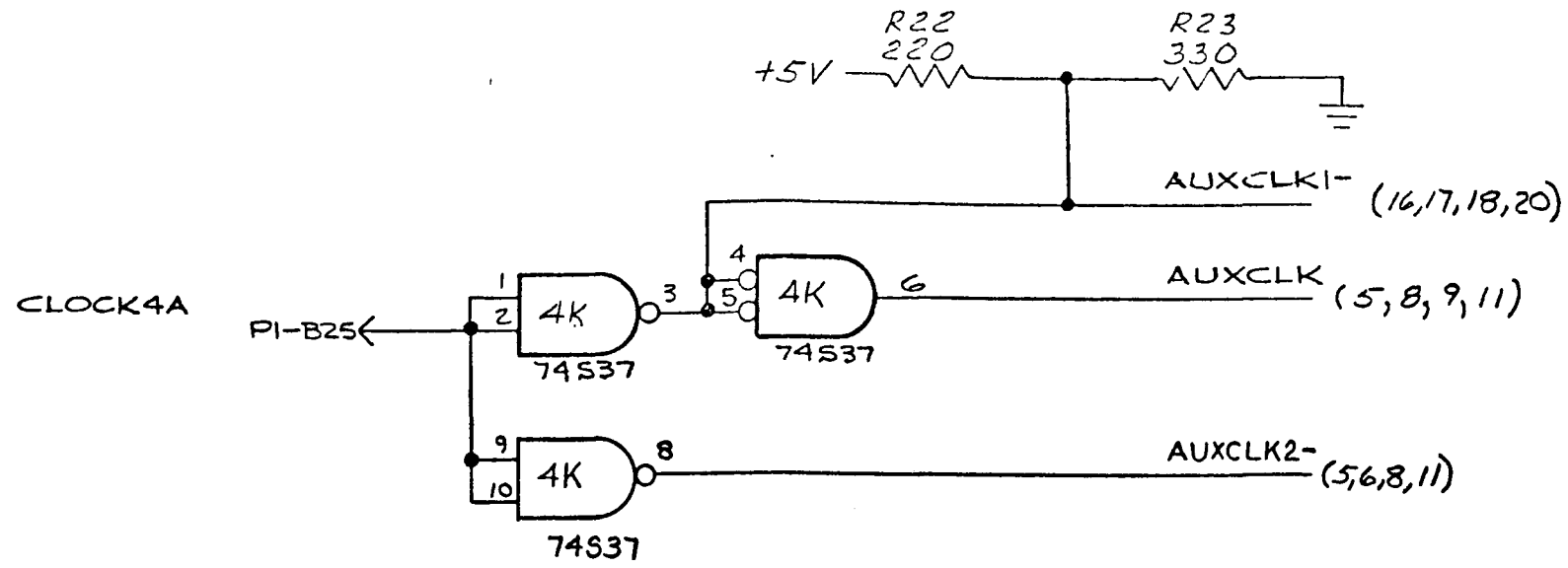
basic / four corporation		
SIZE D	DWG NO 901434	REV H
SCALE —		SH 5 OF 23



REFRESH LOGIC (Cont.)

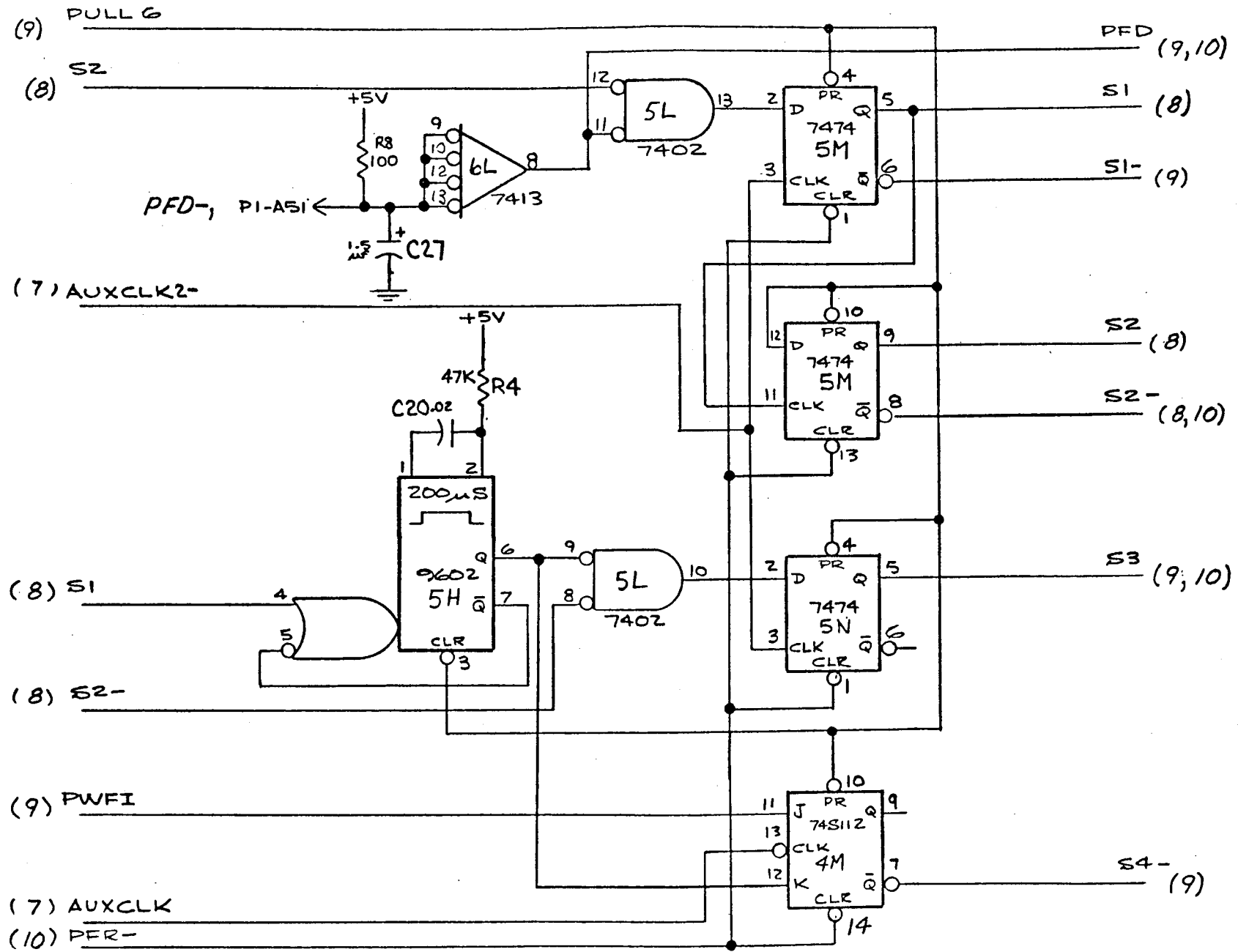
basic / four corporation		
DWG NO	901434	REV
		H
SCALE		SH 6 OF 28





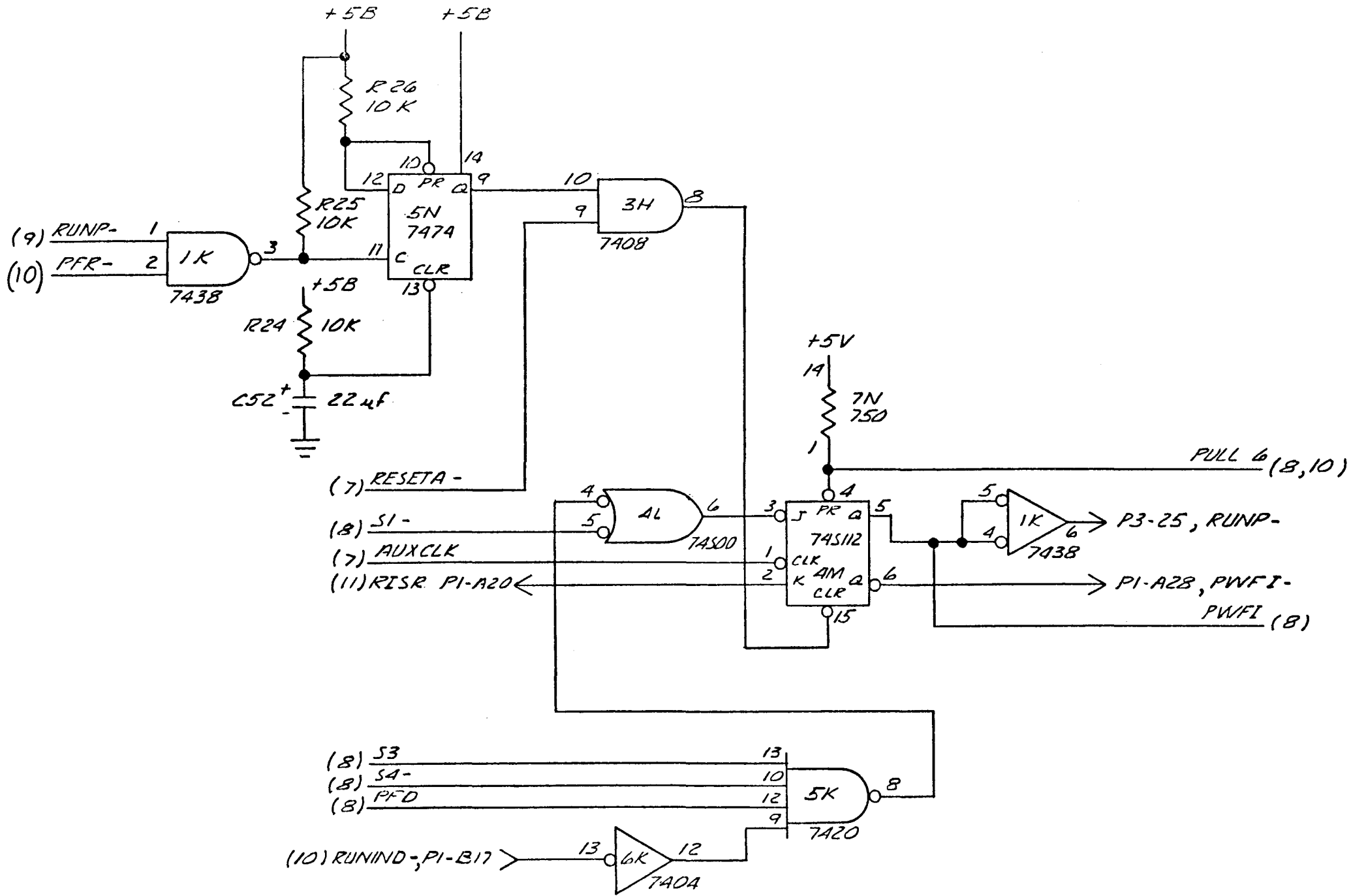
AUX. CLOCK AND RESET

BASIC / FOUR CORPORATION			
SIZE	DWG NO	SCALE	REV
D	901434	—	H
		SH	7 OF 23



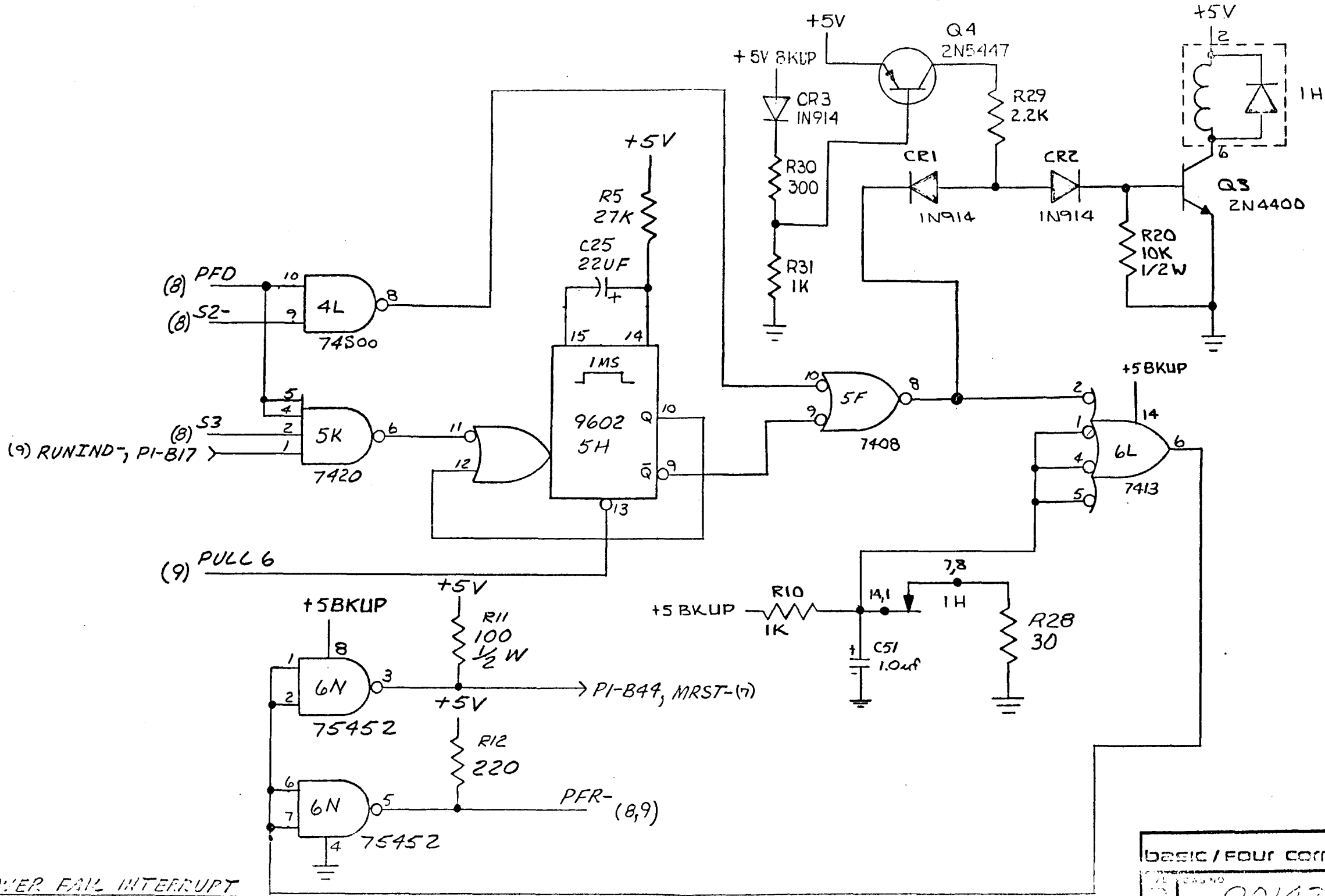
POWER FAIL INTERRUPT

basic / four corporation		
REV	DWG NO	H
	901434	
SCALE		SH 8 OF 23



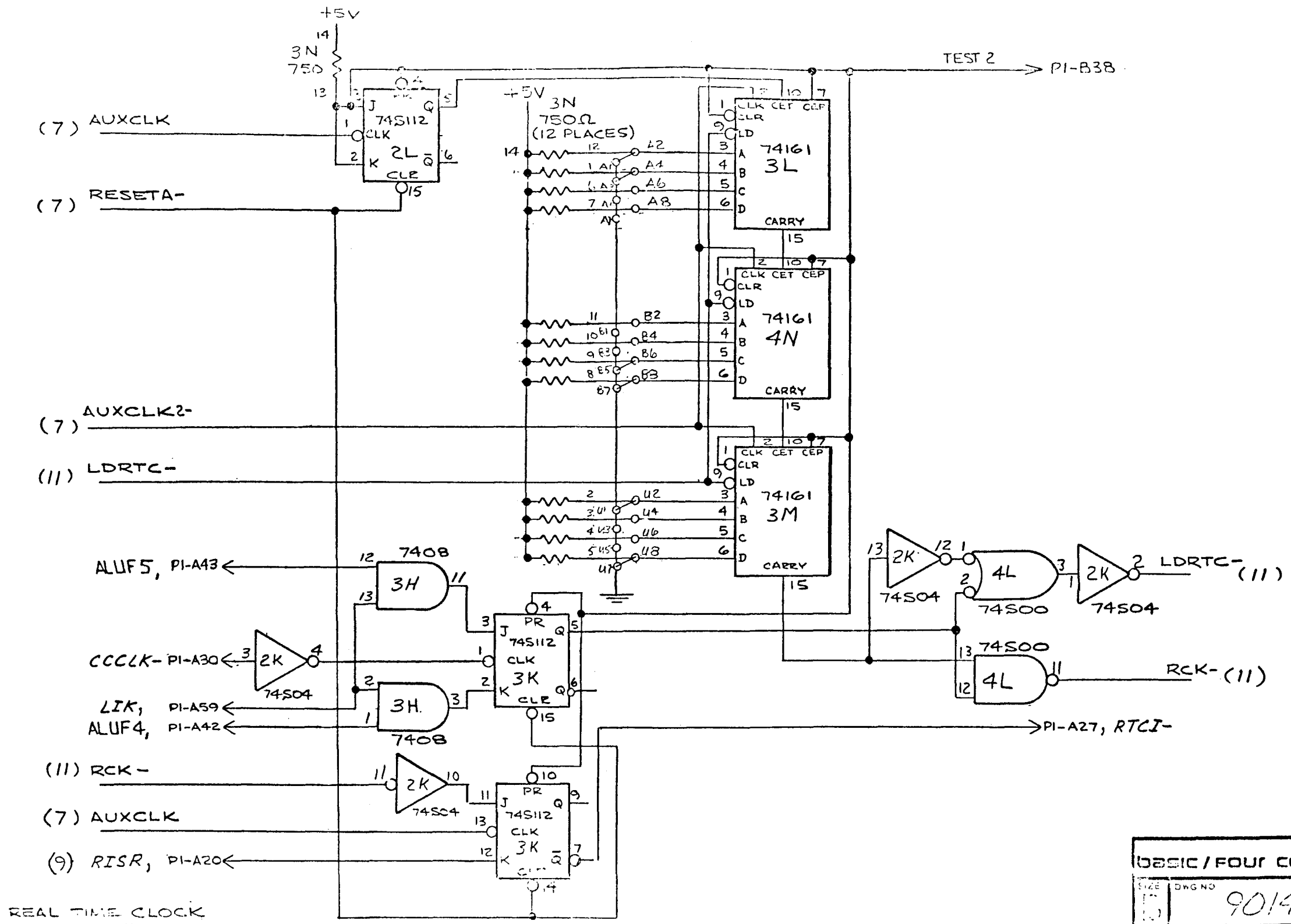
POWER FAIL INTERRUPT (CONTINUED)

basic / four corporation		
REV	DWG NO	REV
H	901434	H
SCALE	SH 9 OF 22	

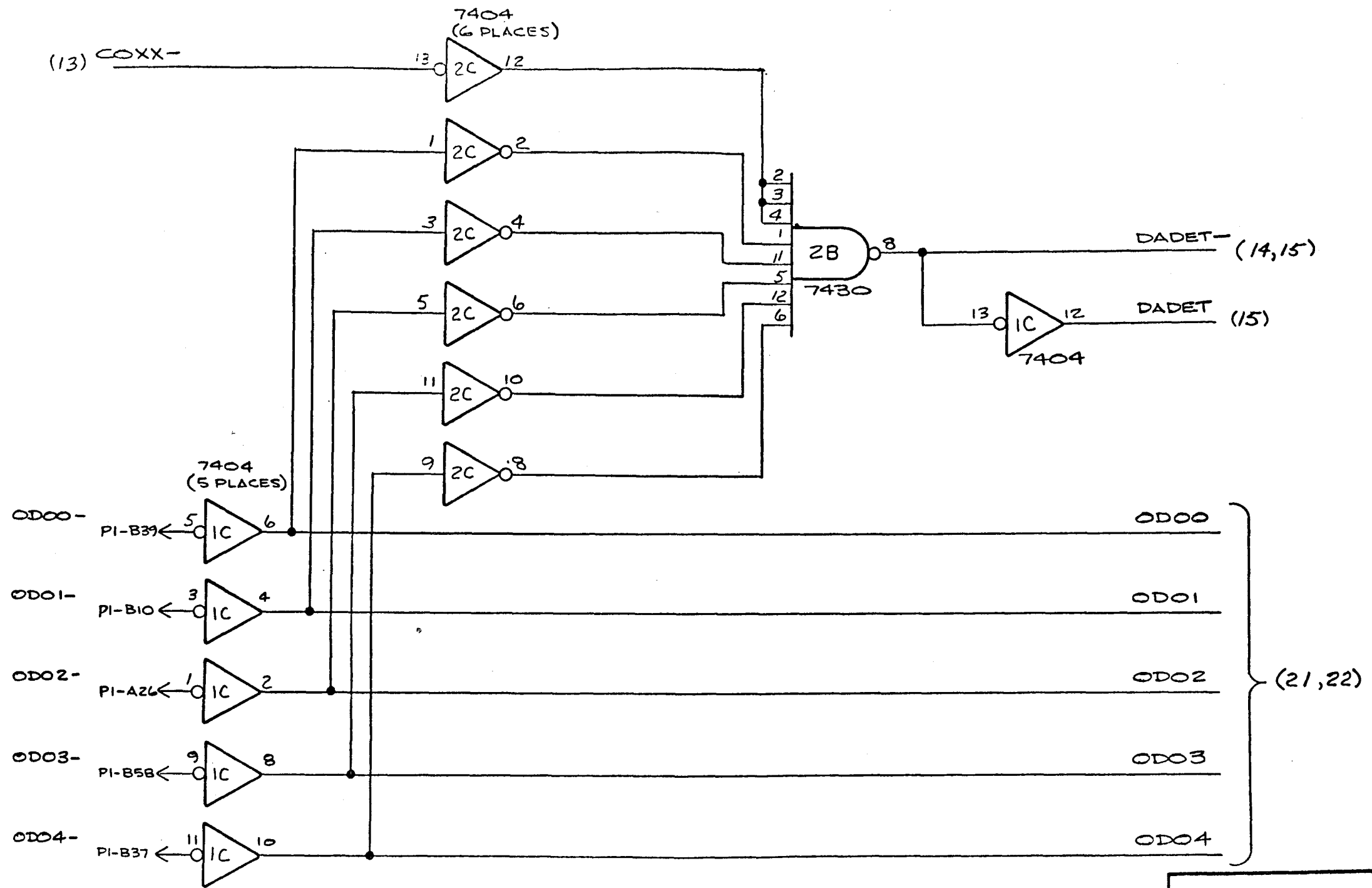


POWER FAIL INTERRUPT  
(CONTINUED)

basic / four corporation		
DESIGN NO	901434	REV
		H
SCALE		SH 10 OF 25

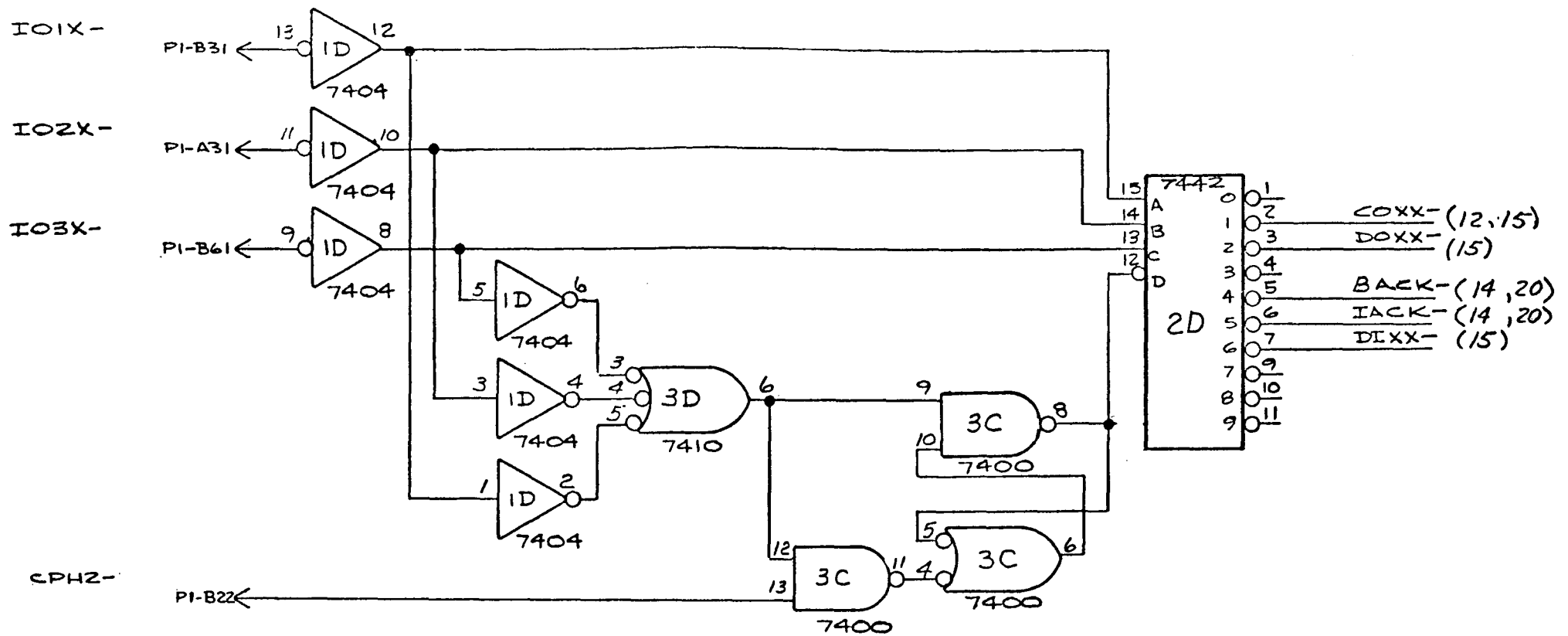


basic / four corporation		
SIZE	DWG NO	REV
	901434	H
SCALE		SH 11 OF 23



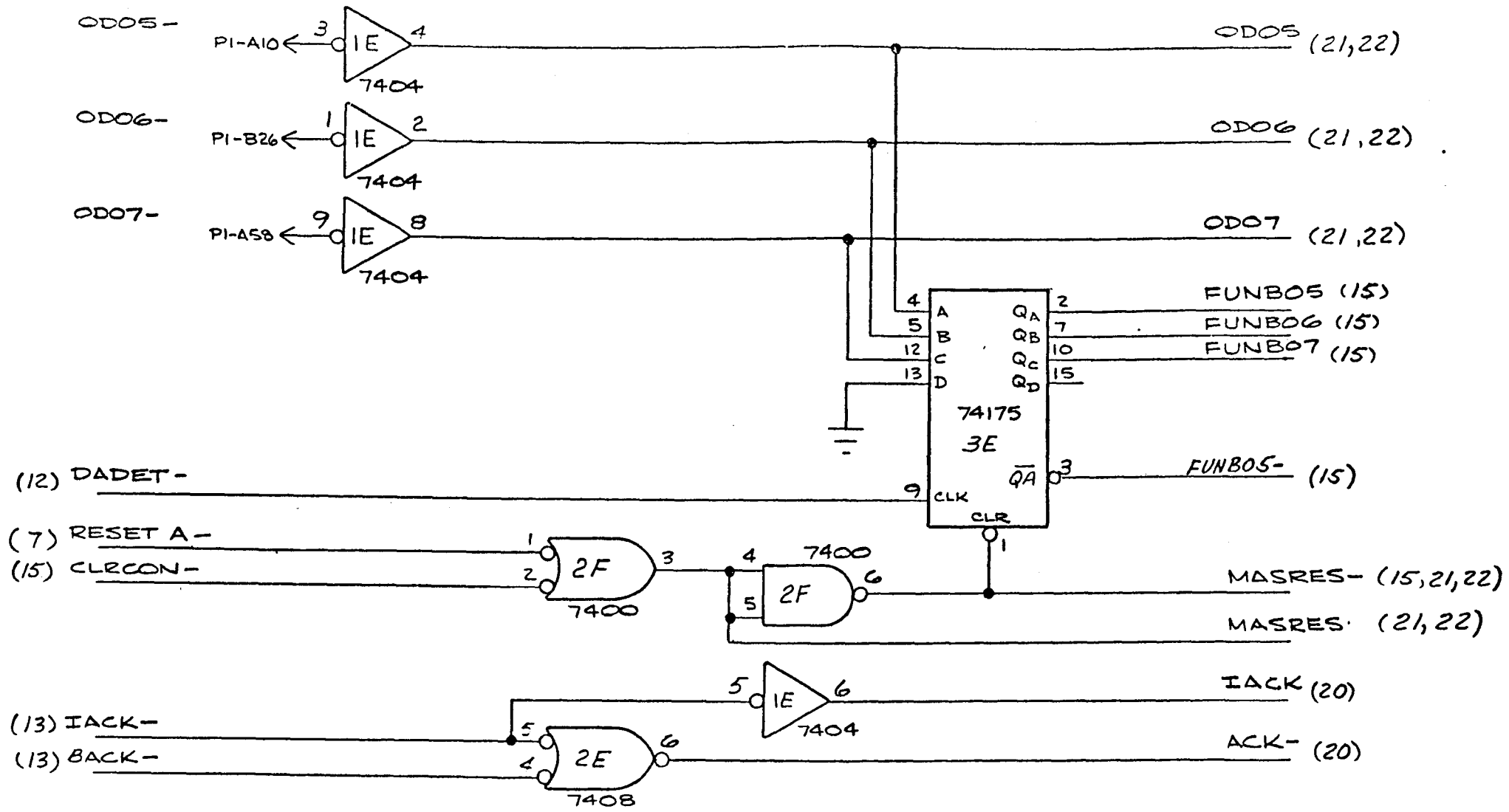
DUAL CHANNEL CONTROLLER - ADDRESS DETECT

basic / four corporation		
DWG NO	901434	REV H
SCALE		SH 12 OF 23



DUAL CHANNEL CONTROLLER - FUNCTION CONTROL

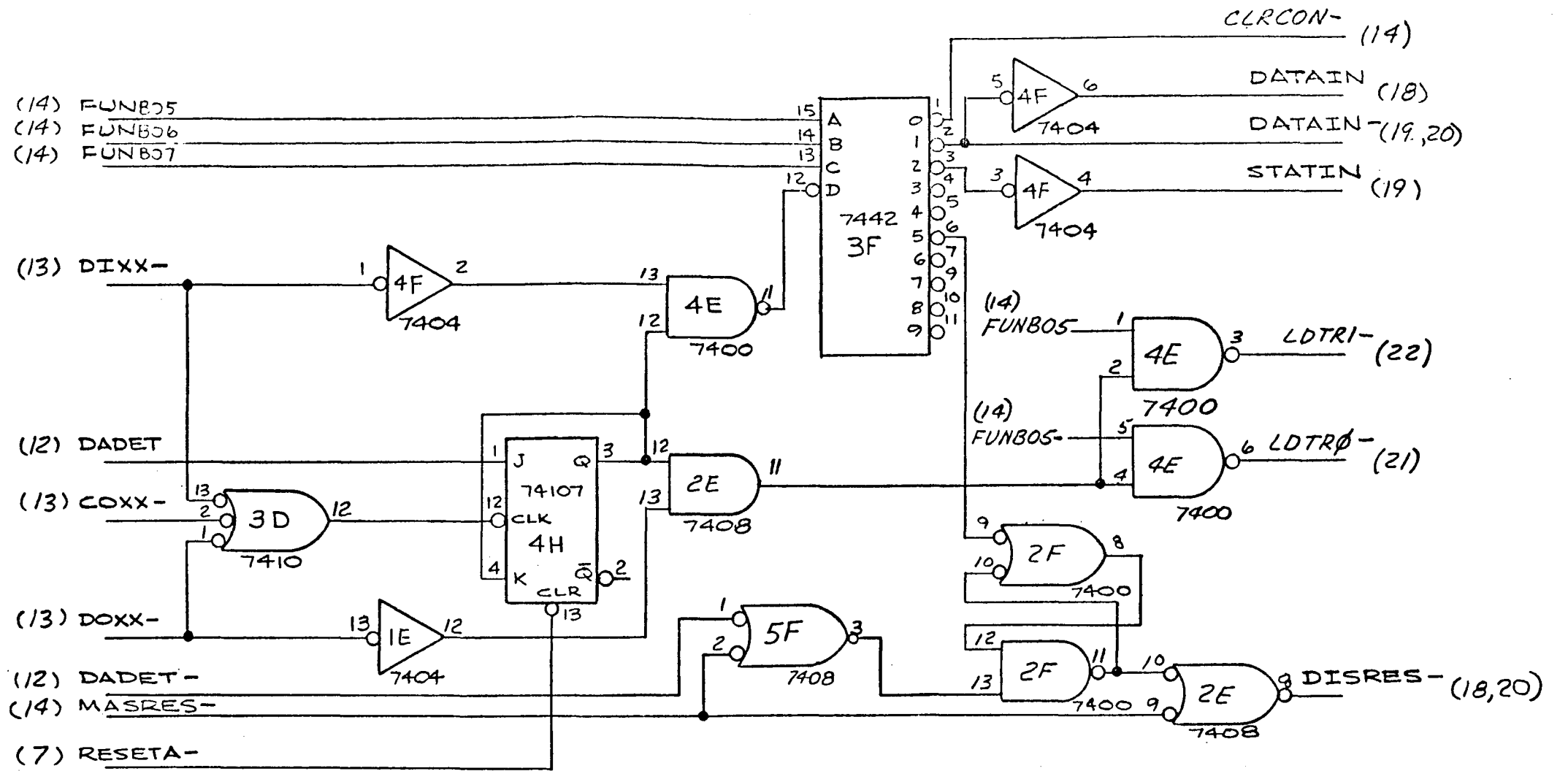
basic / four corporation		REV
DATE	DRG NO	REV
10	901434	H
SCALE		SH 13 OF 23
-		



DUAL CHANNEL CONTROLLER - FUNCTION BIT REGISTER AND CONTROL

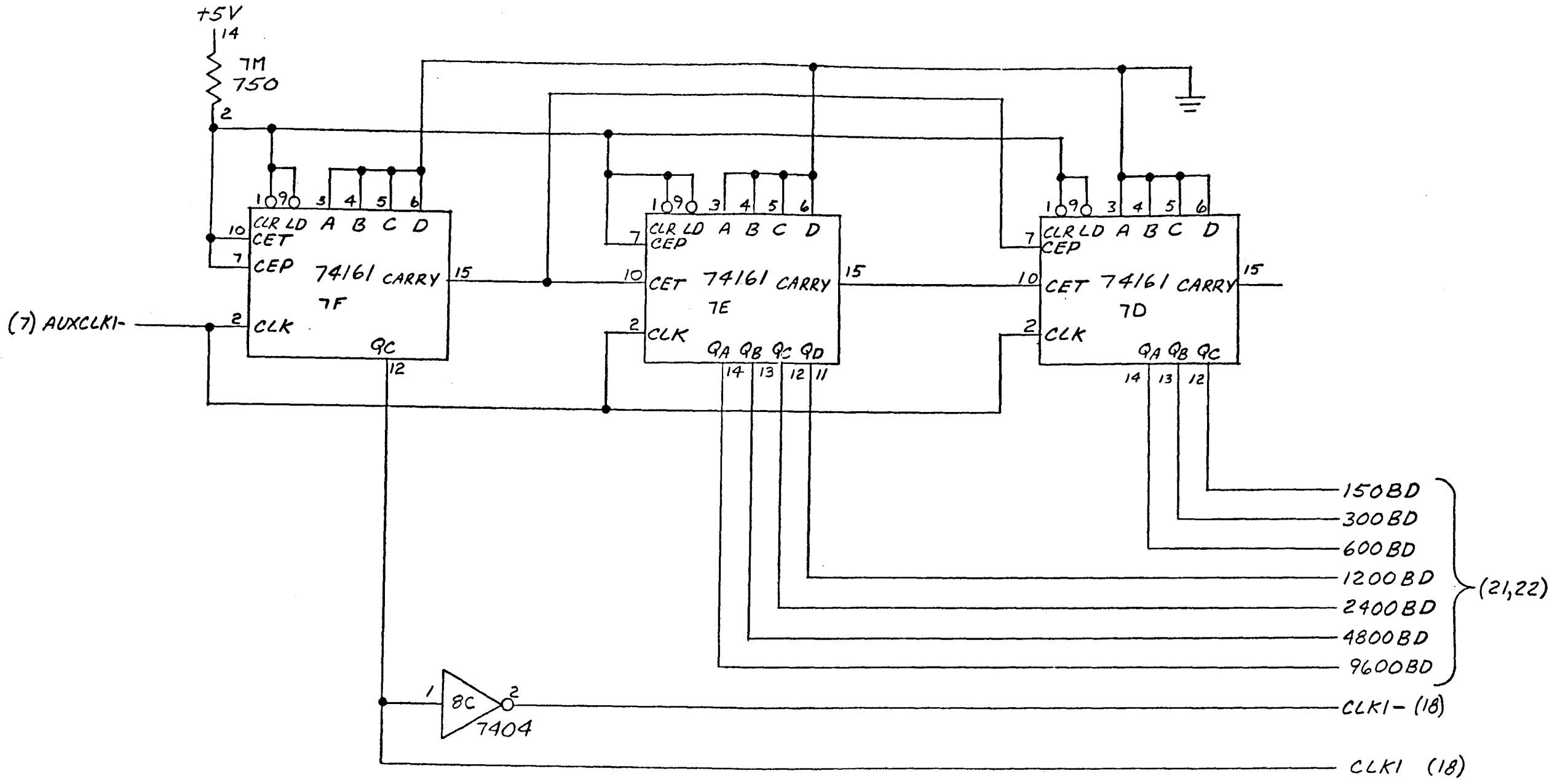
basic / four corporation		
REV	DWG NO	REV
	901434	H
SCALE		SH 14 OF 22





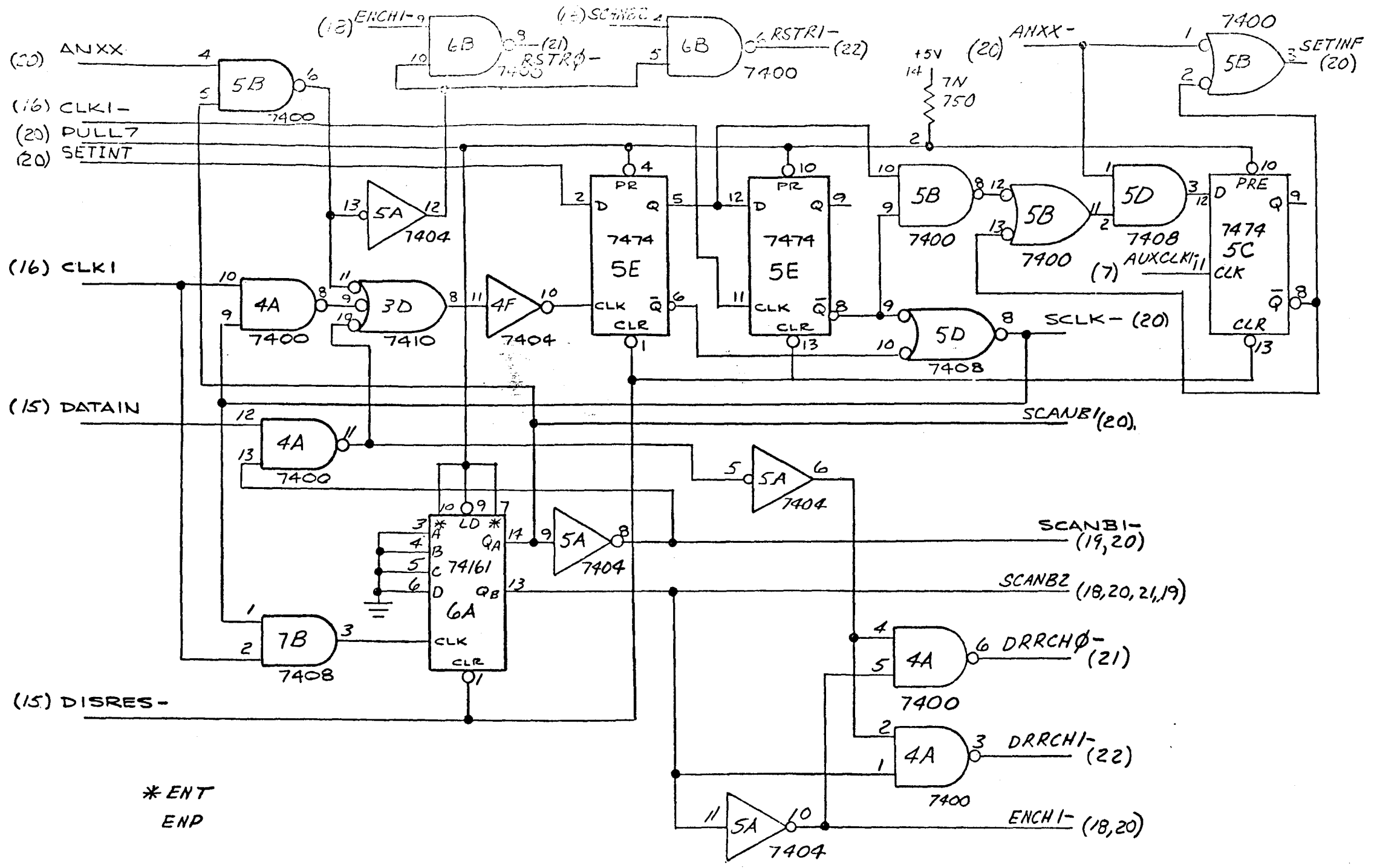
DUAL CHANNEL CONTROLLER - FUNCTION DECODE

basic / four corporation		
REV	EWG NO	REV
	901434	H
SCALE		SH 15 OF 22



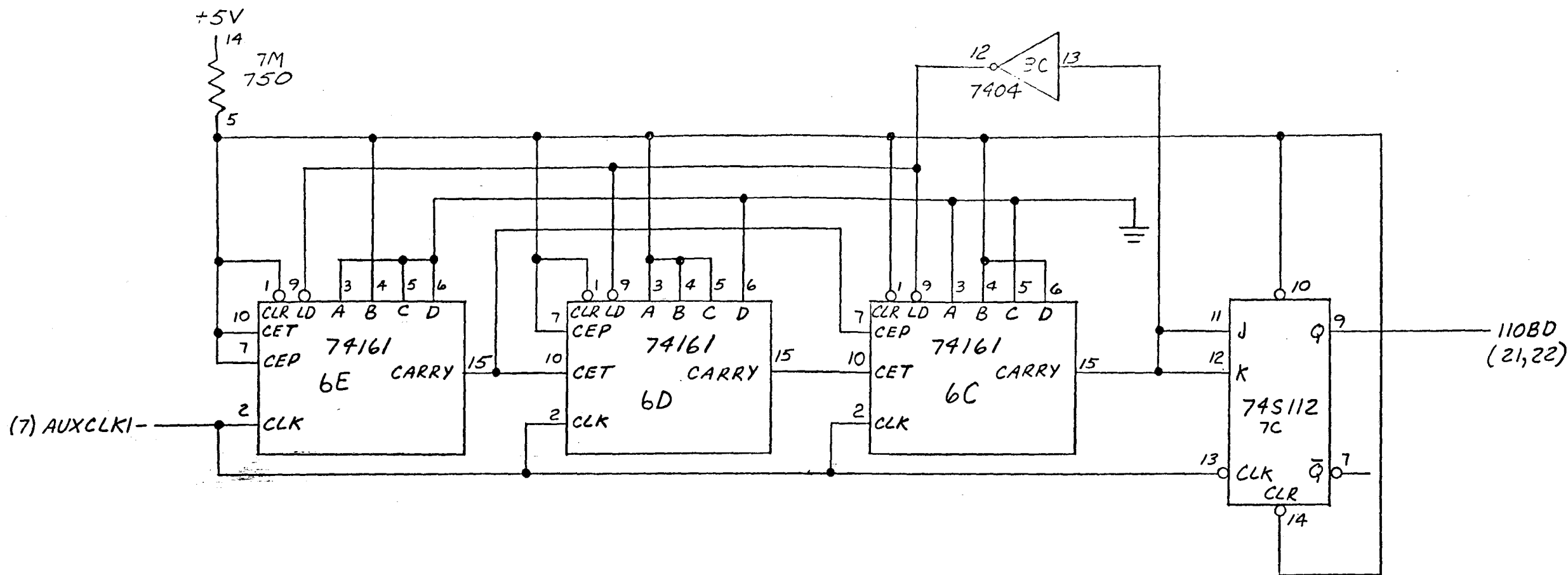
DUAL CHANNEL CONTROLLER - BAUD RATE GENERATOR

basic / four corporation		
DATE	DWG NO	REV
	901434	H
SCALE		SH 16 OF 23

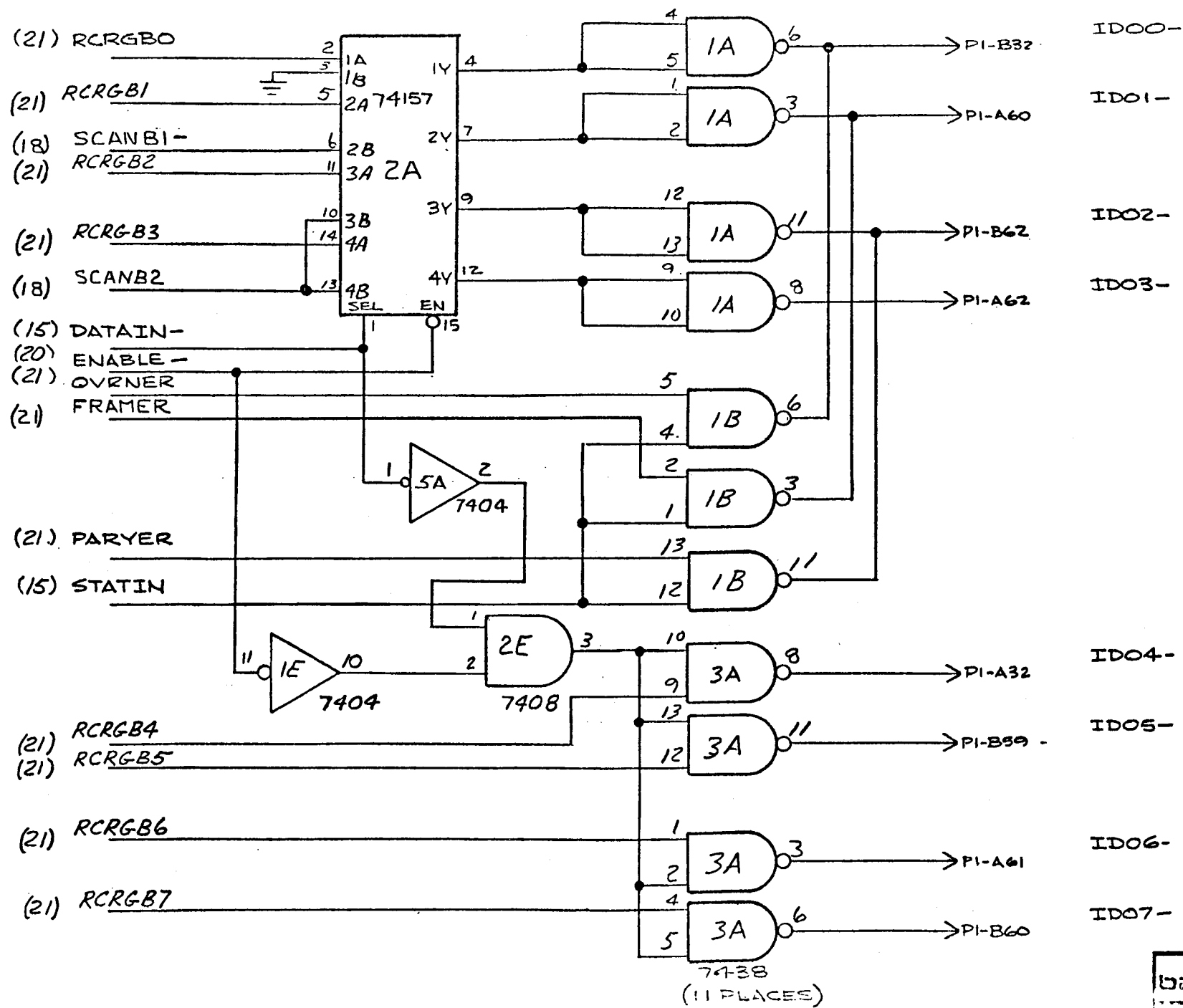


DUAL CHANNEL CONTROLLER - SCAN CONTROL LOGIC

basic / four corporation		
DESIGN NO	901434	REV H
SCALE		SH 18 OF 23

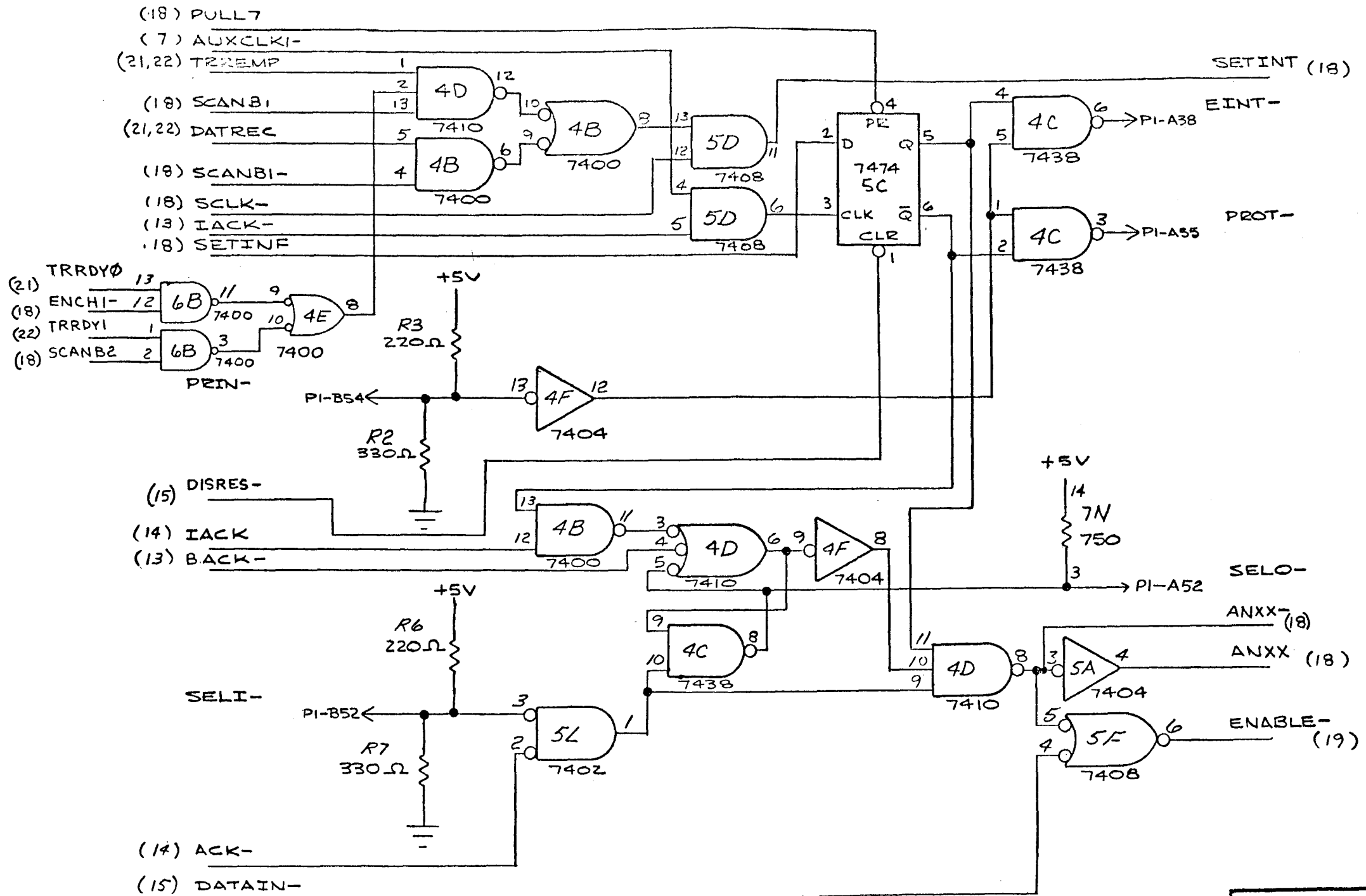


basic / FOUR corporation		
DWG NO	901434	REV H
SCALE	SH 17 OF 23	



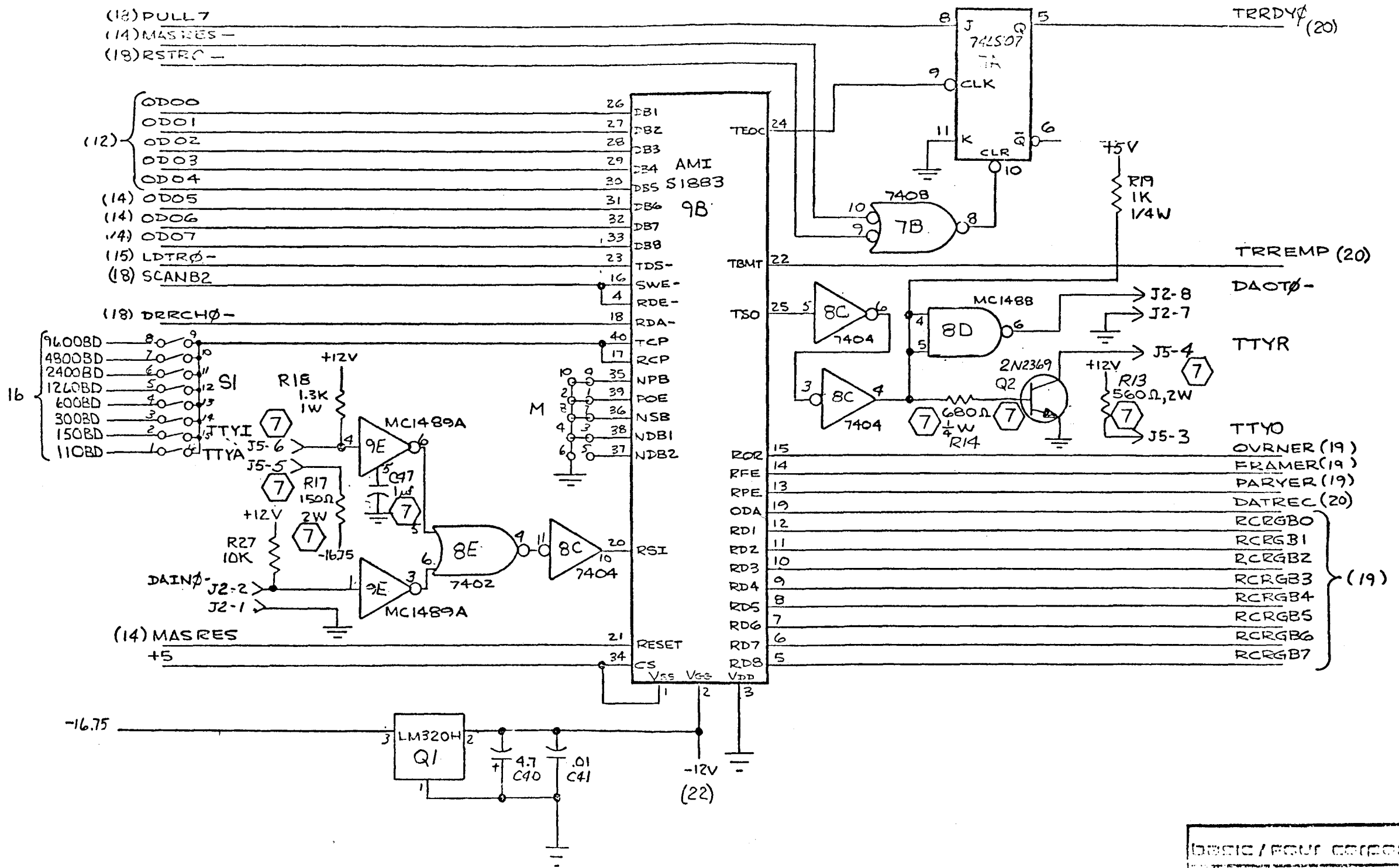
DUAL CHANNEL CONTROLLER - INPUT DATA MULTIPLEXER

basic / four corporation		
SIZE	DWG NO	DIV
	901434	H
SCALE		SH 19 OF 25



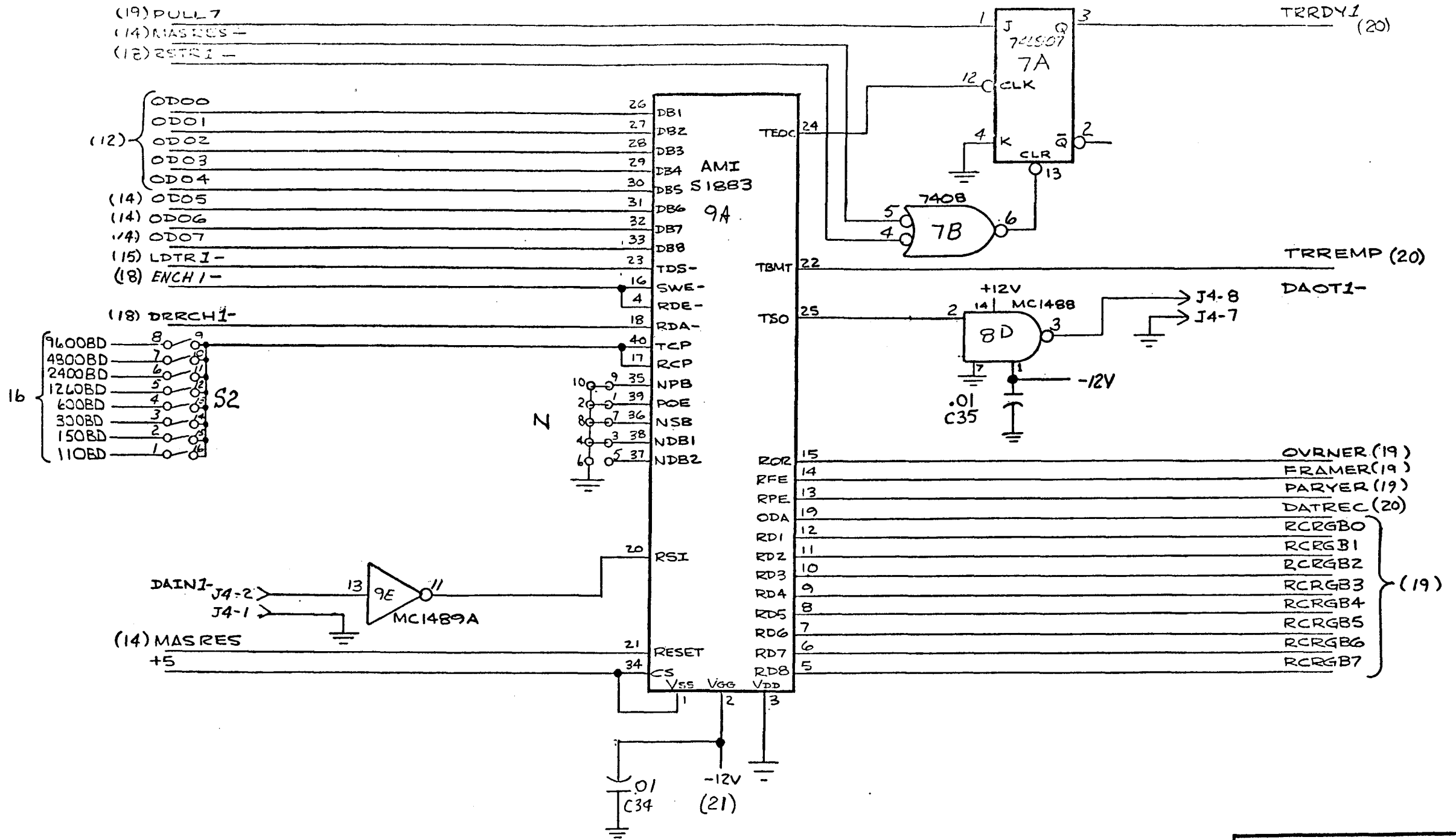
DUAL CHANNEL CONTROLLER - INTERRUPT LOGIC

BASIC / FOUR CORPORATION		
DWG NO	901434	H
SCALE		SH. 20 OF 23



DUAL CHANNEL CONTROLLER - I/O INTERFACE CHANNEL 2

IBM/FOUR CORPORATION		
FIG. NO.	901434	REV. H
SCALE	1 of 2	

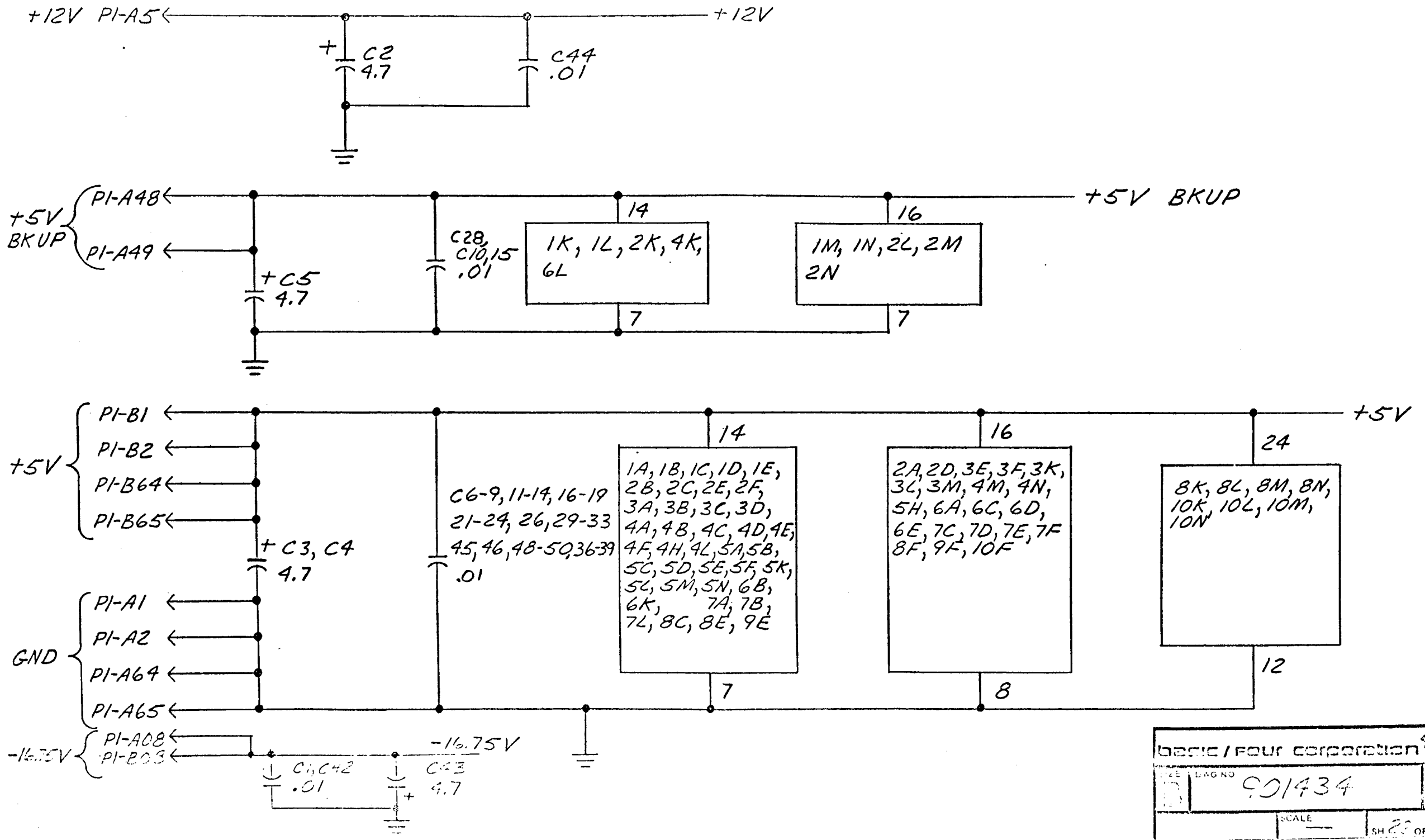


DUAL CHANNEL CONTROLLER - I/O INTERFACE

CHANNEL 1

basic / four corporation		
SIZE	DWG NO	REV
	901434	H
SCALE		SH 22 OF 23



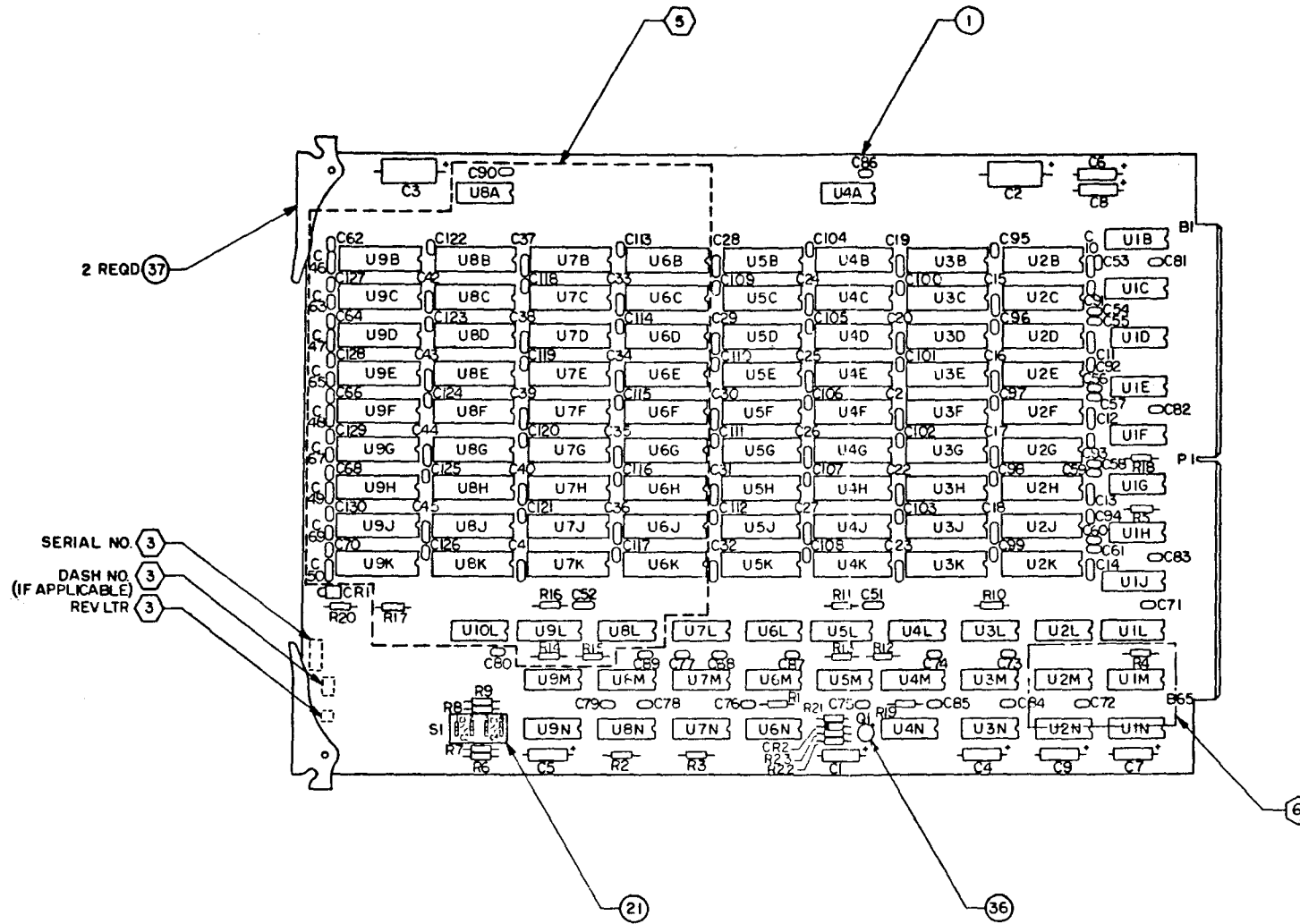


basic / four corporation		
DATE	DWG NO	REV
	901434	H
SCALE	SH. 25 OF 25	

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	DATE	DESCRIPTION	INITIAL	DATE
X3		PROTOTYPE RELEASE		
AX1	1780	PRE-PRODUCTION REL	ML	8-11-77
AX2	2510	SEE LOGIC		12-22-77
A	2178	PRODUCTION RELEASE		8-11-78
A1	2325	SEE ECN		8-11-78



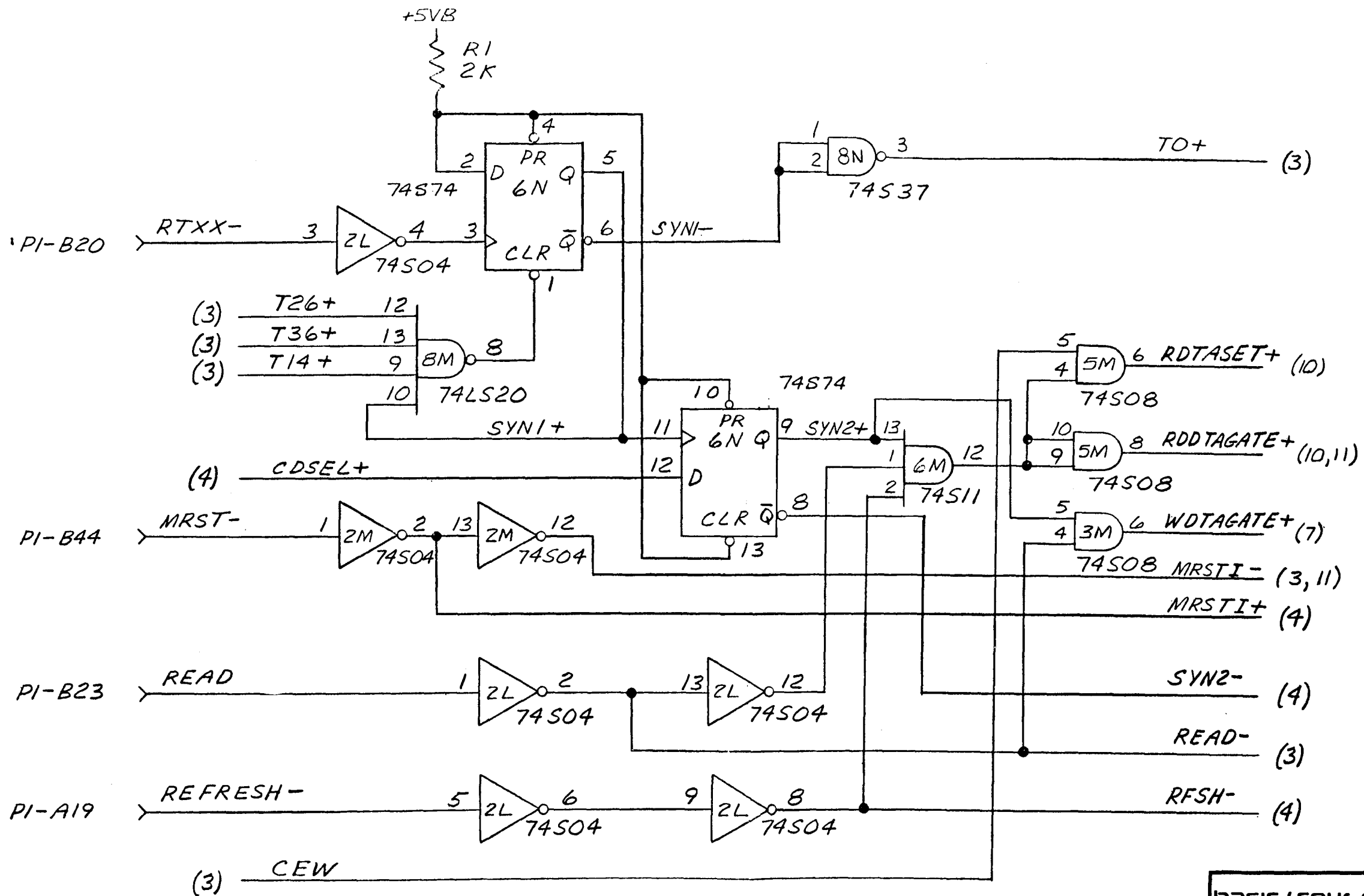
OUTSTANDING ECN'S  
None

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

REWORK PER ECN

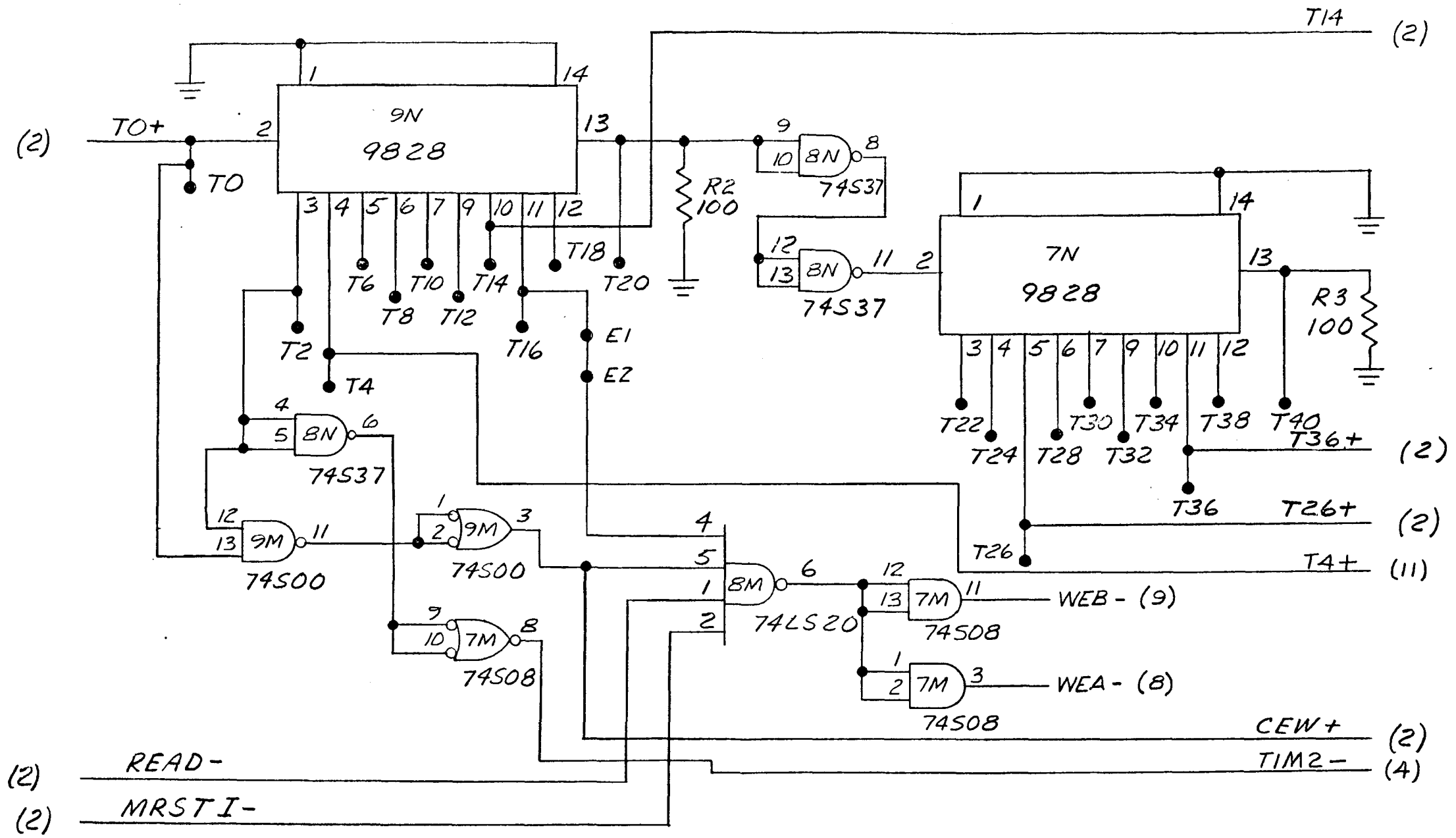
SEE P/L 903020

DIMENSIONS ARE IN INCHES TOLERANCES UNLESS OTHERWISE SPECIFIED X.X1 X.X1-0.01 X.X1-0.02 ANGLES: 1/2"		<b>BASIC / FOUR CORPORATION</b> 1226 South Ojai Avenue, Anaheim, California 92805	
DRAWN	CHKD	ENG	MFG
APP			
MACHINED SURFACES <input checked="" type="checkbox"/>		TITLE PCB ASSY, 32K/16K SEMICONDUCTOR MEMORY Dwg NO 903020 REV A1	
NEXT ASSY	USED ON	DO NOT SCALE DRAWING	SCALE 1:1



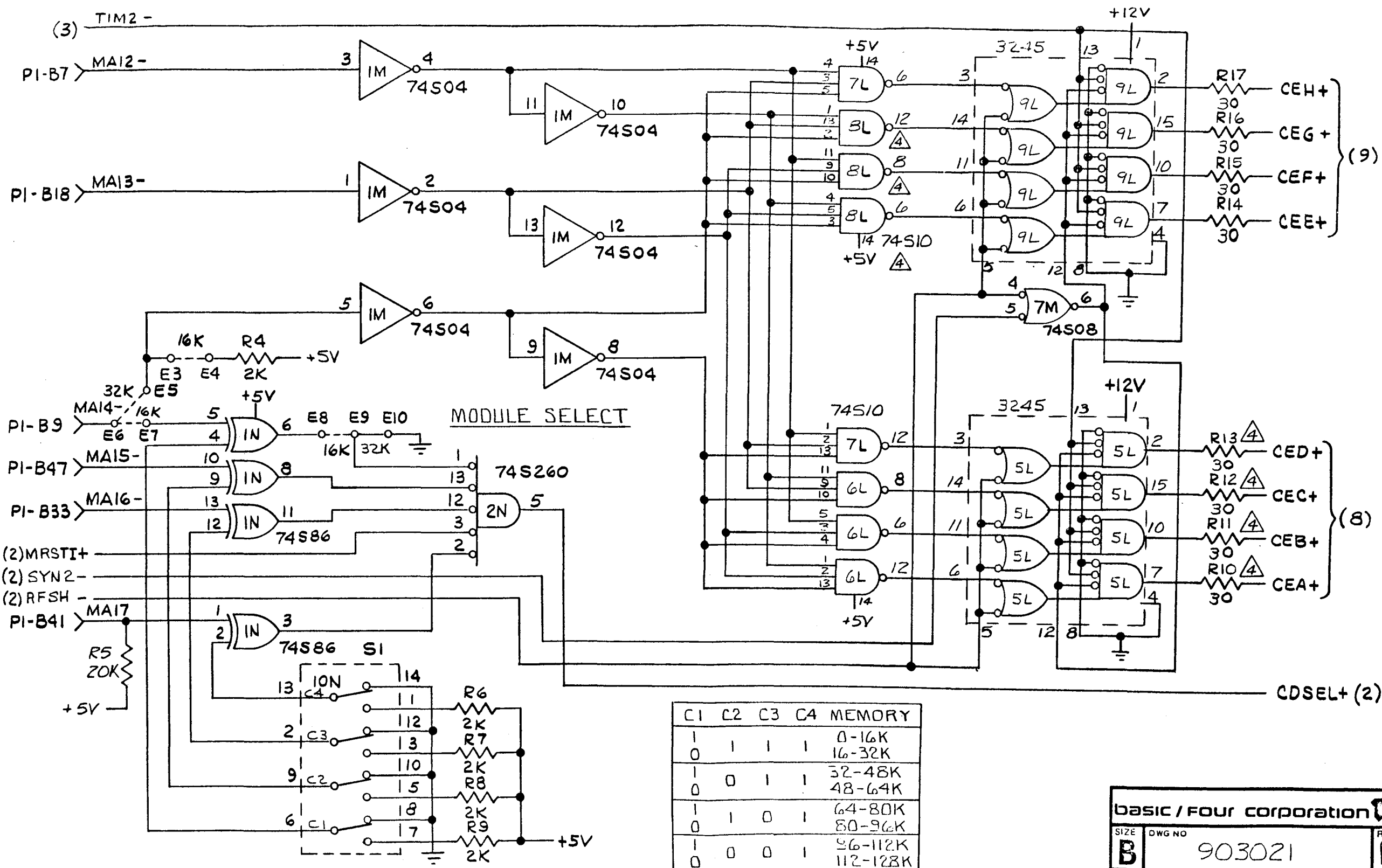
START CONTROL

basic / four corporation		
SIZE	DWG NO	REV
B	903021	B
SCALE		SH 2 OF 12
TIC NE		



TIMING TRAIN

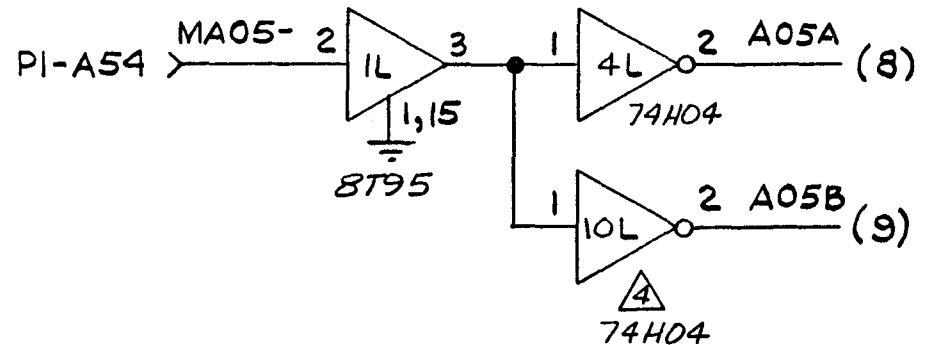
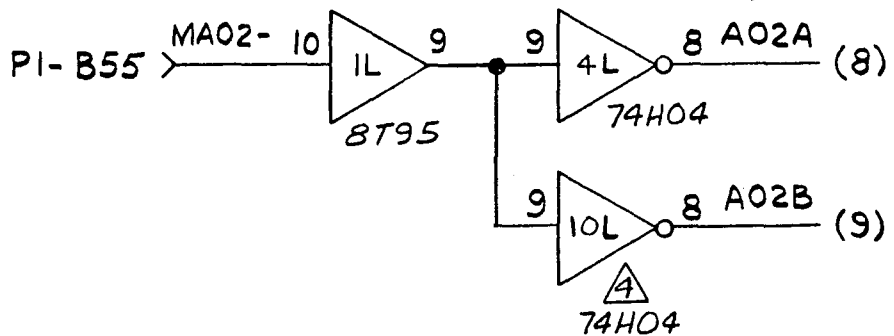
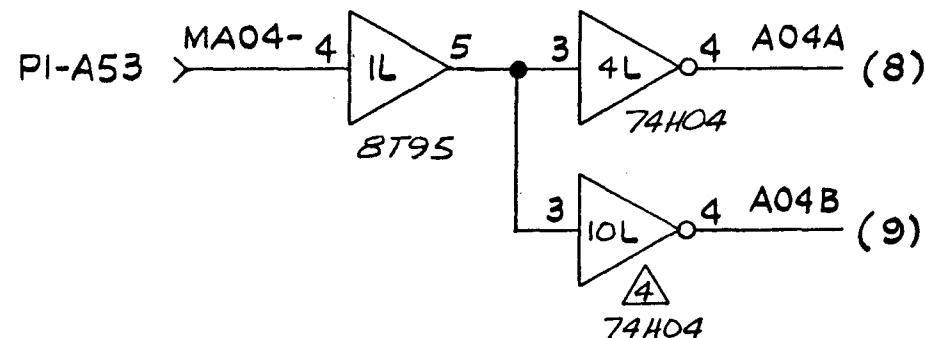
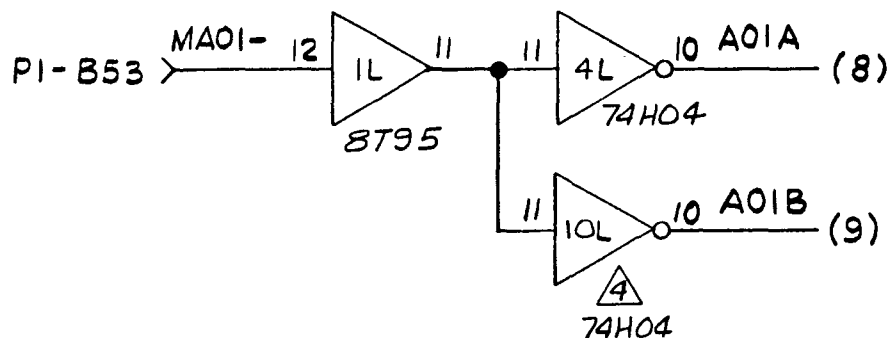
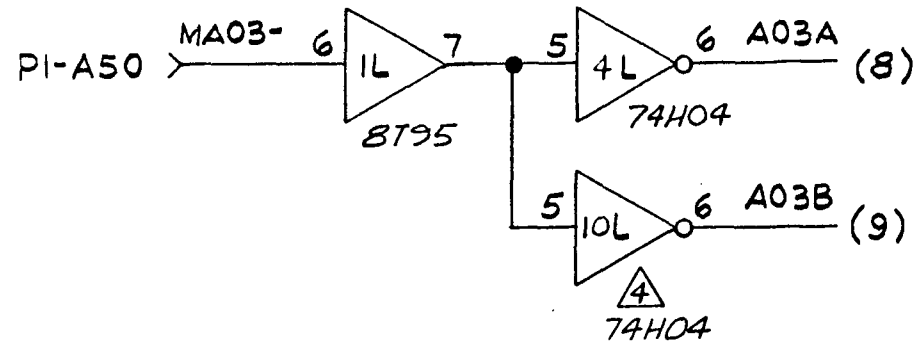
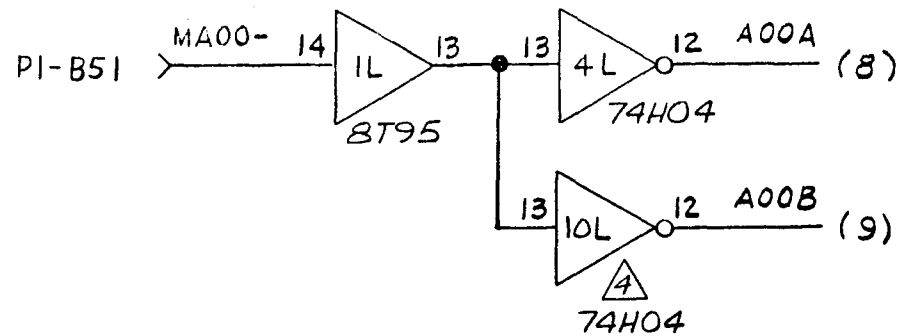
basic / four corporation		
SIZE	DWG NO	REV
B	903021	B
SCALE		SH 3 OF 12
NCNE		



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

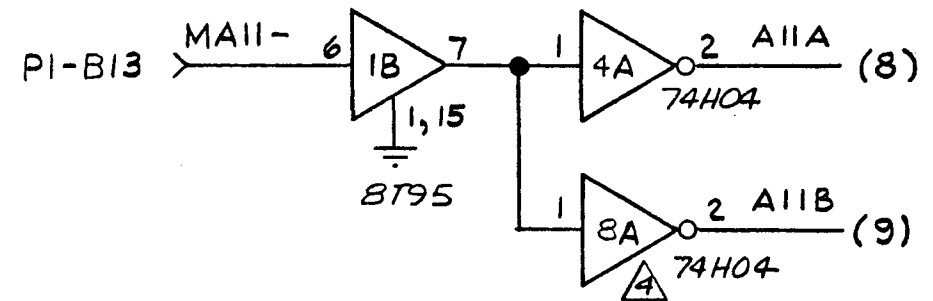
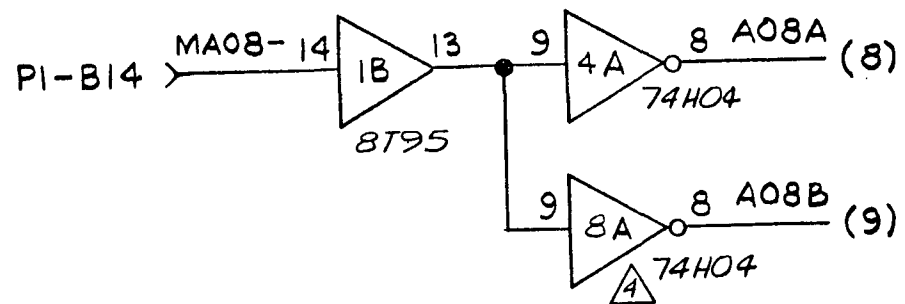
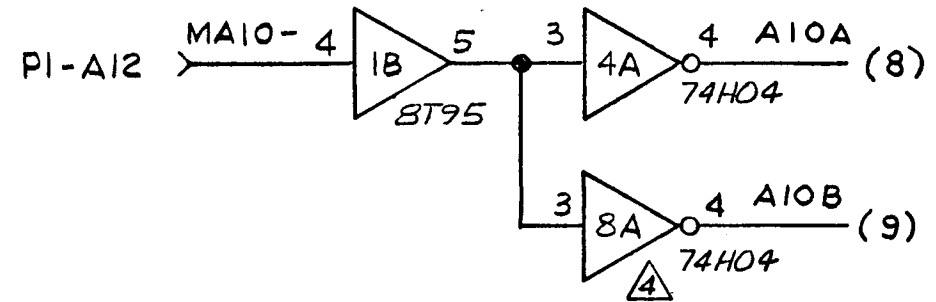
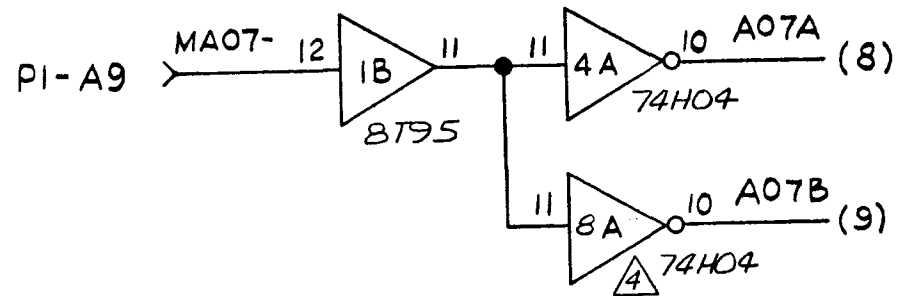
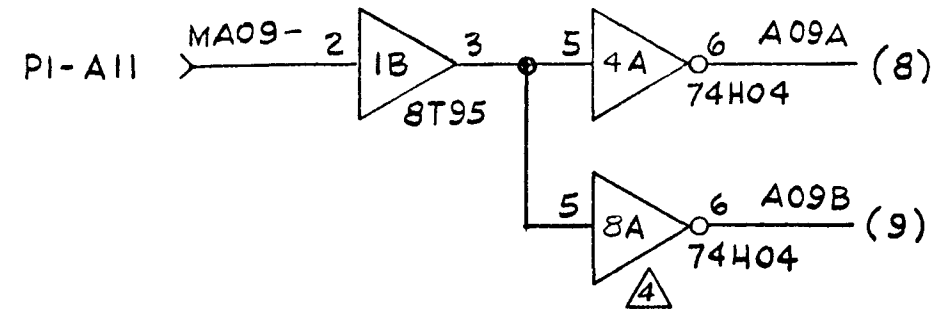
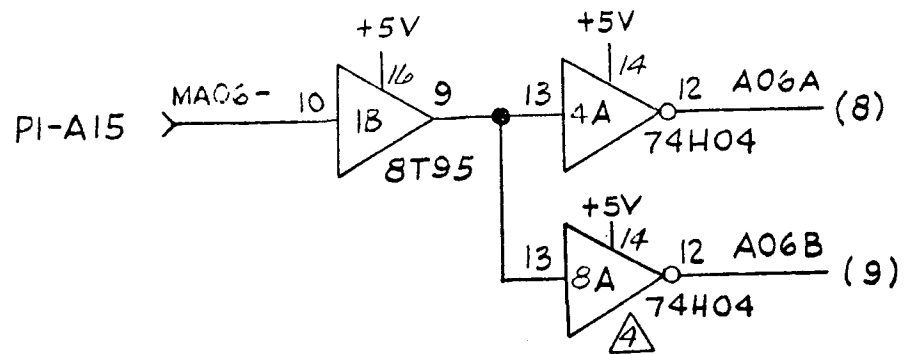
basic / four corporation

SIZE	DWG NO	REV
<b>B</b>	903021	<b>B</b>
SCALE NONE		SH 4 OF 12



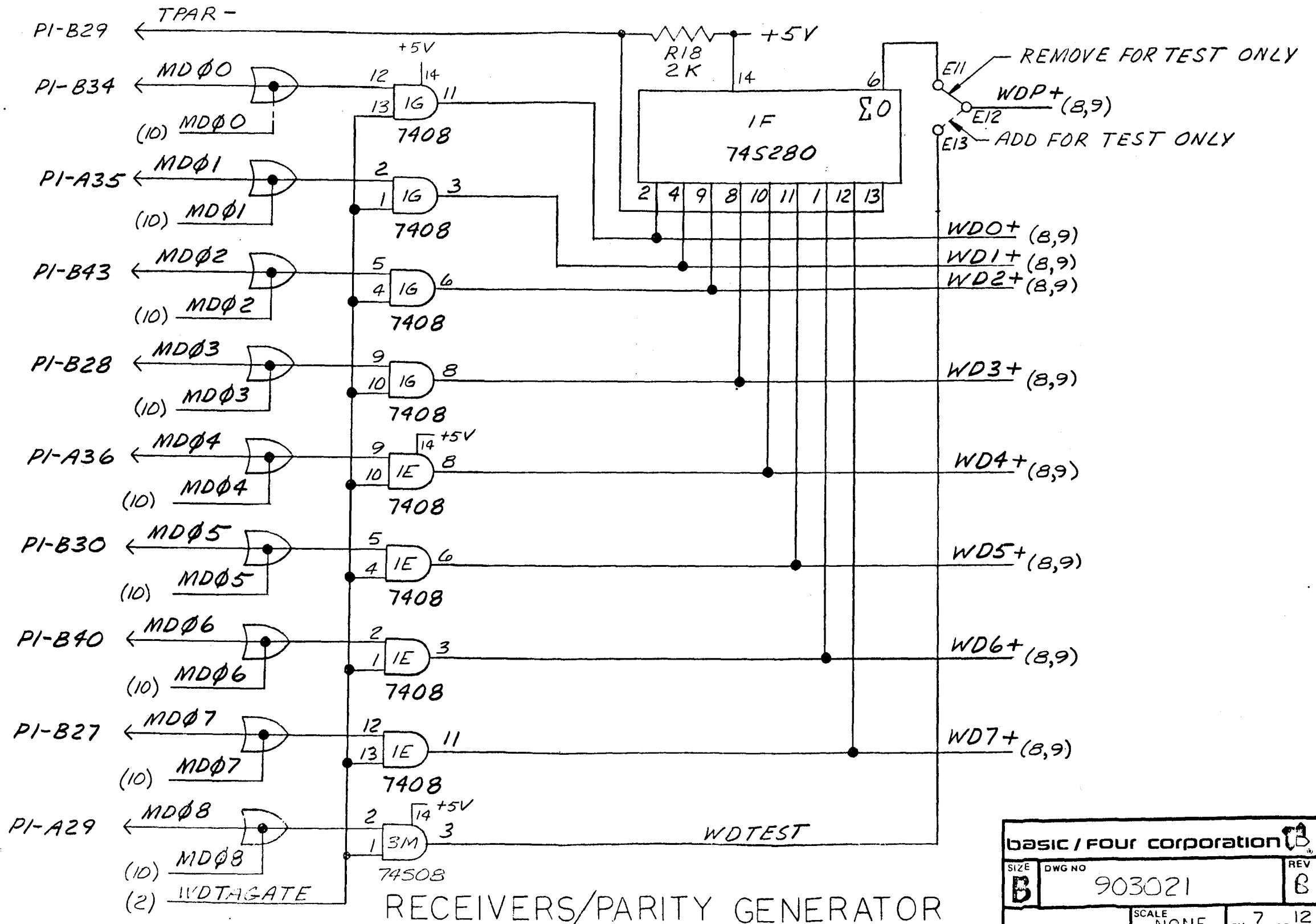
ADDRESS RECEIVERS

basic / four corporation		
SIZE <b>B</b>	DWG NO 903021	REV <b>B</b>
SCALE NONE		SH 5 OF 12



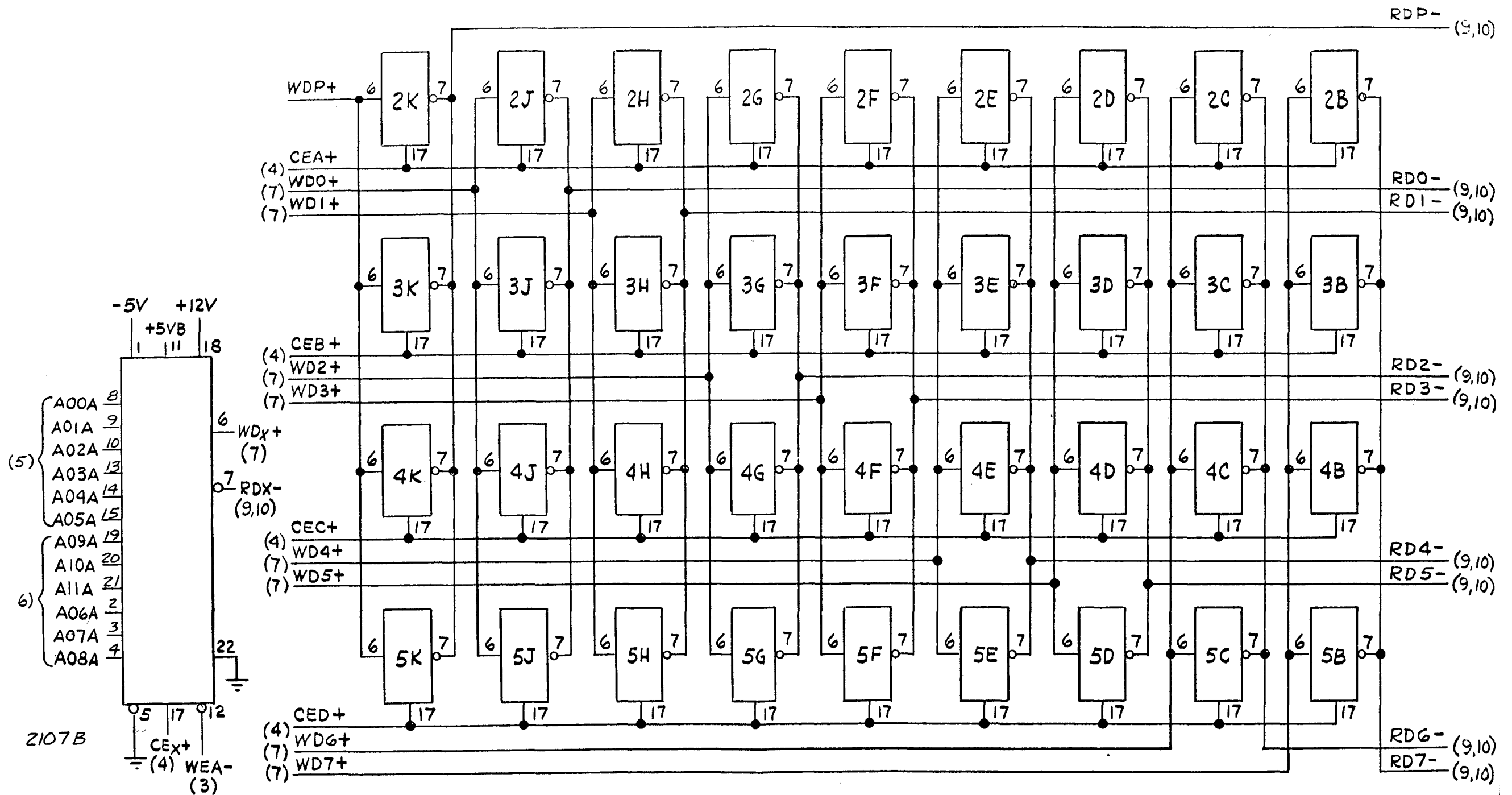
ADDRESS RECEIVERS

basic / four corporation			
SIZE	DWG NO	REV	
<b>B</b>	903021	<b>B</b>	
SCALE		SH 6 OF 12	
NONE			



basic / FOUR corporation		
SIZE	DWG NO	REV
B	903021	8
SCALE		SH 7 OF 12
NONE		

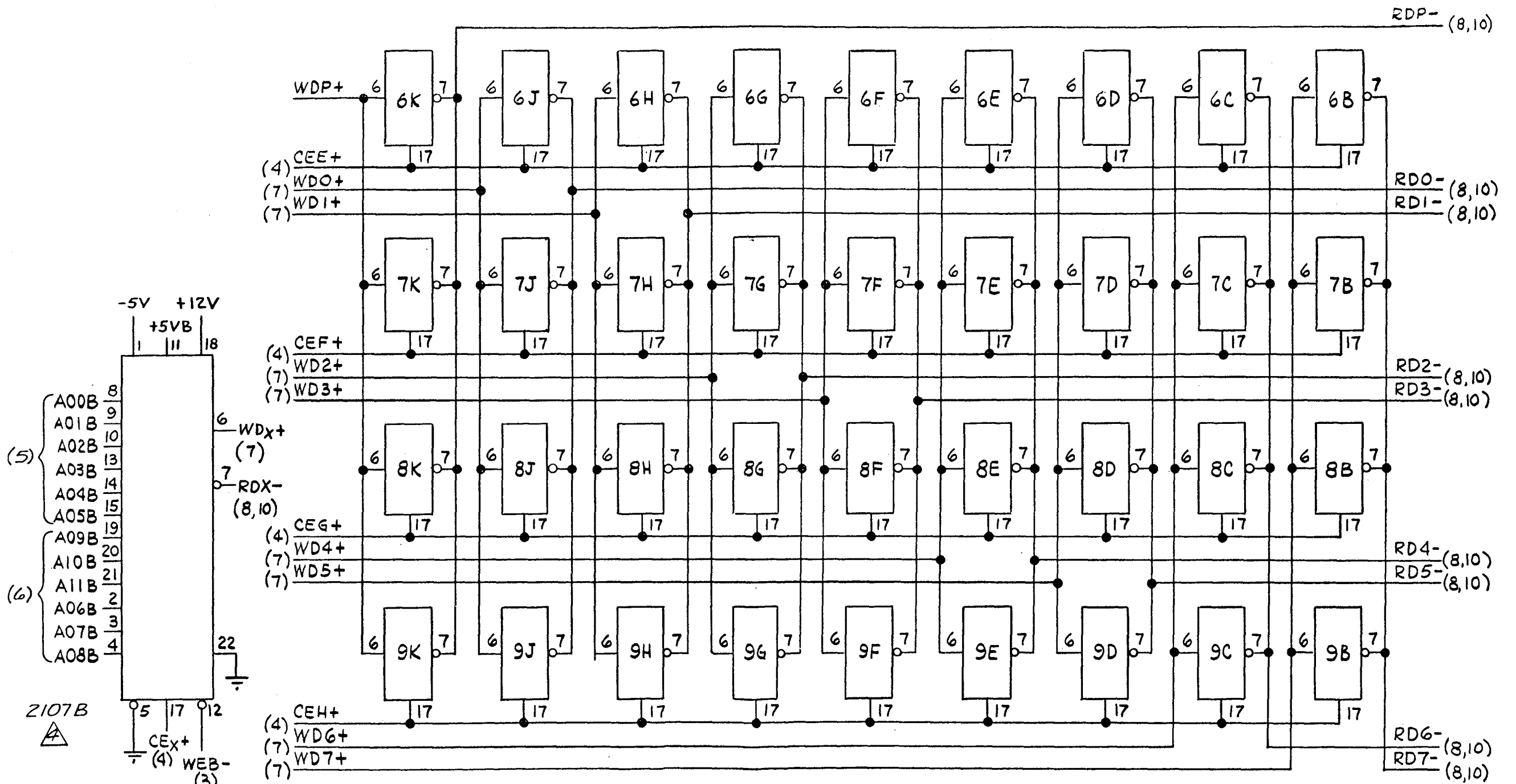




(TYP. 36 PLC'S)

STORAGE ELEMENTS

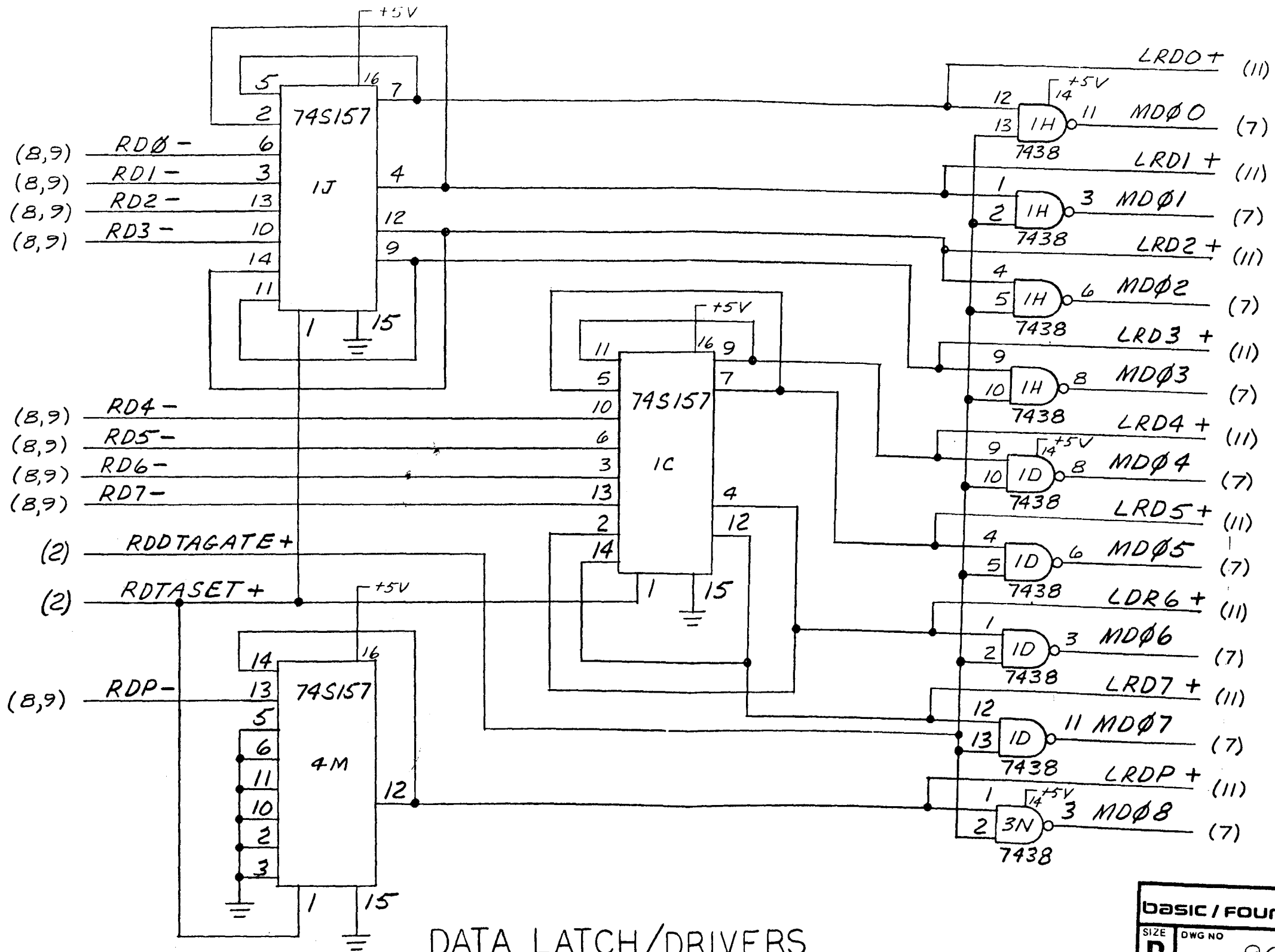
basic / four corporation		
SIZE	DWG NO	REV
B	903021	B
SCALE NONE		SH 8 OF 12



(TYP. 36 PLC'S)

STORAGE ELEMENTS

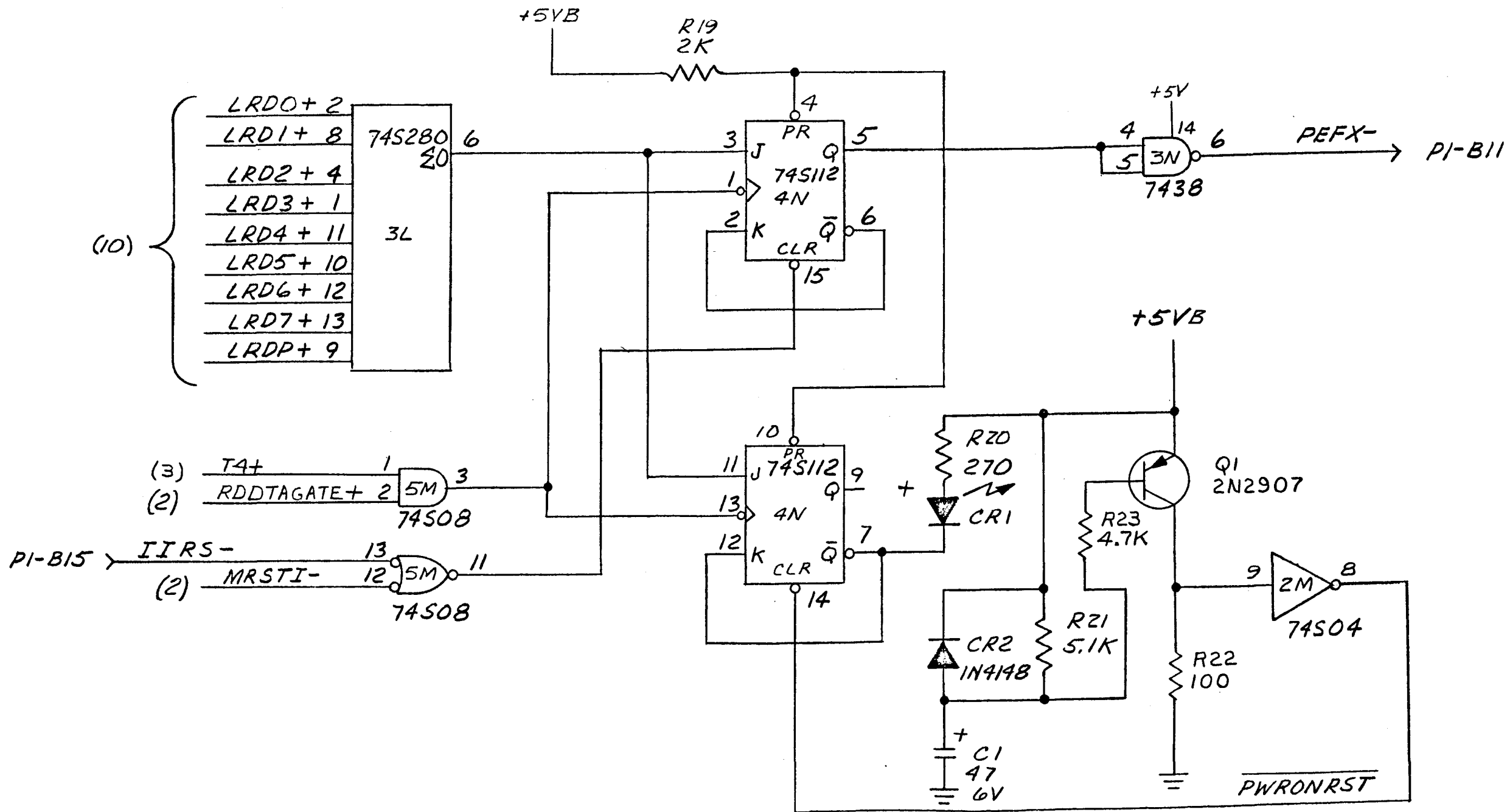
basic / four corporation		
SIZE	DWG NO	REV
<b>B</b>	903021	<b>B</b>
SCALE NONE		SH 9 OF 12



DATA LATCH/DRIVERS

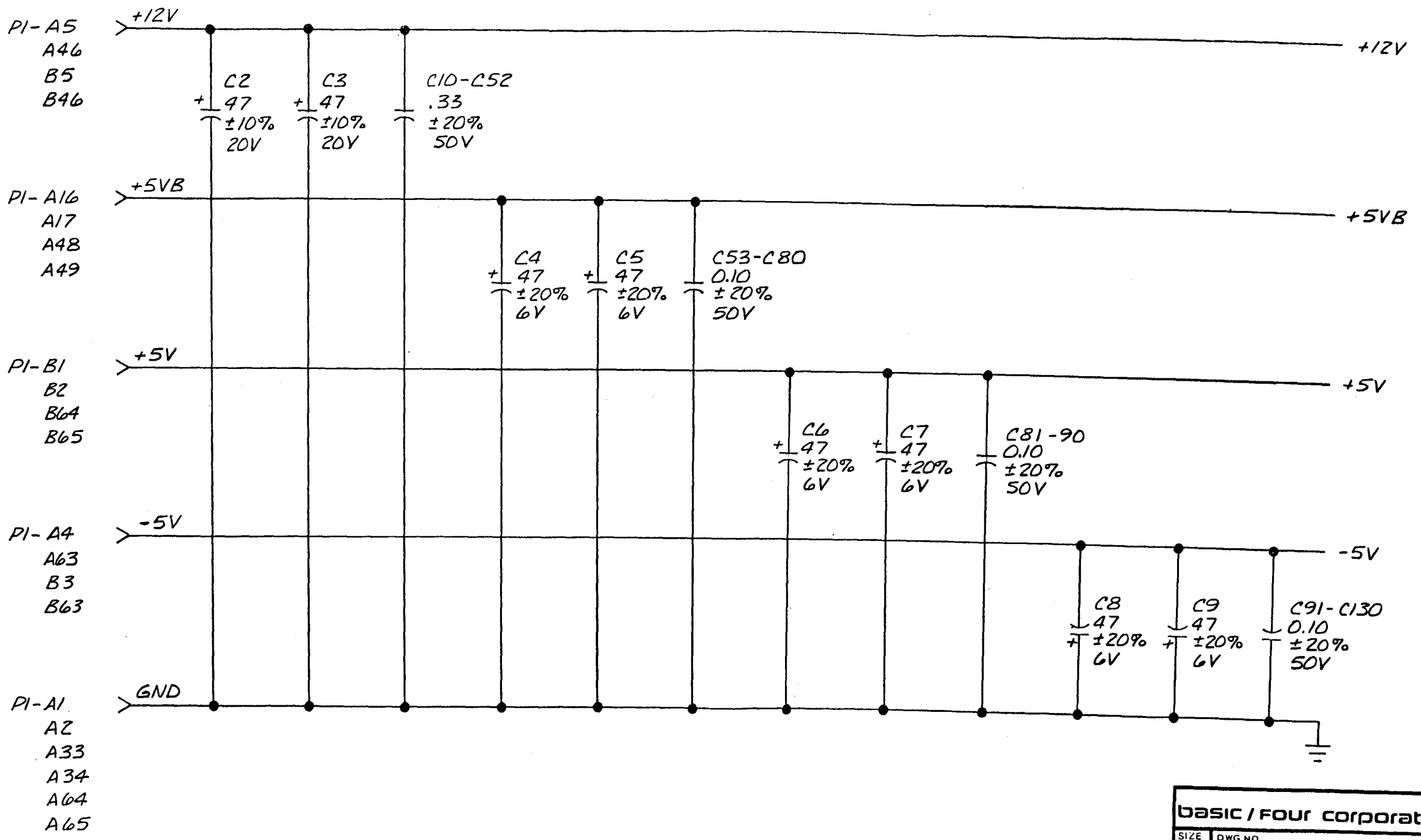
6-75

BASIC / FOUR CORPORATION			
SIZE	DWG NO	REV	
<b>B</b>	903021	<b>B</b>	
SCALE		SH 10 OF 12	
NONE			



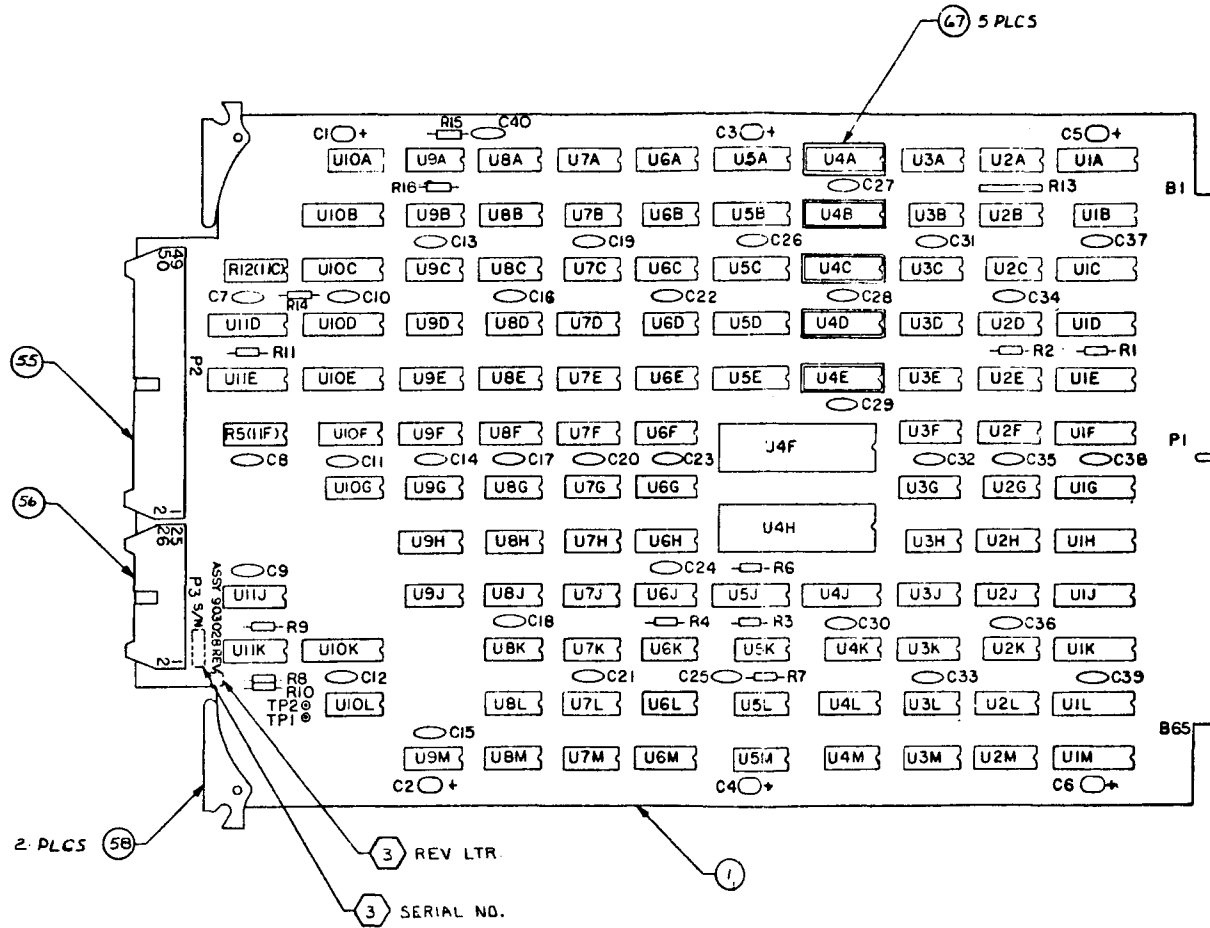
PARITY CHECK/FLAGS

basic / four corporation		
SIZE	DWG NO	REV
<b>B</b>	903021	<b>B</b>
SCALE		SH 11 OF 12
NONE		



basic / four corporation		
SIZE <b>B</b>	DWG NO 903021	REV <b>B</b>
SCALE NONE		SH 12 OF 12

REV	DATE	DESCRIPTION	INITIALS	DATE
1	10-20-77	ISSUE RELEASE	PL	10-20-77
X4	10-20-77	SEE ECN		10-20-77
AX1	10-20-77	PRE PRODUCTION RELEASE		10-20-77
AX2	10-20-77	SEE ECN		10-20-77
AX3	10-20-77	SEE ECN		10-20-77
A	10-20-77	PRODUCTION RELEASE PCB WAS SC4033		10-20-77
B	10-20-77	REVISED PER ECN		10-20-77
C	10-20-77	REVISED PER ECN		10-20-77

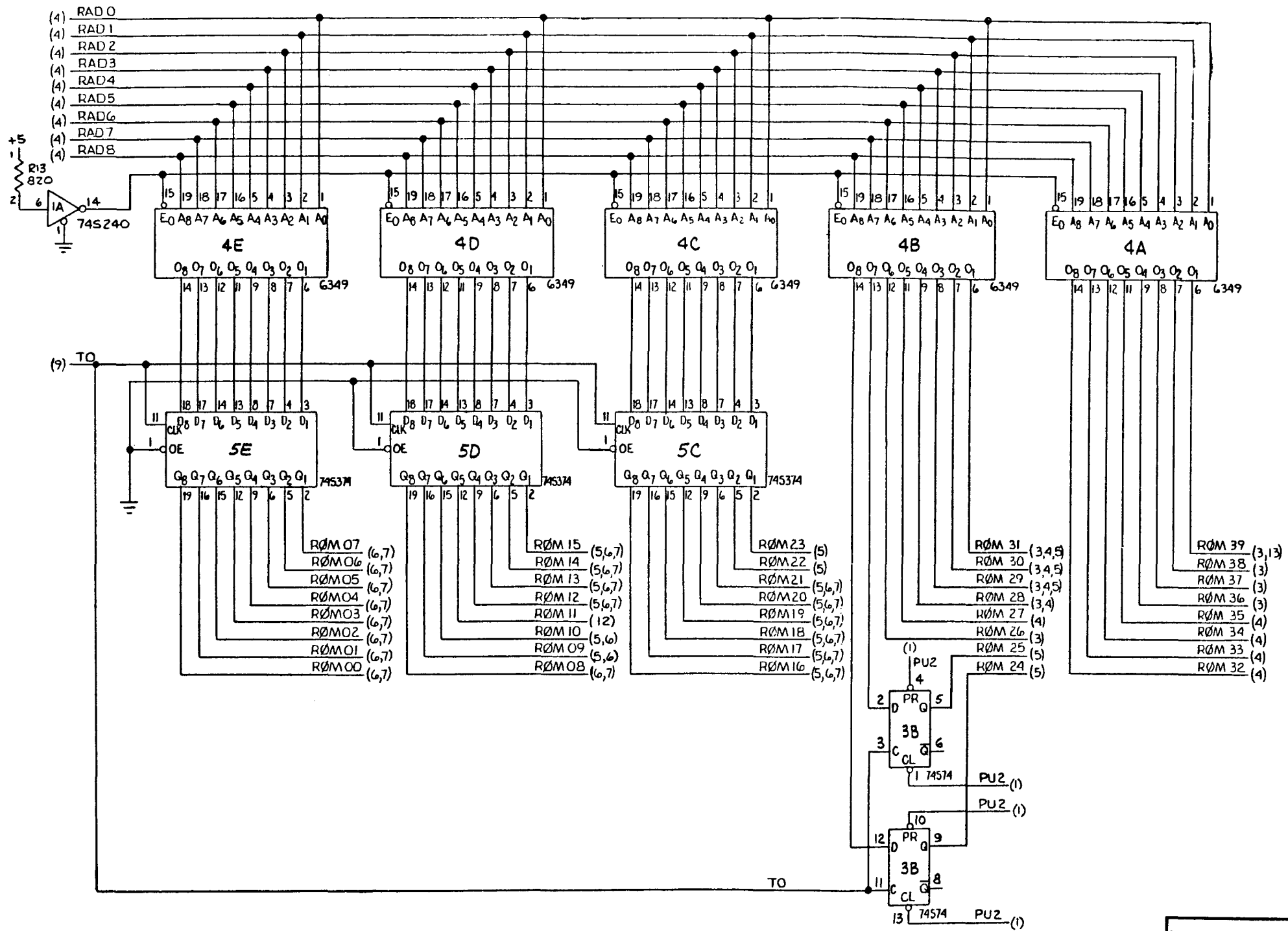


OUTSTANDING ECN'S  
 3029A  
 3148  
 3207

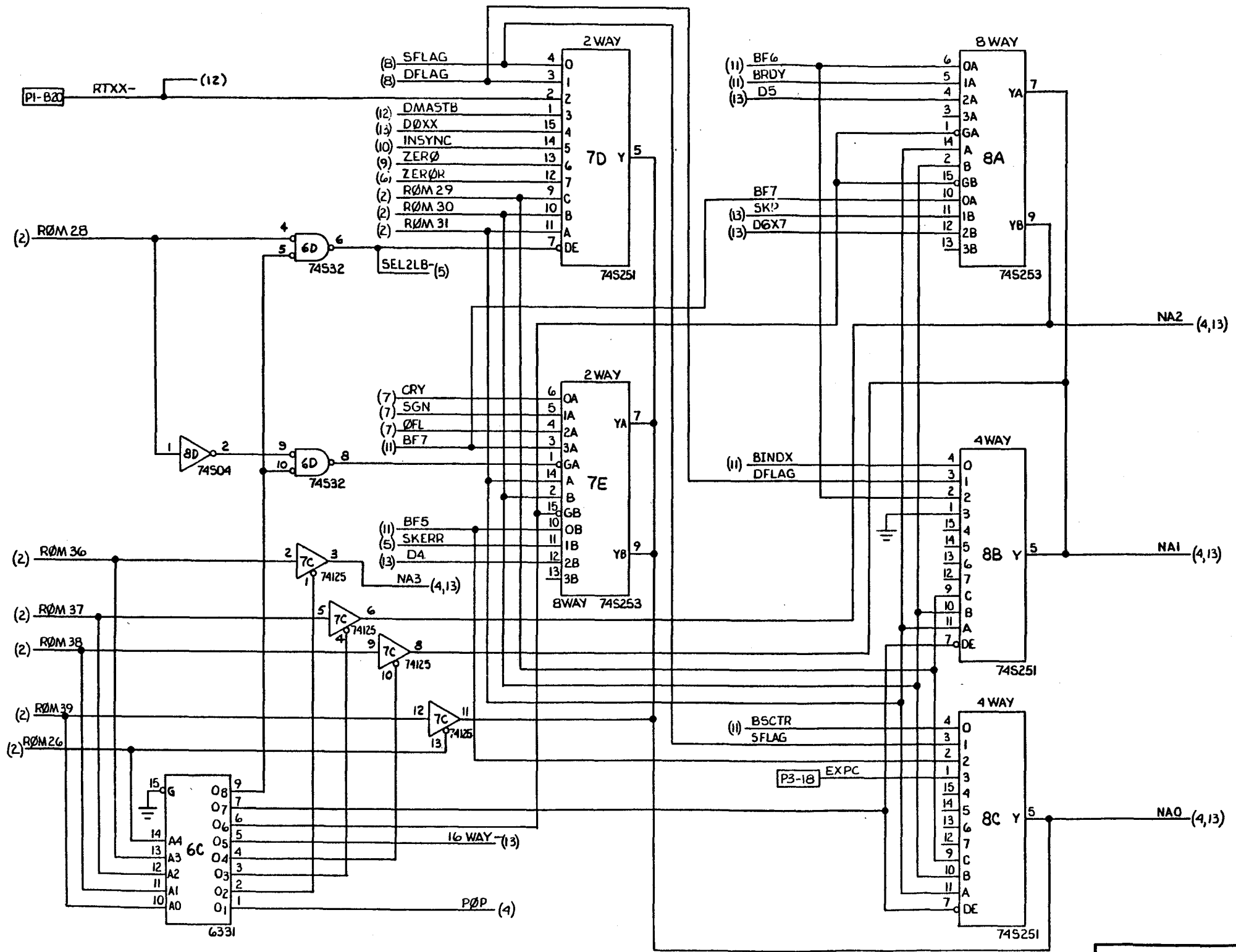
- 4. REFERENCE BOARD DETAIL PART NO. 904072.
  - 3. MARK PER BFC SPECIFICATION 30000 APPROX WHERE SHOWN.
  - 2. FOR SEPARATE PARTS LIST SLE HL 90302B
  - 1. REF LOGIC DIAGRAM 903029.
- NOTES: UNLESS OTHERWISE SPECIFIED

REWORK PER ECN 2841

DIMENSIONS ARE IN INCHES		TOLERANCES UNLESS OTHERWISE SPECIFIED		DRAWN		CHKD		ENG		MFG		APP		TITLE		DATE		REV	
ASST. MANAGER		R10		R9		R8		R7		R6		R5		R4		R3		R2	
TP1		TP2		TP3		TP4		TP5		TP6		TP7		TP8		TP9		TP10	
MACHINED SURFACES		DO NOT SCALE DRAWING		SCALE 1/1		SH 1 OF 1		REV C		DNG NO 90302B		TITLE PCEA FIXED DISC CONT		DATE 7-23-77		DRAWN		CHKD	

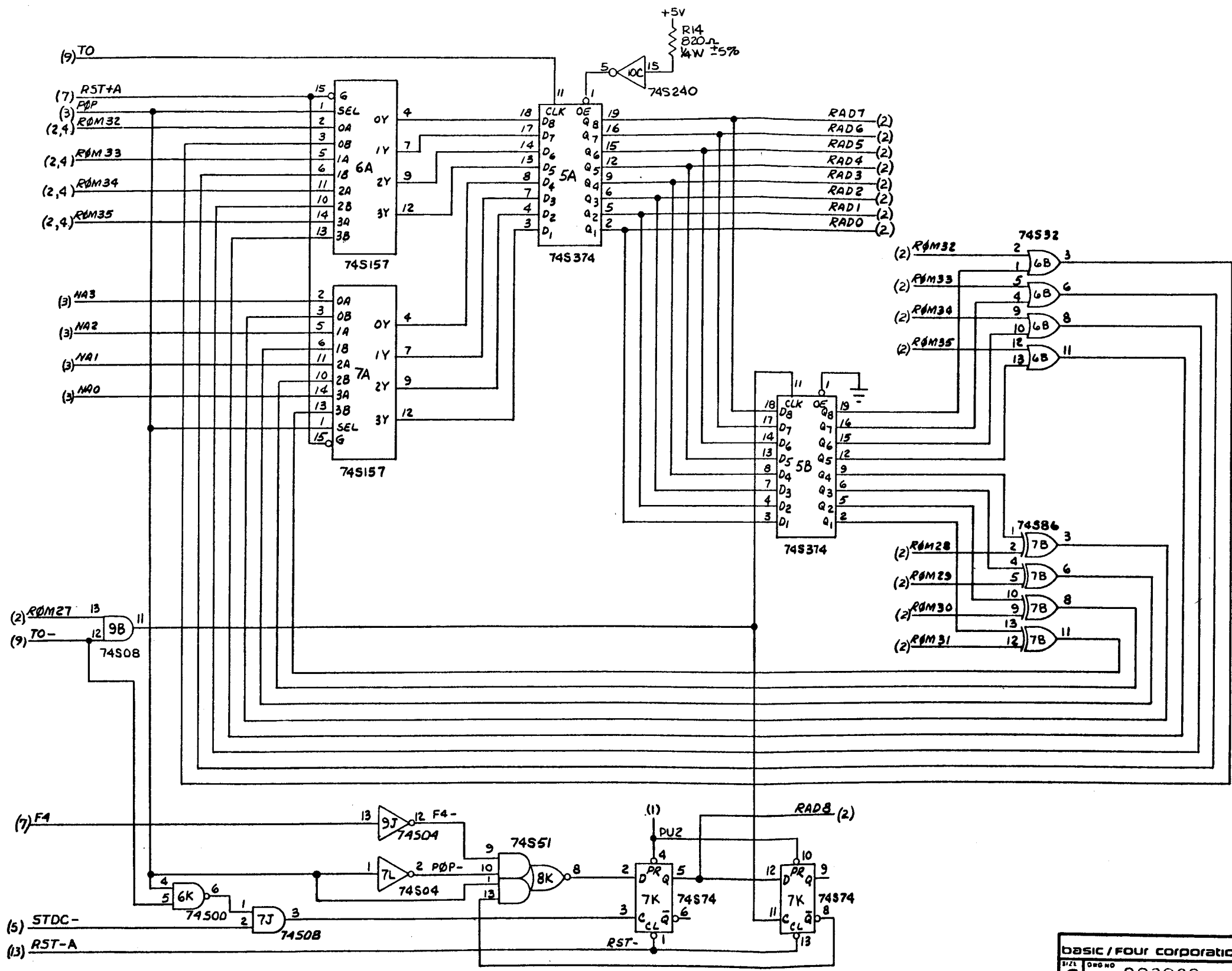


basic / four corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE		SM 2 OF 14



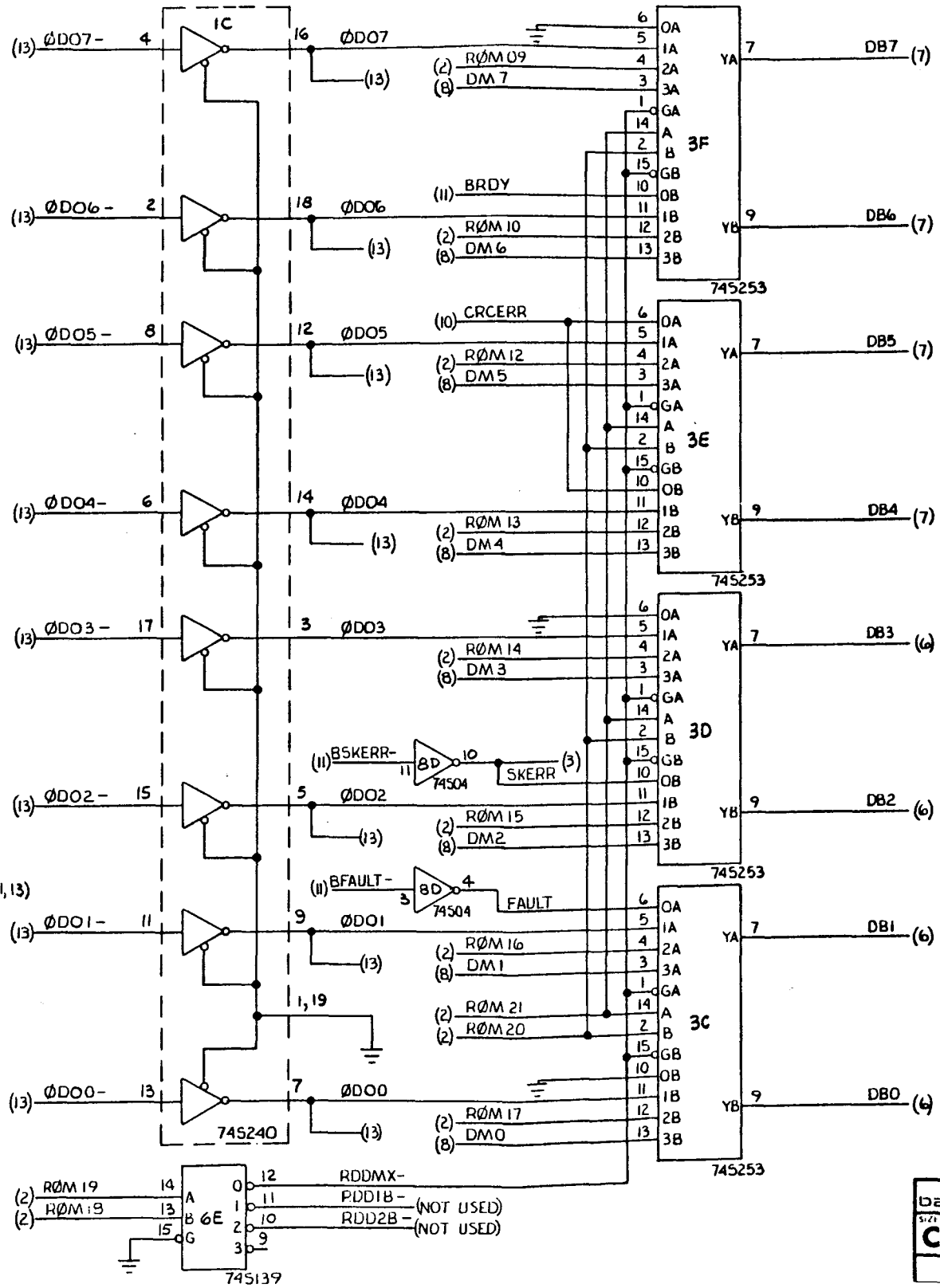
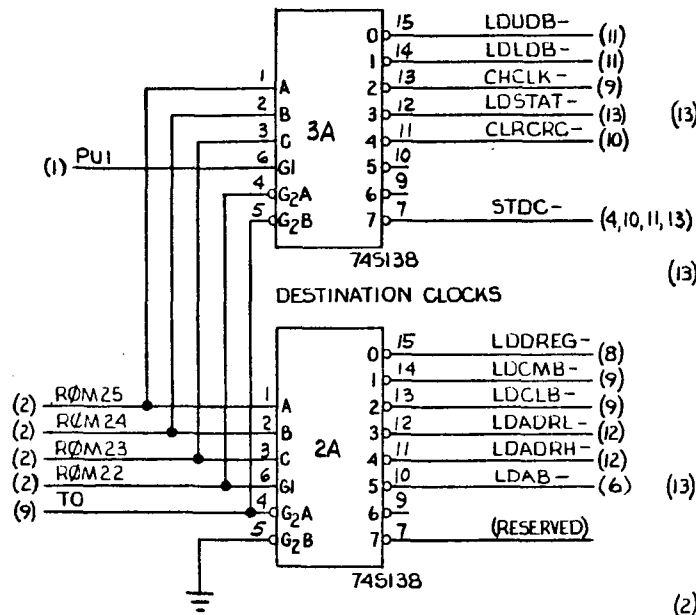
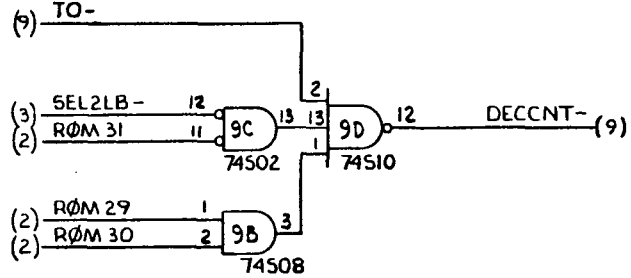
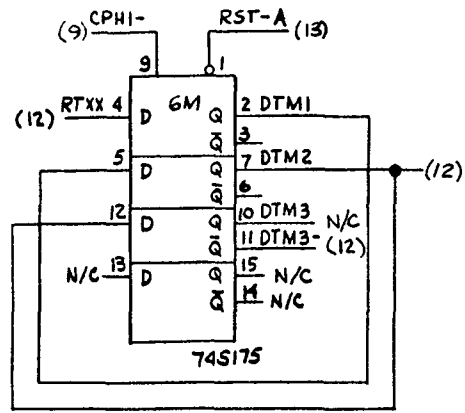
basic / four corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE		SH 3 OF 14

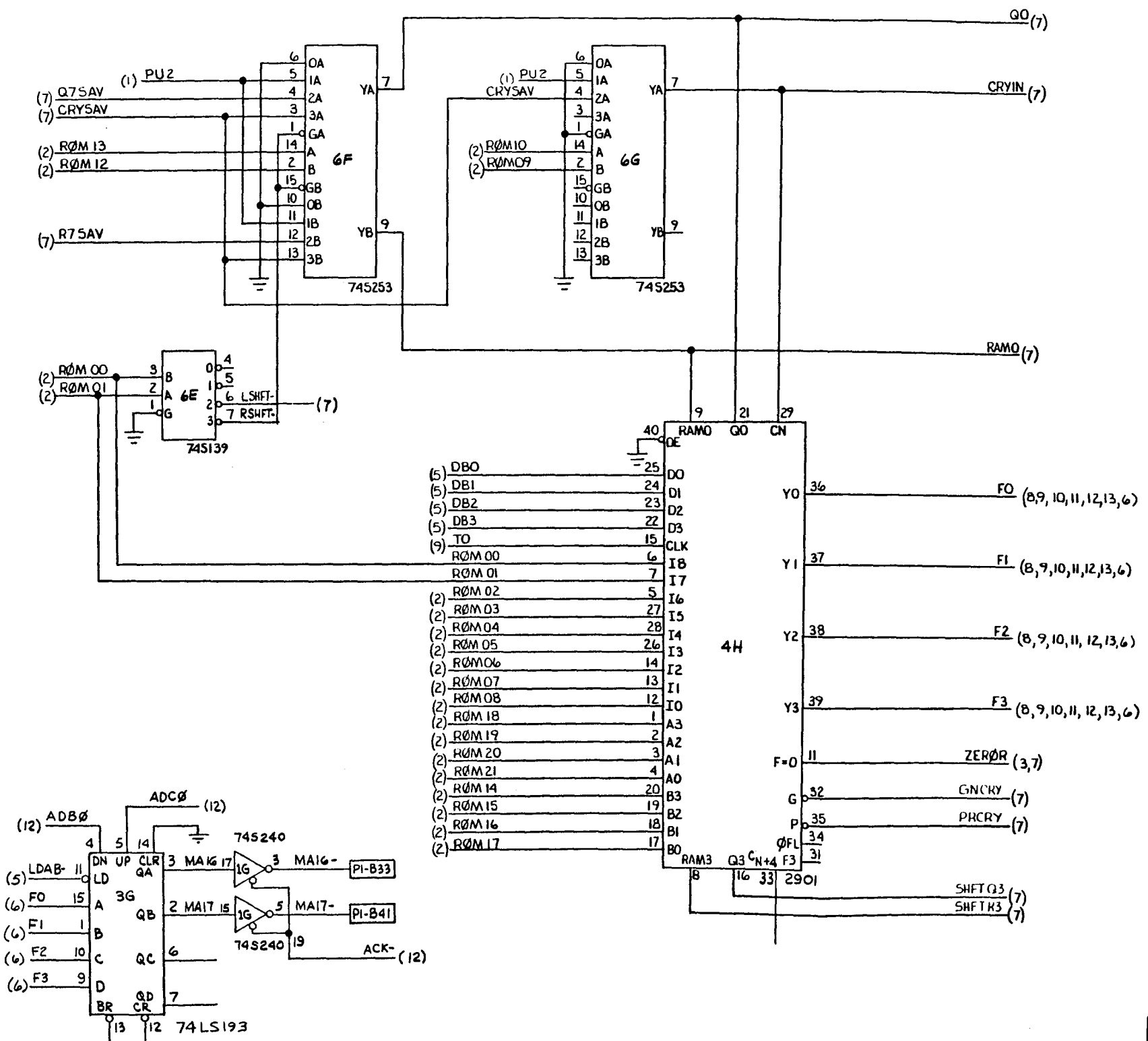




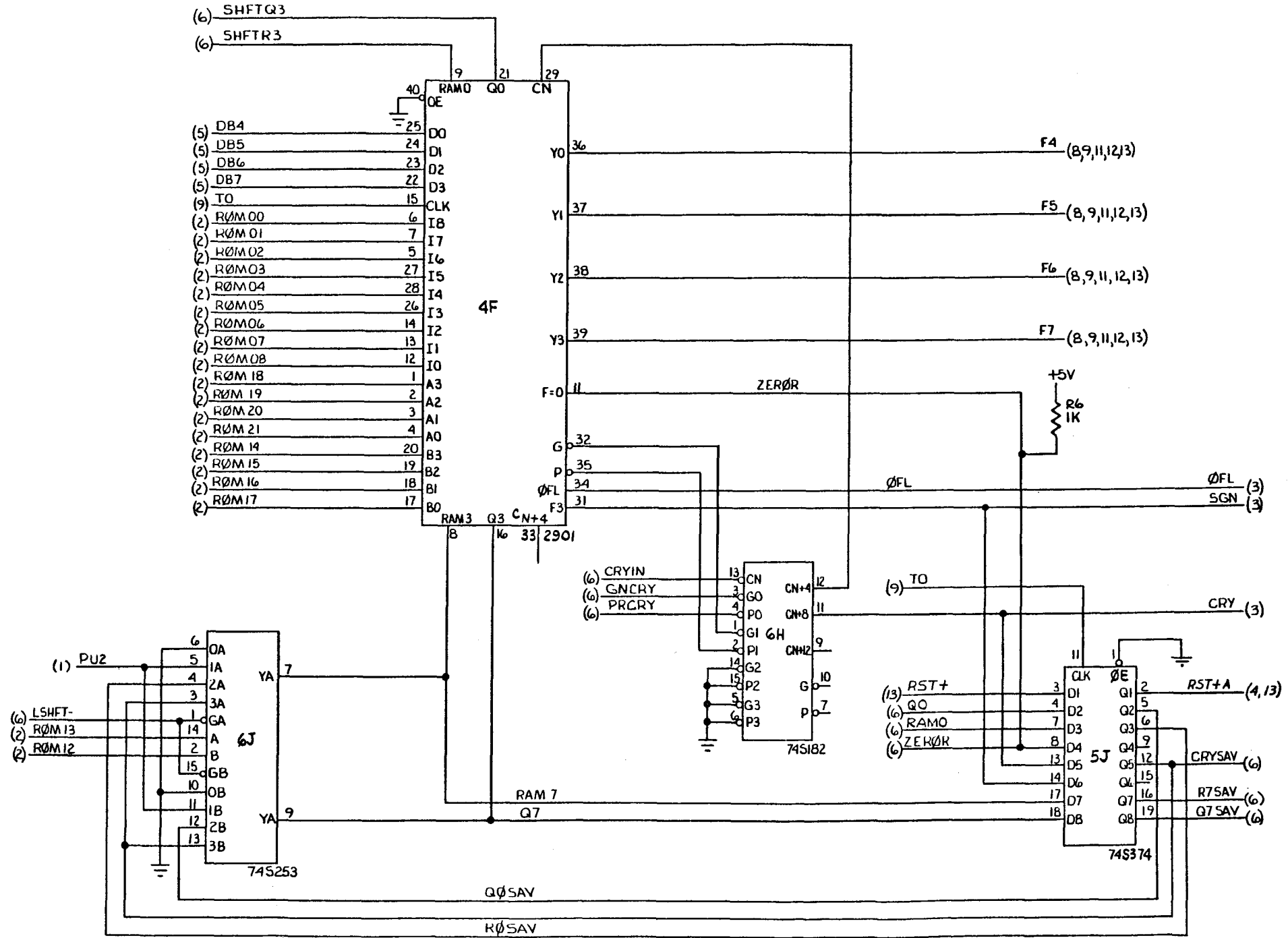
+5V  
 R14  
 820Ω  
 1/4W ±5%

BASIC / FOUR CORPORATION		
SIZE	DRG NO	REV
C	903029	A
SCALE		SH 4 OF 14

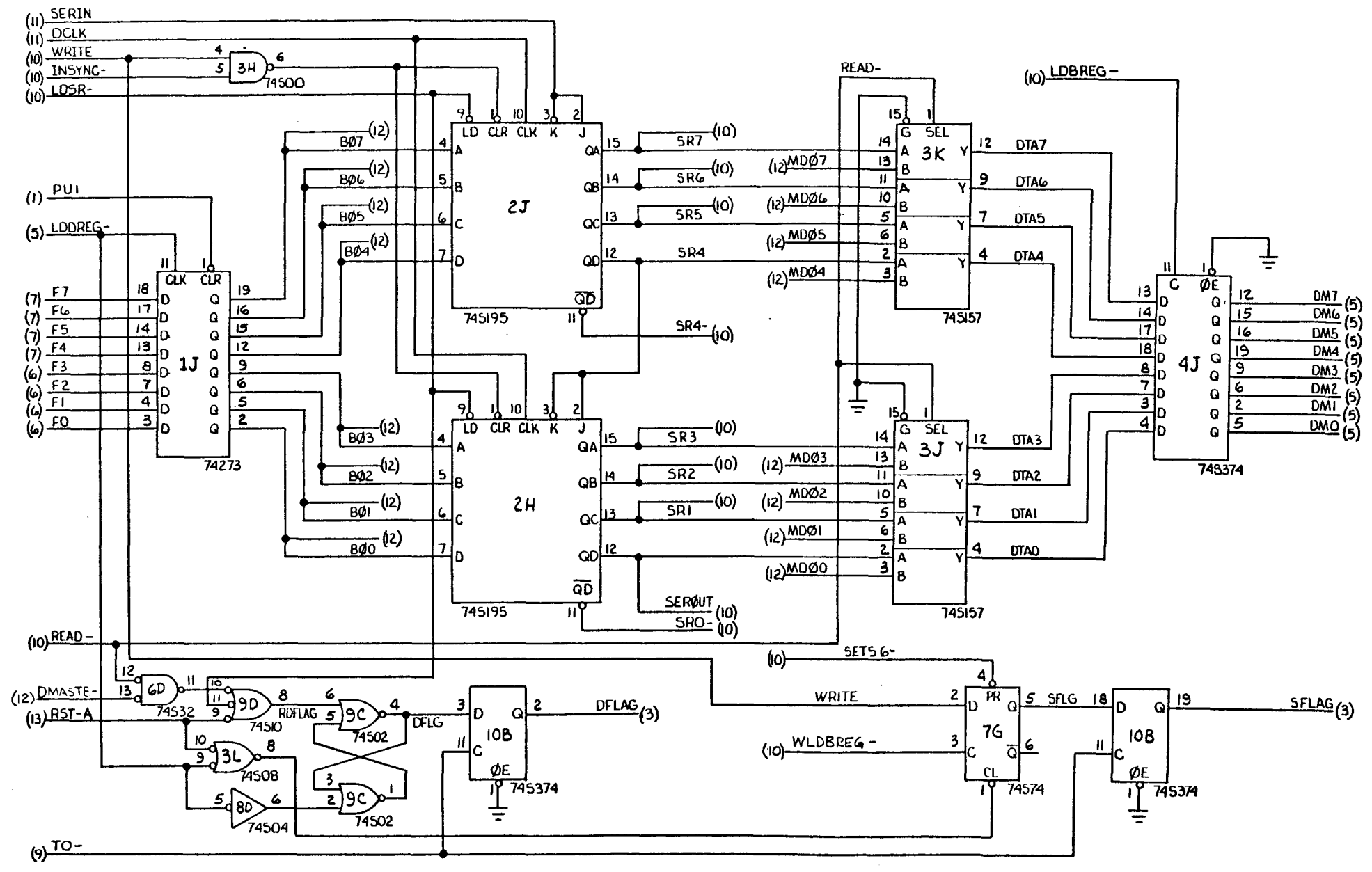




basic / four corporation  
 SIZE Dwg NO 903029 REV A  
 SCALE 1/8" = 1" SH 6 of 14

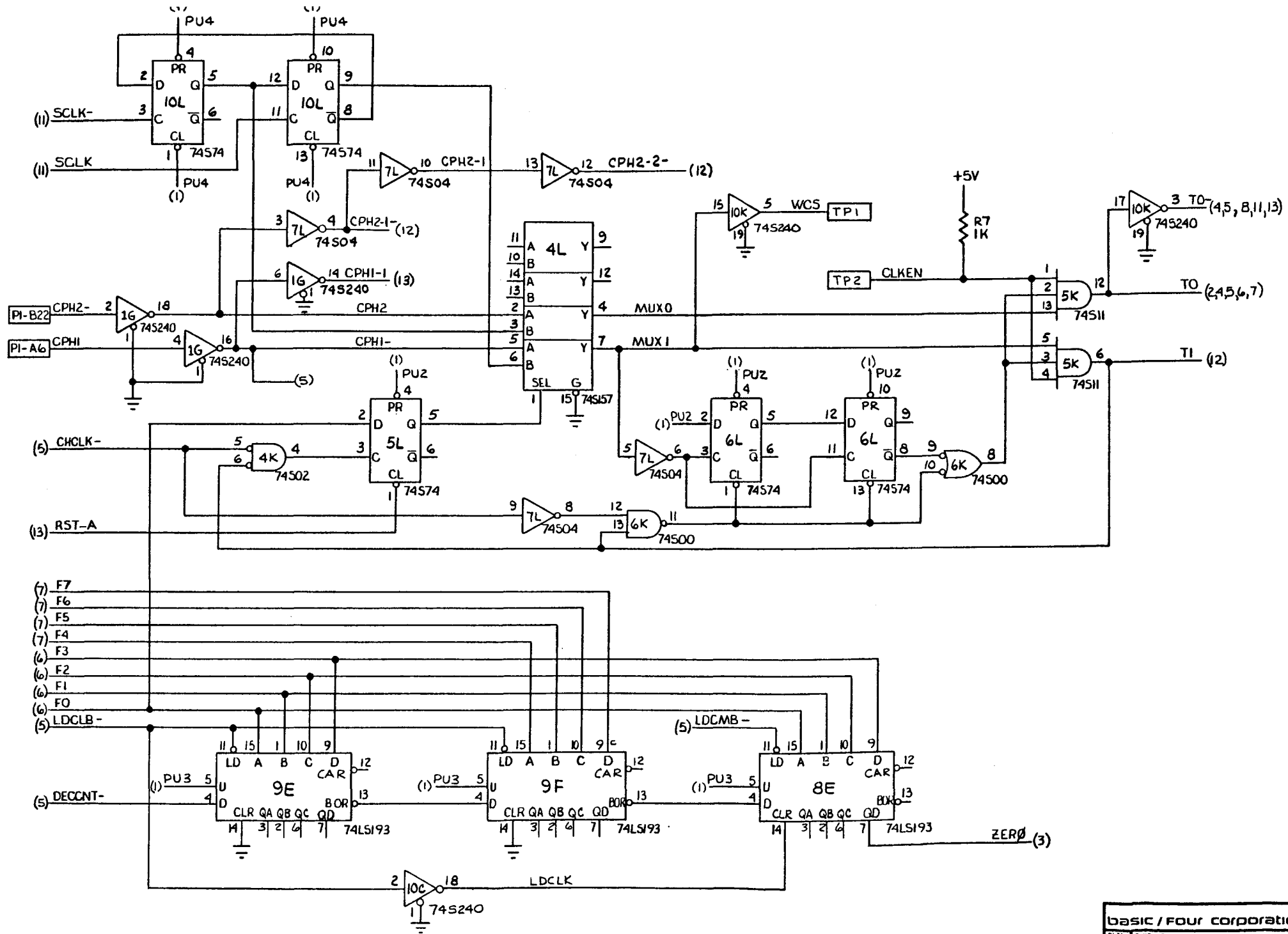


BASIC / FOUR CORPORATION		
SIZE	DRG NO	REV
C	903029	A
SCALE		SH 7 OF 14

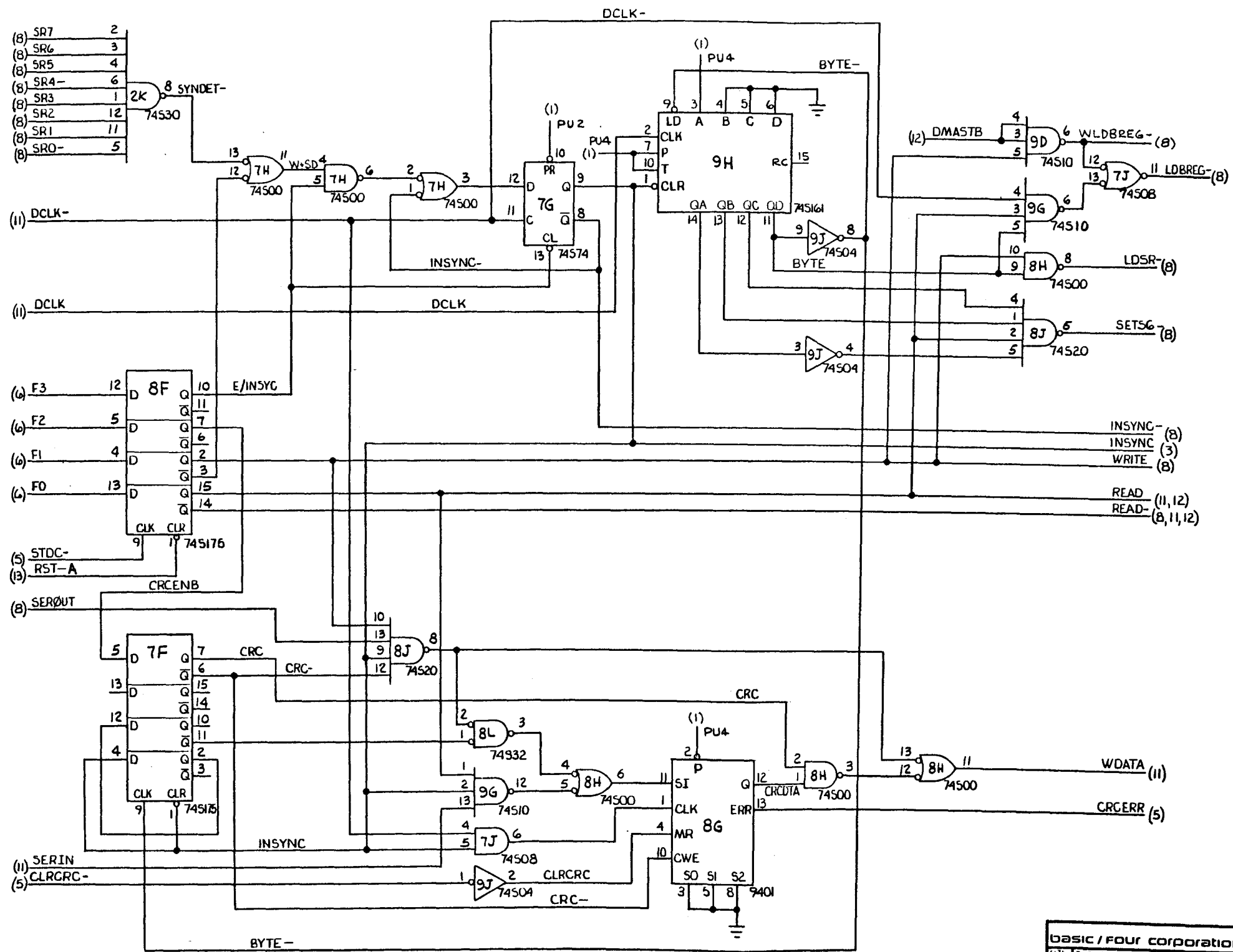


6-85

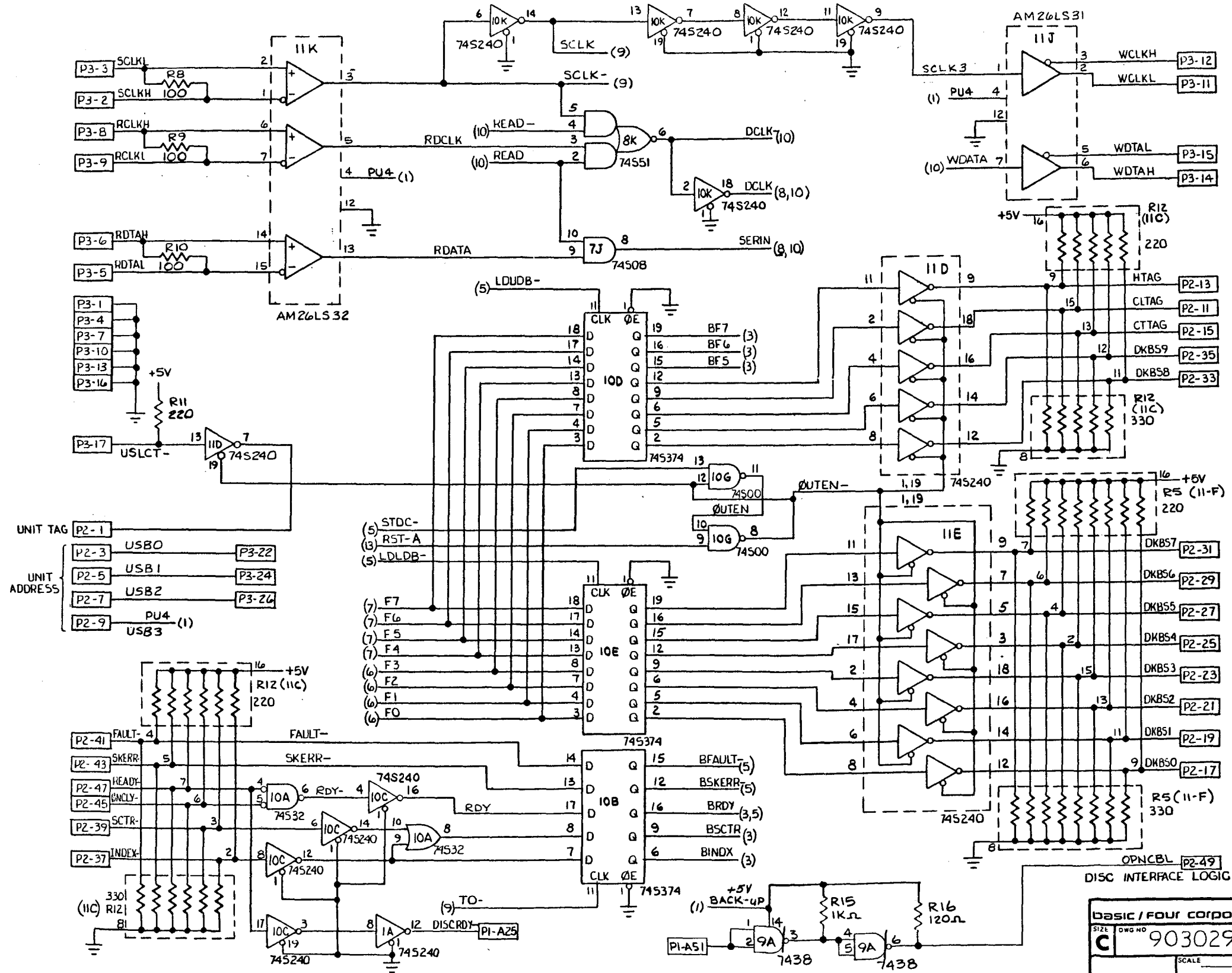
basic / four corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE		SH 8 OF 14



basic / four corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE	SH 9 OF 14	

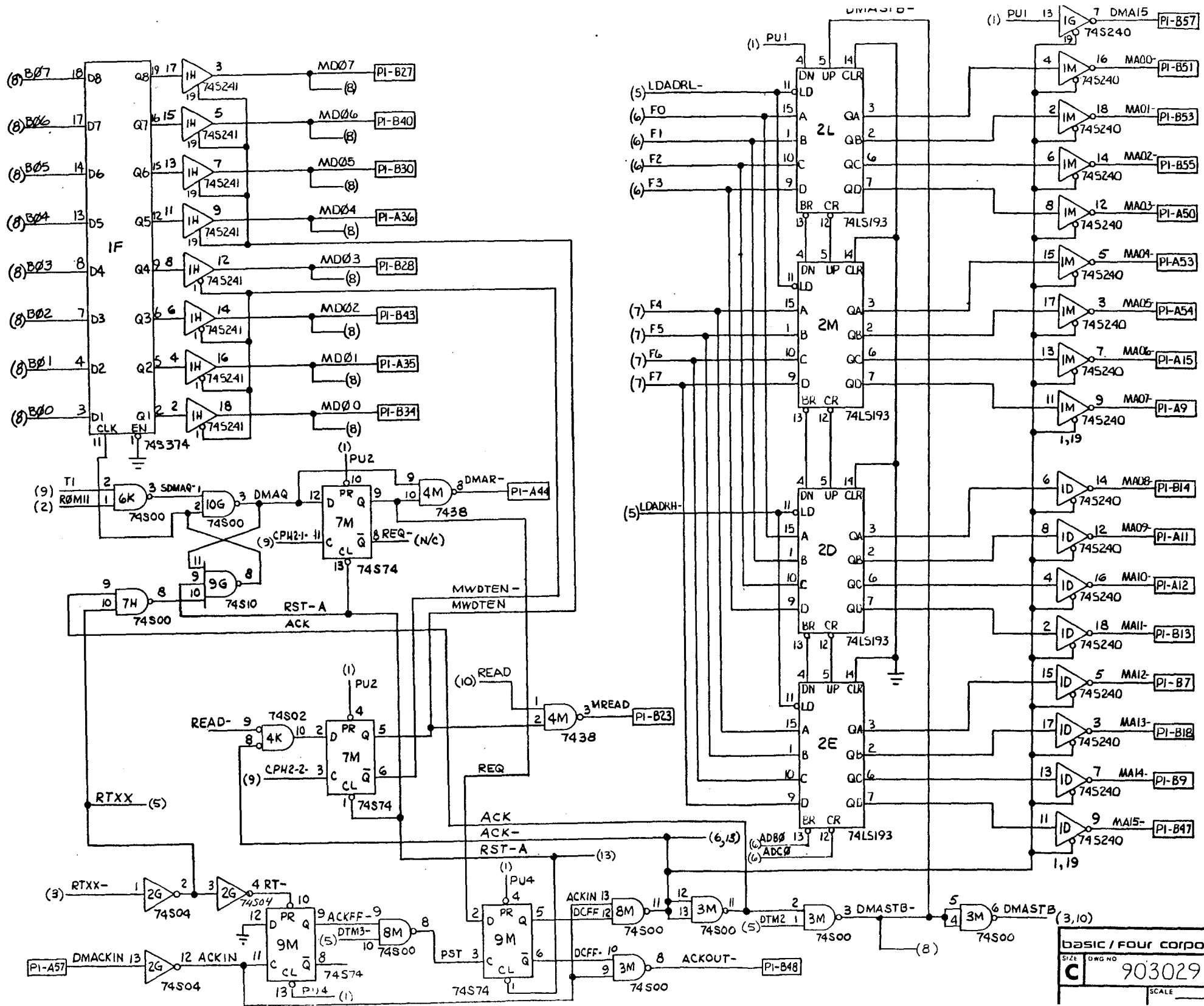


BASIC / FOUR Corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE		SH 10 OF 14



Basic / Four Corporation		
SIZE	DWG NO	REV
C	903029	A
SCALE		SH 11 of 14

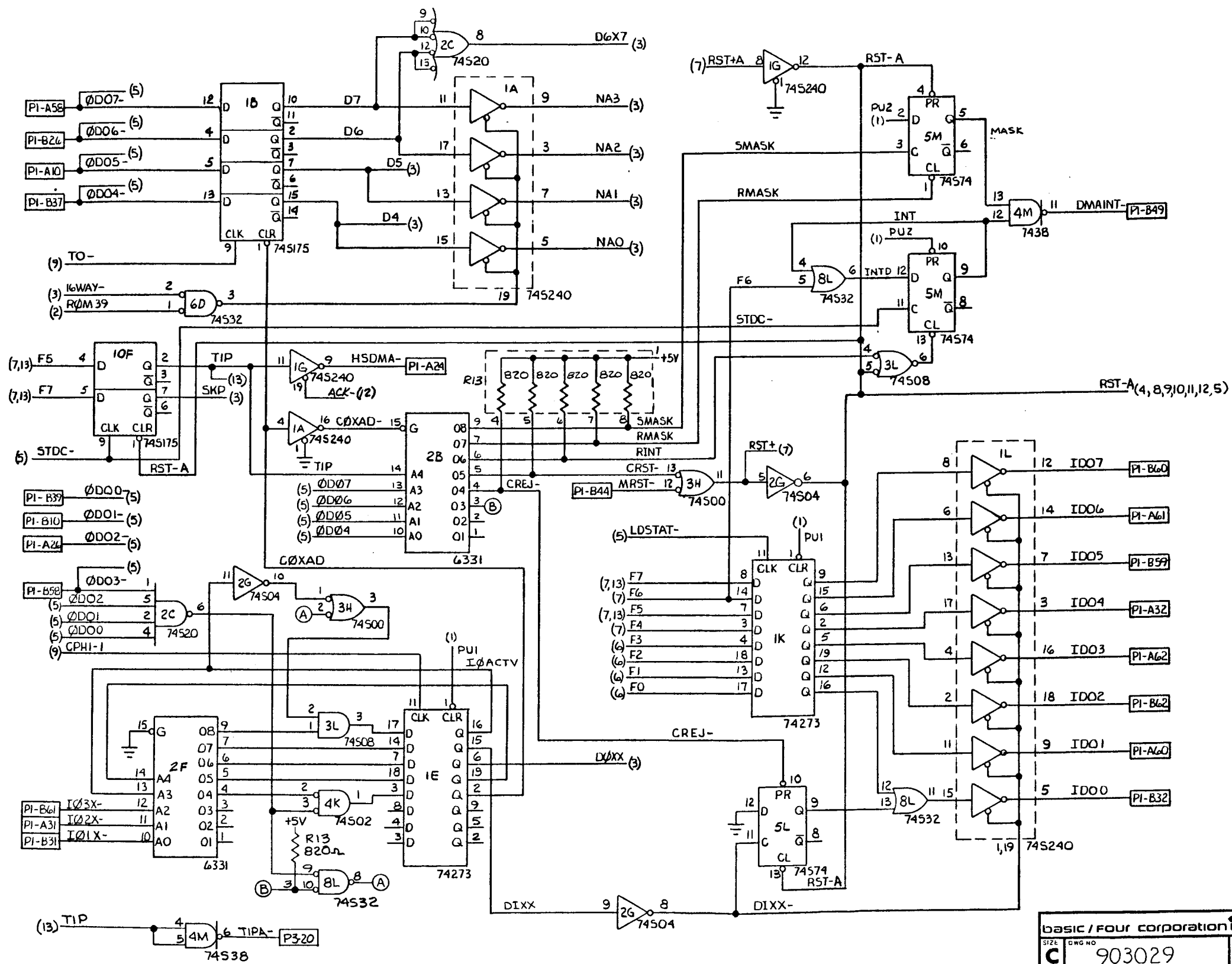




basic / four corporation

SIZE DWG NO. **C 903029** REV **A**

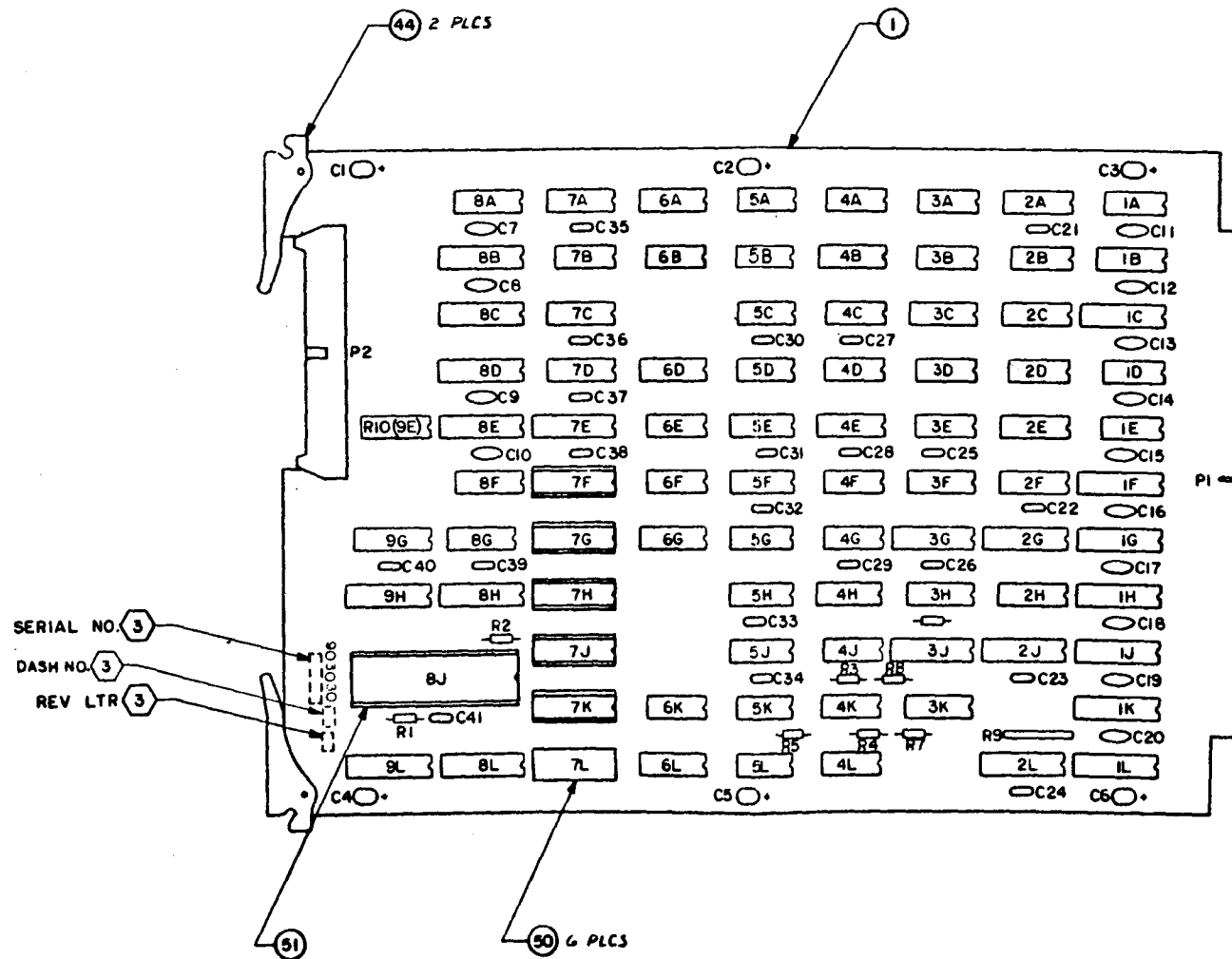
SCALE **1** SH 12 OF 14



basic / four corporation

SIZE	DWG NO	REV
C	903029	AX3
SCALE		SH 13 OF 14

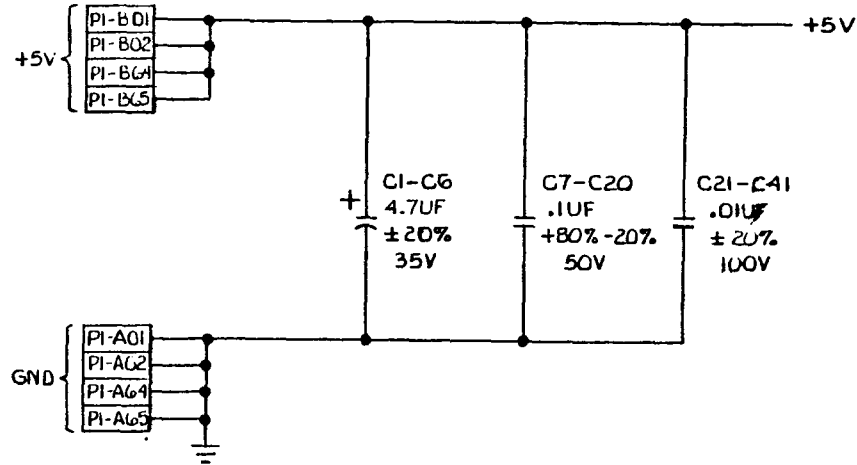
AX1	PRE PRODUCTION RELEASE	11/77	
AX2	SEE ECN	11/77	
AX3	SEE ECN	11/77	
AX4	SEE ECN	11/77	
AX5	SEE ECN	11/77	
AX6	SEE ECN	11/77	
AX7	SEE ECN	11/77	
A	2393 PRODUCTION RELEASE	11/77	
B	2501 IC AT LOC 75 REWORK WAS 165006-DAT	11/77	
B1	2519 CHANGED PN FOR R2 WAS 101018. REWORK ON BD. - 904059	11/77	
B2	2527 ADDED IC AT 5B CHANGED IC'S AT 2D, 4E, 6F & IE. REWORK TO B05. 904031 & 904059	11/77	
C	2423 SEE ECN (ARTS UPDATE)	11/77	
D	2711 REV P/L ITEMED	11/77	



OUTSTANDING ECN'S  
2982

3 MARK PER BFC SPECIFICATION 80000 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		XT 1 XRT 20 XRT 30 ANGLES 1/2"		MACHINED SURFACES ✓		DO NOT SCALE DRAWING	
bbsic / four corporation 1328 South Oxnard Street Anaheim, California 92805				DRAWN: [Signature]		TITLE: PCB A CARTRIDGE TAPE CONT		REV: D	
CHKD: [Signature]				ENG: [Signature]		APP: [Signature]		SCALE: 1:1	
NEXT ASSY:				USED ON:		Dwg No: 903030		REV: D	



REV	DESCRIPTION	INITIAL	DATE
A1	ISSUED FOR PRODUCTION		
AX	SEE ECN		
AX5	SEE ECN		
A	PRODUCTION RELEASED		8-17-75
B	CHANGED LOGIC SHTS. 2, 13 & 14		8-24-75
C	CHANGED LOGIC SHTS. 1, 2, 8 & 10		8-3-75

UNUSED GATES		
LOC	COMPL. 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*

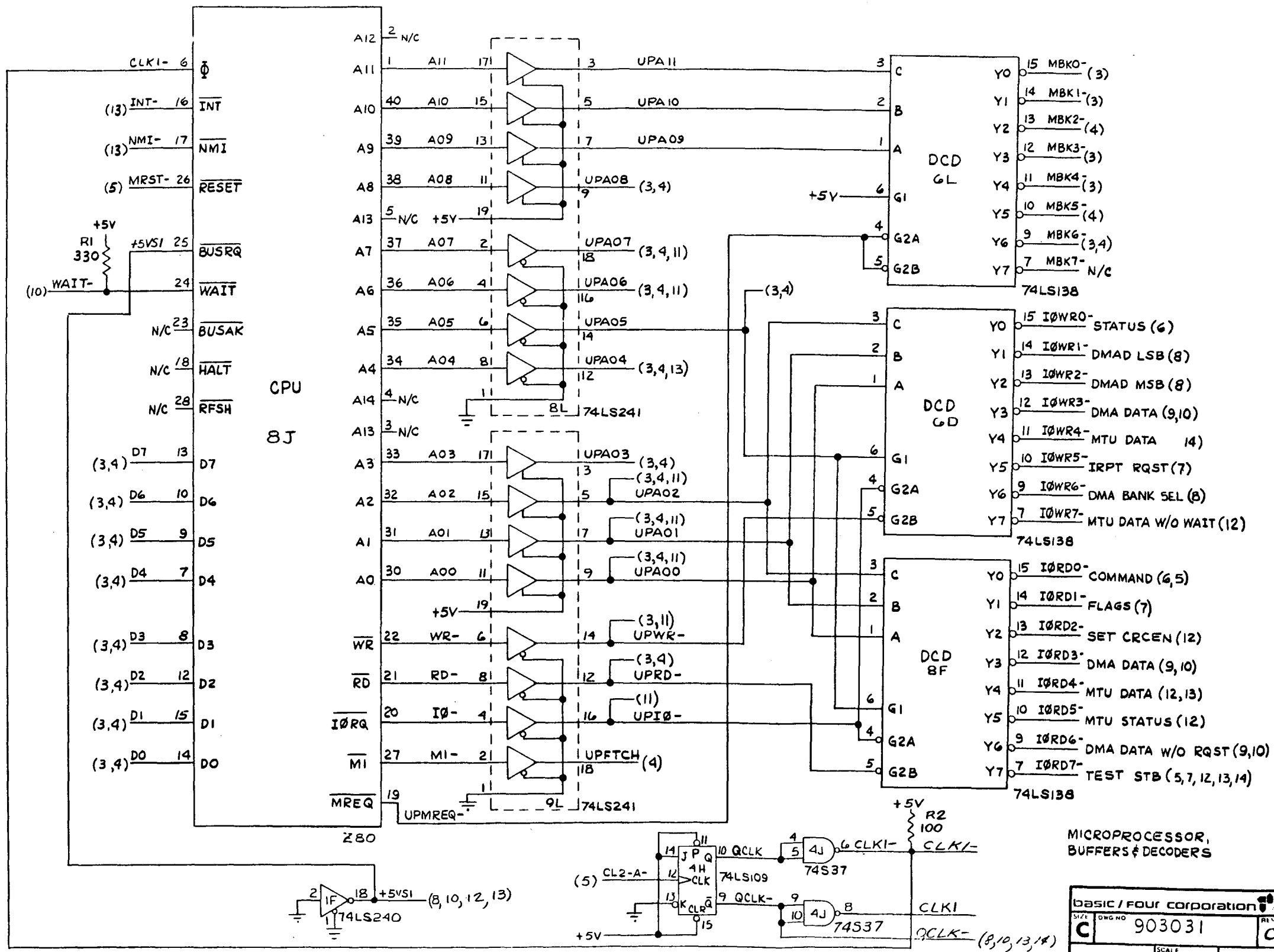
3. FOR P1 AND P2 CONNECTOR FUNCTIONS SEE SHT 15
2. I.C. DESIGNATIONS ON F/D INDICATE BOARD LOCATION. FOR COMPLETE REFERENCE DESIGNATION PREFIX WITH "U". EXAMPLE: "U6A".
1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4 WATT.

NOTES UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES		TOLERANCES UNLESS OTHERWISE SPECIFIED		<b>BASIC / FOUR CORPORATION</b> <small>1335 South Claudine Street Anaheim, California 92806</small>	
X * 1 XX * 03 XXX * 010 ANGLES : 1.0°		DRAWN	R.G. HANSON	6-25-77	TITLE
MACHINED SURFACES ✓		CHKD	J. L. T.	9-30-77	LD
DO NOT SCALE DRAWING		ENG	J. J. J.	9-22-77	CARTRIDGE TAPE CONT
903031	REF	MFG			SIZE DWG NO
NEXT ASSY	USED ON	APP	R.G. ca	9-22-77	903031
					SCALE
					NONE
					SH 1 OF 15

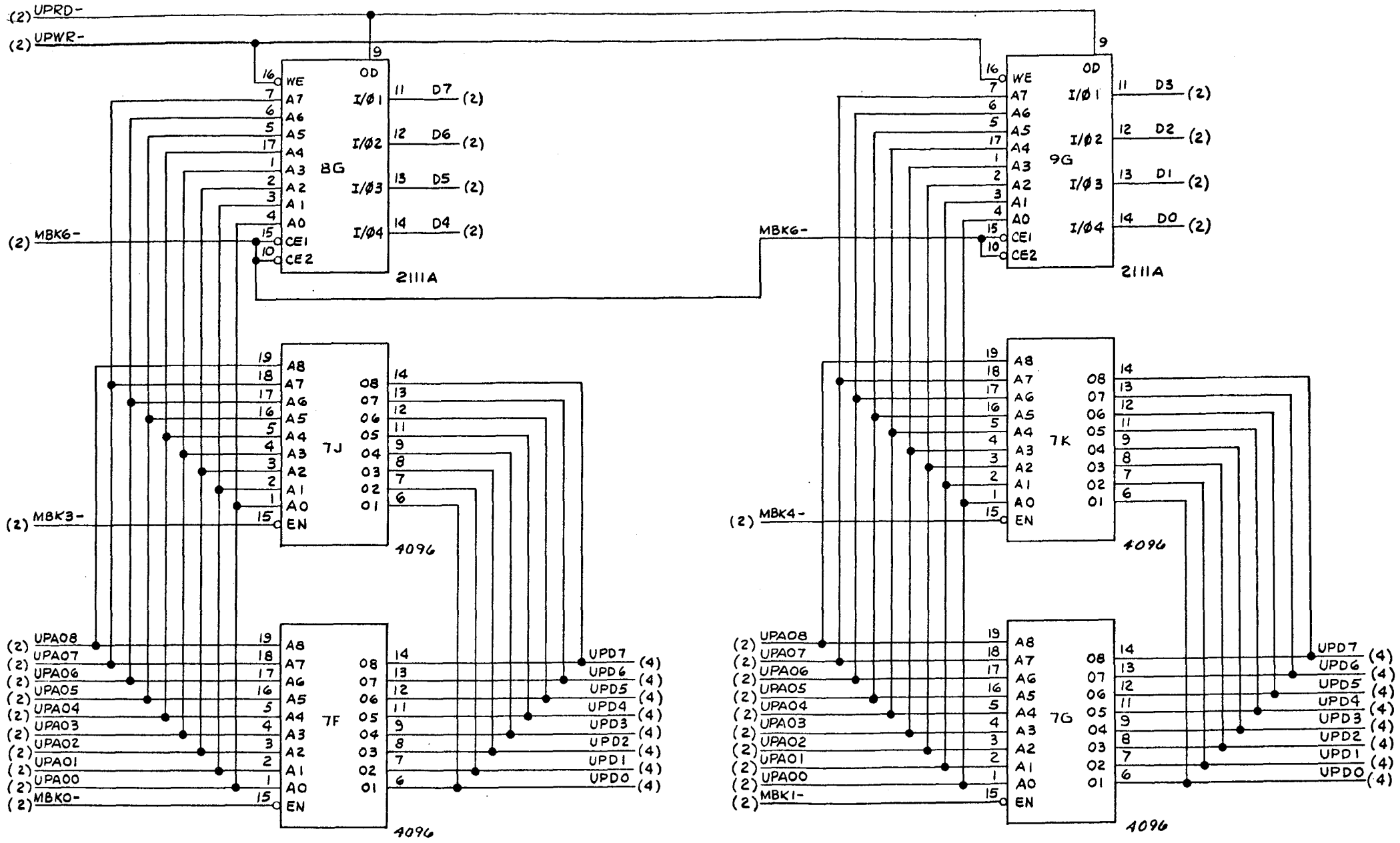
MICROPROCESSOR ADDRESS & CONTROL BUFFERS

MEMORY BANK & I/O DECODE



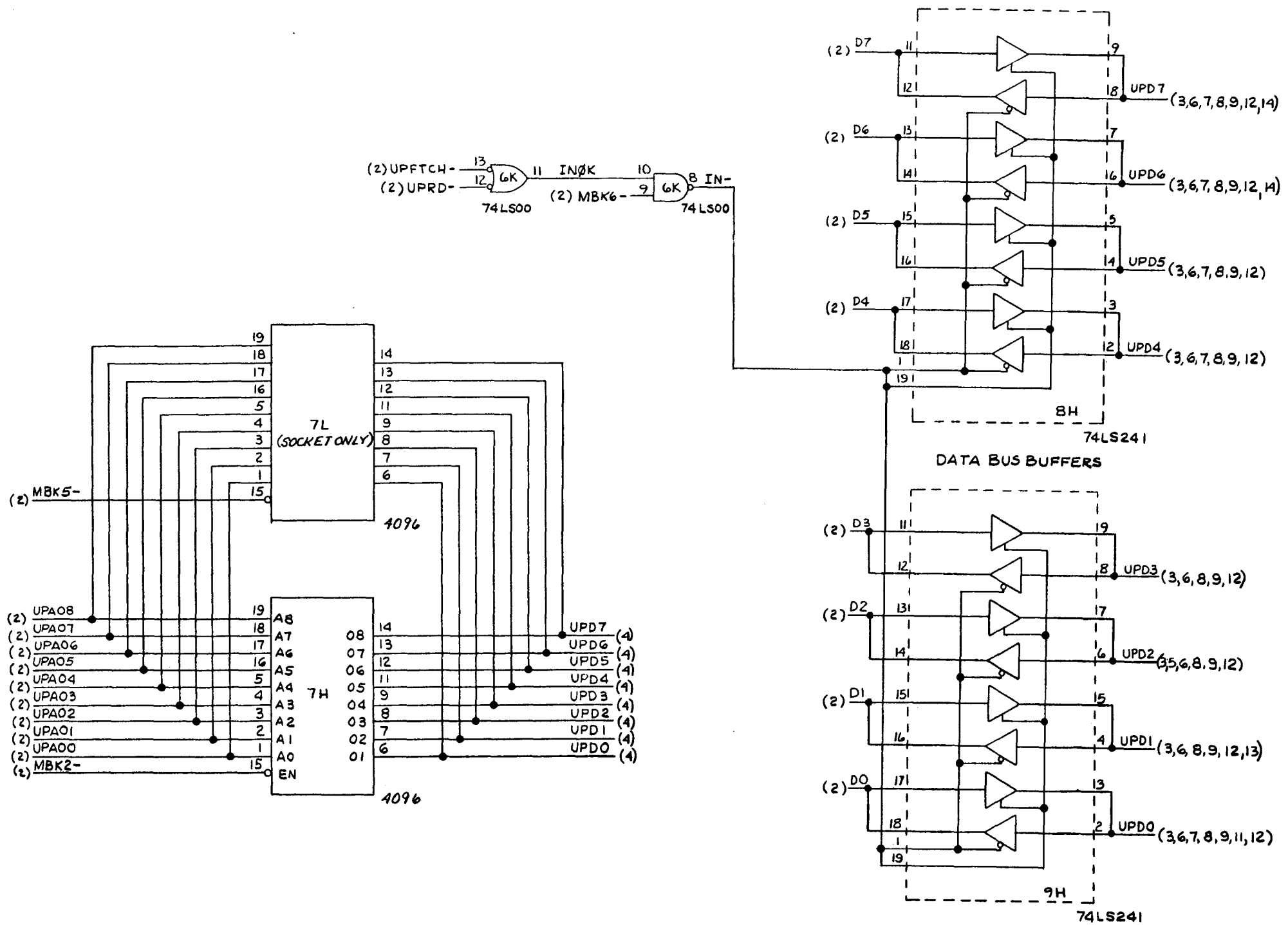
MICROPROCESSOR, BUFFERS & DECODERS

BASIC / FOUR CORPORATION		
SIZE	DWG NO	REV
C	903031	C
SCALE NONE		SH 2 OF 15



RAMS & PROMS

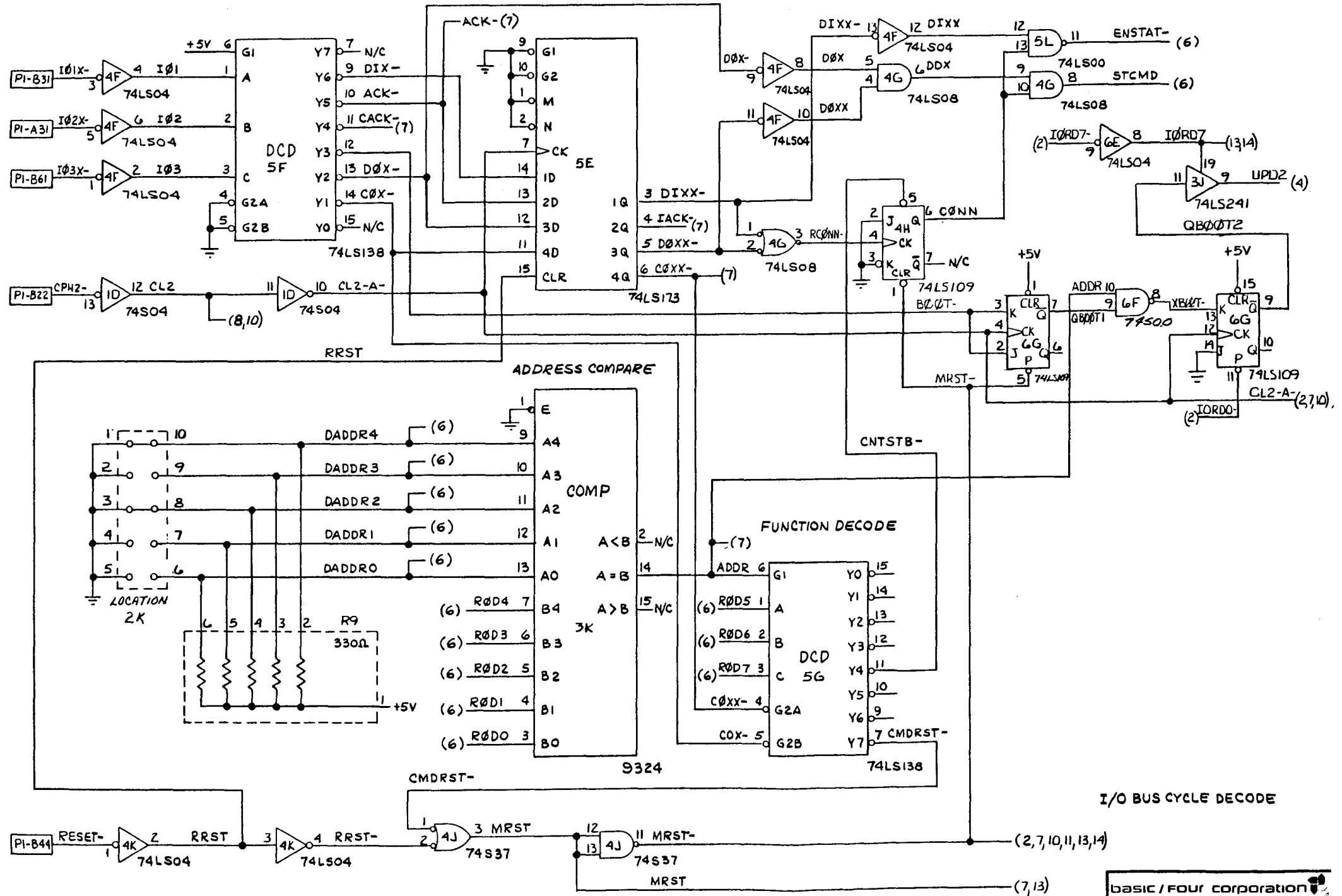
basic / four corporation		
REV	DWG NO	REV
C	903031	C
SCALE		SH
NONE		3 OF 15



**RAMS & PROMS**

BASIC / FOUR corporation		
SIZE	DWG NO	REV
C	903031	C
SCALE NONE		SH 4 of 13

CYCLE DECODE & SYNCHRONIZATION

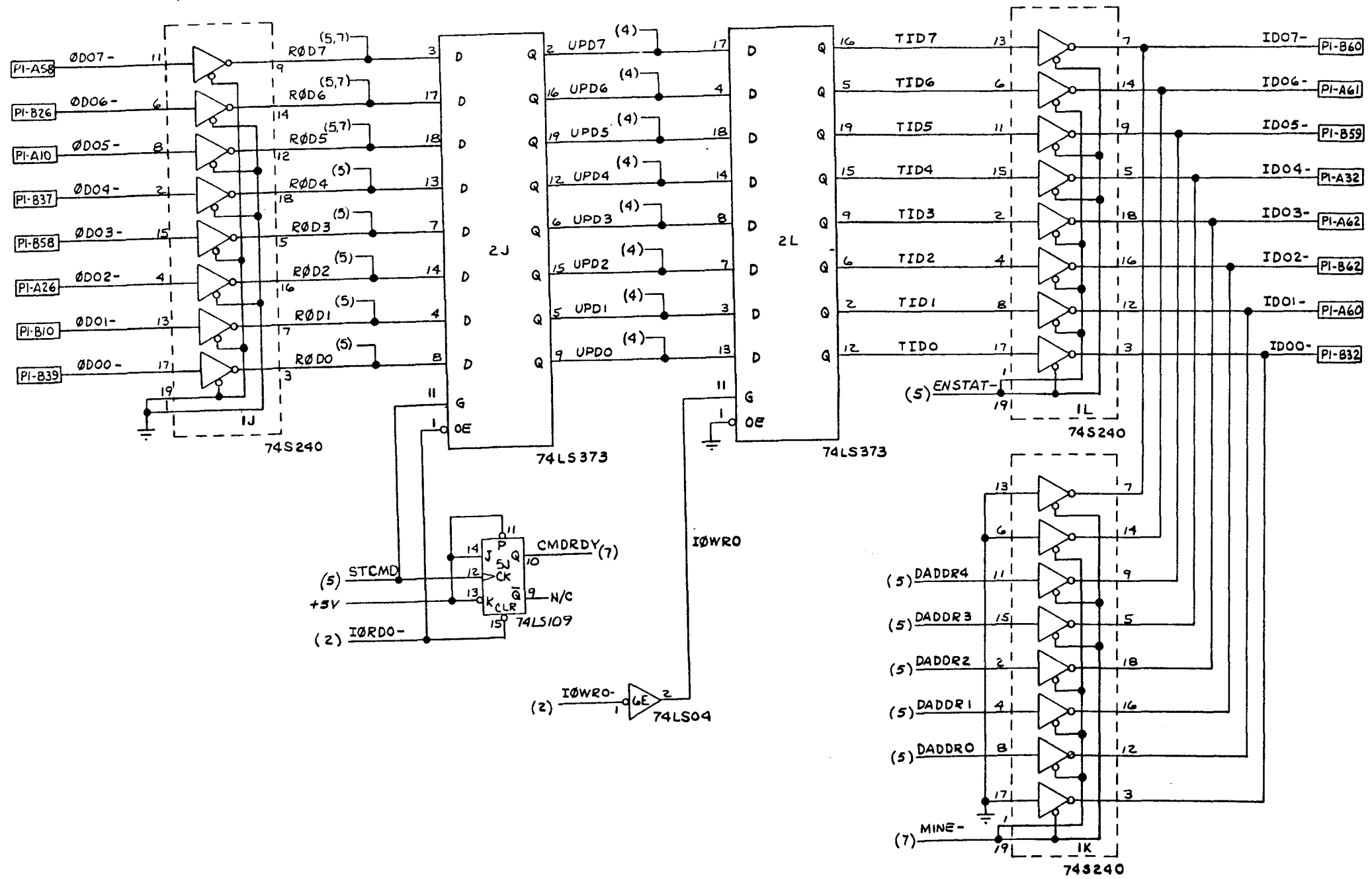


basic / four corporation		
SIZE	DWG NO	REV
C	903031	C
SCALE		SH 5 of 15



I/O DATA RECEIVERS & COMMAND LATCH

MAIN STATUS LATCH & I/O DATA DRIVERS

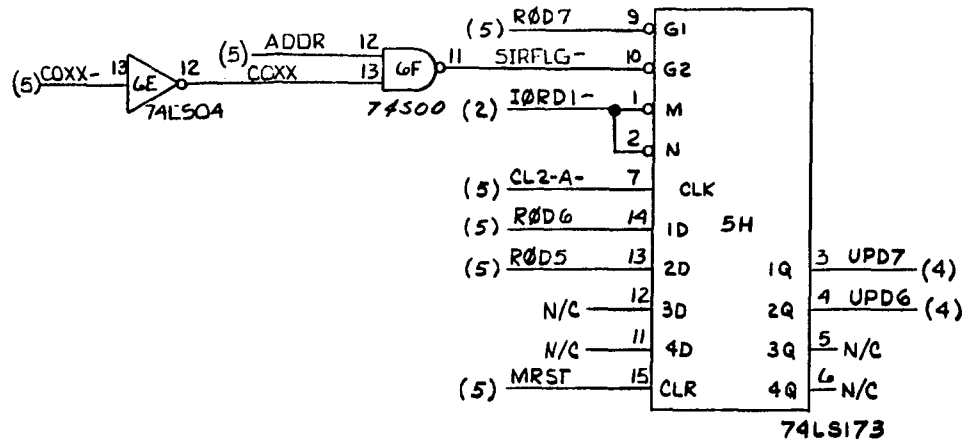
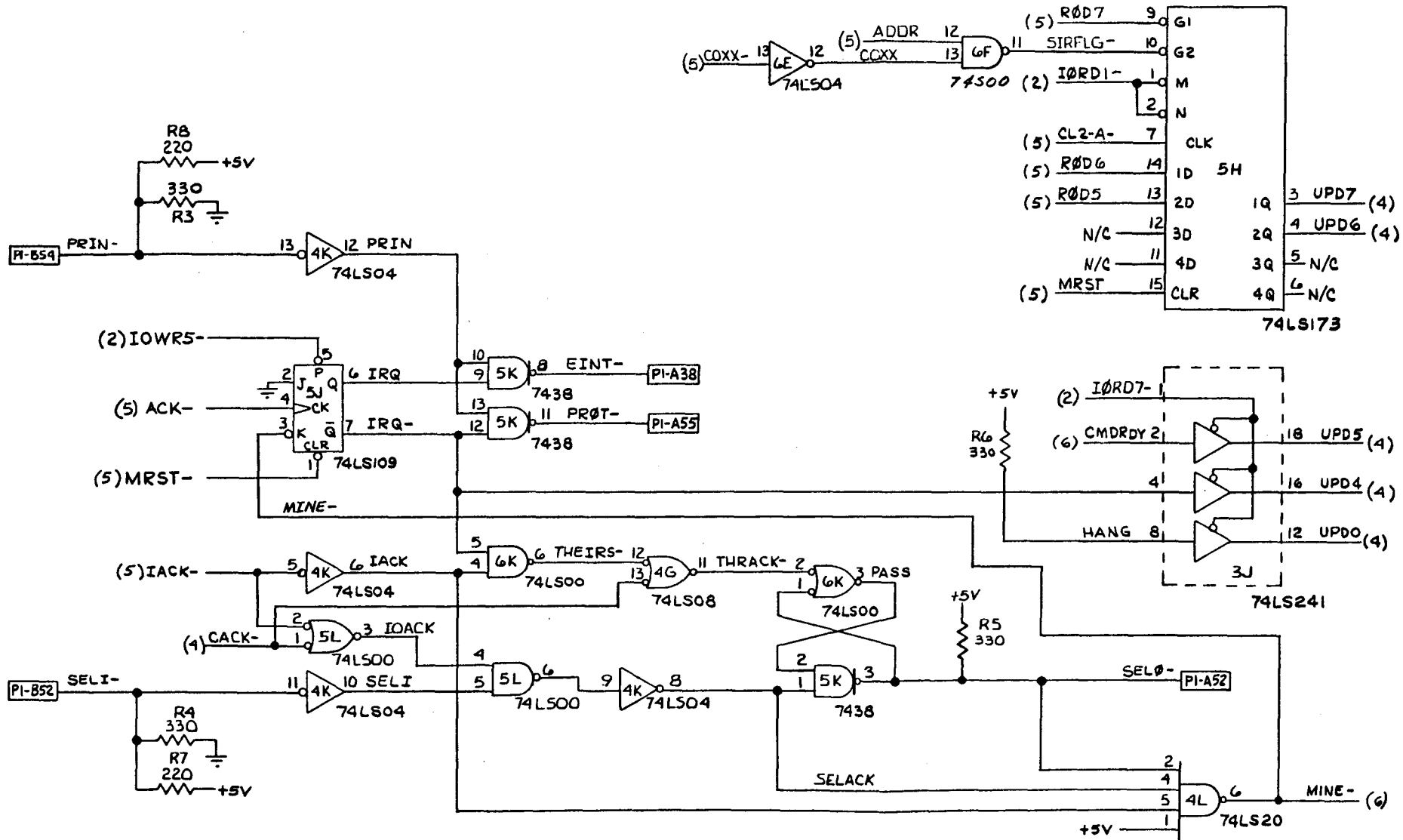


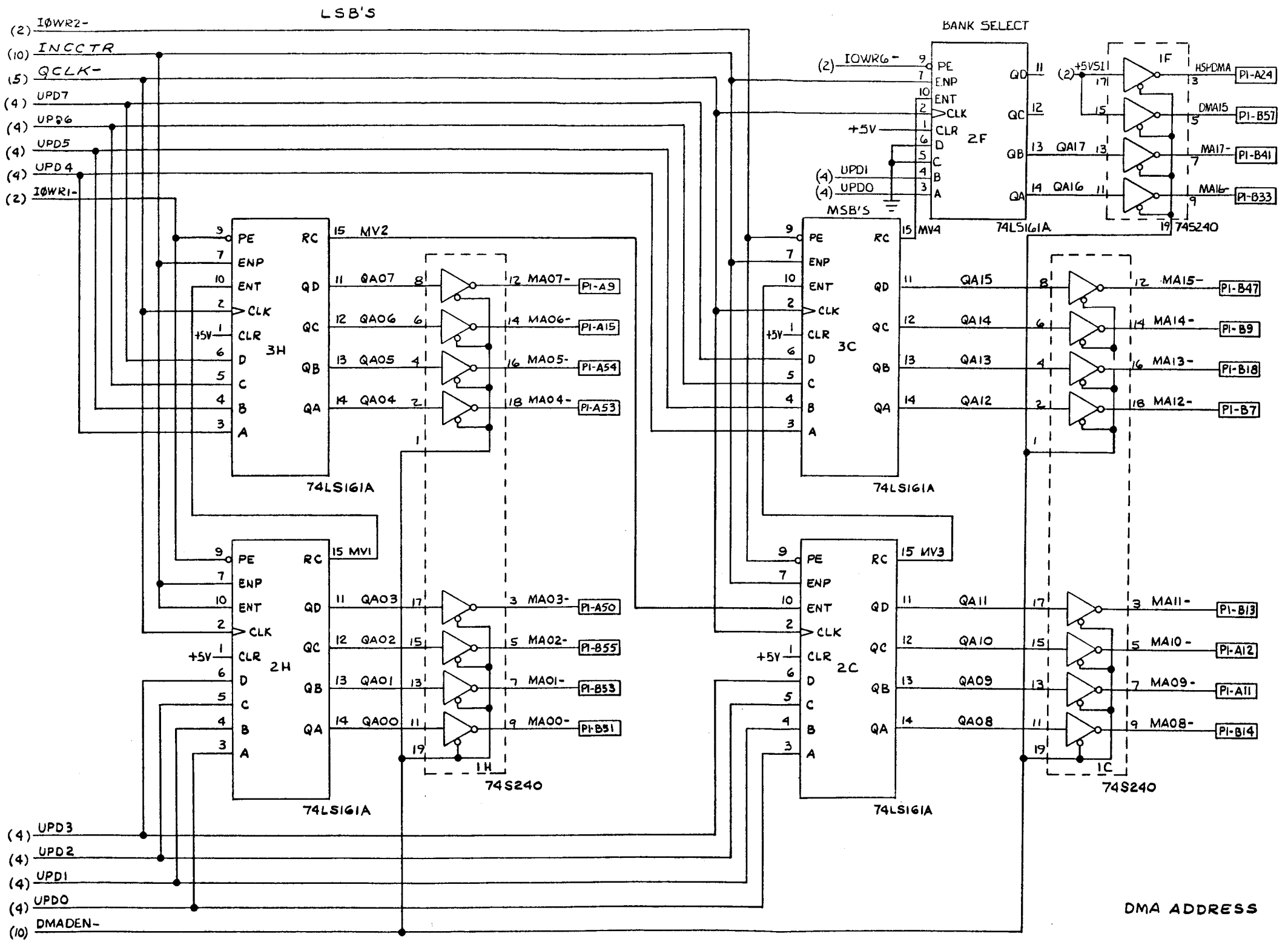
I/O BUS COMMAND & STATUS

basic / four corporation		
SIZ	OWD NO	REV
C	903031	C
SCALE		SH 6 OF 15
NONE		

INTERRUPT & SELECT PRIORITY LOGIC

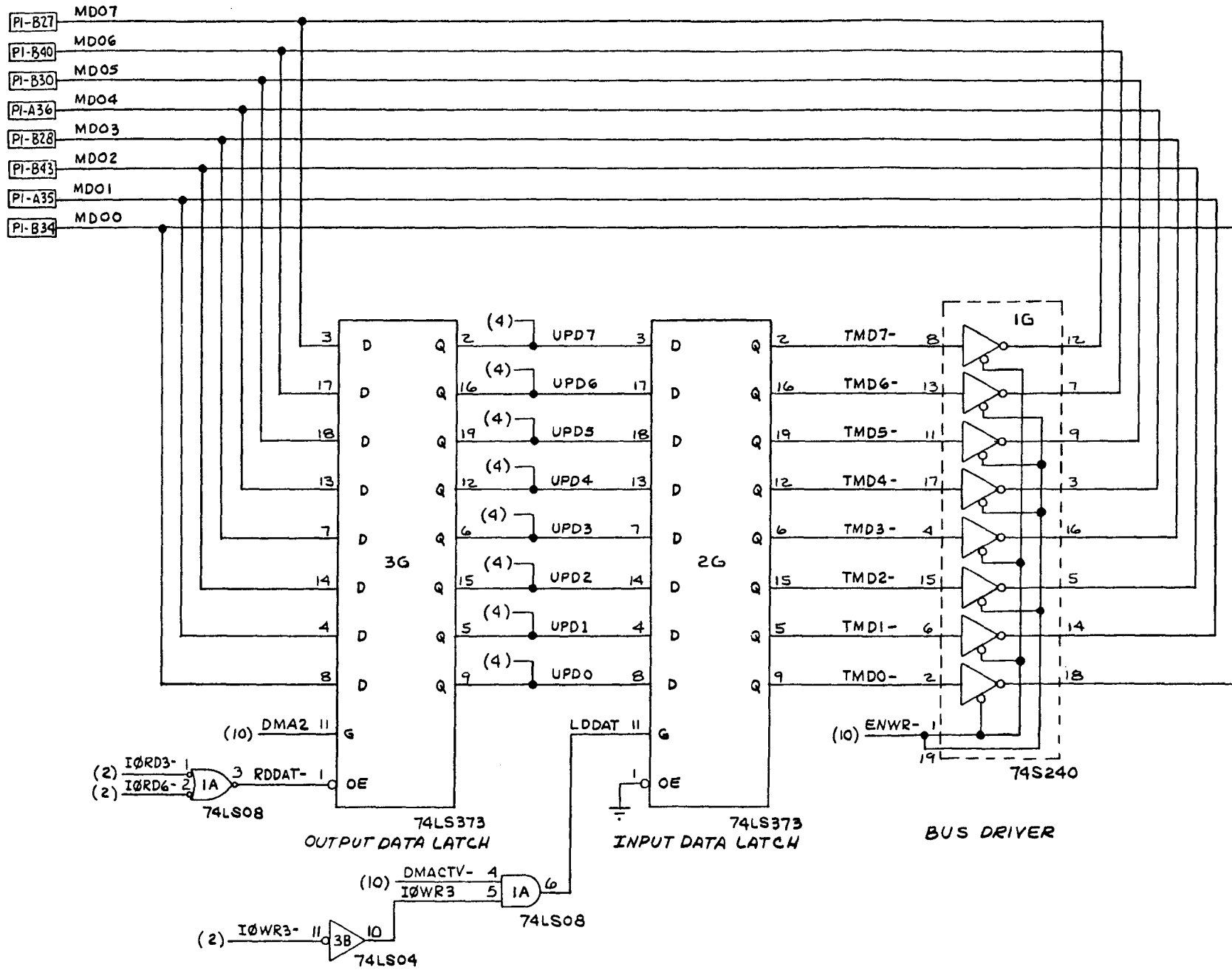
CPU INTERFACE FLAGS TO MPROC





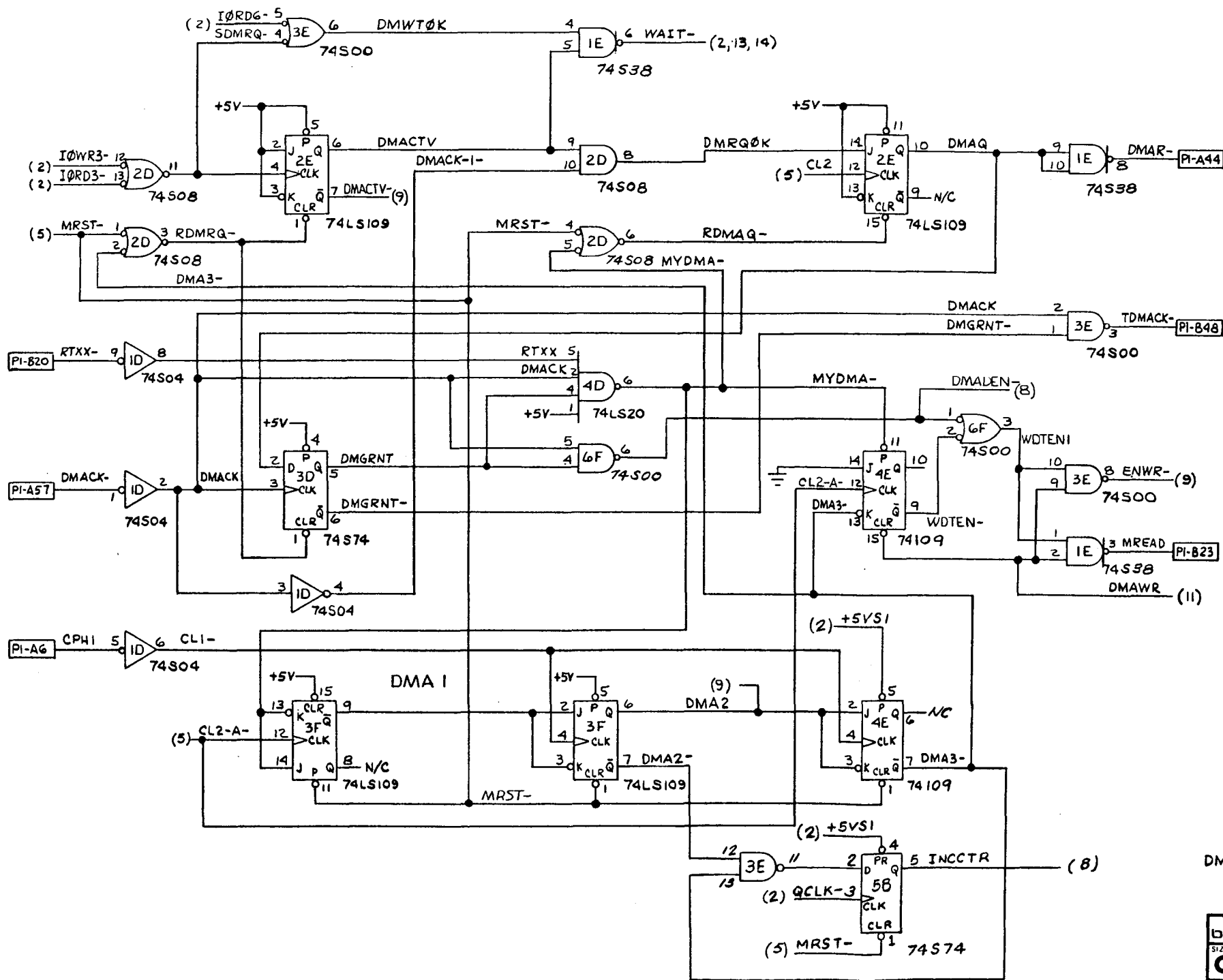
66-9

BASIC / FOUR CORPORATION		
SIZE	DWG NO	REV
C	903031	C
SCALE NONE		SH 8 OF 15



DMA DATA

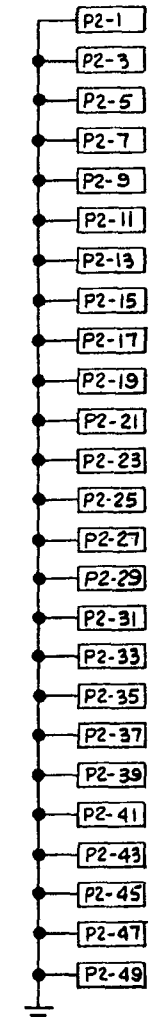
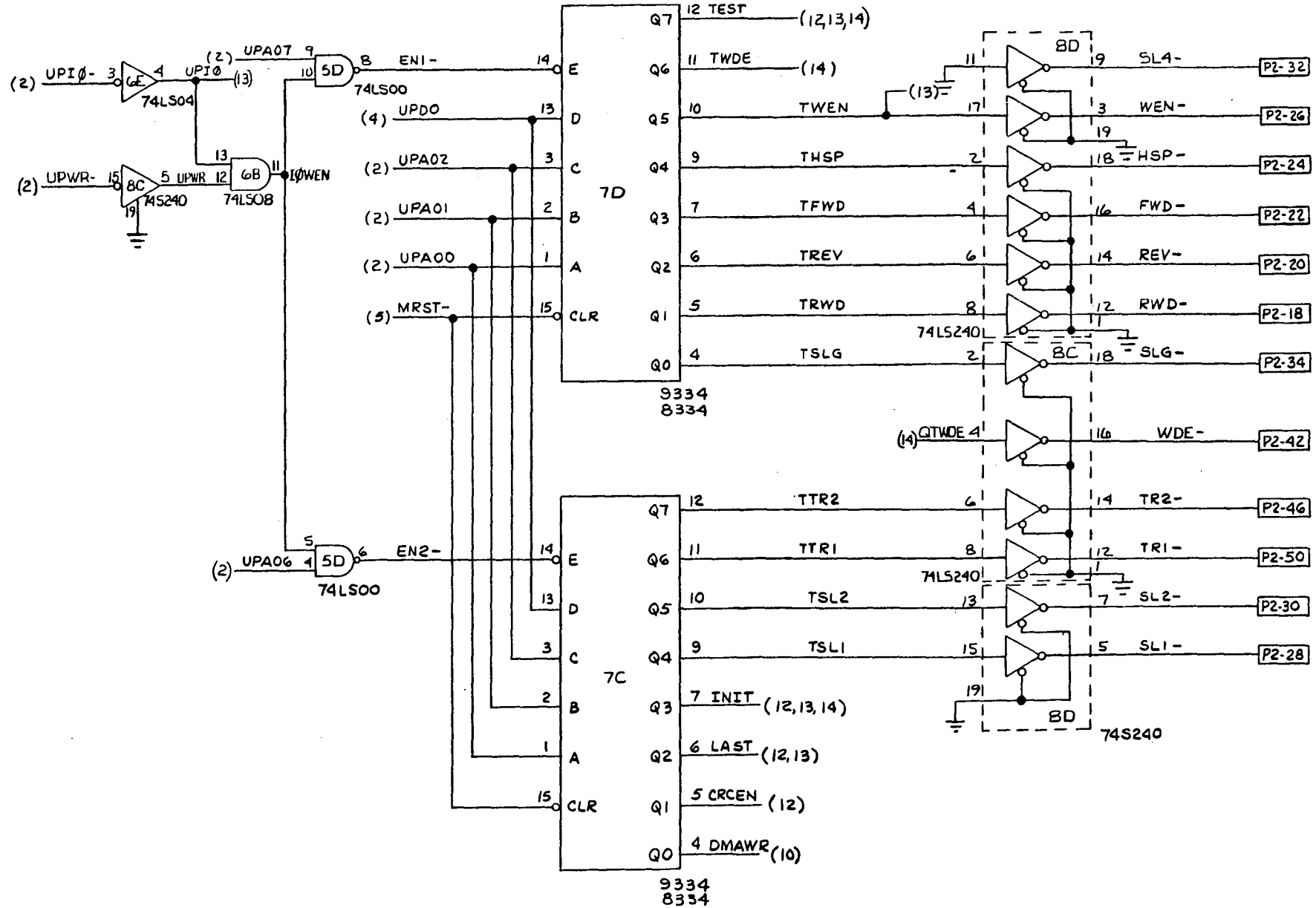
basic / four corporation			
SIZE	DWG NO	REV	
C	903031		C
SCALE		SH 9 of 15	
NONE			



DMA CONTROL & PRIORITY

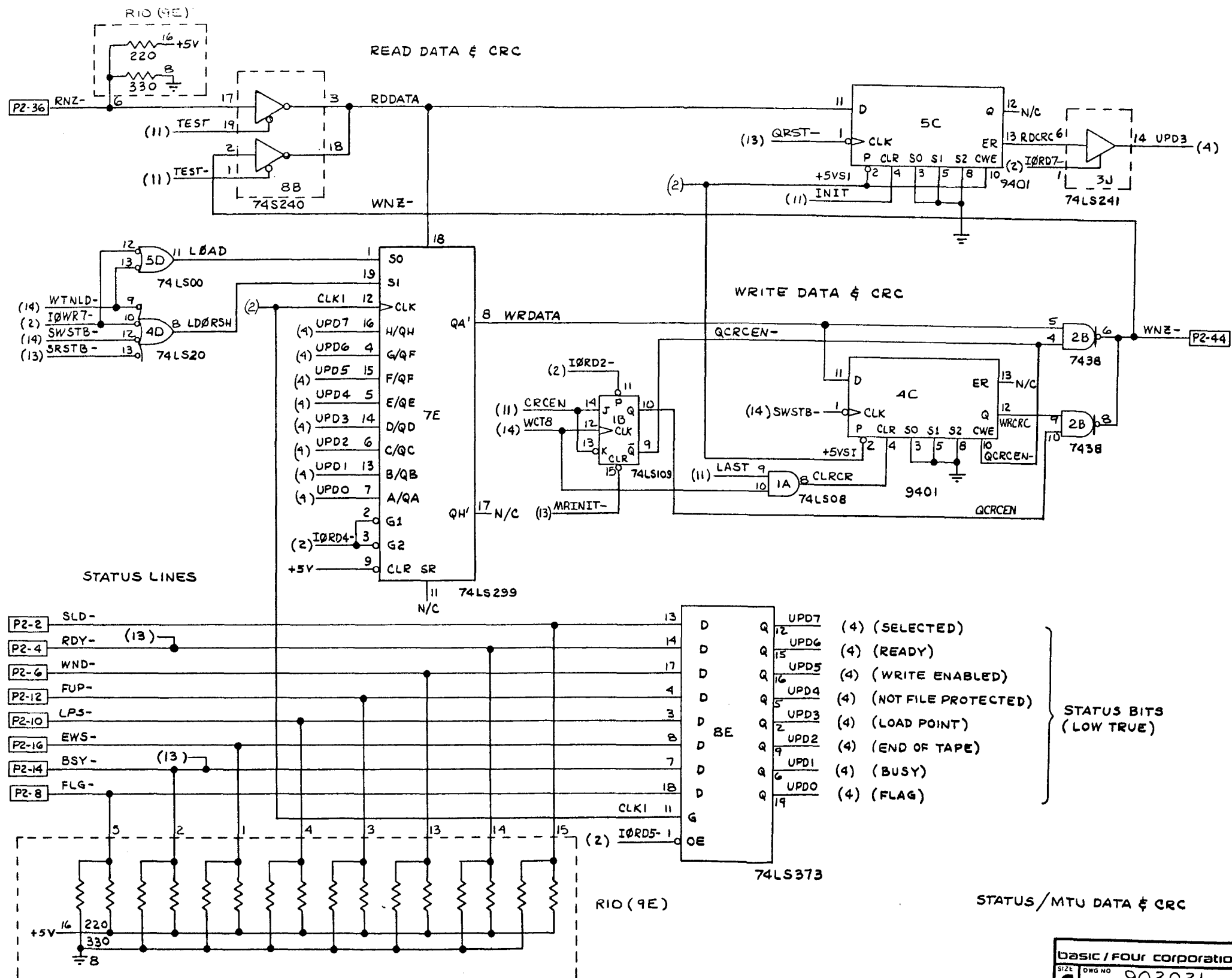
BASIC / FOUR CORPORATION		
SIZE	DWG NO	REV
C	903031	C
SCALE		SH 10 OF 15
NONE		

### CONTROL LINES



### MTU CONTROL

basic / four corporation			
SIZE	DWG NO	903031	REV
C			C
		SCALE	NONE
		SH 11 OF 15	



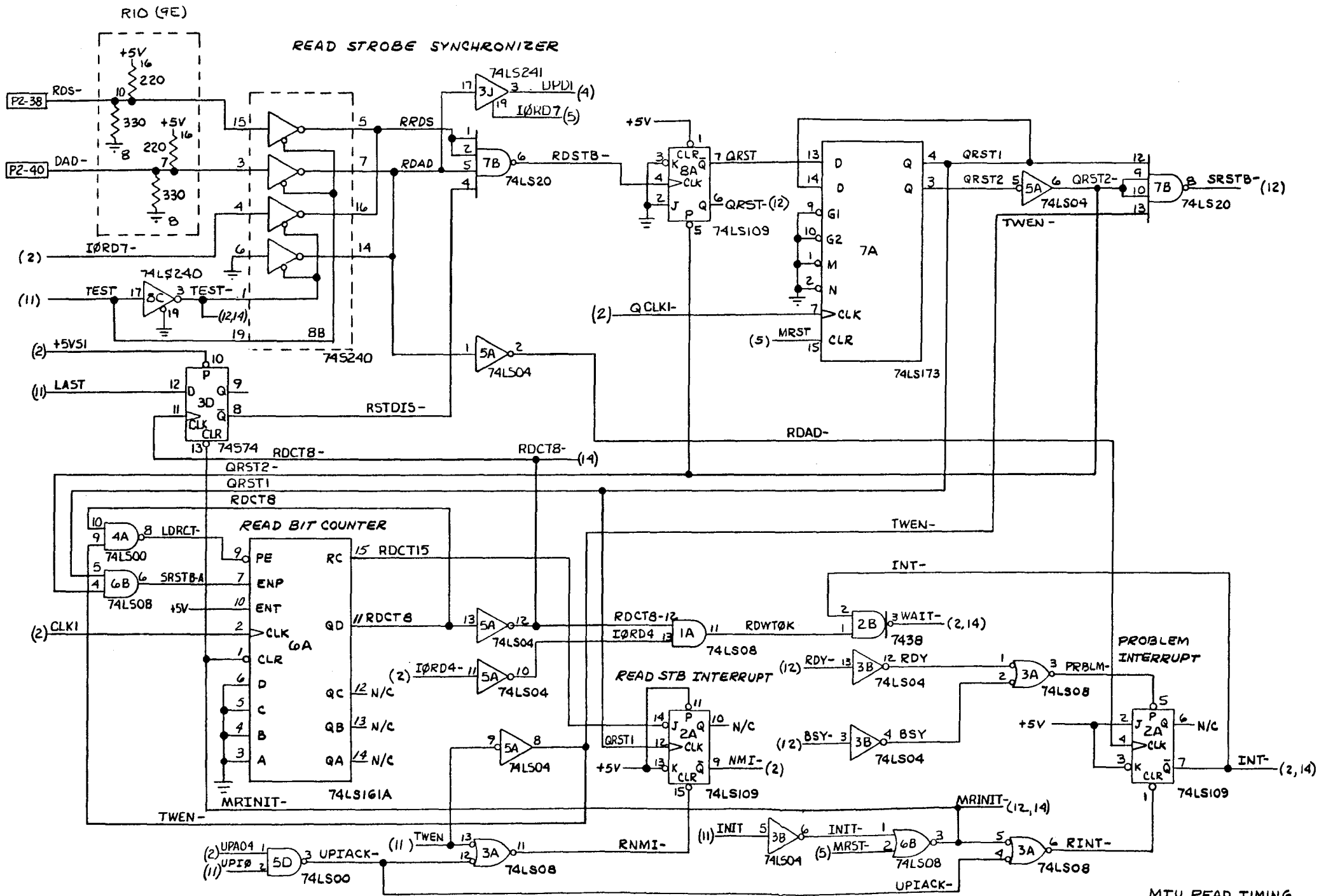
Pin	Signal	Function
12	UPD7	(4) (SELECTED)
15	UPD6	(4) (READY)
16	UPD5	(4) (WRITE ENABLED)
4	UPD4	(4) (NOT FILE PROTECTED)
3	UPD3	(4) (LOAD POINT)
8	UPD2	(4) (END OF TAPE)
7	UPD1	(4) (BUSY)
18	UPD0	(4) (FLAG)

STATUS BITS  
(LOW TRUE)

BASIC / FOUR Corporation

SIZE C DWG NO 903031 REV C

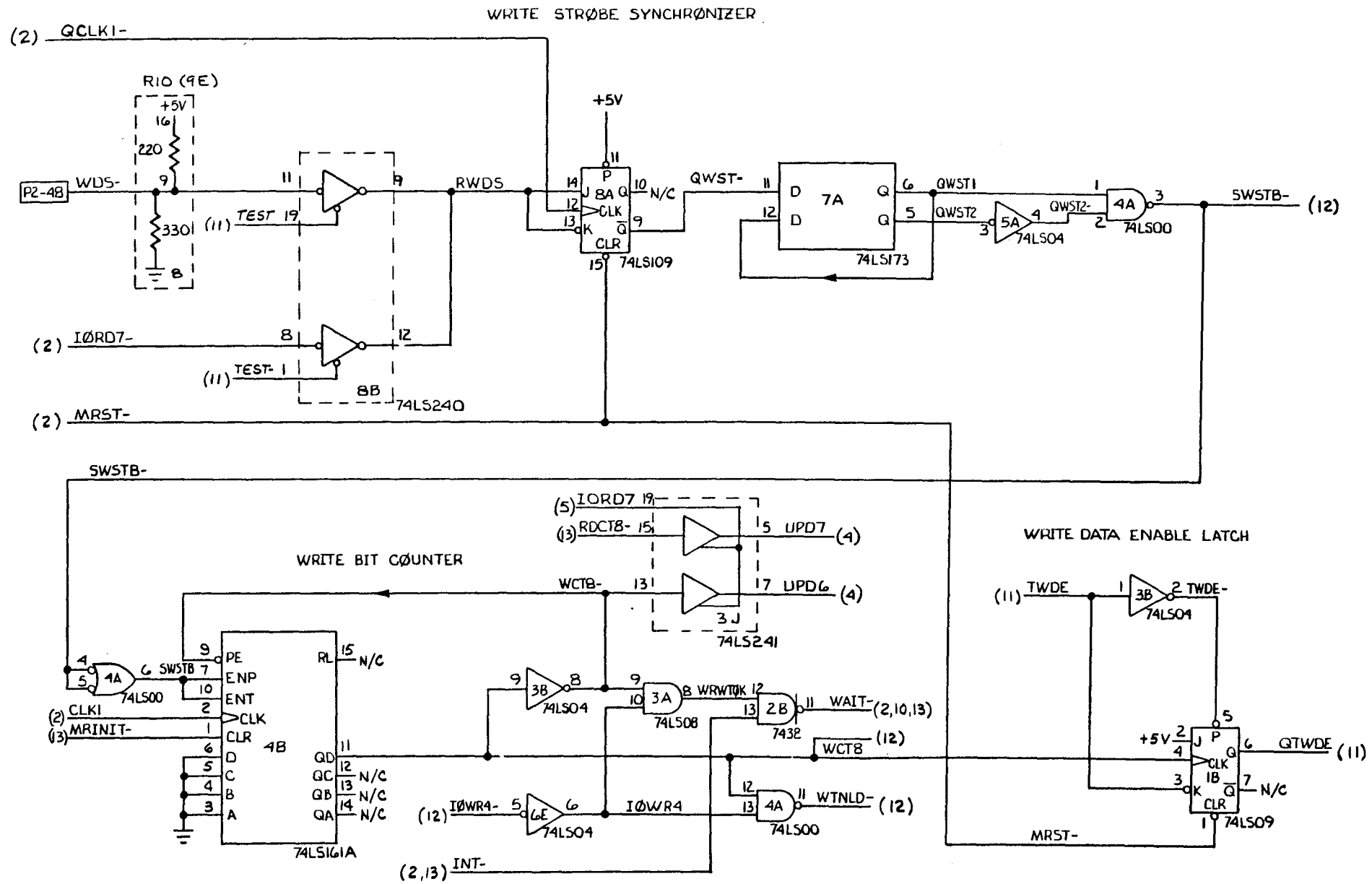
SCALE NONE SH 12 OF 15



MTU READ TIMING

BASIC/FOUR CORPORATION		
SIZE	DWG NO	REV
C	903031	C
SCALE		SH 13 OF 15
NONE		

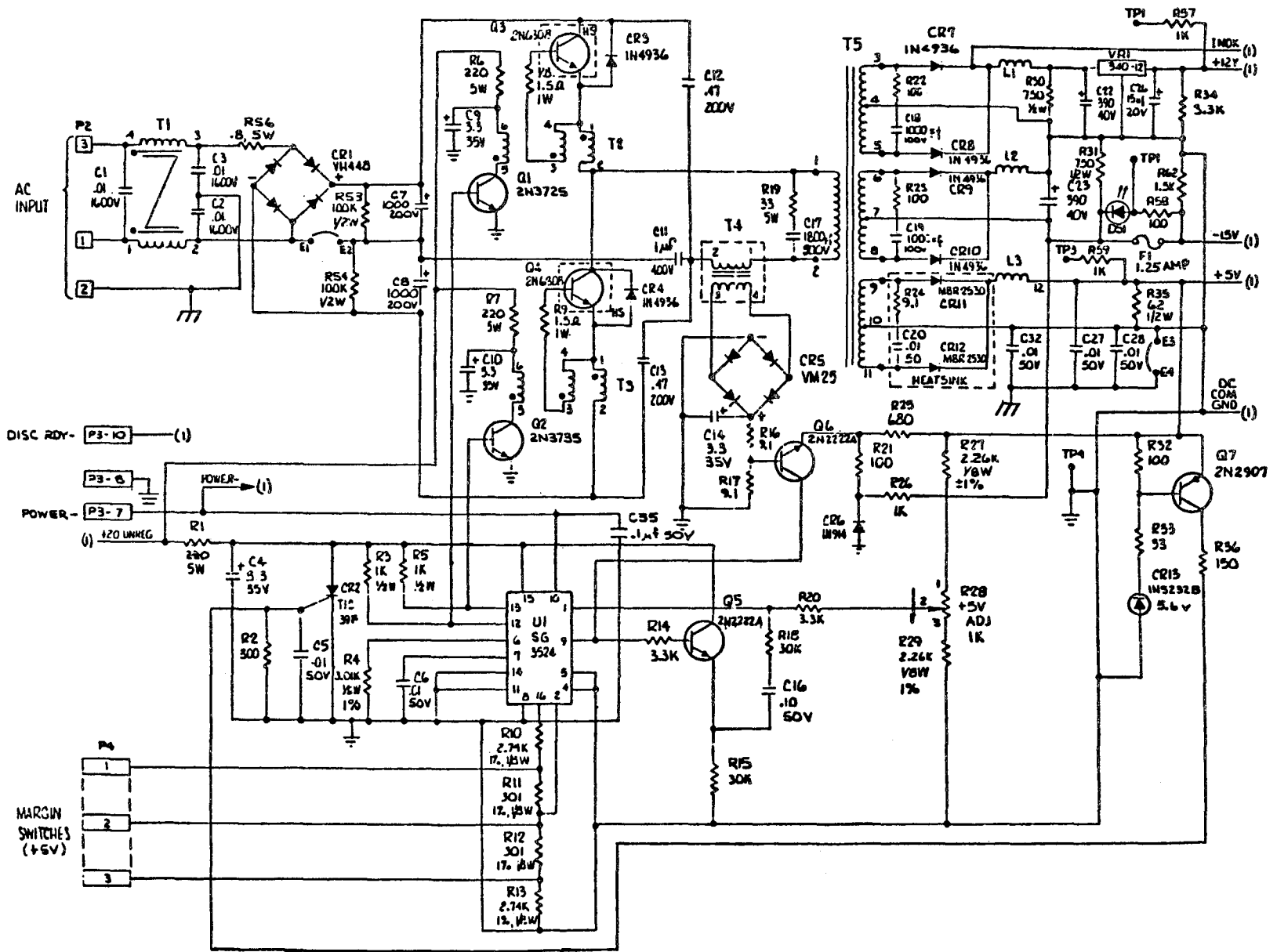




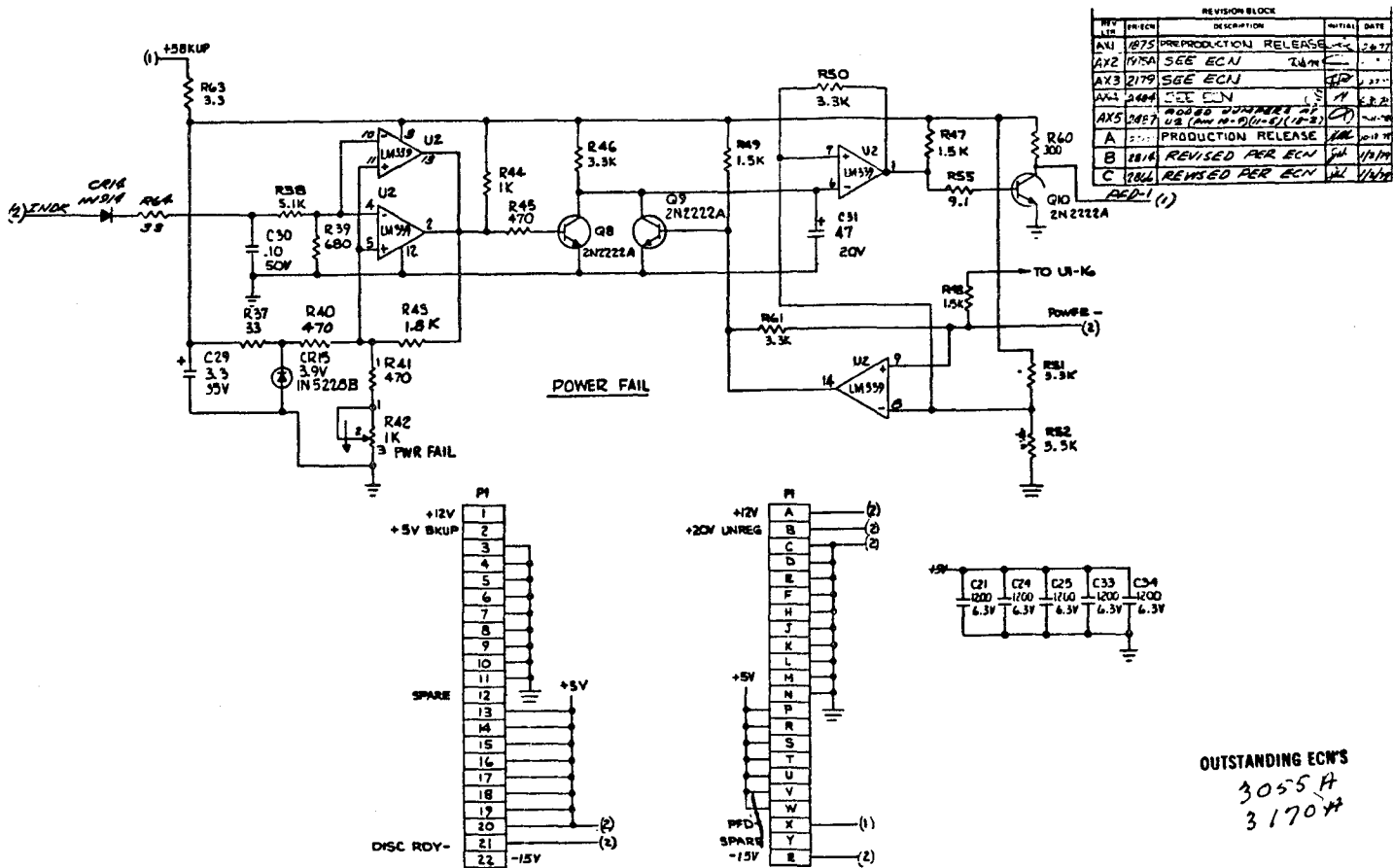
MTU WRITE TIMING

basic / four corporation		
SIZE	DWG NO	REV
C	903031	C
SCALE		SH 14 OF 15
NONE		





C 903039  
 REV. 2 OF 2

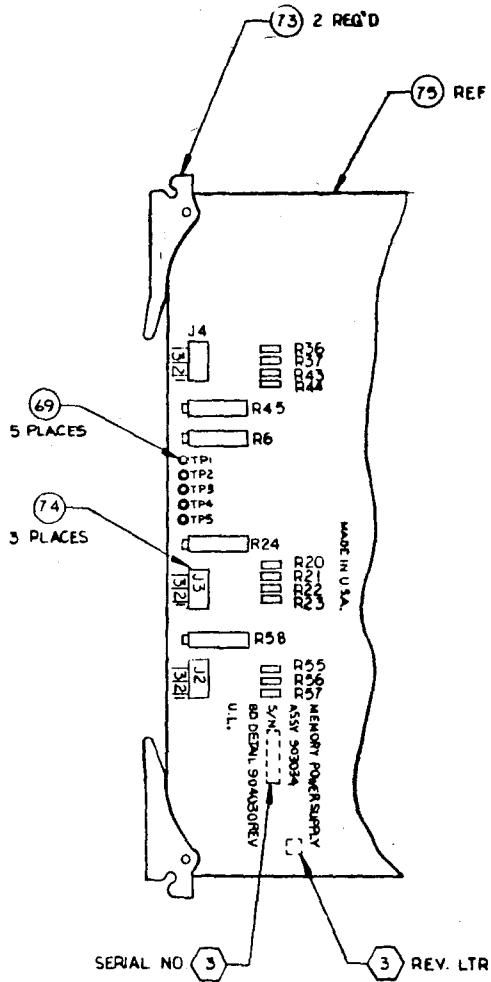


REV	BY	DATE	DESCRIPTION	INITIALS	DATE
AX1	1875		PRE-PRODUCTION RELEASE		2-8-77
AX2	1954		SEE ECN		2-8-77
AX3	2179		SEE ECN		2-22-77
AX4	2444		SEE ECN		3-22-77
AX5	2457		ADD TO DRAWING OF US (REV. 10-10-76) (1-2-77)		3-22-77
A			PRODUCTION RELEASE		10-11-77
B	1814		REVISED PER ECN		11/11/77
C	1814		REVISED PER ECN		11/11/77

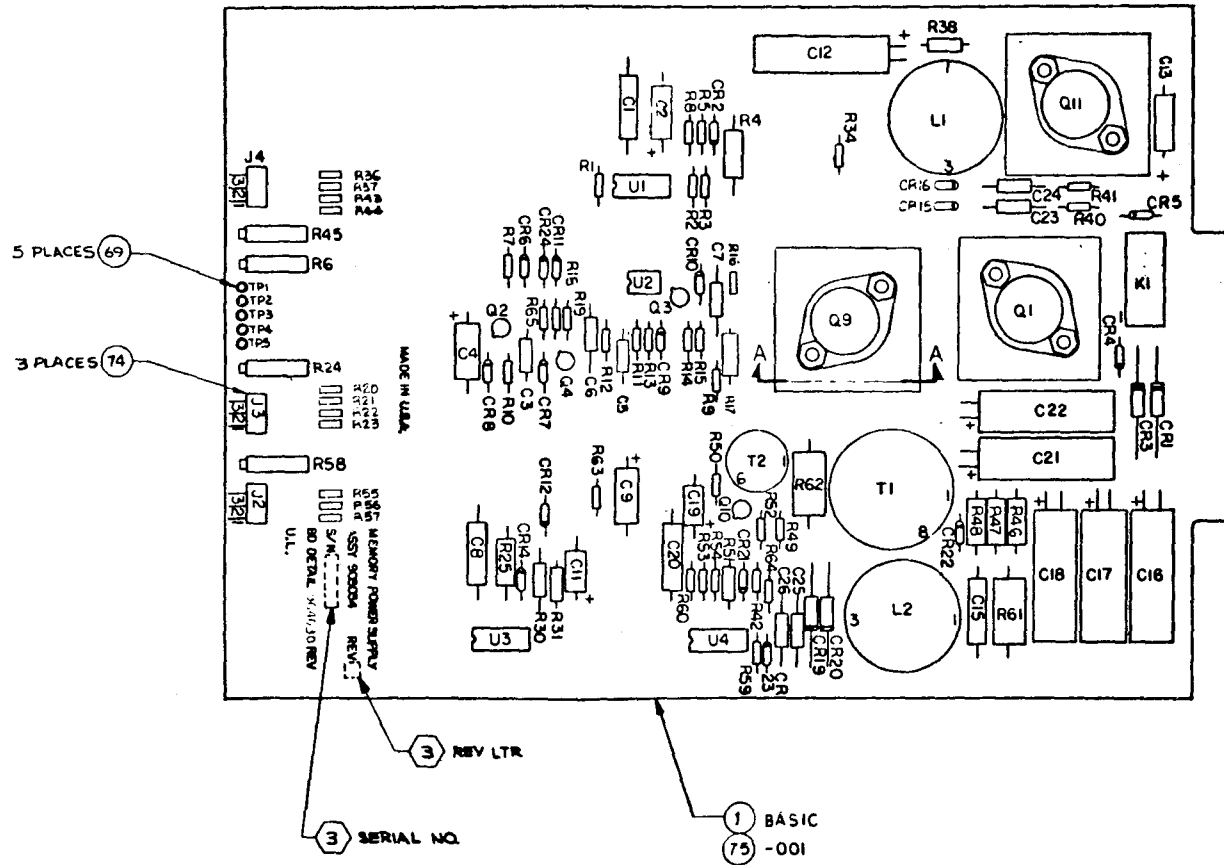
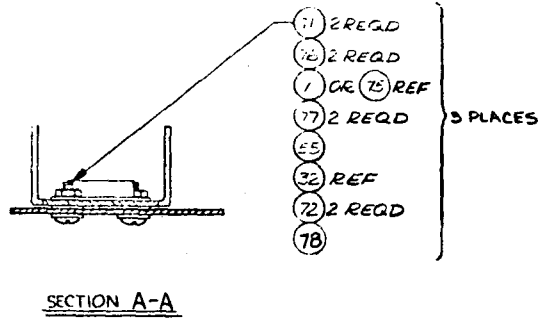
2. ALL CAPACITOR VALUES ARE IN MICROFARADS, ±10%.  
 1. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4 W.  
 NOTES UNLESS OTHERWISE SPECIFIED

REFERENCE DESIGNATION	LAST USED	NOT USED	DIMENSIONS ARE IN INCHES	TOLERANCES UNLESS OTHERWISE SPECIFIED	DRAWN	CHECKED	DATE	TITLE
C35			±.1	±.05	AG	AG	2-8-77	LD CPU POWER SUPPLY
U2			±.005	±.001	AG	AG	2-8-77	
R35			±.005	±.001	AG	AG	2-8-77	
CR15			±.005	±.001	AG	AG	2-8-77	
U1			±.005	±.001	AG	AG	2-8-77	
L3			±.005	±.001	AG	AG	2-8-77	

OUTSTANDING ECN'S  
 3055A  
 3170A



- 001



REV	DESCRIPTION	INITIALS	DATE
AX1	REVISED P/L		
AX2	REVISED P/L		
AX3	REVISED P/L		
AX4	REVISED P/L		
AX5	REVISED P/L		
AX6	REVISED P/L		
A	PRODUCTION P/L		
B	REVISED P/L		
C	REVISED P/L		
D	REVISED P/L		
E	REVISED P/L		
F	REVISED P/L		

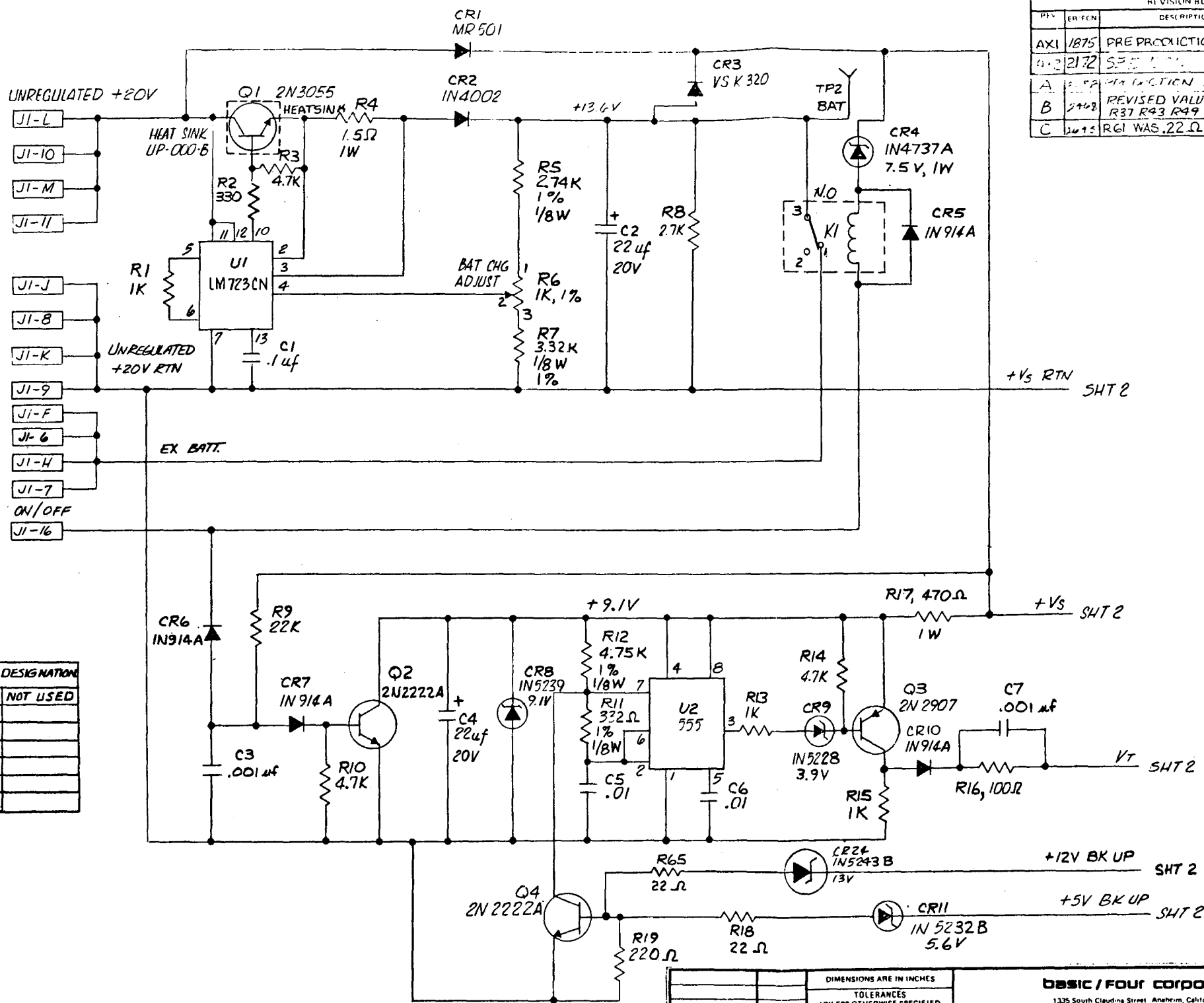
OUTSTANDING ECN'S  
*None*

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

- 3 APPLY DESIGNATION APPROX WHERE SHOWN REF. B/D SPECIFICATION 904030
  - 2 REF B/D. DETAIL 904030 FOR BASIC & 904074 FOR -001.
  - 1 REF LOGIC DIAGRAM 903035
- NOTES UNLESS OTHERWISE SPECIFIED

FOR PARTS LIST, SEE P/L 903034

DIMENSIONS ARE IN INCHES		TOLERANCES UNLESS OTHERWISE SPECIFIED		DDBIC/FOUR CORPORATION	
X ± .1	Y ± .05	ANGLE ± 1.0°		DRAWN R. PERKINS 6/24/77	TITLE
				CHKD [Signature]	FINAL MEMORY
				ENG [Signature]	PRODUCTION
				MFG	REV. 000 NO.
				APP [Signature]	D 903034
					SCALE 1/1
					SH 1 OF 1



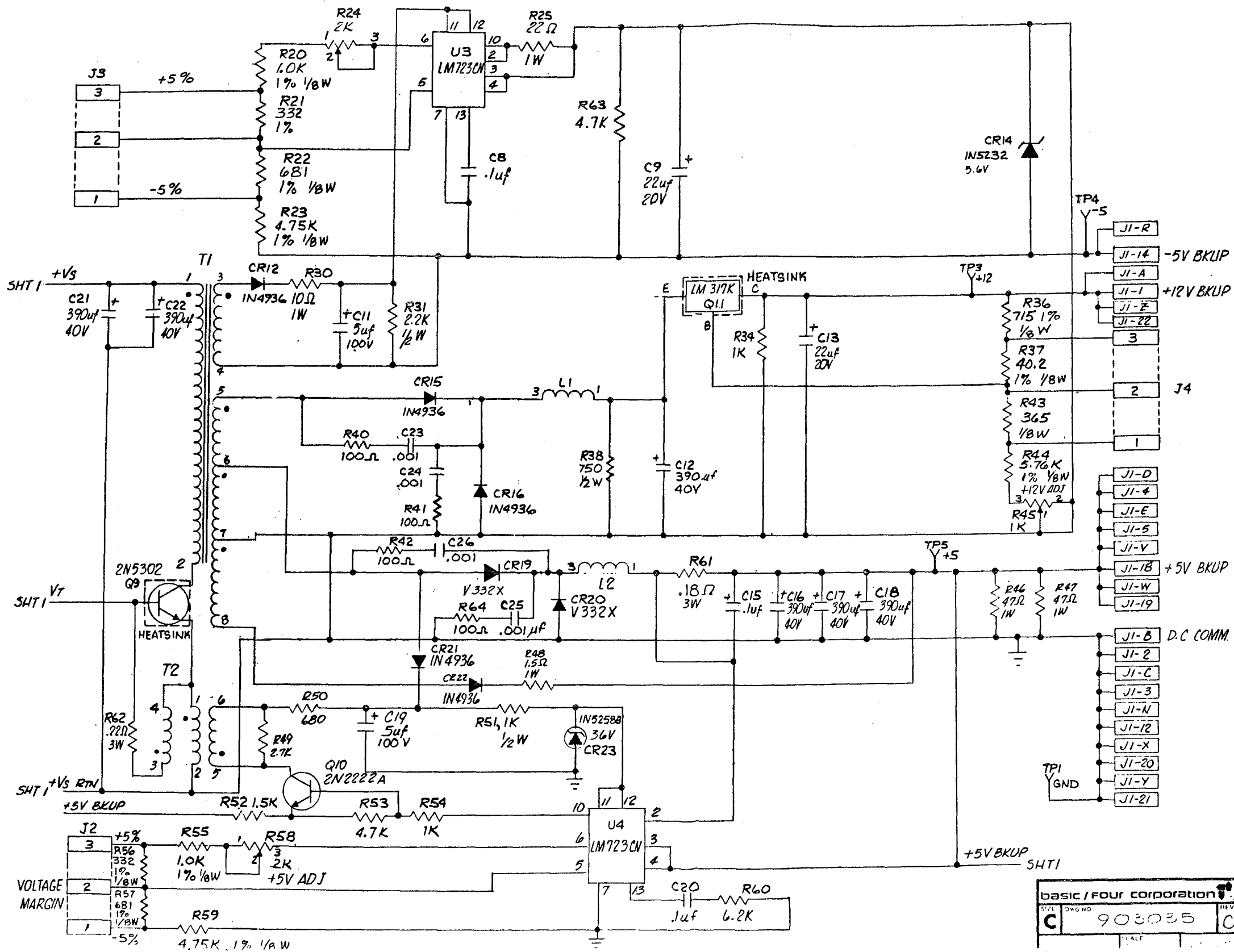
REVISION BLOCK				
REV	ER FCN	DESCRIPTION	INITIAL	DATE
AXI	1875	PRE PRODUCTION RELEASE		10-1-77
4-2	2172	SEE		11-11-77
A	2172	PRE PRODUCTION RELEASE		11-11-77
B	2172	REVISED VALUES OF R36 R37 R43 R49 PER ECN		11-23-77
C	2172	R61 WAS .22 Ω		12-11-77

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

OUTSTANDING  
NONE

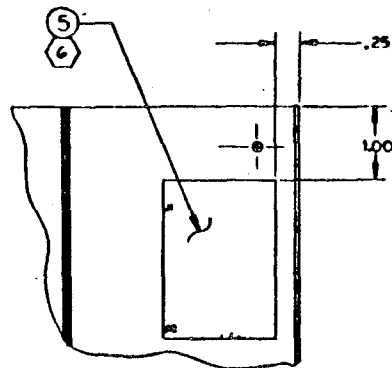
1. ALL RESISTOR VALUES ARE IN OHMS, ± 5% 1/4 W.  
NOTES: UNLESS OTHERWISE SPECIFIED

DIMENSIONS ARE IN INCHES		TOLERANCES UNLESS OTHERWISE SPECIFIED		<b>basic / four corporation</b> 1335 South Claudine Street Anaheim, California 92706	
X + 1 XX ± .03 XXX ± .010 ANGLES: 1.0°		DRAWN: [Signature] CHKD: [Signature] ENG: [Signature] MFG: [Signature] APP: [Signature]	TITLE: SCHEM MEMORY POWER SUPPLY	DWF: C DRG NO: 200025 REV: C	DATE: 11/11/77 SHEET: 1 OF 2
MACHINED SURFACES ✓		DO NOT SCALE DRAWING			

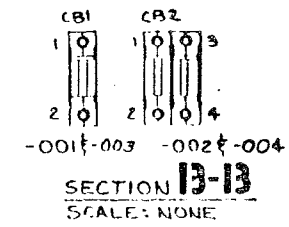
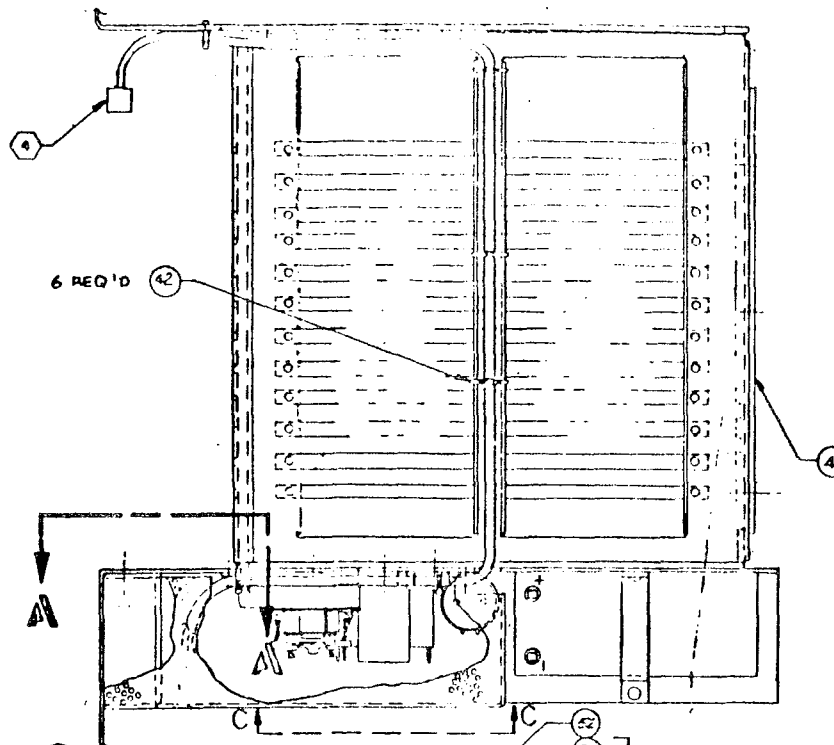


basic / four corporation

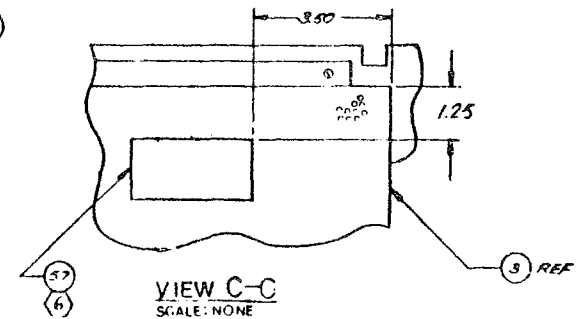
REV C 903035 C



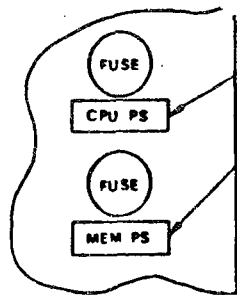
SECTION A-A  
SCALE: NONE



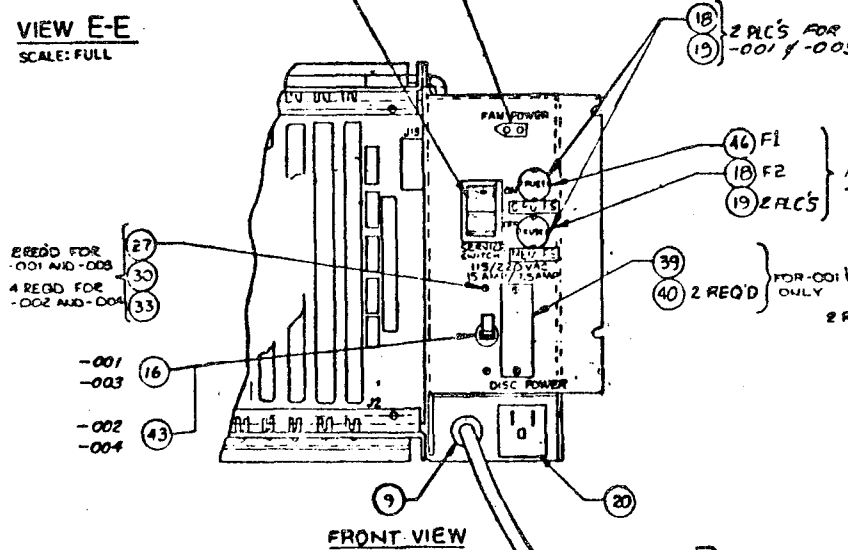
SECTION B-B  
SCALE: NONE



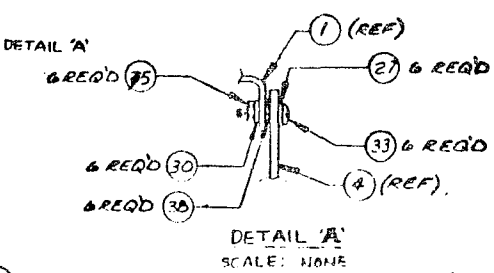
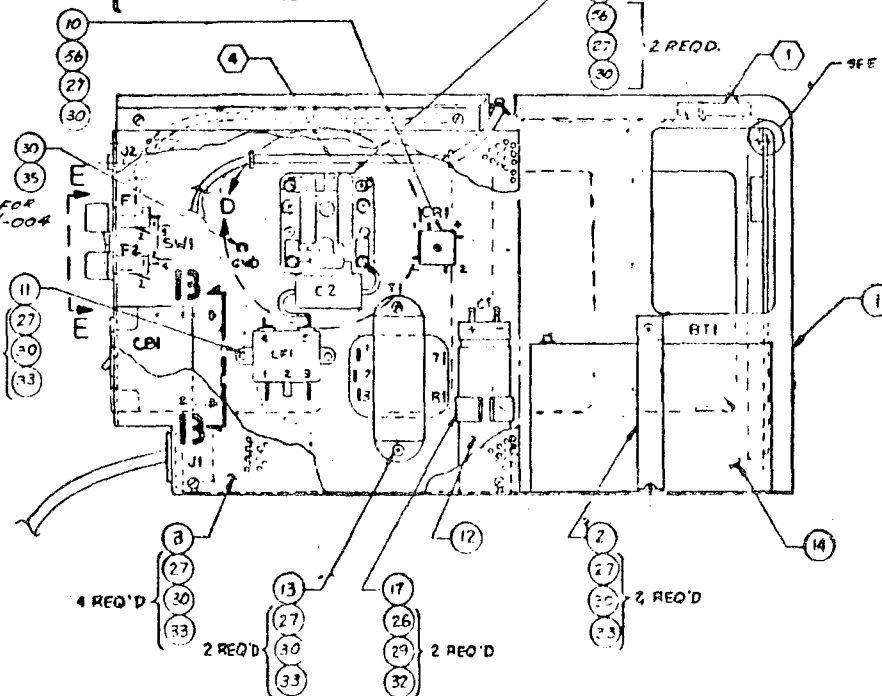
VIEW C-C  
SCALE: NONE



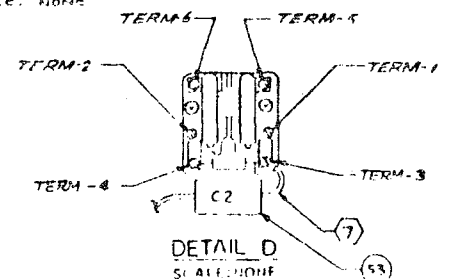
VIEW E-E  
SCALE: FULL



FRONT VIEW



DETAIL A  
SCALE: NONE



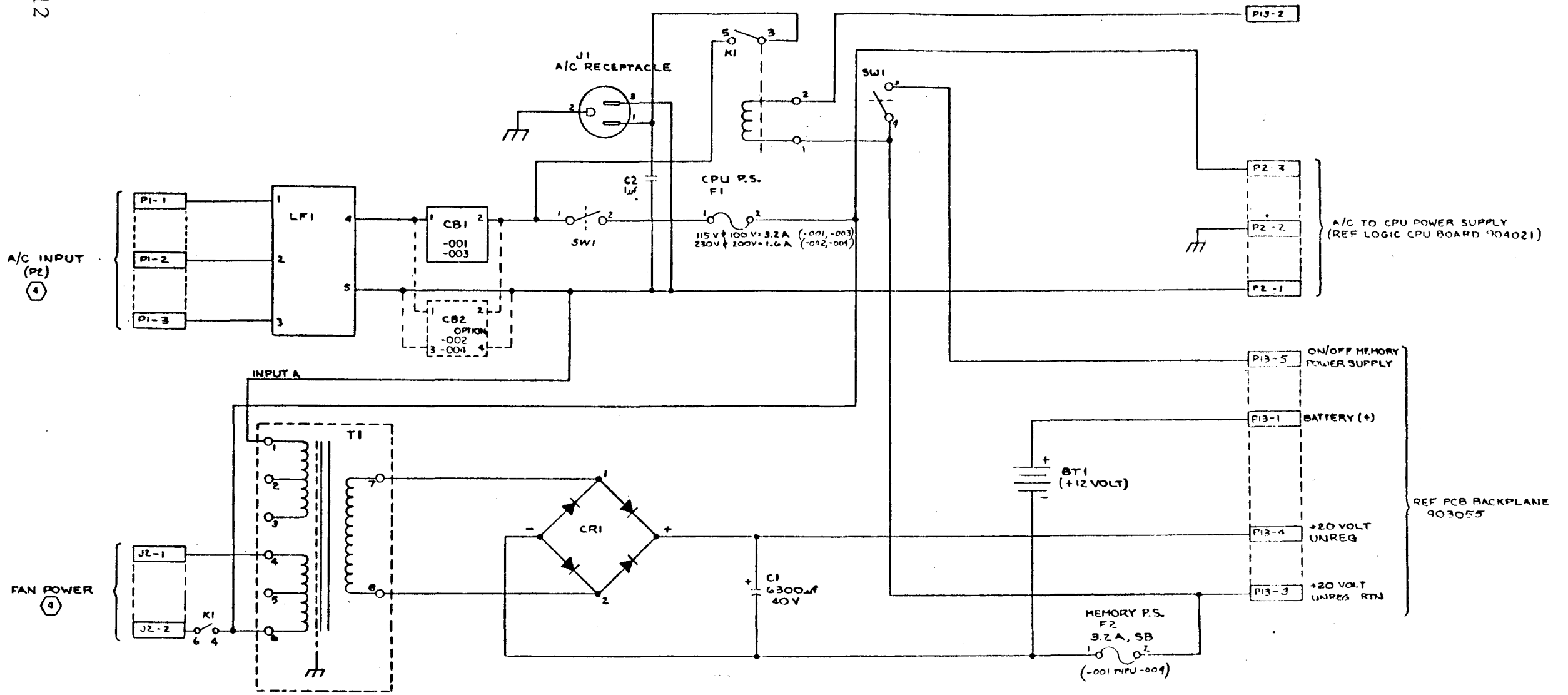
DETAIL D  
SCALE: NONE

PART NO.	MINIMUM ACCEPT REV LEVEL	DESCRIPTION
0001-004	A	100VAC (5)
0002-004	A	100VAC (5)
0003-004	A	250VAC (5)
0004-004	A	115VAC (5)

TABULAR LIST (PART)

- 7 MUST USE INSULATING SLEEVING.
  - 8 PLACE LABELS APPROXIMATELY WHERE INDICATED.
  - 5 REFER TO SHT 2 FOR VOLTAGE TAP CHART.
  - 4 THESE ITEMS ARE SHOWN PICTORIALLY ON THIS DRAWING AND ARE INSTALLED ON THE 90210 LEVEL.
  - 3 SEE APPLICABLE P/L E/F NO. 902670.
  - 2 FOR WIRE LIST SEE E/F PART NO. 902710.
  - 1 MAKE IDENTIFICATION PER SPECIFICATION 800000 WITH APPLICABLE PART NO. AND REV. LTR. APPROX. WHERE SHOWN.
- NOTES UNLESS OTHERWISE SPECIFIED

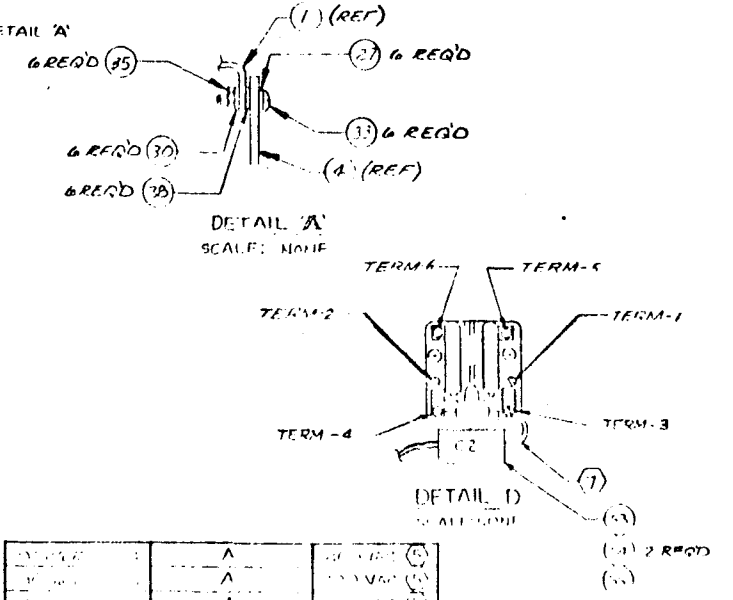
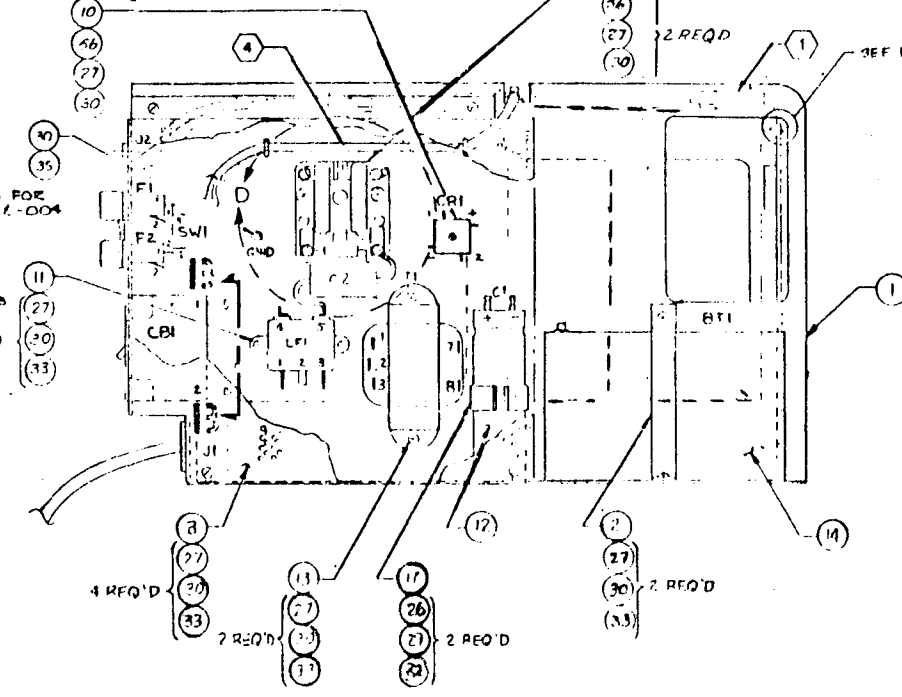
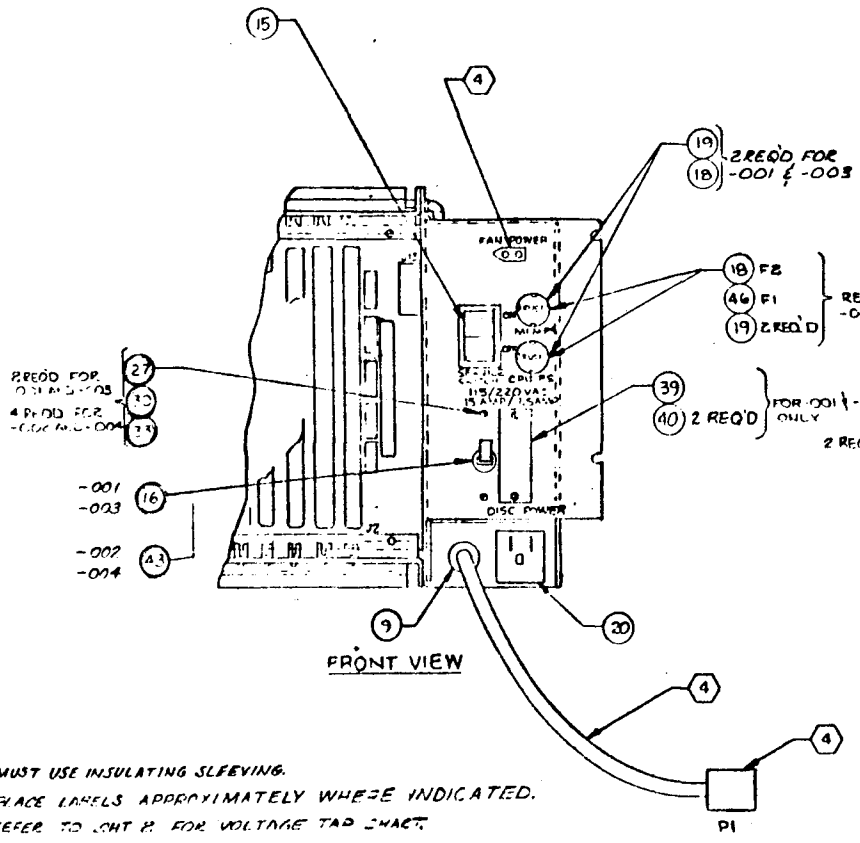
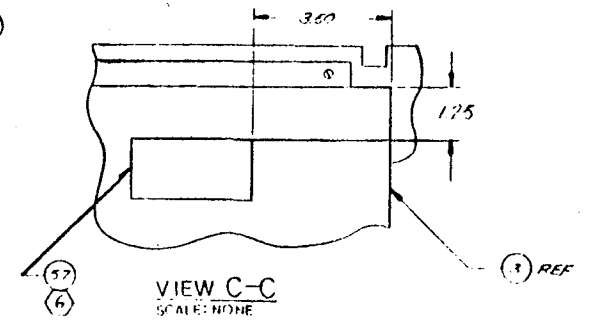
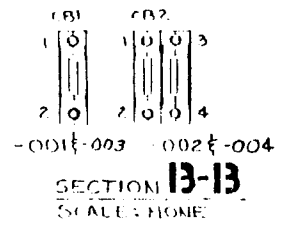
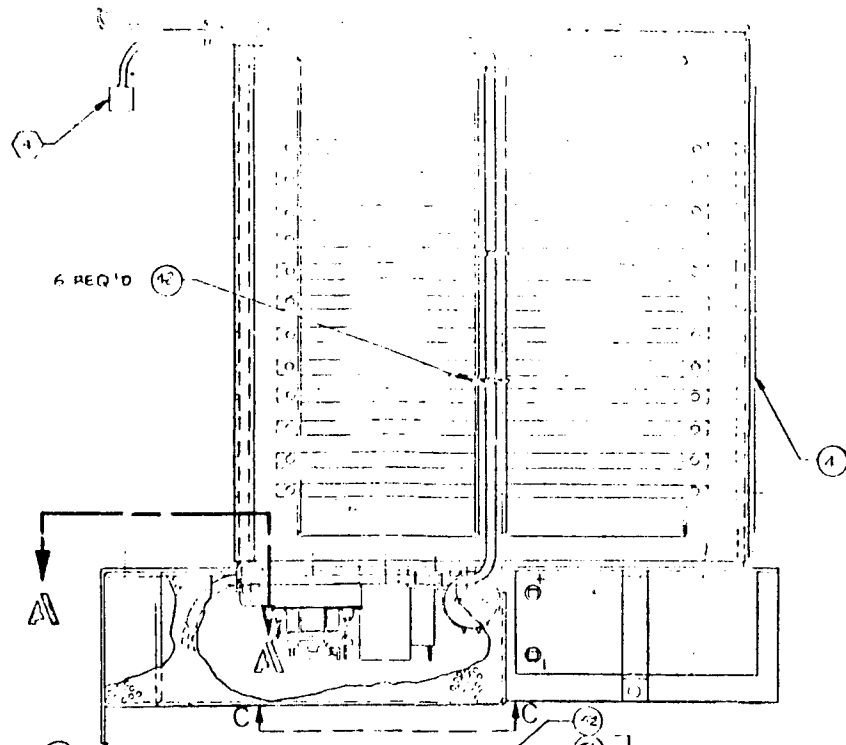
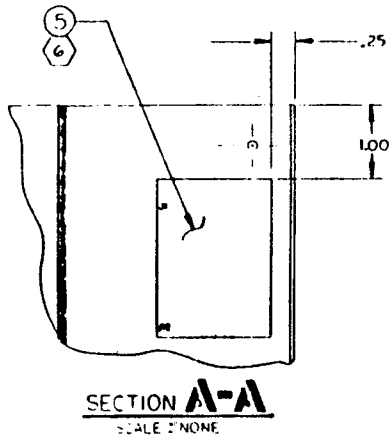
DESIGN AND DEVELOPMENT		BASIC FOUR CORPORATION	
DATE	REVISED	DRAWN	BY
APPROVED	DATE	CHKD	DATE
CHASSIS ASSY CPU		902670	
TOLERANCES UNLESS OTHERWISE SPECIFIED		SCALE	



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	



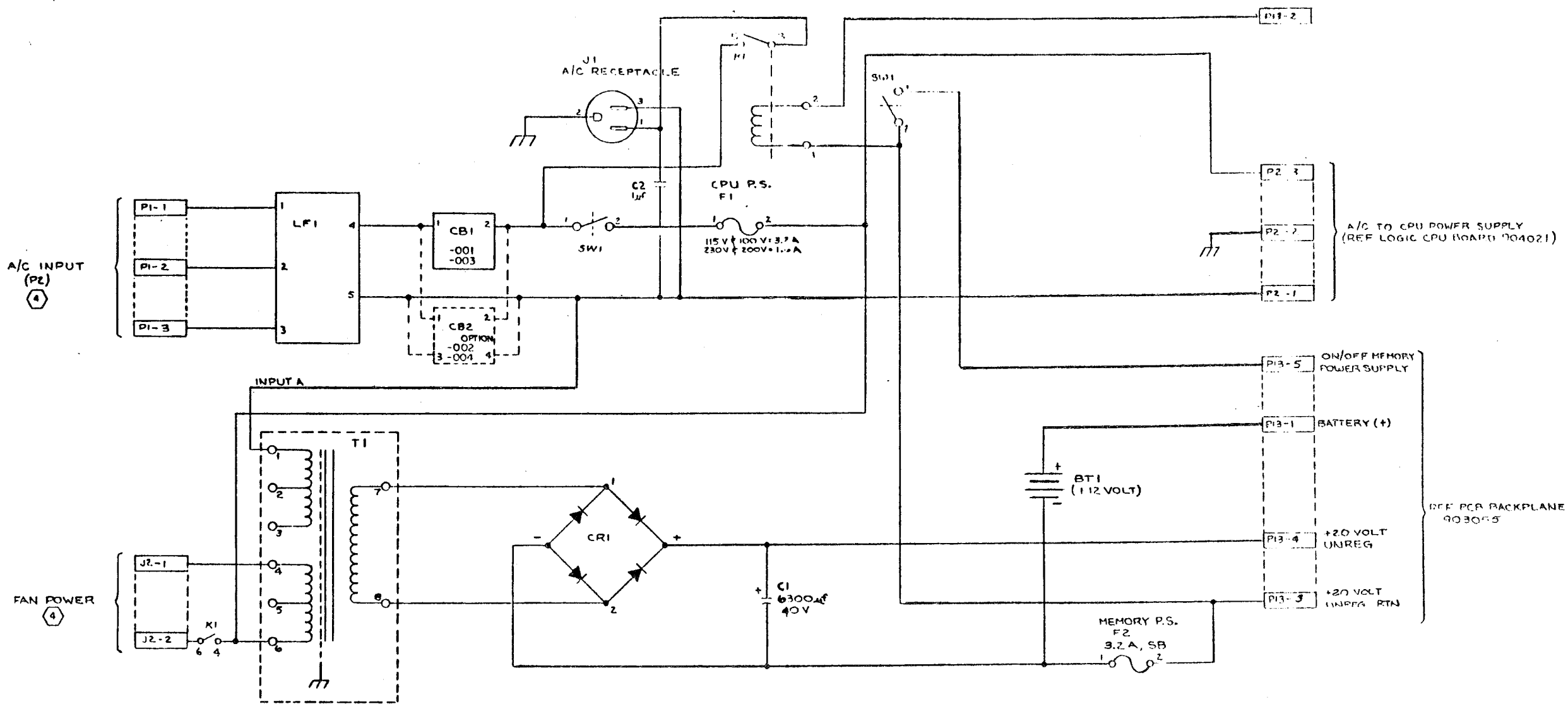


SYMBOL	DESCRIPTION	QUANTITY
1	...	...
2	...	...
3	...	...
4	...	...
5	...	...
6	...	...
7	...	...
8	...	...
9	...	...
10	...	...

NO.	DESCRIPTION	QTY.	REVISION
1	...	...	...
2	...	...	...
3	...	...	...
4	...	...	...
5	...	...	...
6	...	...	...
7	...	...	...
8	...	...	...
9	...	...	...
10	...	...	...

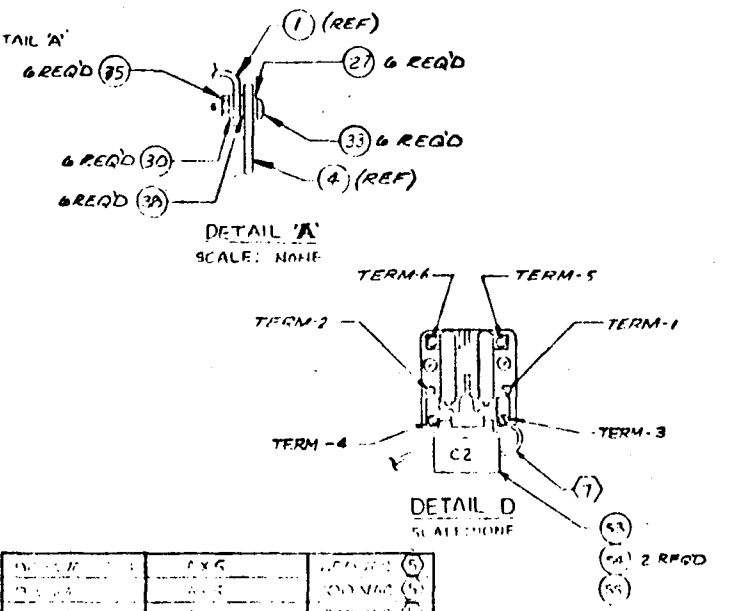
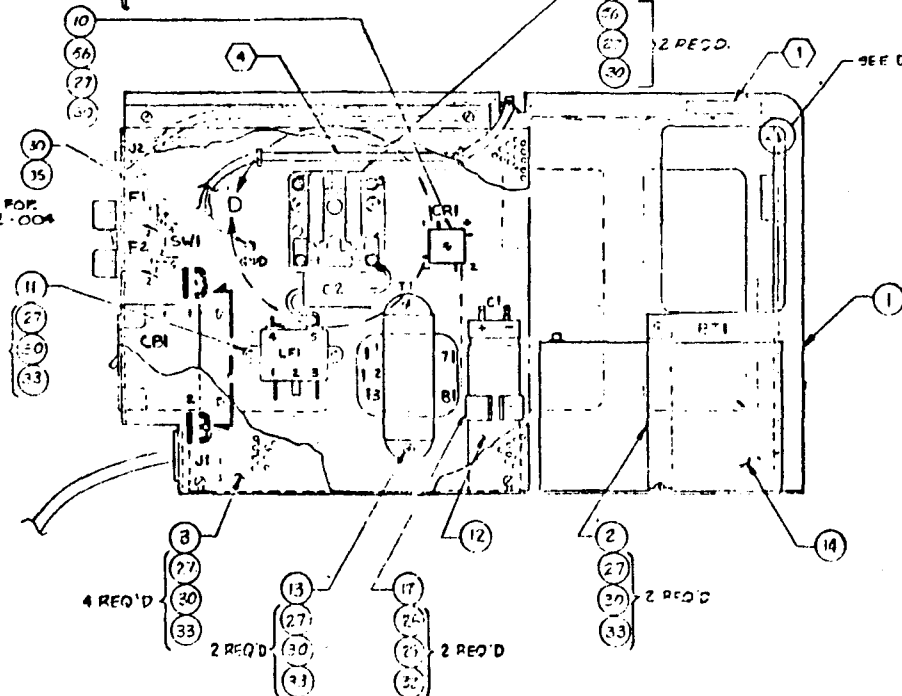
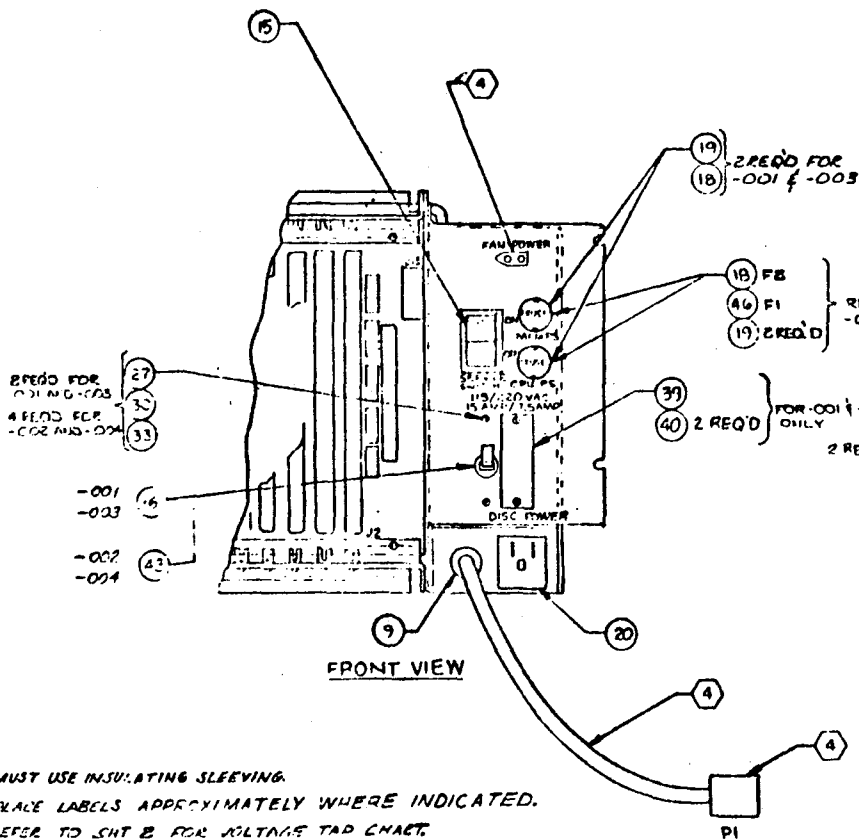
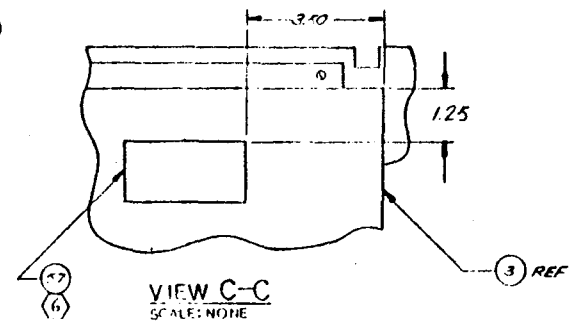
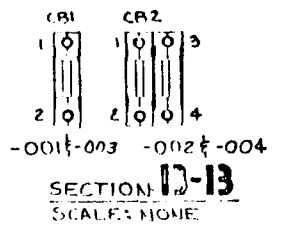
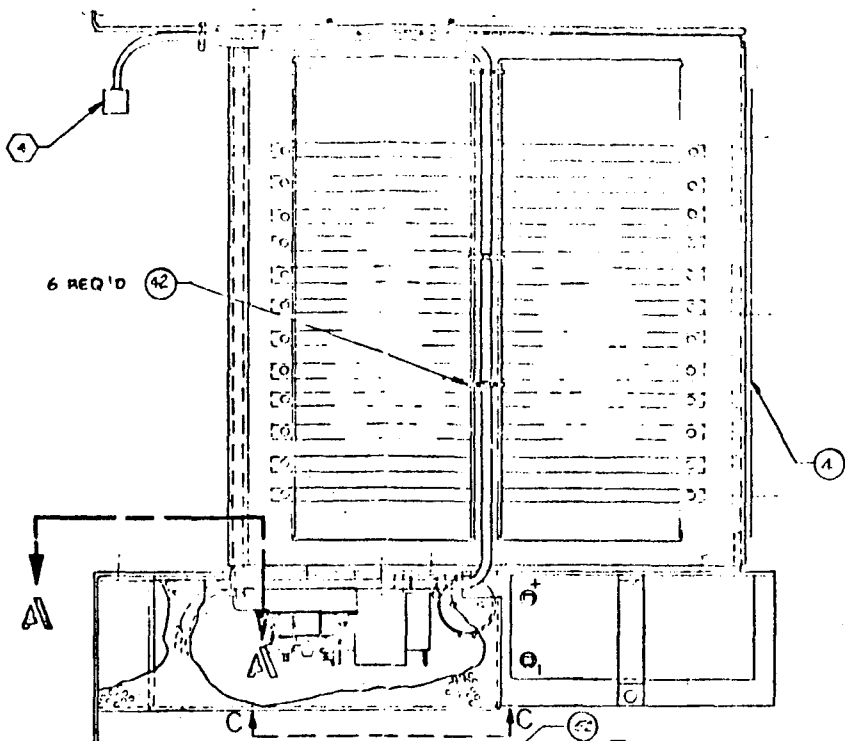
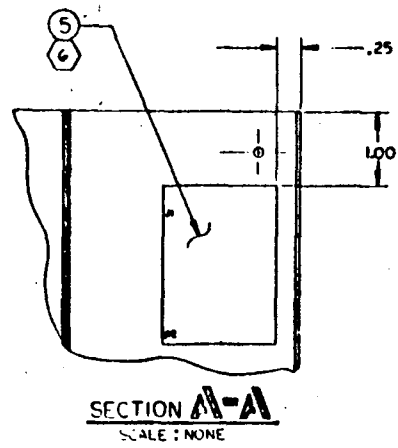
CHASSIS ASSY CPU

MUST USE INSULATING SLEEVING.  
 PLACE LABELS APPROXIMATELY WHERE INDICATED.  
 REFER TO CHART R FOR VOLTAGE TAP CHART.  
 THESE ITEMS ARE SHOWN PICTORALLY ON THIS DRAWING AND ARE INSTALLED ON THE 902710 LEVEL.  
 SEE APPLICABLE P/L & F.M. FOR REQ'D.  
 THE WIRE LIST USE B.F. PART NO. 902710.  
 WIRE IDENTIFICATION (I.P. REGULATION) 902710 WITH APPLICABLE PART NO. AND REV. LTL. (IF OK, WHERE SHOWN).  
 UNLESS OTHERWISE SPECIFIED.



VOLTAGE TAP CHART (T1)

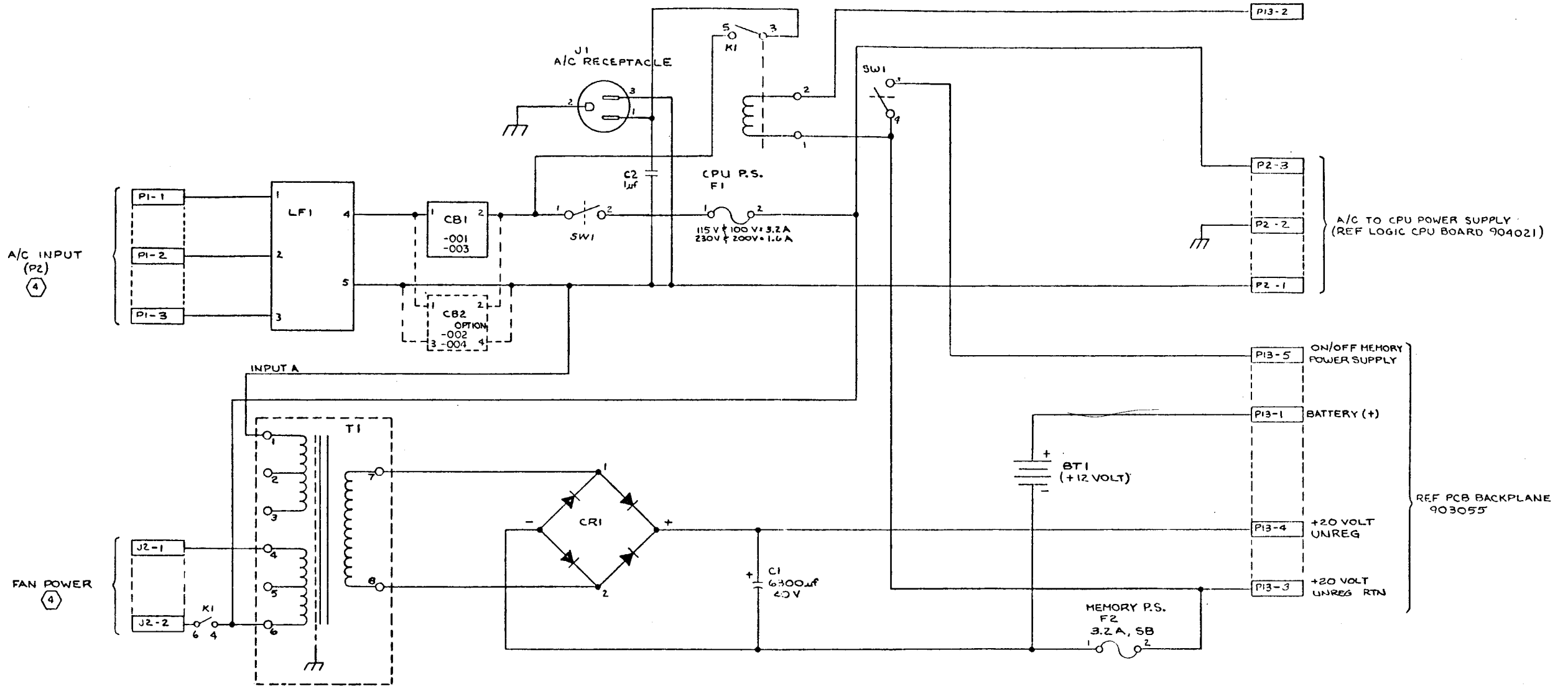
	-001 (115 VAC)	-002 (230 VAC)	-003 (100 VAC)	-004 (200 VAC)
INPUT	A TO T1-1	A TO T1-1	A TO T1-2	A TO T1-2
JUMPER	T1-1 TO T1-4	T1-3 TO T1-4	T1-2 TO T1-5	T1-3 TO T1-5
JUMPER	T1-3 TO T1-6		T1-3 TO T1-6	



NO.	QTY	DESCRIPTION
1	1	...
2	2	...
3	3	...
4	4	...
5	5	...
6	6	...
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97	97	...
98	98	...
99	99	...
100	100	...

PART NO.		DESCRIPTION		QUANTITY	
902670	AX5	CHASSIS ASSY CPU	1		

MUST USE INSULATING SLEEVING.  
PLACE LABELS APPROXIMATELY WHERE INDICATED.  
REFER TO SHIT B FOR VOLTAGE TAP CHART.  
THESE ITEMS ARE SHOWN POSITIONALLY ON THIS DRAWING.  
THEY ARE INSULATED ON THE 70210 LEVEL.  
SEE APPLICABLE P/L S/F NO. 902670.  
FOR WIRE LIST SEE S/F PART NO. 902110.  
WIRE IS INSULATED WITH P. SPECIFICATION 904000 WITH  
APPLICABLE PART NO. 724 REV. 11A, 11B, 11C, 11D, 11E, 11F, 11G, 11H, 11I, 11J, 11K, 11L, 11M, 11N, 11O, 11P, 11Q, 11R, 11S, 11T, 11U, 11V, 11W, 11X, 11Y, 11Z.  
SEE UNLESS OTHERWISE SPECIFIED



VOLTAGE TAP CHART (T1)

	-001 (115 VAC)	-002 (220 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	