

Disassembly/Assembly

OVERVIEW

This chapter describes how to remove and replace the major assemblies of the NCR Personal Computer.

WARNING

Disconnect the power supply cord before removing the cabinet. Dangerous voltages are present when working on the computer with the cover removed.

ONLY TRAINED ENGINEERS AND NCR TRAINED SERVICE PERSONNEL SHOULD ATTEMPT TO WORK ON THE COMPUTER WITH THE COVER REMOVED AND THE POWER ON.

It is recommended that the first operation after removing the cover should be to discharge the CRT anode voltage.

CAUTION

Electrostatic discharge can cause damage to some solid-state components used in the computer. Use special wrist-ground straps and integrated circuit handling procedures. Avoid touching the components or the circuit paths; handle printed circuit boards by their edges.

REMOVE ADAPTER CARDS

ACCESS DOOR REMOVAL

To gain access to adapter cards installed in the computer, first remove the access door which covers most of the bottom half of the back of the computer. Proceed as follows:

1. Make certain the power switches for any external devices (printer, etc.) are turned OFF.

2. Make certain the processing unit power switch is turned OFF.
3. Unplug the power cord from the wall outlet. If any external devices have separate power cords, unplug them too.
4. Unplug the power cord from the back of the processing unit.
5. Remove the access door screw shown in Figure 7-1.

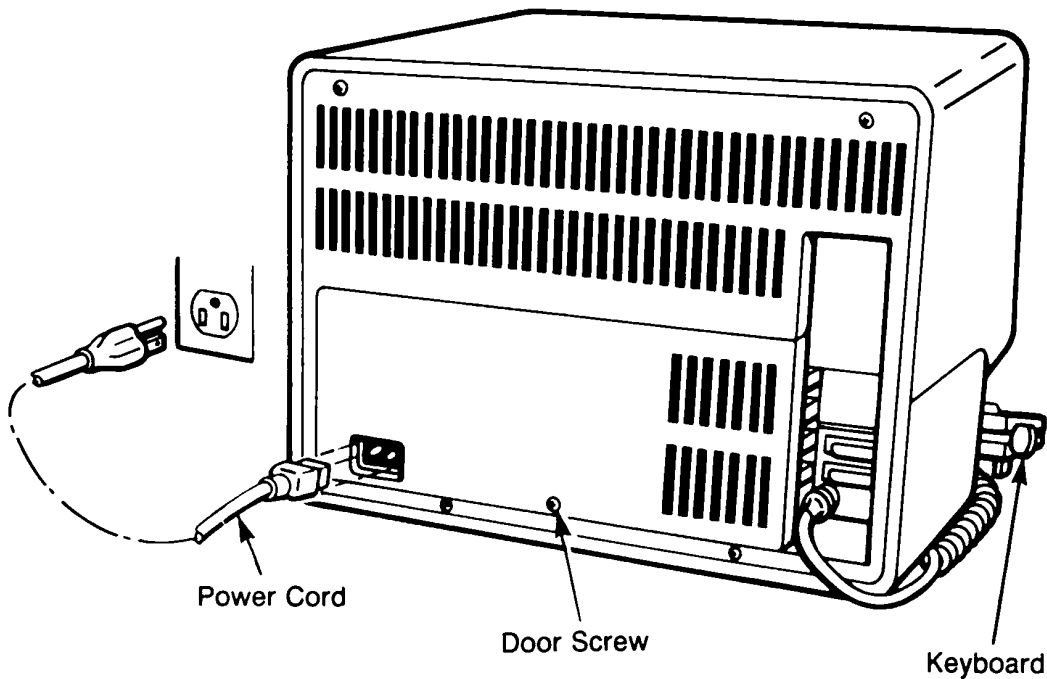


Figure 7-1 Access Door Removal

6. Grasp the right side of the access door and pull out at the bottom, then grasp the bottom corners and pull down gently. The top edge will come free as two formed-in lugs slide out of their matching slots in the back panel.

REMOVAL OF ADAPTER CARDS

With the access door removed, the Main Processor Board (MPB) is now visible. The MPB is installed in a vertical position inside the cabinet of the NCR Personal Computer. Figure 7-2 shows a picture of the adapter card board slots with the access door removed.

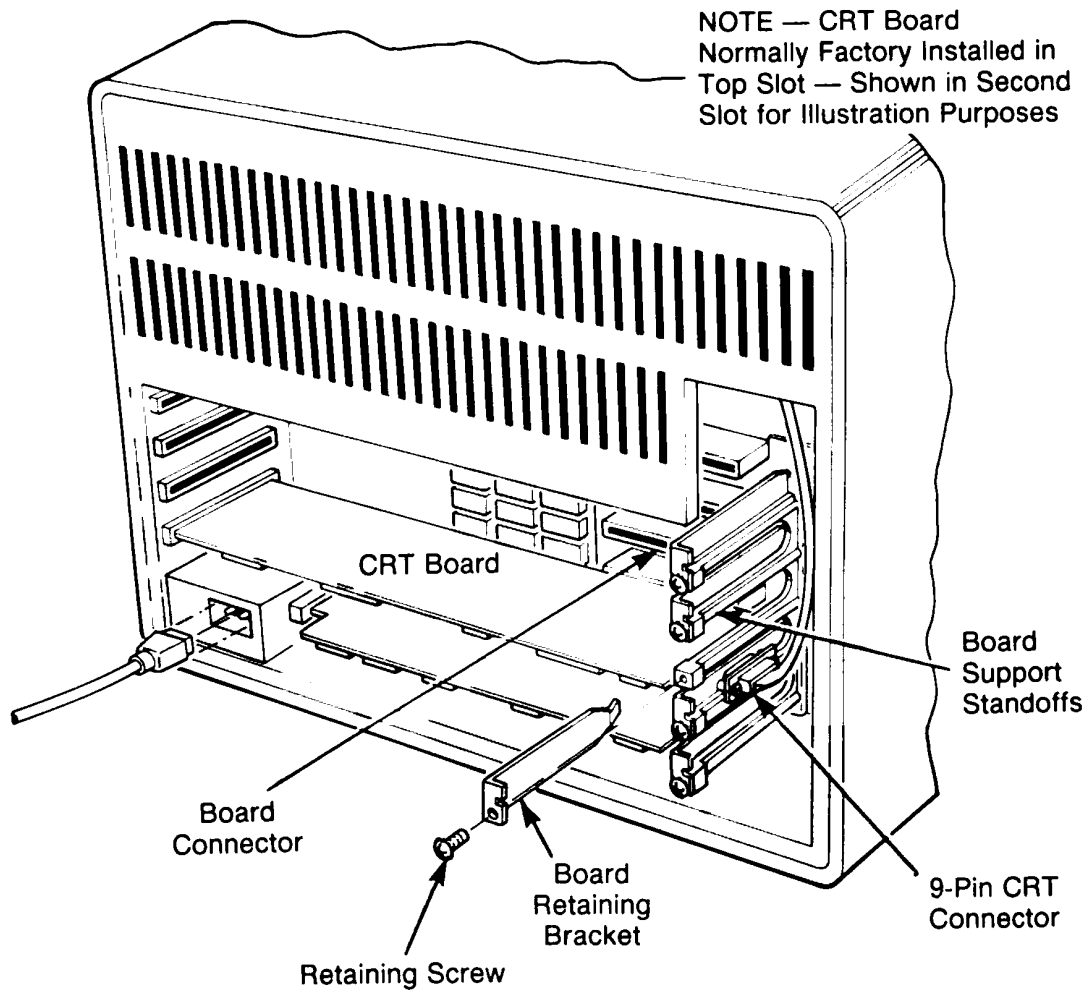


Figure 7-2 Adapter Card Slots

A unit with one or two flexible disk drives has a minimum of two adapter cards originally installed. The shorter bottom card with the flat ribbon cable attached to the left end is the flexible disk drive controller card; the longer card with the nine-pin connector on the right end is the monochrome or color/graphics CRT controller card.

A unit with a single flexible disk drive and a fixed disk drive has another longer card which is the fixed disk drive controller. This card has two flat ribbon cables attached.

Figure 7-3 shows a diagram of the portion of the MPB which is visible with the access door removed. The original memory chips, the expansion area which contains two sets of expansion memory sockets, and the five board connectors are indicated.

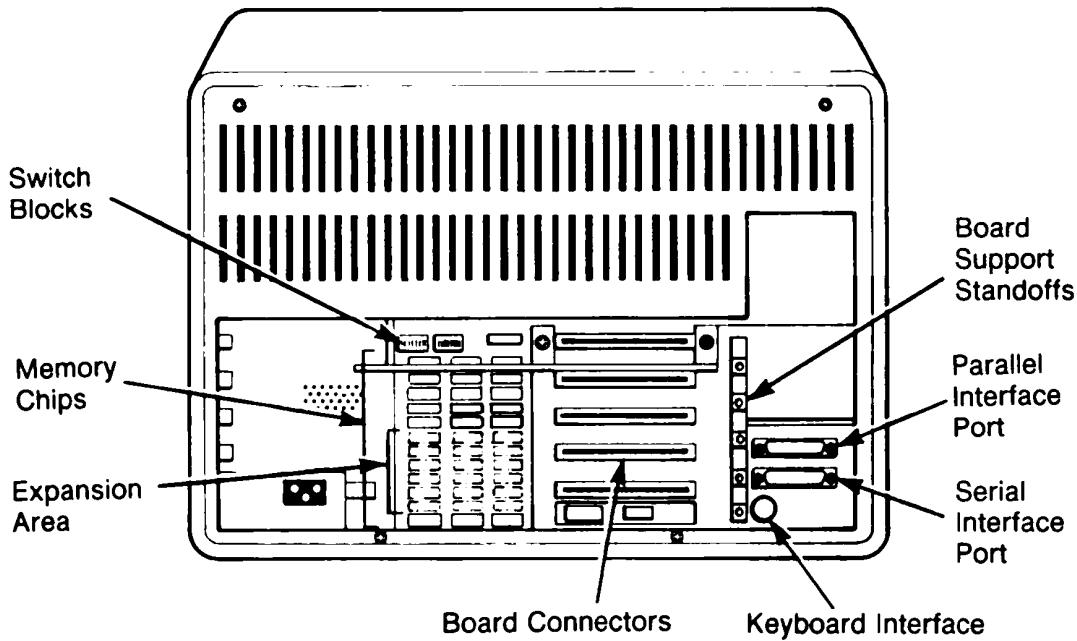


Figure 7-3 Main Processor Board

You need to remove all adapter cards installed in the computer if you are going to remove the cabinet. You may need to remove only the board, if any, in the top slot in order to reach the switches in switch block 1 or 2 (SW1 or SW2).

Remove each board gently but firmly after removing the retaining screw. If a cable is attached to a connector on the end of the board, unscrew the connector and unplug the cable.

To keep the retaining screw from getting lost, screw it loosely by hand back into the board support standoff.

CABINET

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Remove Adapter Cards

PROCEDURE

NOTE: Systems having a Winchester disk drive and a flexible disk drive will have separate ribbon cables for each. When removing the ribbon cables from their respective controller cards, mark the cables to ensure proper reassembly (Winchester drive to Winchester card and flexible disk drive to flexible card). When returning an adapter card to the top bus expansion slot of the main processor board, it is easy to accidentally change the system

configuration switch setting of SW1 or SW2. Always verify these switch settings after installing a card in the top expansion slot.

1. Remove the two (2) cabinet-back screws at the top of the cabinet back.
2. Slowly pull the cabinet back towards you, away from the unit; guide the adapter card cables through the card cage area to prevent damage.
3. Remove the cabinet top by gently but firmly lifting the back edge of the cabinet top. The joint between the cabinet top and bottom should be opened approximately 1/2 inch to allow the cabinet alignment lugs to disengage.
4. Carefully slide the cabinet top forward, lifting, as required, to clear the components.

KEYBOARD

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- None

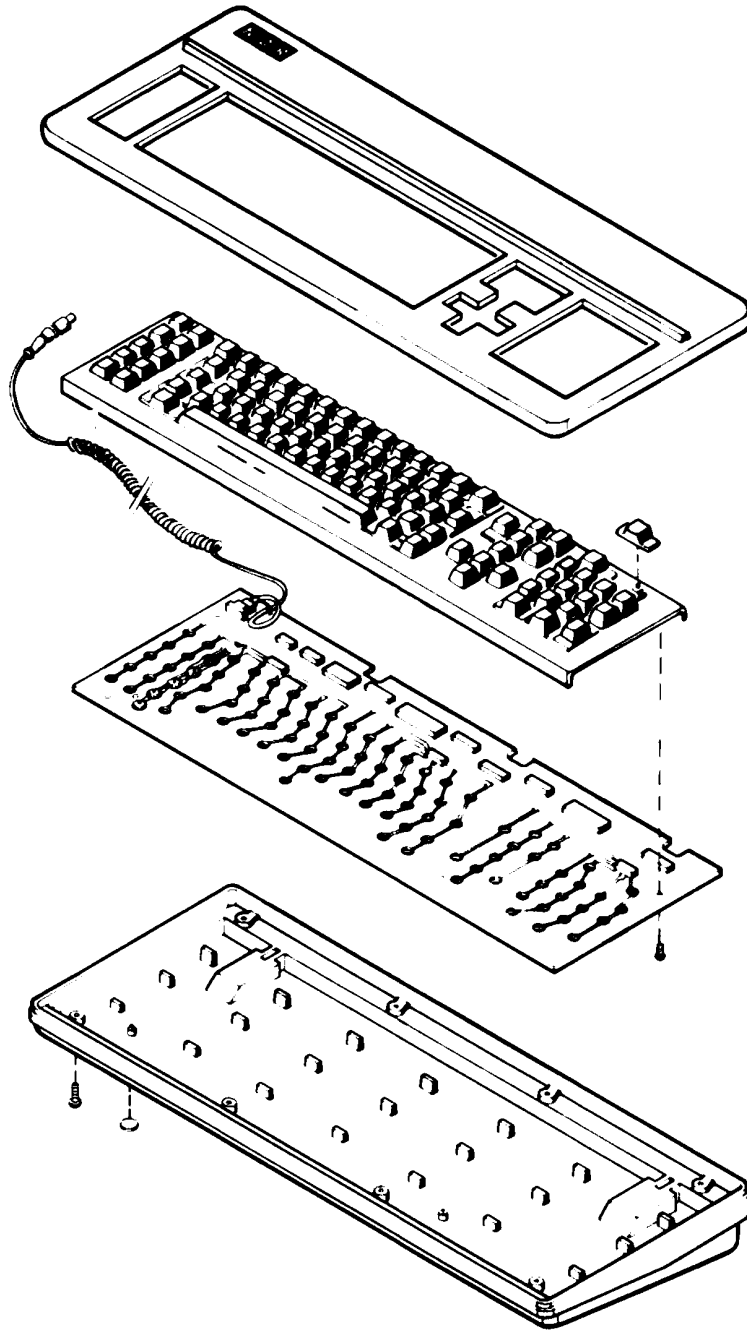


Figure 7-4 Keyboard Disassembly

KEYCAP REPLACEMENT PROCEDURE

1. Disconnect Keyboard cord from the back of the unit.
2. Using a flat-bladed tool, gently pry the keycap up off the key stem.
3. To replace keycap, center the keycap on the key stem and press down until the keycap snaps in place.

KEYBOARD DISASSEMBLY PROCEDURE

1. Disconnect keyboard cord from the back of the unit.
2. Turn keyboard over and remove the seven (7) screws on the back.
3. Holding the halves together, turn the keyboard key side up and lift off top cover.
4. Remove the four (4) screws holding the circuit assembly to the keyboard bottom.
5. Remove the key pad from the circuit board by removing the eight (8) screws located on the bottom (board side) of the assembly.

WINCHESTER DISK DRIVE

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

PROCEDURE

1. Disconnect the ribbon cables attached at the back of the Winchester disk drive.

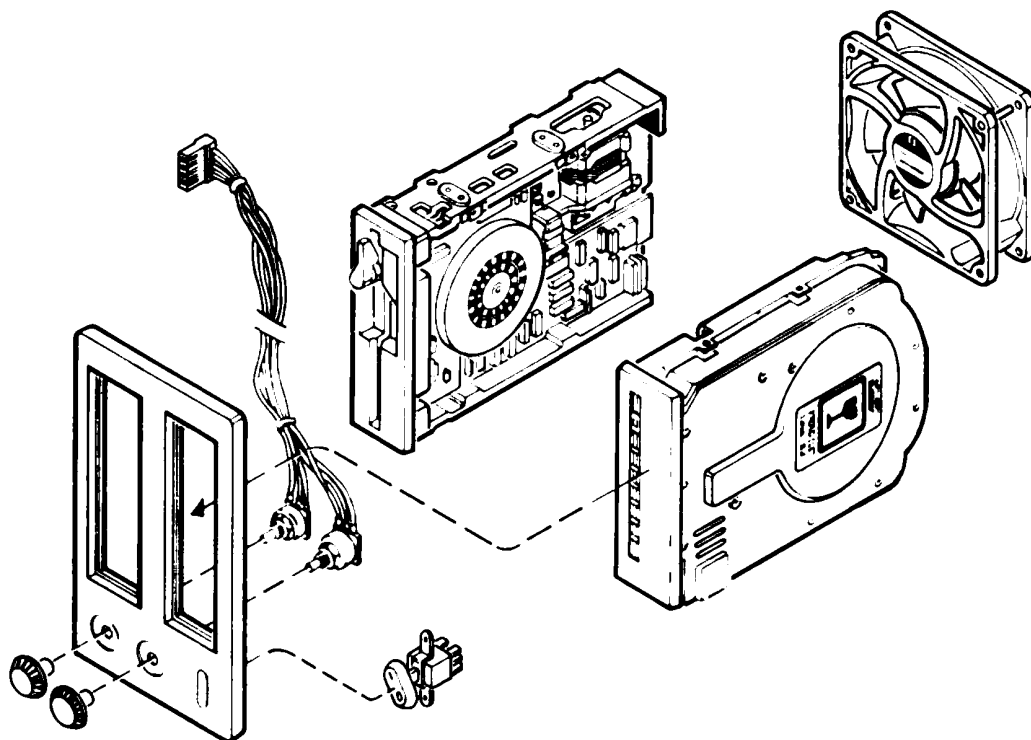


Figure 7-5 Disk Drive Removal

2. Disconnect the DC power plug from the Winchester disk drive.
3. Remove the three (3) drive retaining screws. Two screws are located on the top drive mounting bracket and the third screw is located on the underside of the bottom drive bracket near the control panel.

NOTE: The three (3) retaining screws for the Winchester disk are metric and the three (3) screws used to retain the flexible disk are SAE. Do not exchange these screws from one drive to another of a different type.

4. Carefully guide the drive out the front of the disk control panel bezel.

FLEXIBLE DISK DRIVE

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

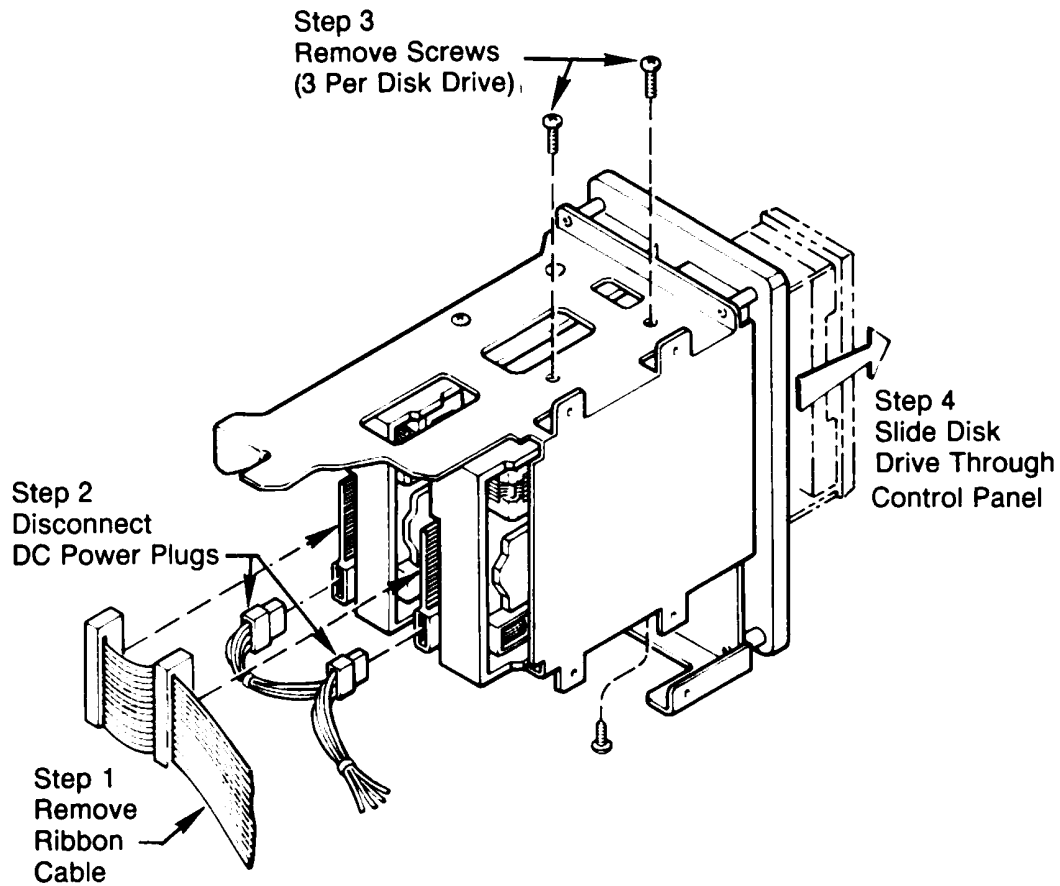


Figure 7-6 Flexible Disk Drive Removal

PROCEDURE

1. Disconnect the ribbon cable attached at the back of the flexible drive(s).
2. Disconnect the DC power plug from the flexible disk unit(s).
3. Remove the three (3) drive retaining screws for the disk drive unit being serviced. Two screws are located on the top drive bracket and the third screw is on the underside of the bottom drive bracket near the control panel.
4. Slide the disk drive forward through the control panel.

POWER SWITCH

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

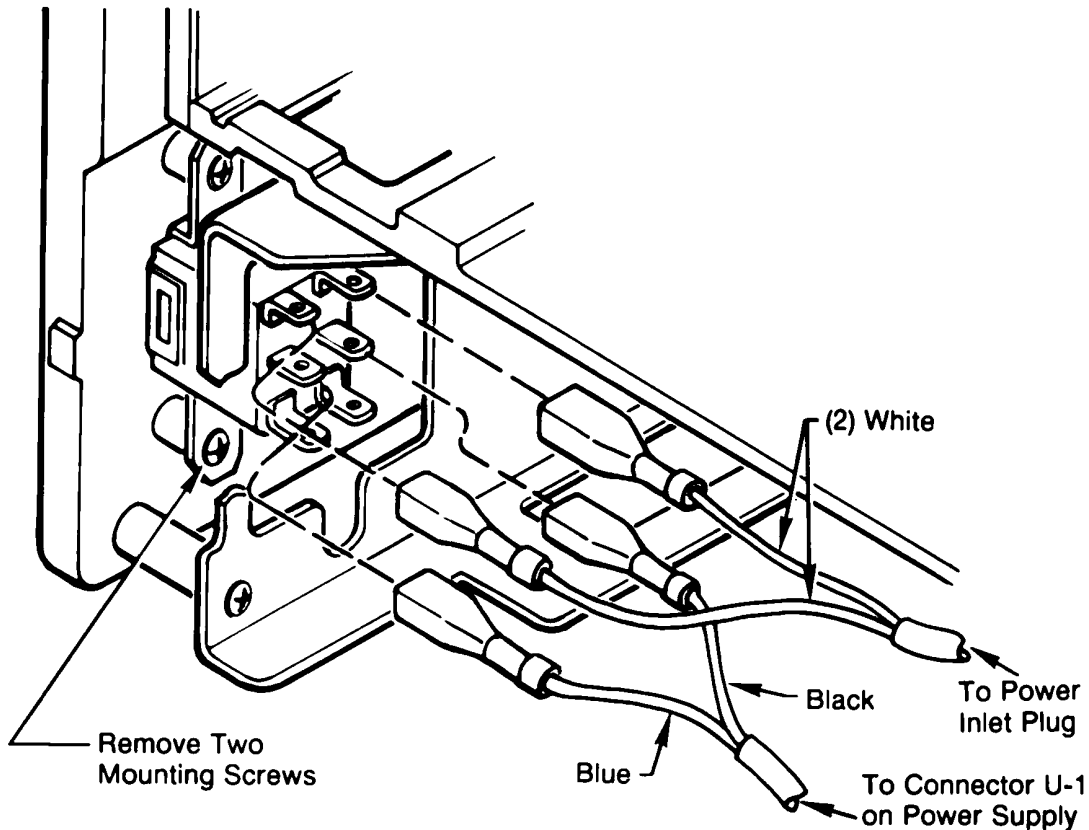


Figure 7-7 Power Switch Disassembly

PROCEDURE

1. Verify that the power cord is disconnected from the back of the unit.
2. Remove the four (4) wire connectors from the back of the switch.
3. Remove the two (2) switch mounting screws located above and below the switch.
4. Push the switch back into the cabinet; it will clear the lowest bracket.

BRIGHTNESS AND VOLUME CONTROLS

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

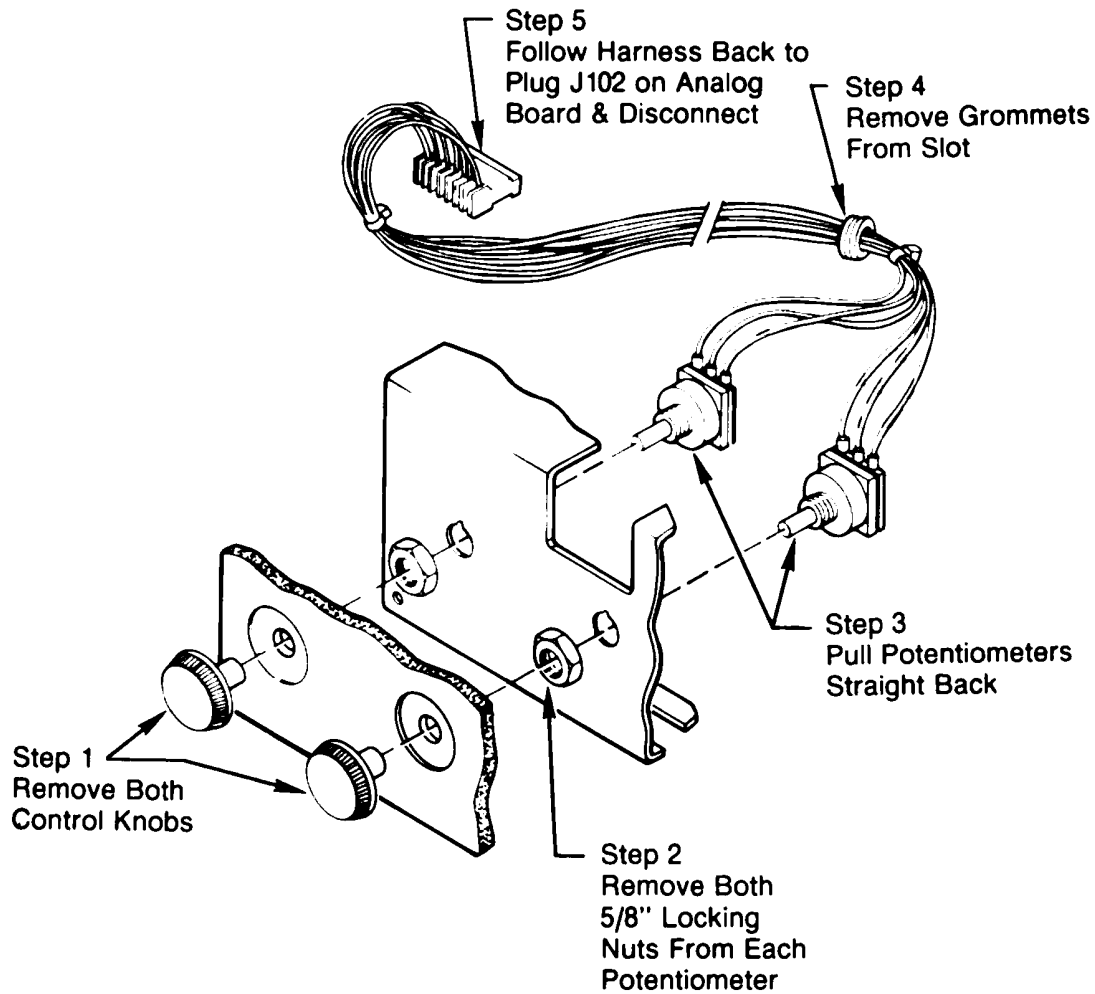


Figure 7-8 Brightness and Volume Controls Disassembly

PROCEDURE

1. Remove the two (2) control knobs by pulling each away from the control panel.
2. Using a 5/8" open-ended wrench, back off the potentiometer locking nuts (located on the threaded shafts of each potentiometer).
3. Pull the potentiometers back, freeing them from the cover panel.
4. Remove the cable strain relief grommet by carefully pulling it down out of its slot.
5. Follow the wire harness back to the connector plug J102 on the CRT analog board; disconnect.

FAN

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

PROCEDURE

1. Remove the two (2) wire connectors from the bottom of the fan.
Note that the blue wire connects to the positive (+) terminal.
2. Remove the two (2) fan mounting bolts.

MONOCHROME CRT AND ANALOG BOARD

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURES:

- Cabinet
- Main Processor Board

WARNING — HIGH VOLTAGES

High voltages may be present on the CRT anode even when the display is not operating. *Always* discharge the CRT high voltage anode before servicing any part of the CRT assembly. Refer to “CRT Discharge Procedure” in this disassembly section. Always assume that a CRT is charged until *you* discharge it. Any conductive material (i.e. tools, service personnel, etc.) placed near the flyback transformer can cause an arc to jump the gap between the transformer and the conductive material.

WARNING — HIGH VACUUM

Cathode Ray Tube (CRT) “contains” a high vacuum. Minor damage from scratches or hits can result in CRT implosion and injuries can occur from flying glass. Observe the following safety procedures:

1. Wear safety glasses when installing or removing CRT's.
2. Do not carry CRT's by the neck — always carry CRT's by holding near the mounting support band.
3. Temporary storage of a CRT on the service bench should be accomplished by placing it screen-side down on a clean, thick pad or towel.

MONOCHROME CRT DISCHARGE PROCEDURE

You will need a 12-18 inch insulated wire jumper with alligator clips on both ends; a flat-blade screwdriver with a long, thin shaft and a clean, insulated handle.

1. Disconnect power supply and adapter card plugs to the analog board.
2. Attach one end of the wire jumper to the aquadag spring (located on the tapered back of the Cathode Ray Tube).

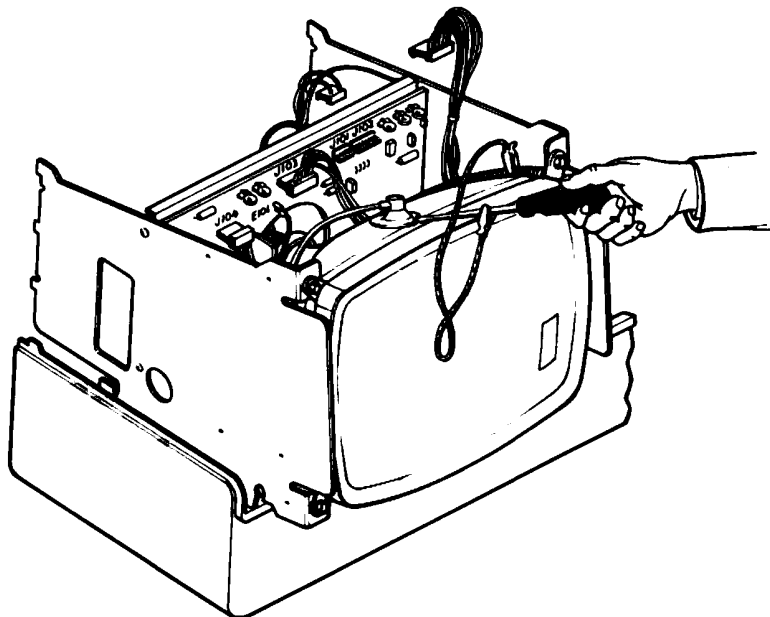


Figure 7-9 CRT Discharge Procedure

3. Attach the other end of the wire jumper to the center of the screwdriver shaft.
4. Grasp insulated handle well away from the screwdriver shaft.
5. Guard against electric shock. (See Warning)

WARNING

There is a natural tendency to use *both* hands while performing the discharge procedure. However the possibility of electric shock increases greatly when using both hands. Therefore, keep your free hand in your pocket until the discharge procedure is completed.

6. Slip the screwdriver blade between the anode cap and the CRT. The anode cap may stick requiring you to twist the blade of the

screwdriver back and forth to “walk” it under the anode cap. Remember to keep your hand in your pocket.

7. Carefully push the blade of the screwdriver to the center of the anode lead under the anode cap; usually, a noticeable spark (3/8” to 1/2”) will result.
8. Maintain this screwdriver-to-anode contact for a minimum of 5 seconds.
9. Remove the anode cap.

MONOCHROME CRT REMOVAL

1. Disconnect the green ground wire (attached to the aquadag spring) from the pin on the analog board.
2. Disconnect analog board plugs J104 and the plug on the neck of the CRT.
3. Remove the four (4) hex-head machine screws located at the “corners” of the screen mounting ring. Remember to support the CRT to prevent damage.
4. Move the CRT forward until the neck clears the analog board. Lift CRT clear and place screen side down on a clean, thick pad.

MONOCHROME ANALOG BOARD REMOVAL

1. Disconnect the green ground wire (Pin E101) from the analog board. Disconnect analog board plugs J101, J102, J103, and J104.
2. Disconnect the plug on the neck of the CRT: guide the connector back through the analog board opening.
3. Remove the two (2) top analog bracket screws (located top right and top left). Locate the three (3) gray board clips holding the analog board to the top of the analog board bracket.
4. Carefully squeeze the two locking tabs on each clip and push them through the bracket.
5. Tilt the analog board and its bracket back until the analog board can clear the neck of the CRT. Remove the analog board.

COLOR CRT AND ANALOG BOARD

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURES:

- Cabinet
- Main Processor Board

WARNING — HIGH VOLTAGES

High voltages may be present on the CRT anode even when the display is not operating. *Always* discharge the CRT high voltage anode before servicing any part of the CRT assembly. Refer to “CRT Discharge Procedure” in this disassembly section. Always assume that a CRT is charged until *you* discharge it. Any conductive material (i.e. tools, service personnel, etc.) placed near the flyback transformer can cause an arc to jump the gap between the transformer and the conductive material.

WARNING — HIGH VACUUM

The Cathode Ray Tube (CRT) “contains” a high vacuum. Seemingly minor damage from scratches or accidental bumps can result in CRT implosion and injuries can occur from flying glass. Observe the following safety procedures:

1. Wear safety glasses when installing or removing CRT's.
2. Do not carry CRT's by the neck — always carry CRT's by the mounting support band.
3. Temporary storage of CRT's on the service bench should be to place the screen side down on a clean, thick pad or towel.

COLOR CRT DISCHARGE PROCEDURE

You will need a 12-18 inch insulated wire jumper with alligator clips on both ends; a flat-blade screwdriver with a long thin shaft and having a clean insulated handle.

1. Disconnect power supply and adapter card plugs to the analog board.
2. Attach one end of the wire jumper to the aquadag spring (located on the tapered back of the Cathode Ray Tube). Refer to Figure 7-9 in the “Monochrome CRT Discharge Procedure” section of this chapter for an illustration of this attachment.

3. Attach the other end of the wire jumper to the center of the screwdriver shaft.
4. Grasp insulated handle well away from the screwdriver shaft.
5. Guard against electric shock. (See Warning)

WARNING

There is a natural tendency to use *both* hands while performing the discharge procedure. However, the possibility of electric shock increases greatly when using both hands. Therefore keep your free hand in your pocket until the discharge procedure is completed.

6. Slip the screwdriver blade between the anode cap and the CRT. The anode cap may stick requiring you to twist the blade of the screwdriver back and forth to "walk" it under the anode cap. Remember to keep your hand in your pocket.
7. Carefully push the blade of the screwdriver to the center of the anode lead under the anode cap; usually, a noticeable spark (3/8" to 1/2") will result.
8. Maintain this screwdriver-to-anode contact for a minimum of 5 seconds.
9. Remove the anode cap.

COLOR CRT REMOVAL

1. Disconnect the green ground wire (attached to the aquadag spring) from the pin on the analog board.
2. Disconnect analog board plugs J104 and the plug on the neck of the CRT.
3. Remove the four (4) hex-head machine screws located at the "corners" of the screen mounting ring. Remember to support the CRT to prevent damage.
4. Move the CRT forward until the neck clears the analog board. Lift CRT clear and place screen side-down on a clean, thick pad.

COLOR ANALOG BOARD REMOVAL

1. Disconnect the green ground wire (Pin E101) from the analog board. Disconnect analog board plugs J101, J102, J103, and J104.

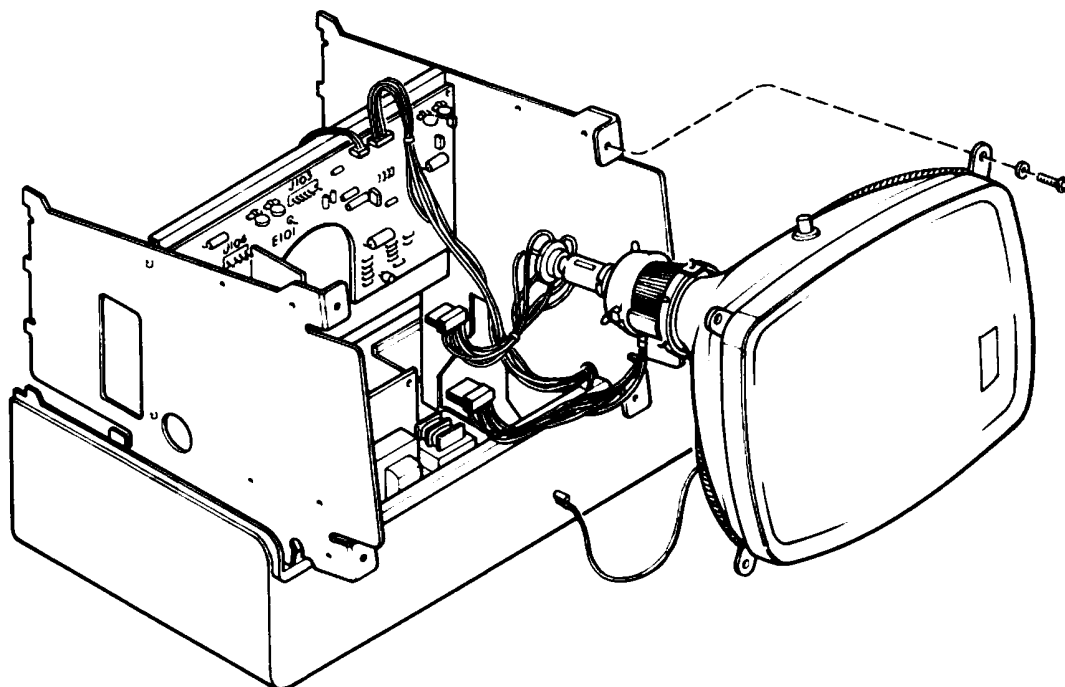


Figure 7-10 Color CRT Removal

2. Disconnect the plug on the neck of the CRT: guide the connector back through the analog board opening.
3. Remove the two (2) top analog bracket screws (located top right and top left). Locate the three (3) gray board clips holding the analog board to the analog board bracket.
4. Carefully squeeze the two locking tabs on each chip and push them through the bracket.
5. Tilt the analog board and its bracket back until the analog board can clear the neck connector of the CRT. Remove the analog board.

MAIN PROCESSOR BOARD

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE:

- Cabinet

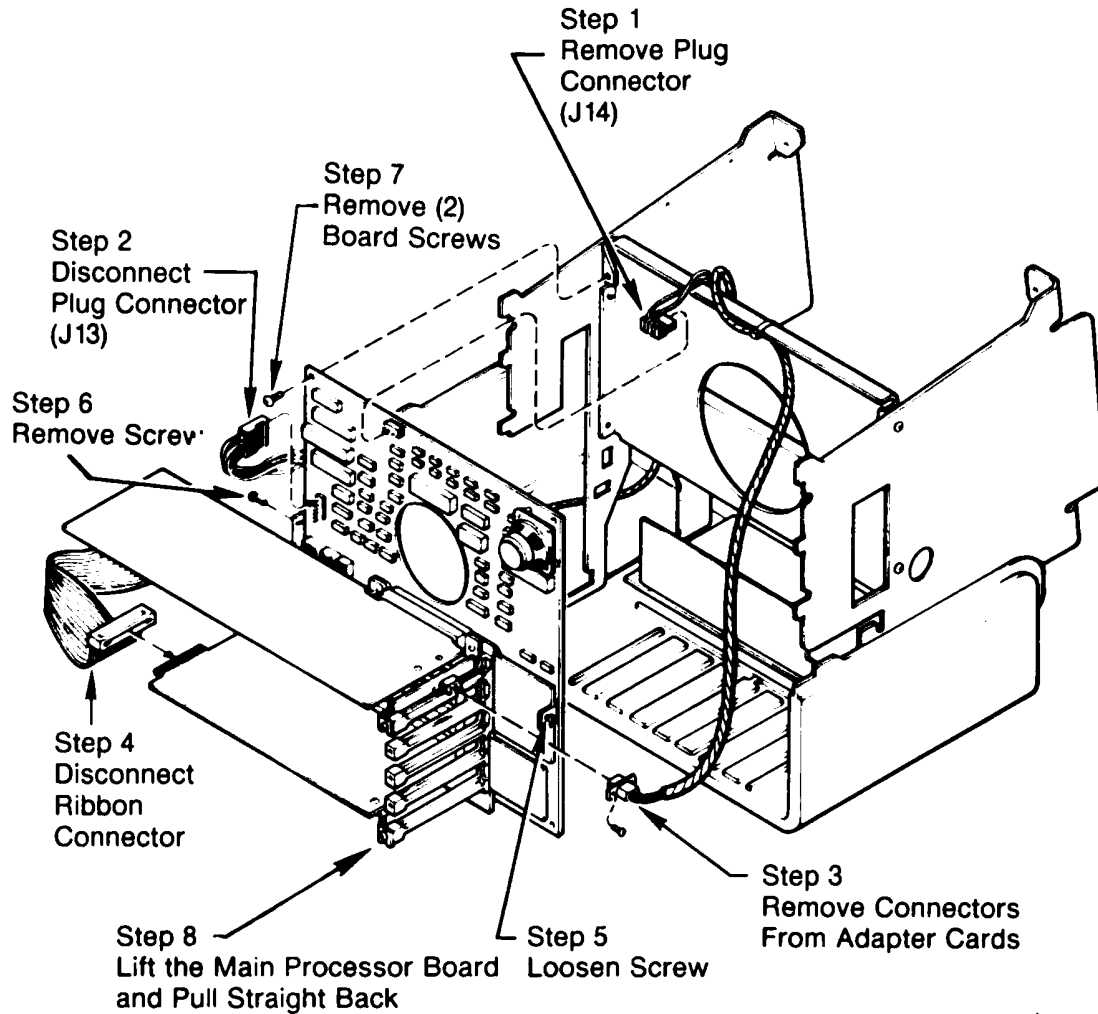


Figure 7-11 Main Processor Board Removal

BOARD REMOVAL PROCEDURE

1. Disconnect the plug connector (J14), located at the top of the Main Processor Board.
2. Disconnect the plug connector (J13), located at the left side of the Main Processor Board.
3. Remove connectors from adapter cards (if adapter cards were not previously removed).
4. Disconnect ribbon connector(s) from adapter card(s) (if adapter cards were not previously removed).
5. Locate the far right bracket screw and loosen it.

6. Locate the far left shelf bracket screw, located under the disk drive assembly, and remove.
7. Remove (2) board screws from upper corners of board.
8. Lift the main processor board and pull straight back.

BRACKET REPLACEMENT PROCEDURE

1. Loosen adapter card bracket mounting screws (one (1) for each adapter card), remove cables (see NOTE below), and remove adapter cards, if not previously done.

NOTE: Systems having a Winchester disk drive and flexible disk drive will have separate ribbon cables for each. When removing the ribbon cables from their respective controller cards, mark the cables to ensure proper reassembly (Winchester drive to Winchester card and flexible disk drive to flexible card).

2. Remove the six (6) bracket screws located on the left and right of the bus expansion slots.
3. Remove the three (3) Card Holder bracket screws located on the back of the Main Processor Board.

IC CHIP REMOVAL

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURE

- Main Processor Board

PROCEDURE

1. Locate the removable socket-mounted IC's referenced in the following illustration:

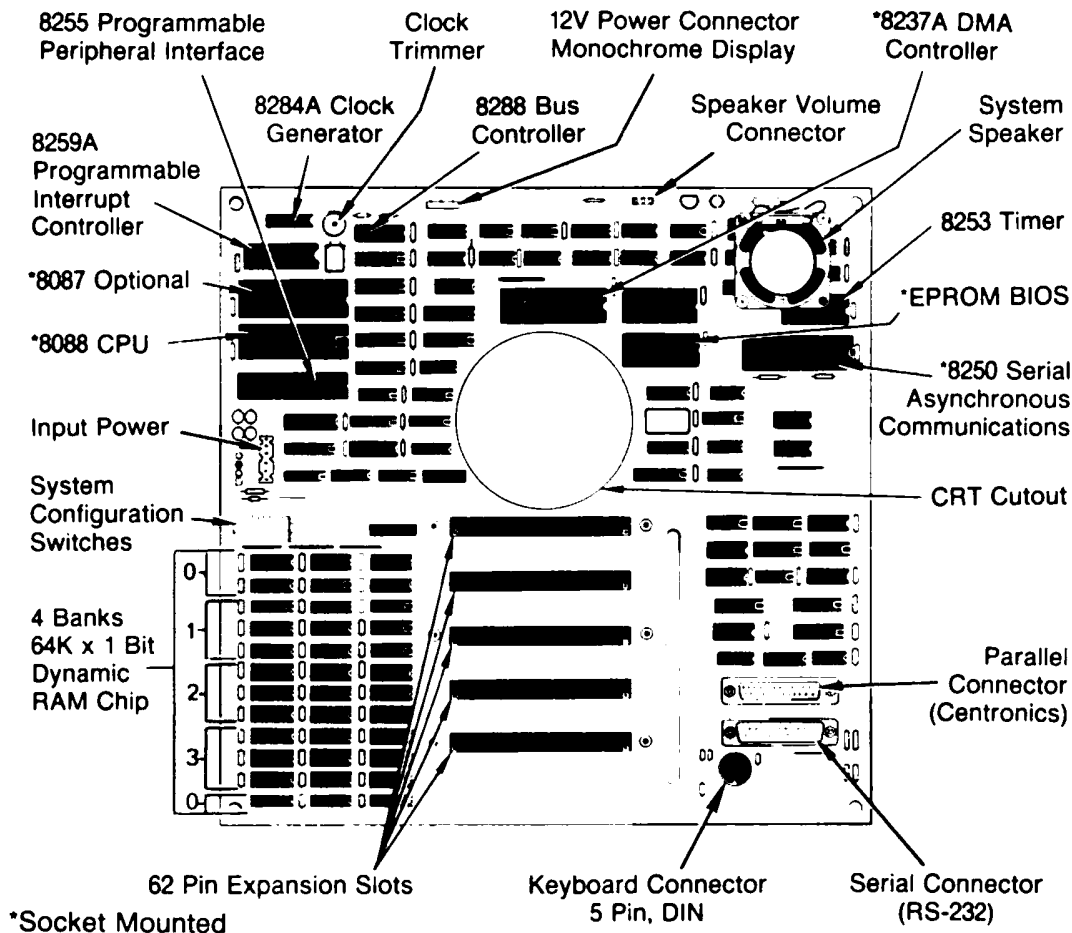


Figure 7-12 Main Processor Board (MPB) Components

Refer to Figure 6-5 in the Level 1 Diagnostics Error Returns chapter of this manual for MPB component location designations.

2. Use an IC insertion/removal tool to perform chip replacement.

POWER SUPPLY

PREVIOUSLY PERFORMED DISASSEMBLY PROCEDURES:

- Cabinet
- Main Processor Board

WARNING

Due to the close proximity of the power supply to the High Voltage areas of the CRT, the following precautions must be followed:

1. Following the procedure outlined in the CRT disassembly, discharge the CRT anode voltage. Carefully observe all warnings

2. Do not bump, scratch, or strike the CRT vacuum tube with tools or jewelry; it can implode and cause injury. Wear safety glasses.

PROCEDURE

1. Disconnect the primary DC power cable plug, located at the far right corner of the power supply board. Disconnect the secondary AC power harness plug, located at the left corner of the power supply board.

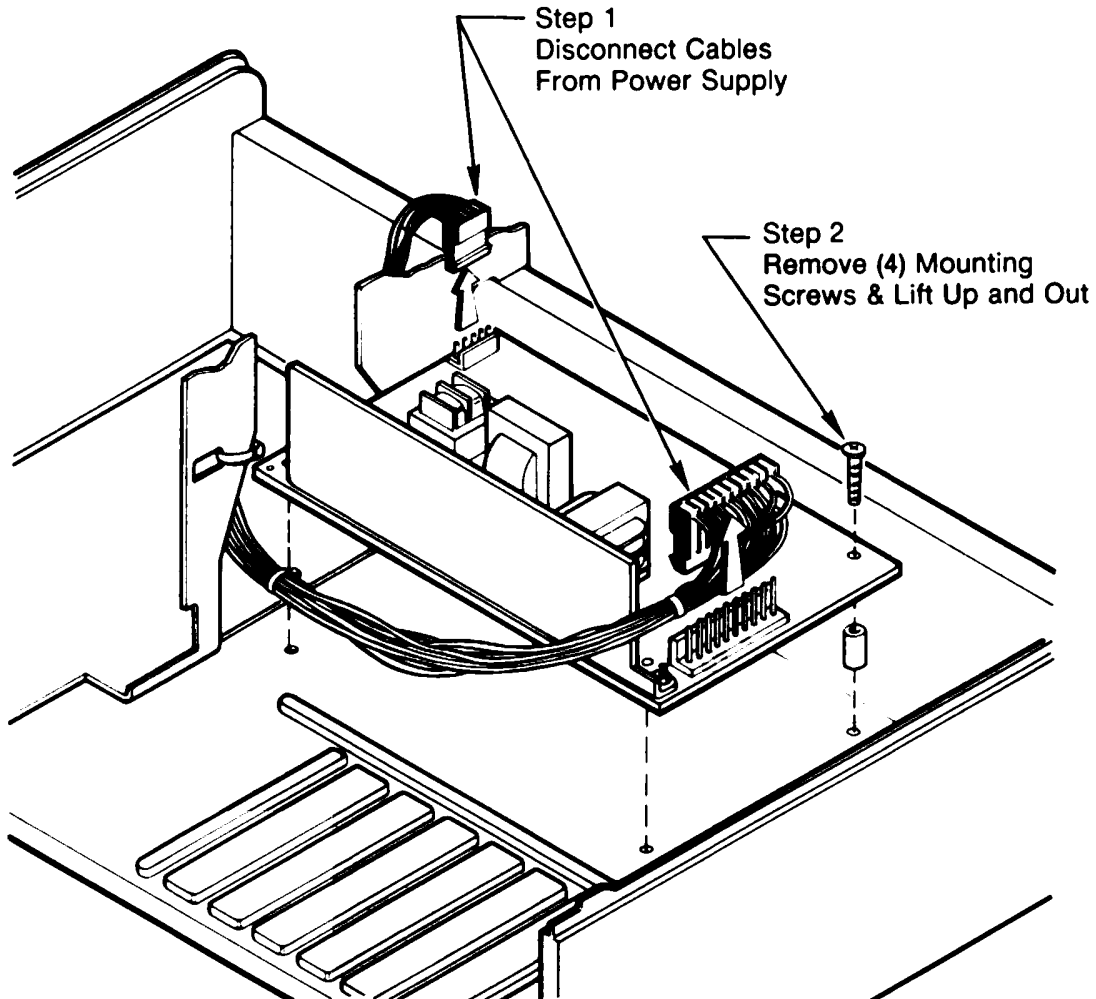


Figure 7-13 Power Supply Removal

2. Remove the four (4) power supply board mounting screws, located at each corner of the power board.
3. Slide the power supply board toward the back of the cabinet.
4. Remove the two (2) board screws located upper left and upper right corners of the Main Processor Board.

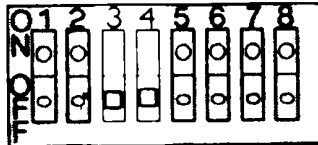
5. Grasp the adapter card bracket, lift the Main Processor Board vertically $1/4 - 1/2$ inch and pull the board straight back and out of the unit.

Configuration Switch Settings

MAIN PROCESSOR BOARD SWITCH SETTINGS

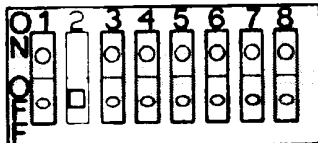
Switch 1

Memory

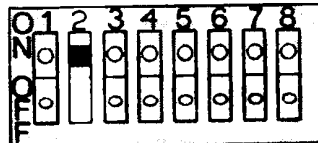


128K to 640K

Coprocessor

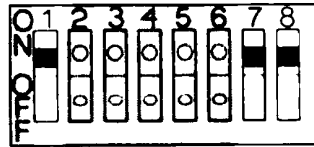


Coprocessor installed

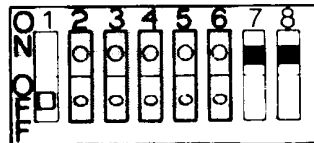


No coprocessor

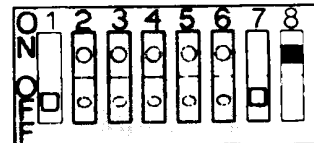
Drives



No drives

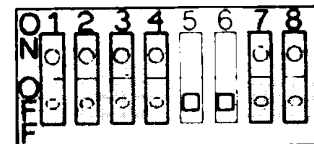


1 Drive

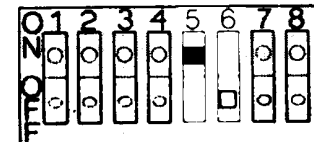


2 Drives

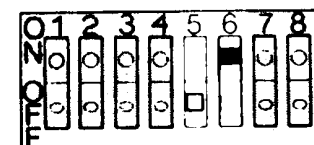
Displays



Monochrome

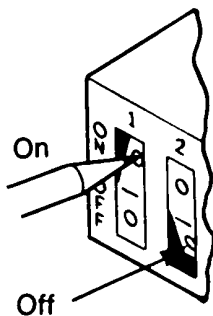


Color/graphics 80 x 25



Color/graphics 40 x 25

NOTE: Depress End of Rocker Switch Which Corresponds with Indicated Setting

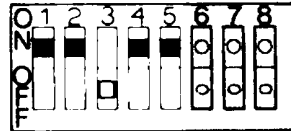


Switch 2

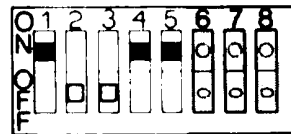
Total system memory



128K



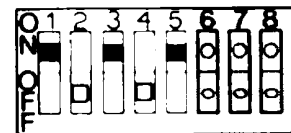
192K



256K



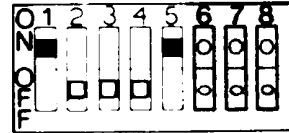
320K



384K



448K



512K

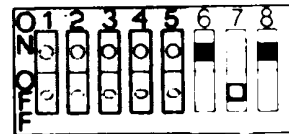


576K

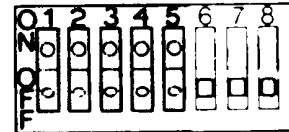


640K

Serial port



COM 1 Enabled



Serial Port Disabled

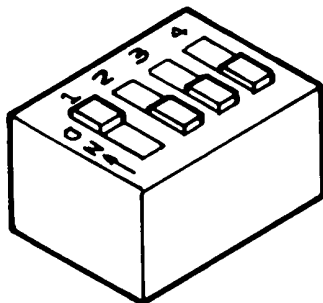
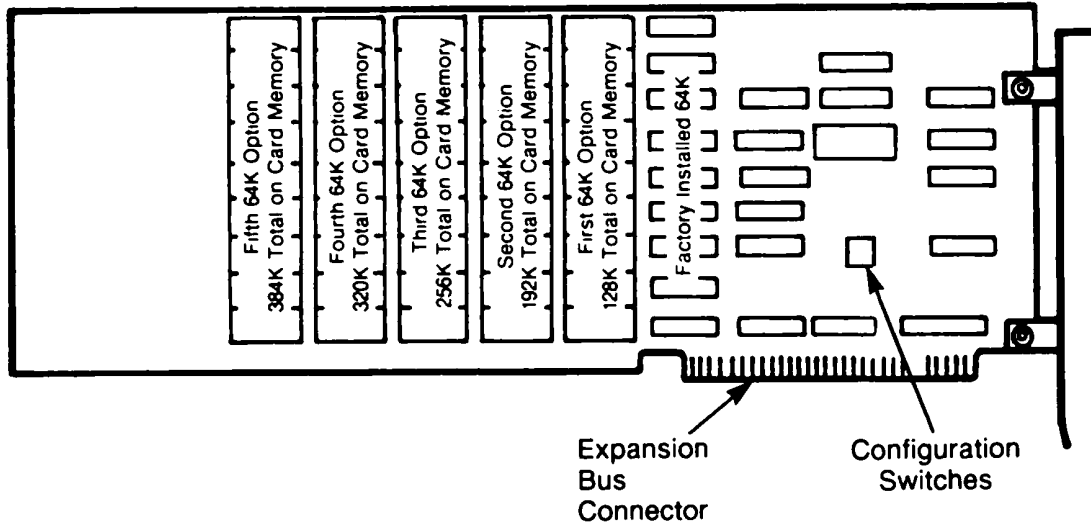
System Switch Settings

SW1				
Pos	1	7	8	Number of Flexible Disk Drives
	ON	ON	ON	None
	OFF	ON	ON	1 Flexible disk drive
	OFF	OFF	ON	2 Flexible disk drives
Pos	3	4	Memory	
	OFF	OFF	128 to 640 KB (see SW2)	
Pos	2	Coprocessor		
	OFF	Installed		
	ON	No Coprocessor		
Pos	5	6	Displays	
	OFF	OFF	Monochrome	
	ON	OFF	Color/Graphics 80 x 25	
	OFF	ON	Color/Graphics 40 x 25	

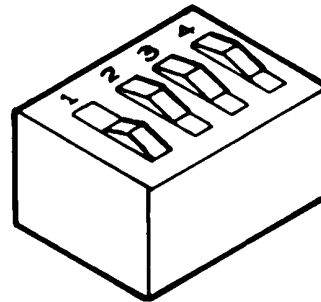
NOTE: If any monochrome display is connected to your system, switch positions 5 and 6 must always be OFF

SW2						
Pos	1	2	3	4	5	Memory
	ON	OFF	ON	ON	ON	128 KB
	ON	ON	OFF	ON	ON	192 KB
	ON	OFF	OFF	ON	ON	256 KB
	ON	ON	ON	OFF	ON	320 KB
	ON	OFF	ON	OFF	ON	384 KB
	ON	ON	OFF	OFF	ON	448 KB
	ON	OFF	OFF	OFF	ON	512 KB
	ON	ON	ON	ON	OFF	576 KB
	ON	OFF	ON	ON	OFF	640 KB
Pos	6	7	8	Serial Port		
	ON	OFF	ON	COM1 Enabled		
	OFF	OFF	OFF	Serial Port Disabled		

EXPANSION MEMORY CARD SWITCH SETTINGS



Slide

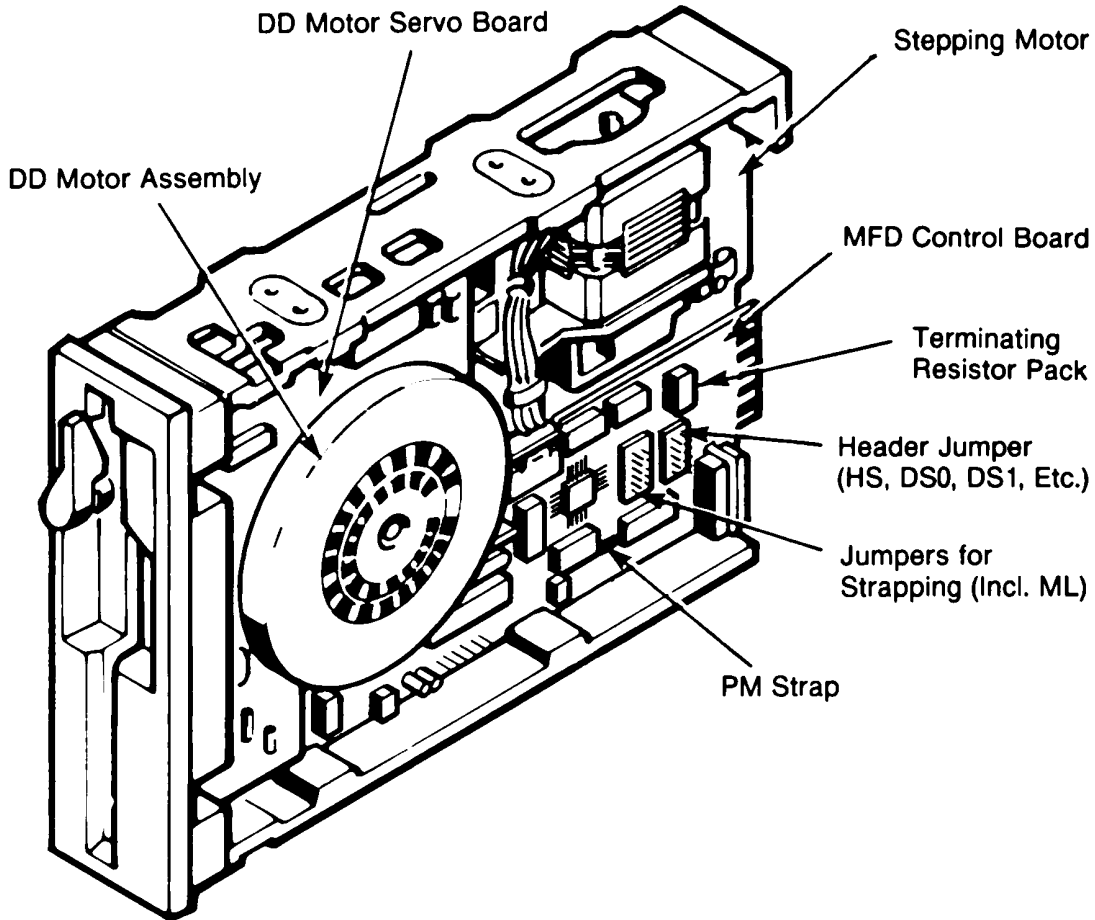


Rocker

Switch Position Settings				Total Memory on Board (in KB)	Total Memory in System with 256 KB on Main Pro- cessor Board
1	2	3	4		
On	On	On	On	64	320
Off	On	On	On	128	384
On	Off	On	On	192	448
Off	Off	On	On	256	512
On	On	Off	On	320	576
Off	On	Off	On	384	640

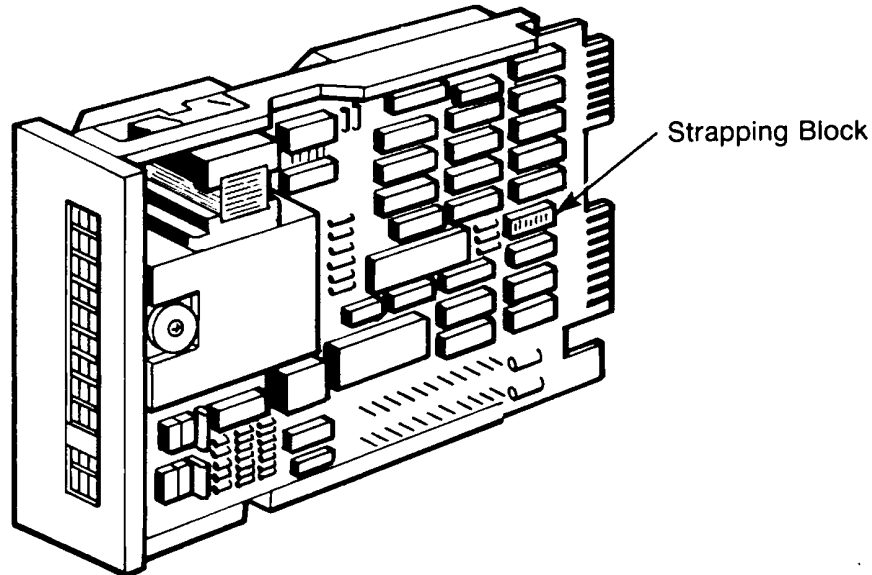
FLEXIBLE DISK DRIVE HEADER JUMPERS

The flexible disk drives of the system are selected by connecting a jumper between certain contacts of the header jumper. The following diagrams illustrate the location of the header jumper on the flexible disk drive unit, a blow-up of the header jumper, and the meanings of the various jumper connections.



Header Jumper Connections	{	HS	Head Load on Drive Select (Jumper In)
		DS 0	Drive Select 0 Jumper in for Drive 0
		DS 1	Drive Select 1 Jumper in for Drive 1
		HM	Open
		DS 2	Open
		DS 3	Open
		MX	Open

FIXED (WINCHESTER) DISK DRIVE STRAPPING



The fixed (Winchester) disk drive can be strapped as drive C, D, E or F. The "Option Shunt Block", or strapping block, is a 14-pin component inserted in a 16-pin location as shown (pin numbers are not printed on the board). Four Drive Select straps (DS1, DS2, DS3 and DS4) select the drive designation (C, D, E or F, respectively). The three Drive Select straps *not* in use must be cut with a small knife or screwdriver blade.

To select drive C (DS1), cut DS2 (7-10), DS3 (6-11) & DS4 (5-12).

To select drive D (DS2), cut DS1 (8-9), DS3 (6-11) & DS4 (5-12).

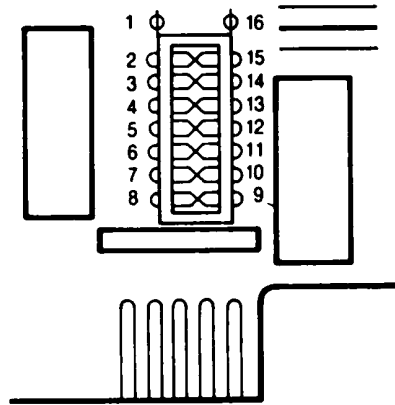
To select drive E (DS3), cut DS1 (8-9), DS2 (7-10) & DS4 (5-12).

To select drive F (DS4), cut DS1 (8-9), DS2 (7-10) & DS3 (6-11).

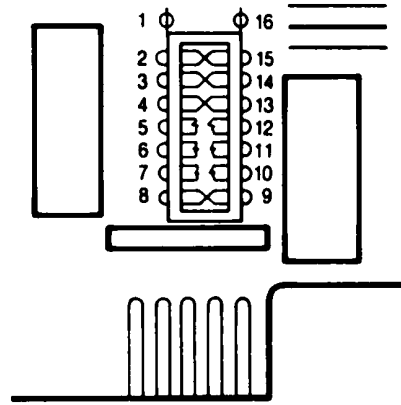
Bend one or both ends of each cut strap back away from the center of the block, to avoid any possibility of accidental contact.

CONFIGURATION SWITCH SETTINGS

- (1-16 R) N/A
 - 2-15 NC
 - 3-14 NC
 - 4-13 NC
 - 5-12 DS4
 - 6-11 DS3
 - 7-10 DS2
 - 8-9 DS1
- (R = Radial Operation)



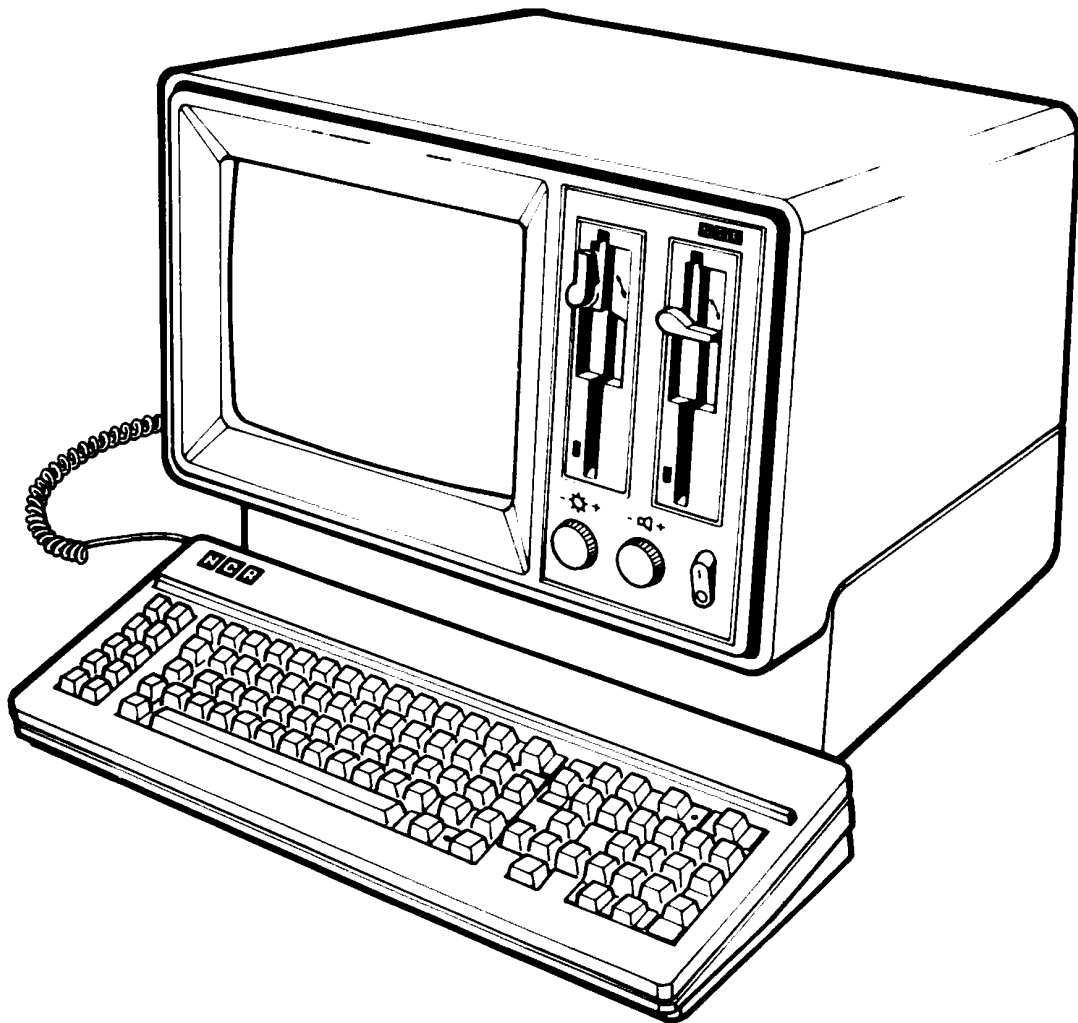
Strapping Block Uncut



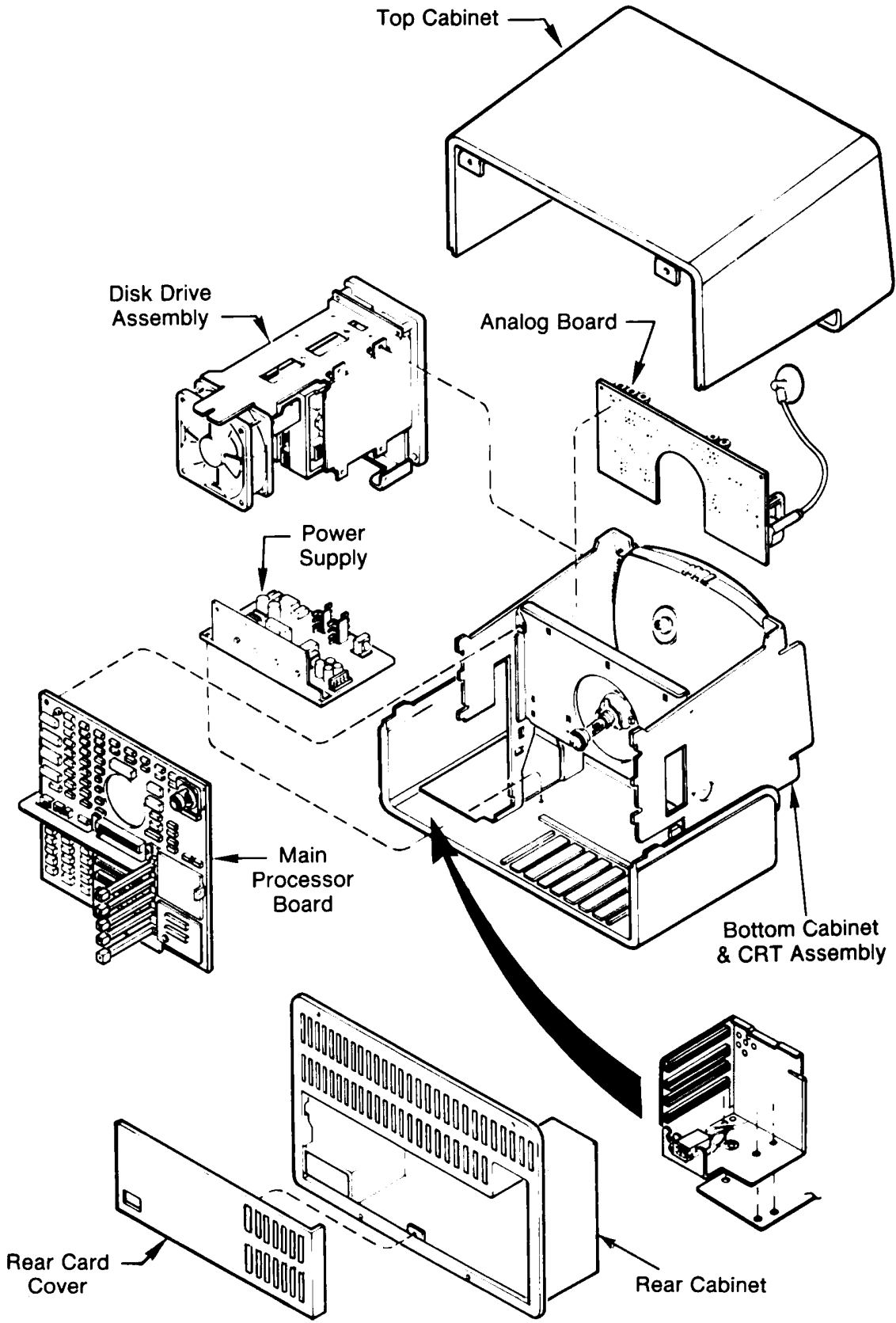
Strapped As Drive C

Subassembly Placement

The Subassembly Placement drawing is designed as an aid in identifying and locating the subassemblies of the NCR PERSONAL COMPUTER, Model 4.



NCR PERSONAL COMPUTER Model 4



Subassembly Placement (Rear View)

Parts Catalog

STANDARD MODELS

NCR Model Number	Model Description
3284-1101-0000	Monochrome, Single Flex Drive
3284-1102-0000	Monochrome, Dual Flex Drive
3284-1103-0000	Monochrome, One Flex, One Fixed Drive
3284-1201-0000	Color, Single Flex Drive
3284-1202-0000	Color, Dual Flex Drive
3284-1203-0000	Color, One Flex, One Fixed Drive

CABINET and KEYBOARD

NCR Part Number	Part Description
017-0033541	Cabinet Top
017-0033542	Cabinet Bottom
150-0000164	Back Panel
150-0000166	Access Panel
008-0072560	Keyboard w/Cord
150-0000156	Control Cover Panel

CABINET and KEYBOARD (Continued)

NCR Part Number	Part Description
150-0000157	Control Panel Escutcheon
007-9827317	NCR Logo
006-0088350	Main Power Switch
008-0084224	Control Knob

MAIN PROCESSOR BOARD

NCR Part Number	Part Description
150-0000211	Main Processor Board w/128K RAM
	Plug-In Replacement Parts
006-1062668	Intel 8088 16-Bit Microprocessor IC
007-1667710	DMA Controller IC
150-0000344	16K EPROM IC (2764)
006-1005365	Speaker

NOTE: The first 128K of memory is soldered to the CPU/Memory board. Additional memory IC chips are inserted into the memory bank sockets already on the processor board. Refer to the "Option Kits" section of this appendix for additional information.

VIDEO DISPLAY

NCR Part Number	Part Description
150-0000345	Monochrome CRT w/Analog Board
150-0000273	Monochrome Display Adapter Card
150-0000121	Color CRT w/Analog Board
006-1049321	Color Display Adapter Card
150-0000271	Video Display Cable — Monochrome
150-0000217	Video Display Cable — Color

Options

Kit No. 3284-K141 is required for an external monochrome display device. Refer to the "Option Kits" section of this Appendix for additional information.

Kit No. 3284-K140 is required for an external color display device. Refer to the "Option Kits" section of this appendix for additional information.

STORAGE UNIT ASSEMBLY

NCR Part Number	Part Description
150-0000149	Power-On Harness with brightness and volume controls — Monochrome
150-0000368	Power-On Harness with brightness and volume controls — Color

STORAGE UNIT ASSEMBLY (Continued)

NCR Part Number	Part Description
008-0068013	Cooling Fan, 12 VDC
	Flexible Disk
150-0000343	5 1/4" Flexible Disk Drive
150-0000312	Flexible Disk Controller Card
150-0000060	Cable, Disk Data Ribbon (Triple Header)
150-0000146	Cable, Disk to Card Logic (Double Header)
	Options
	Owners of single flexible disk drive systems may add a second flexible disk drive by ordering Kit No. 3284-K110. Refer to the "Option Kits" section of this appendix for additional information.
	Winchester (Hard) Disk
150-0000142	5 1/4" Winchester Disk Drive w/bezel
150-0000339	Winchester Disk Controller Card
	Options
	Owners of single flexible disk systems may add a Winchester Disk by ordering Kit No. 3284-K111. Refer to the "Option Kits" section of this appendix for additional information.

POWER SUPPLY

NCR Part Number	Part Description
801-0013900	Power Supply
006-0007164	Power Supply Cord
150-0000062	Primary AC Power Harness w/Filter and inline Fuse
150-0000063	Secondary AC Power Harness (Monochrome)
150-0000369	Secondary AC Power Harness (Color)
150-0000064	DC Power Harness

OPTION KITS**NCR
Kit Number****Part Description****CRT Display Adapter Cards**

3284-K140

External Color Display Kit. Kit supports one external color CRT device. Includes Video Display cable, Color Display Adapter Card, and instructions.

3284-K141

External Monochrome Display Kit. Kit supports one external monochrome CRT device. Includes Video Display cable, Monochrome Display Adapter Card, and instructions.

Storage Unit Kits

3284-K110

Integrated Flexible Disk Drive Kit. Includes 5 1/4 inch Flexible Disk Drive unit and installation instructions for adding a second flexible disk drive to single disk drive systems.

6097-6561

Free-standing Dual 8 inch Flexible Disk Drive Kit. Consists of assembled unit: (cabinet, power supply, disk assemblies), cables, and instructions.

NOTE: Since the flexible disk adapter can support a maximum of four flexible disk drives, this kit is intended for systems currently using one or two flexible disk units.

OPTION KITS (Continued)

NCR Kit Number	Part Description
6097-6661	Free-standing single 8 inch Flexible Disk Drive Kit.
6097-K820	Second flexible disk drive (only) to add to 6097-6661.
6097-K900	Cables for 6097-K820
3284-K111	Integrated Winchester Disk Drive Kit. Includes 5 1/4 inch 10 Megabyte disk unit, Winchester disk drive adapter card, cables, and installation instructions.
6097-K196	PC Model 4 Winchester Disk Drive installation instructions, boot maintenance diskette, host adapter card, SCSI cable.
6097-4341	Free-standing 11 Megabyte Winchester Disk Drive Kit. Consists of assembled unit (cabinet, power supply, disk assembly, SCSI controller) and instructions.
6097-4441	Free-standing 22 Megabyte Winchester Disk Drive Kit. Consists of assembled unit: (cabinet, power supply, dual 11 MB disk assemblies, SCSI controller) and instructions.
6097-5341	Free-standing 32 Megabyte Winchester Disk Drive Kit. Consists of assembled unit: (cabinet, power supply, 32MB disk assembly, SCSI controller) and instructions.
6097-5441	Free-standing 64 Megabyte Winchester Disk Drive Kit. Consists of assembled unit: (cabinet, power supply, dual 32 MB disk assemblies, SCSI controller) and instructions.

OPTION KITS (Continued)

NCR Kit Number	Part Description
6097-7241	Free-standing 32 Megabyte Winchester Disk Drive with 45 MB Streaming Tape Kit. Consists of assembled unit: (cabinet, power supply, 32MB disk assembly, tape assembly, SCSI controller) and instructions.
Kits to Upgrade 6097-4341 or 6097-5341	
6097-K852	11 MB fixed disk and mounting hardware.
6097-K858	32 MB fixed disk and mounting hardware.
6097-K785	1/4 in. Streamer Tape 45 MB and mounting hardware.
6097-K053	Tape controller.
6097-K903	Internal cables for disk add-on.
6097-K908	Internal cables for tape and tape controller add-on.
Parallel And Serial Communication Kits	
3284-K120	Parallel Printer Cable. Includes Centronics-type printer cable and instructions.
3284-K122	Asynchronous Communications Cable. Includes Cable and instructions.
3284-K121	Serial Printer Cable. Includes Serial (RS232C) Printer Cable, and instructions.

OPTION KITS (Continued)

NCR Kit Number	Part Description
3284-K130	<p>RS232C Asynchronous Communications Adapter Card Kit. This kit provides a second serial port to the CPU/Memory bus to support a modem, plotter, or serial printer. The kit includes Asynchronous Communication Adapter Card and User Guide.</p> <p>NOTE: This kit does not include cables; refer to the above cable option kits for the correct device (modem or serial printer) cable.</p>

Memory Expansion Kits

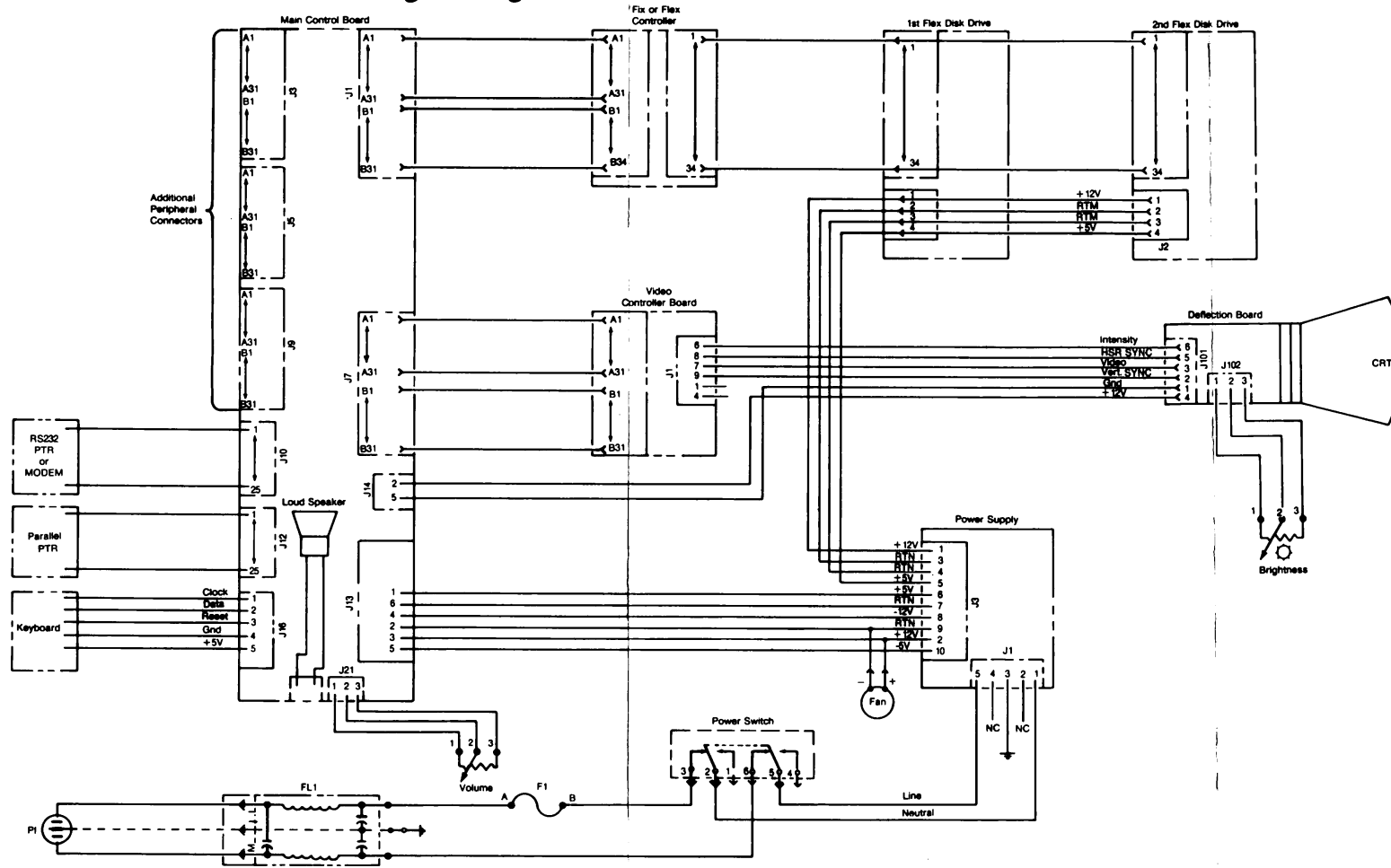
3284-K100	<p>64K RAM Kit includes nine 64K RAM ICs and installation instructions.</p> <p>NOTE: The first expansion of memory requires 2 kits added to the processor board, resulting in a memory configuration of 256K.</p>
3284-K102	<p>128K RAM Kit. Includes 18 64K RAM ICs and installation instructions.</p>
3284-K101	<p>Memory Expansion Card Kit. Includes instructions and a card populated with 64K.</p>

NOTE:

1. This card can be used only when the CPU/Memory board is at its maximum memory configuration of 256K.
2. Memory may be added to this card in 64K increments by ordering one of Kit No. 3284-K100 for each 64K desired.
3. This card has a maximum configuration of 384K (original card memory of 64K, plus five 64K Kits). The result is a system maximum of 640K.

Appendix D

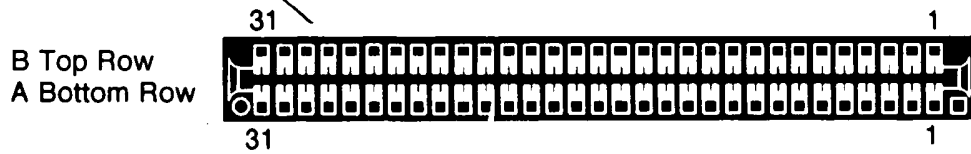
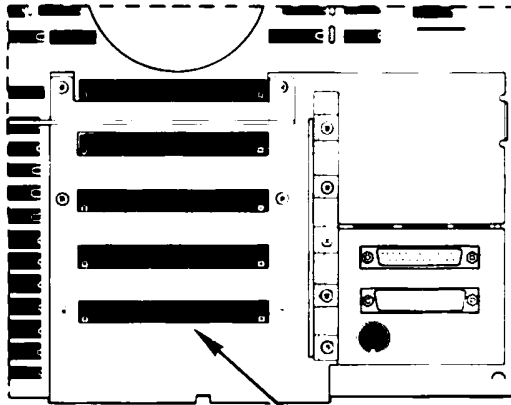
Connection And Logic Diagrams



PHYSICAL CONNECTIONS/PIN ASSIGNMENTS

The following pages contain illustrations of the principal physical connectors on the Main Processor Board, along with listings of their individual pin assignments.

Expansion Slot Connections

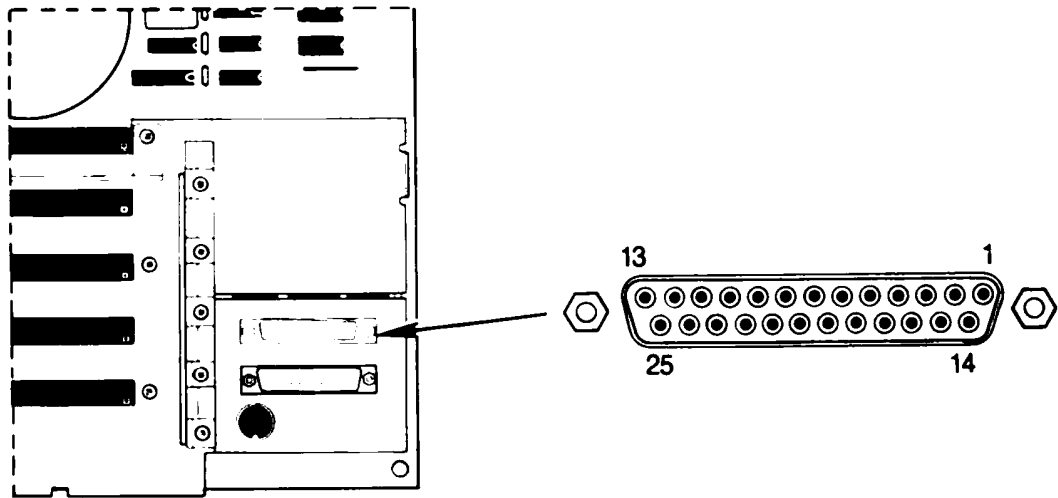
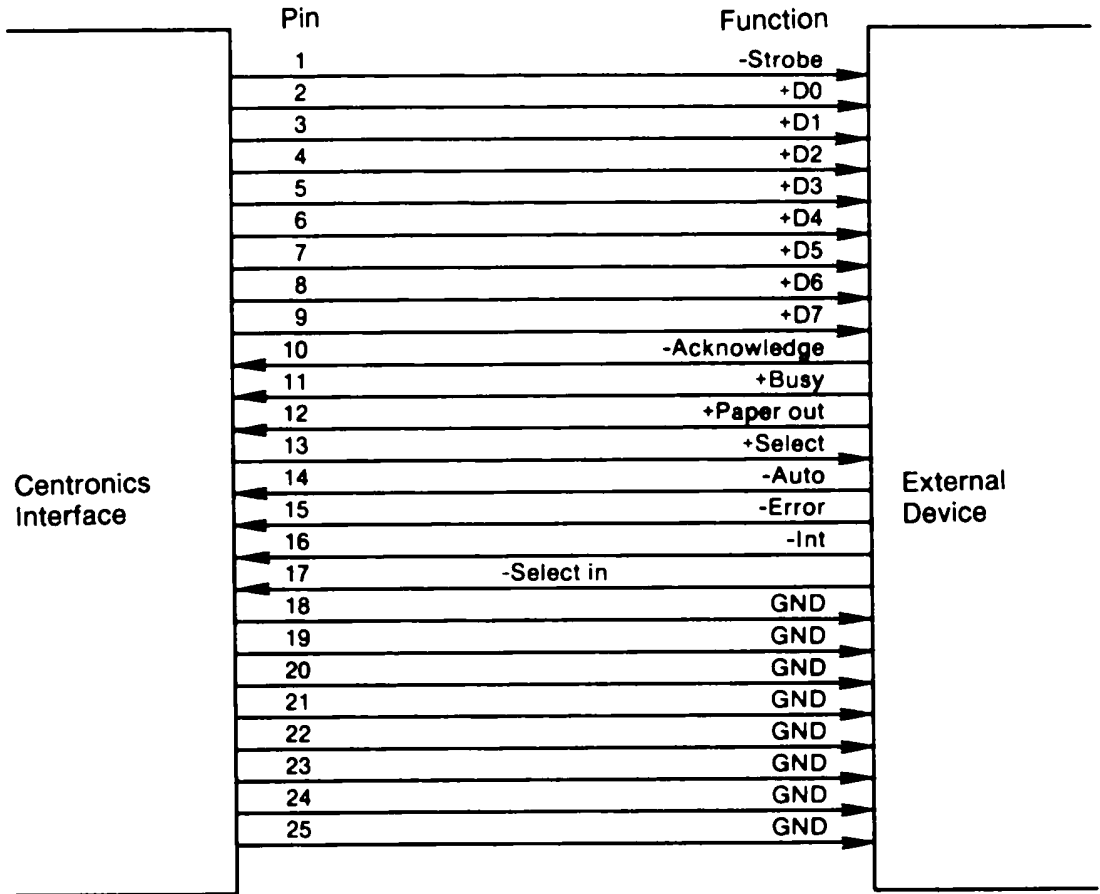


Main Processor Board — Expansion Slots

B	FUNCTION	A	FUNCTION
1	GND	1	-I/O CHECK
2	+RESET DRIVE	2	+D7
3	+5V	3	+D6
4	IRQ2	4	+D5
5	-5V	5	+D4
6	+DRQ2	6	+D3
7	-12	7	+D2
8	-HRQ I/O	8	+D1
9	+12V	9	+D0
10	GND	10	+I/O CH RDY
11	-MEMW	11	+AEN
12	-MEMR	12	+A19
13	-IOW	13	+A18
14	-IOR	14	+A17
15	-DACK3	15	+A16
16	+DRQ3	16	+A15
17	-DACK1	17	+A14
18	+DRQ1	18	+A13
19	-DACK0	19	+A12
20	+CLOCK	20	+A11
21	+IRQ7	21	+A10
22	+IRQ6	22	+A9
23	+IRQ5	23	+A8
24	+IRQ4	24	+A7
25	+IRQ3	25	+A6
26	-DACK2	26	+A5
27	+T/C	27	+A4
28	+ALE	28	+A3
29	+5V	29	+A2
30	+OSC	30	+A1
31	GND	31	+A0
			(-ASSERTS LOW) (+ASSERTS HIGH)

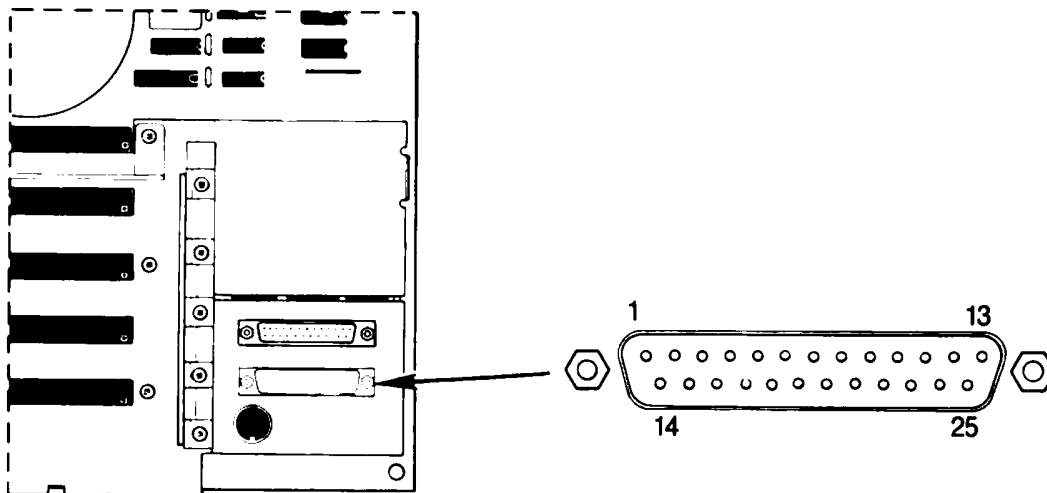
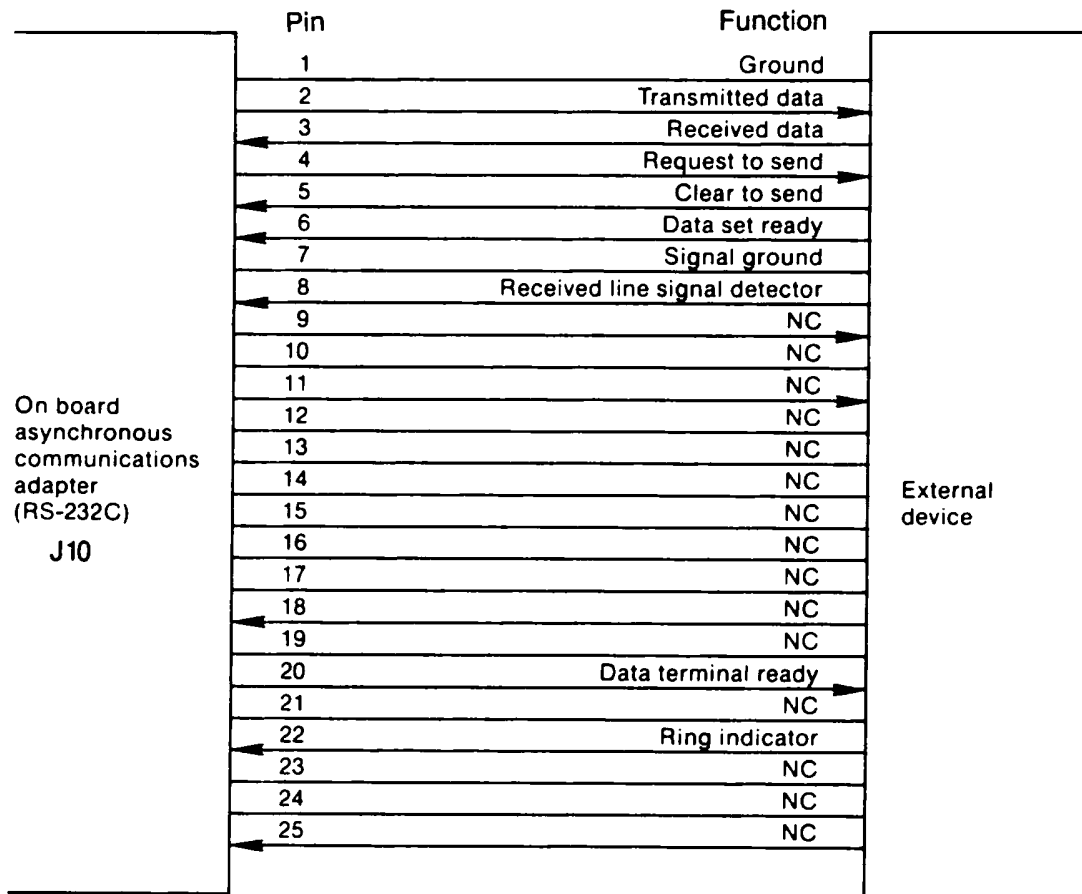
Expansion Slot Signals

Main Processor Board Parallel (Centronics) Connector



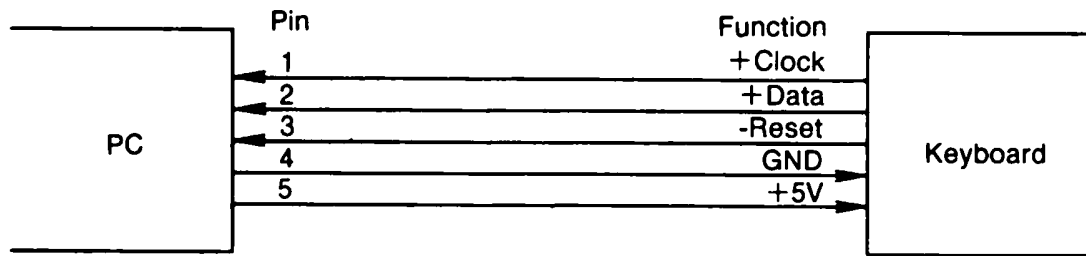
Main Processor Board — Parallel Printer Connector (Centronics)

Main Processor Board Serial (RS 232) Connector

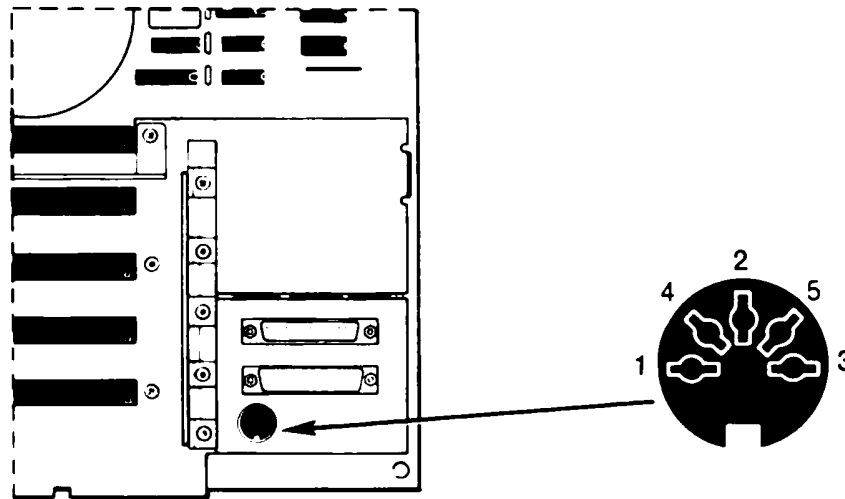


Main Processor Board — Serial Connector

Main Processor Board Keyboard Connection

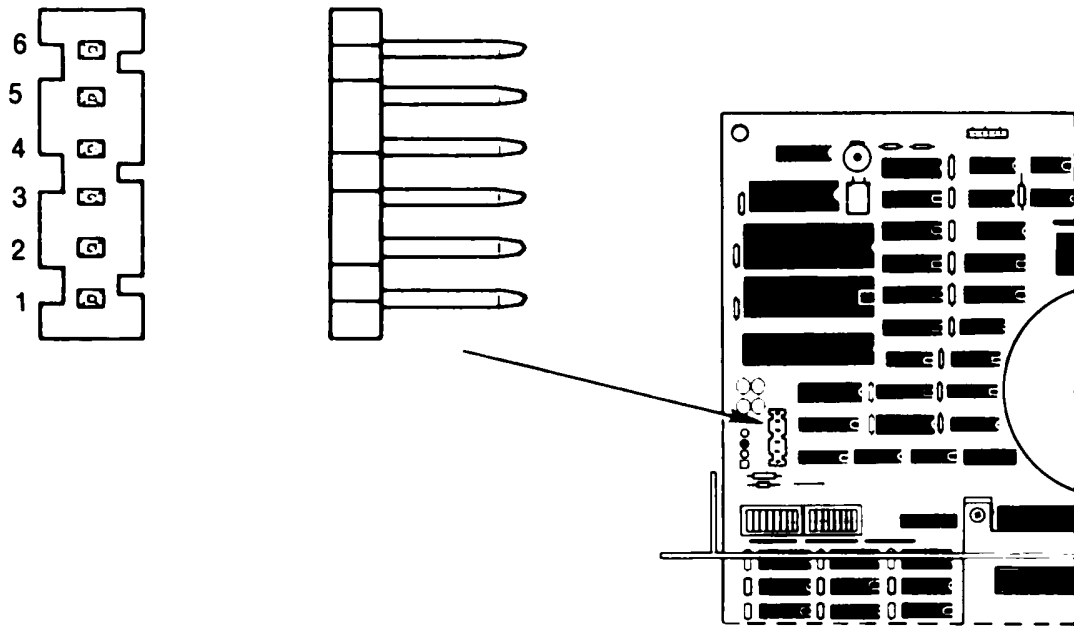


Keyboard Interface Signals

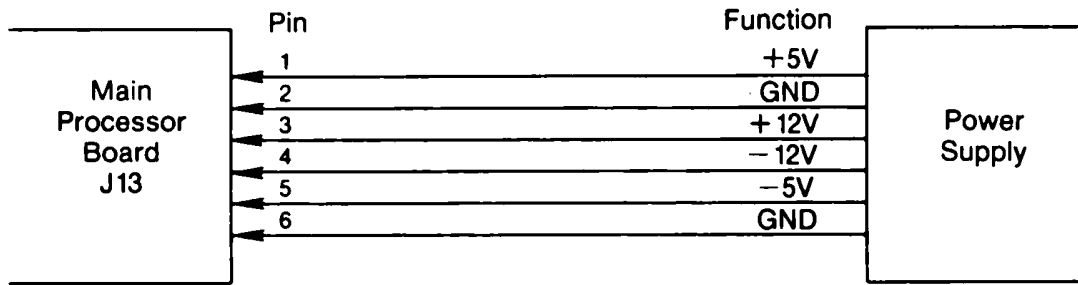


Main Processor Board — Keyboard Connector

Main Processor Board Power Connector



Main Processor Board — D.C. Power Connector



D.C. Power Cable Voltages

Page	Title	Illustration Number
11	Main Processor — Logic	1 of 15
13	•	2 of 15
15	•	3 of 15
17	•	4 of 15
19	•	5 of 15
21	•	6 of 15
23	•	7 of 15
25	•	8 of 15
27	•	9 of 15
29	•	10 of 15
31	•	11 of 15
33	•	12 of 15
35	•	13 of 15
37	•	14 of 15
39	•	15 of 15
41	Display — Adapter Monochrome	2 of 6
43	•	3 of 6
45	•	4 of 6
47	•	5 of 6
49	•	6 of 6
51	Display — Adapter Color	2 of 7
53	•	3 of 7
55	•	4 of 7
57	•	5 of 7
59	•	6 of 7
61	•	7 of 7
63	Flexible Disk Controller	1 of 4
65	•	2 of 4
67	•	3 of 4
69	•	4 of 4
71	Flexible Disk Drive	1 of 8
73	•	2 of 8
75	•	3 of 8
77	•	4 of 8
79	•	5 of 8
81	•	6 of 8
83	•	7 of 8
85	•	8 of 8
87	Hard Disk Drive	1 of 2
89	•	2 of 2
91	Expanded Memory	1 of 3
93	•	2 of 3
95	•	3 of 3
97	Keyboard	1 of 1
99	Power Supply	1 of 2
101	•	2 of 2

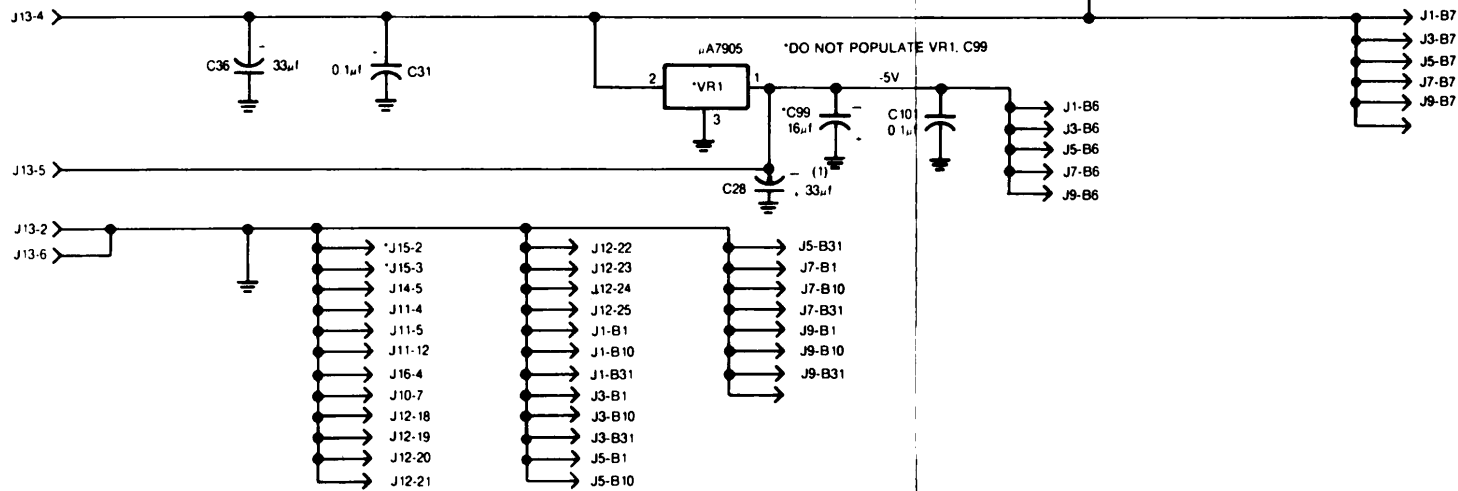
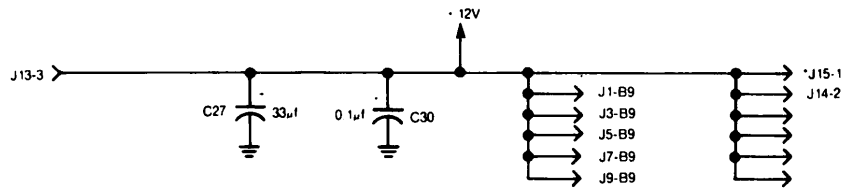
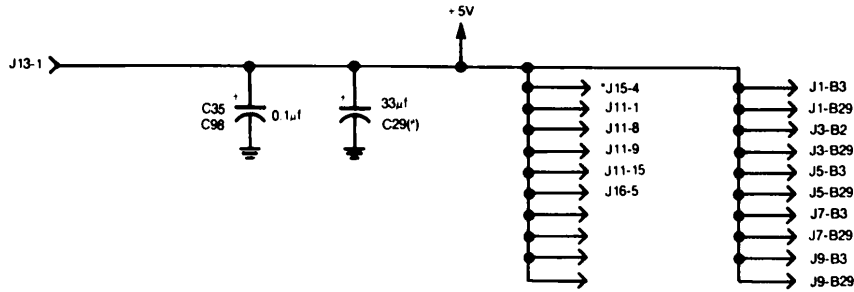
Logic Diagram Index

LOGIC DIAGRAMS

Logic Diagrams for the NCR Personal Computer are presented in the following pages of this appendix.



CONNECTION AND LOGIC DIAGRAMS



Main Processor Board (1 of 15)

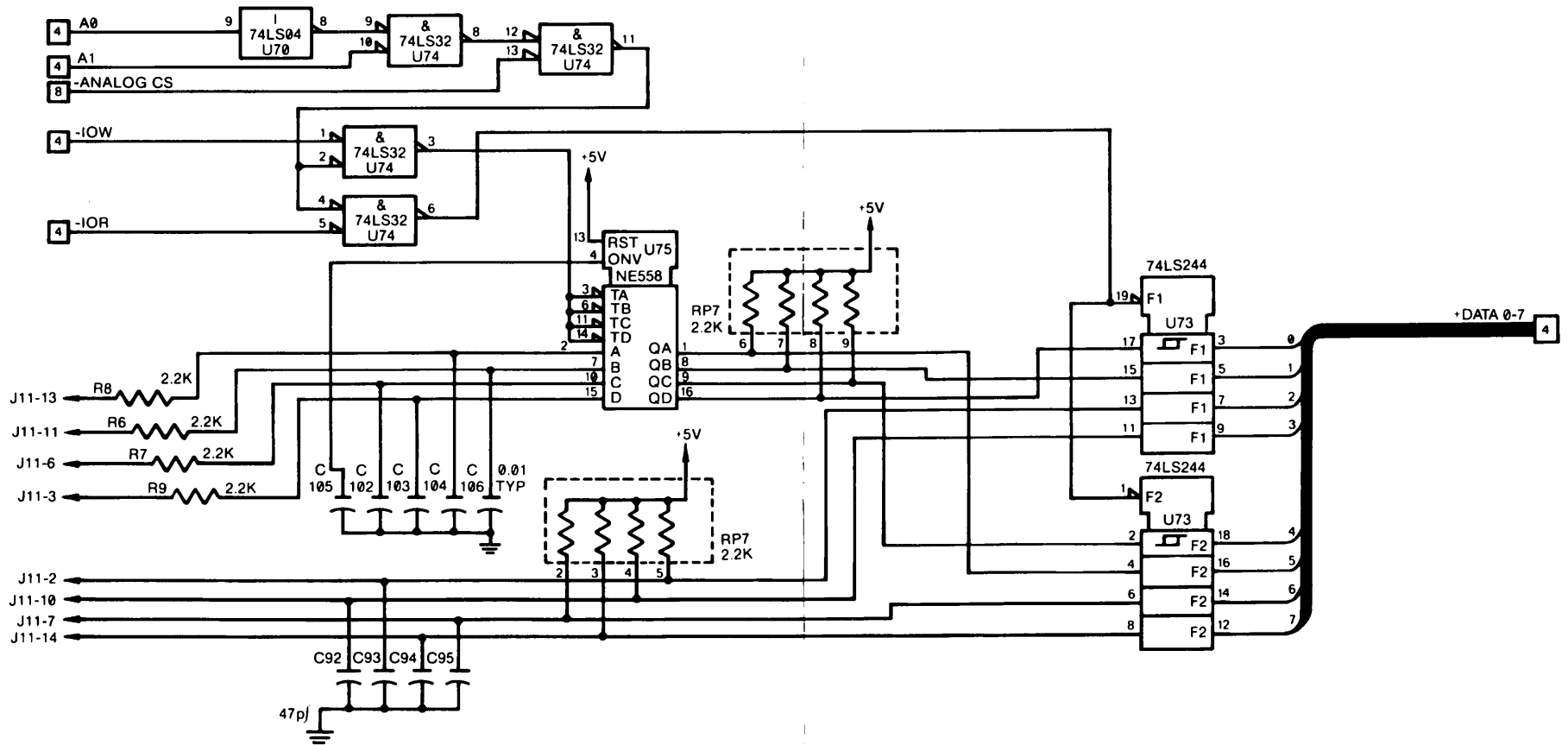
U Number	Pin Number	
	+5	GND
U44	16	8
U65	14	7
U38	14	7
U45	14	7
U112	14	7
U46	14	7
U74	14	7
U73	20	10
U9	16	8
U28	14	7

U Number	Pin Number	
	+5	GND
U49	14	7
U62	16	8
U54	16	8
U40	14	7
U64	14	7
U23	16	8
U68	16	8
U53	14	7
U63	14	7
U66	20	10
U22	20	10
U24	20	10
U25	20	10
U31	20	10
U72	14	7
U4	14	7
U17	14	7
U59	14	7
U70	14	7
U6	14	7
U13	14	7
U18	16	8
U39	16	8

U Number	Pin Number	
	+5	GND
U75	5	12
U1	18	9
U30	40	20,1
U2	20	10
U10	28	14
U21	40	1,20
U26	31.5	20
U76-111	8	16
U29	24	12
U35	26	7
U33	28	14
U27	28	14
U51	16	8
U56	16	8
U42	20	10
U34	40	20
U19	20	10
U20	20	10
U32	20	10
U47	20	10
U67	20	10
U11	20	10
U36	20	10
U55	20	10
U58	20	10
U61	20	10
U43	16	8
U48	16	8
U16	14	7
U3	14	7
U12	14	7
U52	16	8
U60	14	7
U69	20	10
U50	14	7
U41	5	10
U7	14	7
U37	14	7
U8	14	7
U14	14	7
U15	14	7
U57	14	7
U5	16	8
U71	16	8

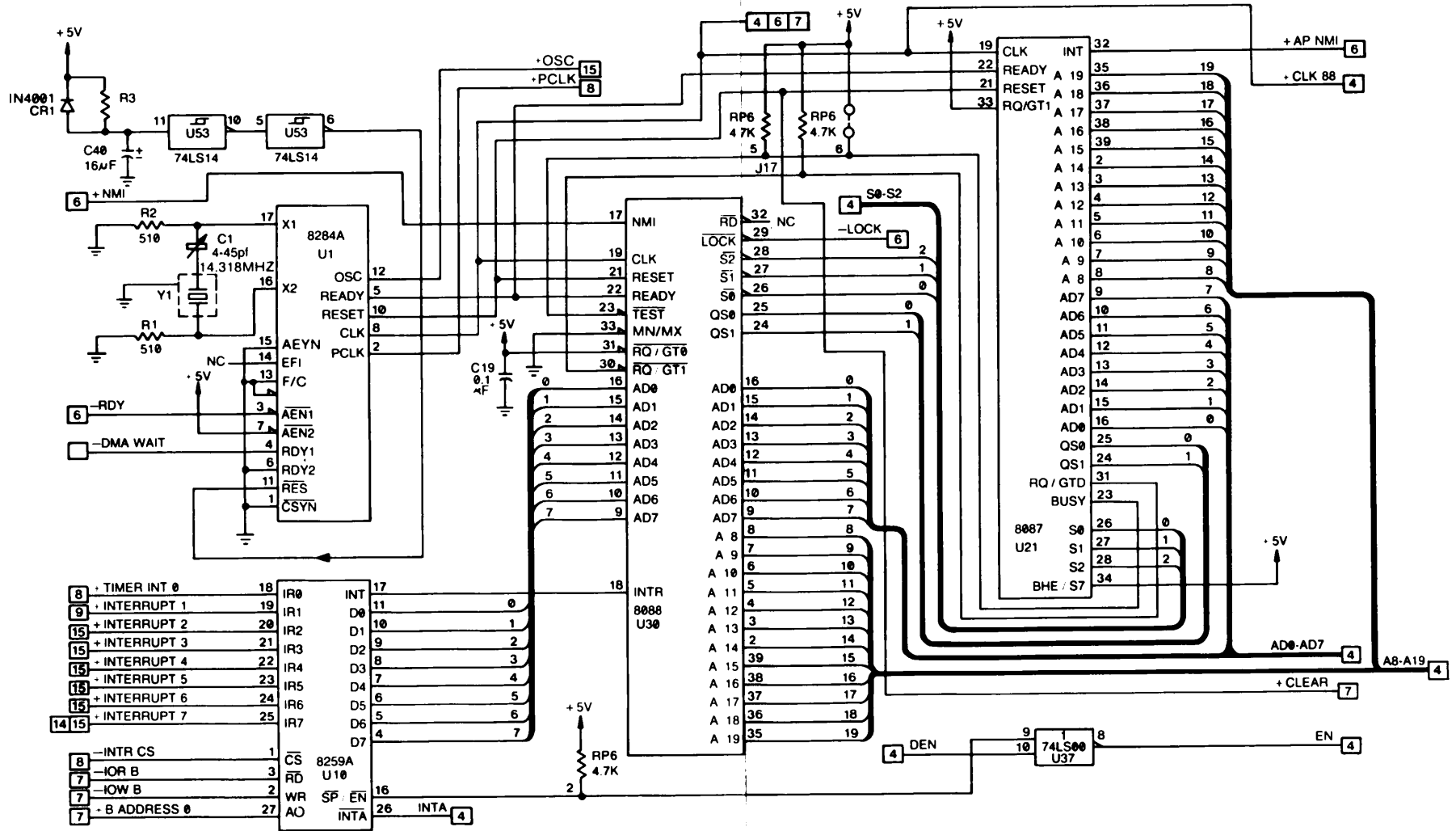
U Number	Unused Gates
U17	11-10 13-12
U65	13-12
U63	11-10 3-4
U36	6-14 7-13 8-12 9-11
U19	17-3 15-5 13-7
U15	4,2,3,1-5,6
U28	9,10,11-8
U71	12-10,11 13-15,14
U62	14-15
U40	9,10-8 12,13-11
U64	2,1-3 9,10-8 12,13-11
U56	6-11 5-12 4-13

CONNECTION AND LOGIC DIAGRAMS



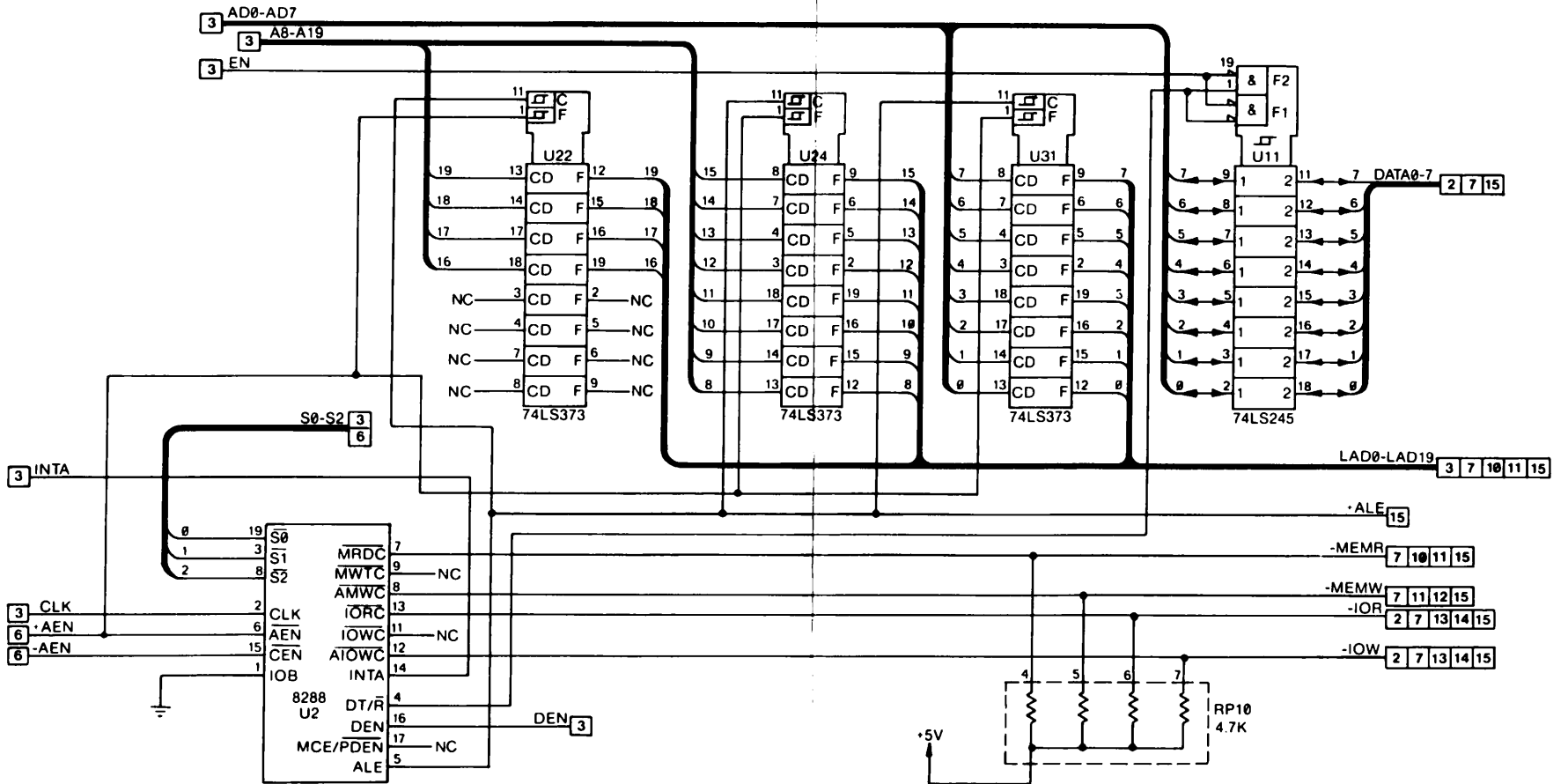
Main Processor Board (2 of 15)

CONNECTION AND LOGIC DIAGRAMS

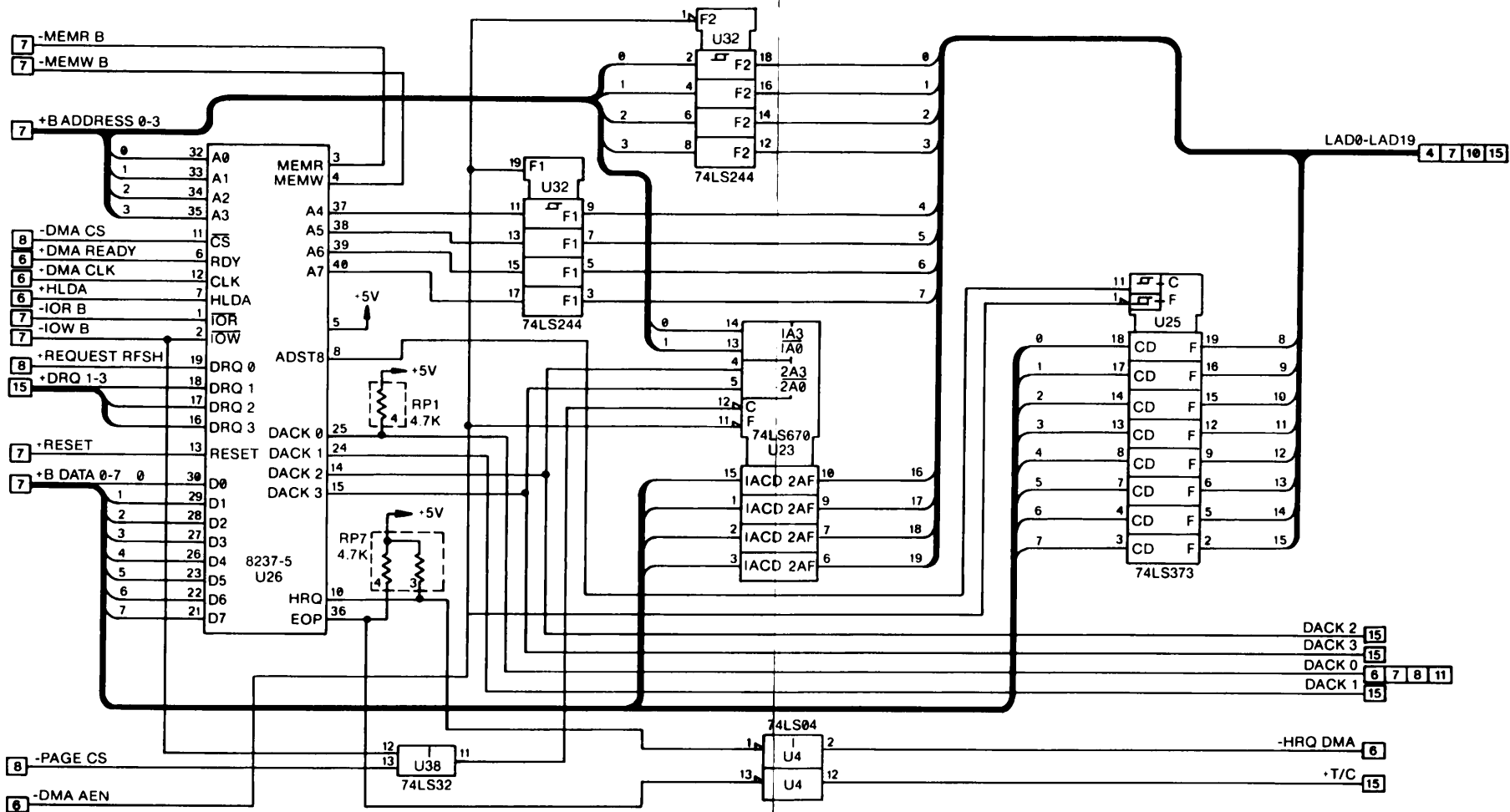


Main Processor Board (3 of 15)

CONNECTION AND LOGIC DIAGRAMS

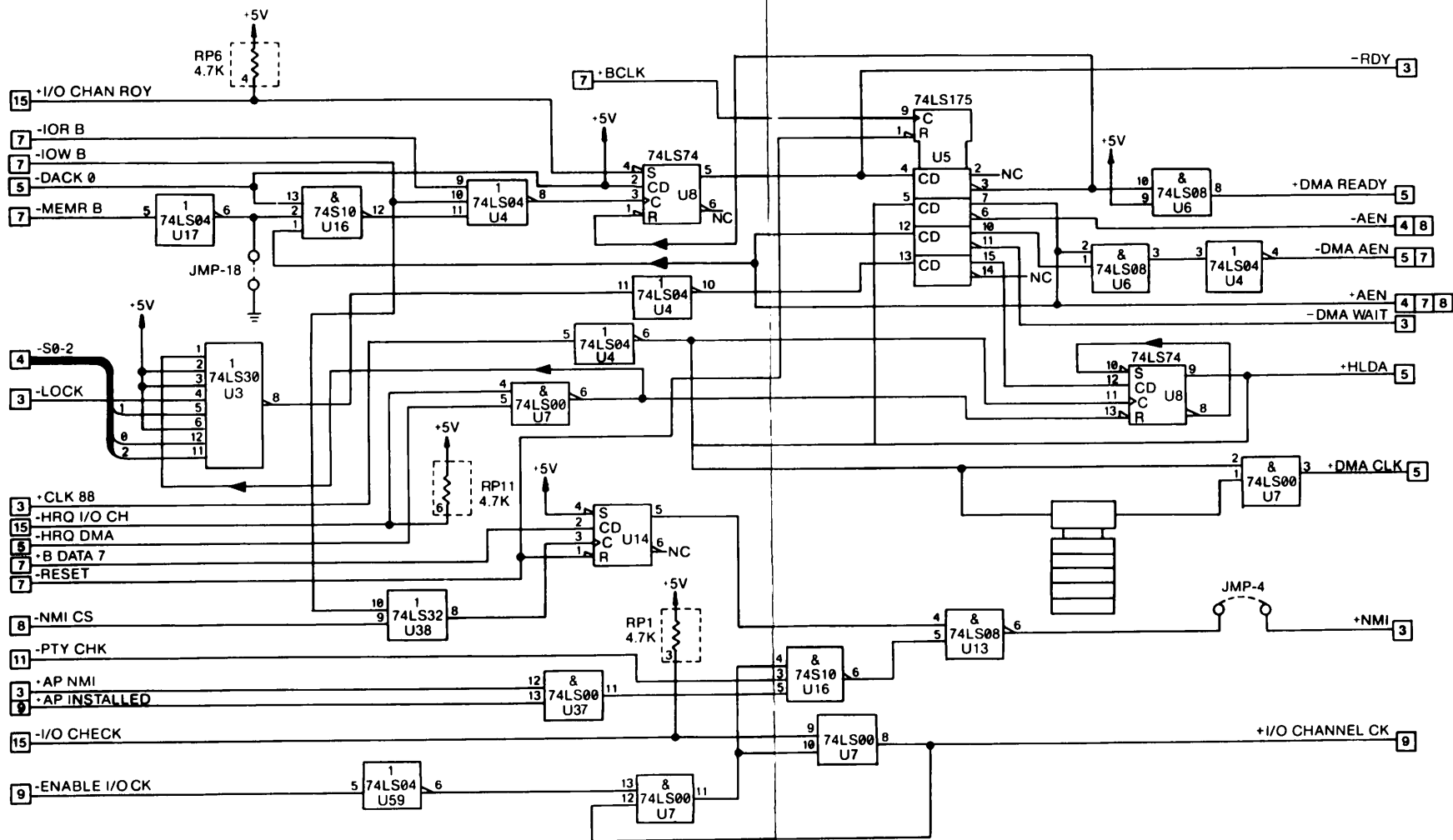


Main Processor Board (4 of 15)



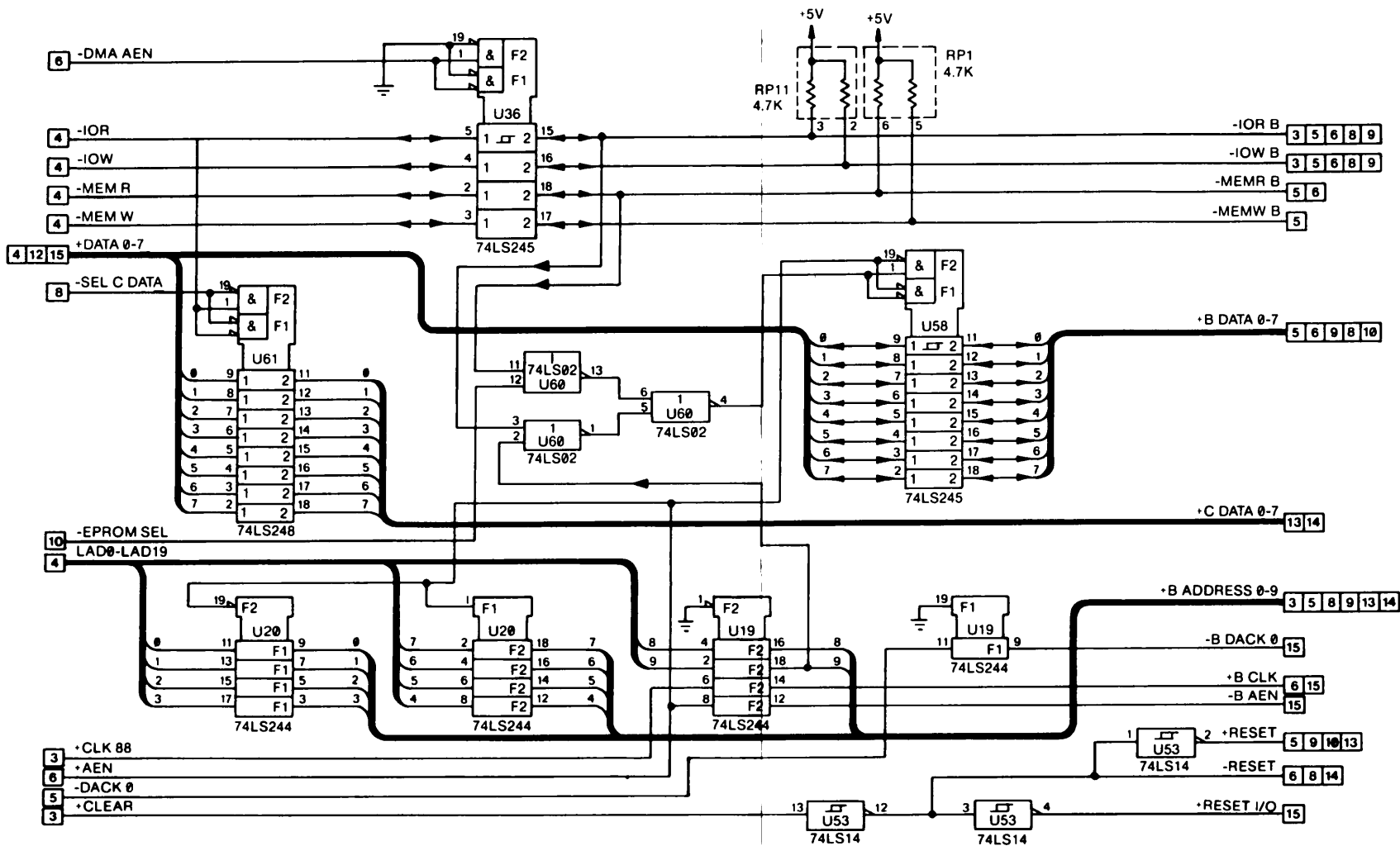
Main Processor Board (5 of 15)

CONNECTION AND LOGIC DIAGRAMS



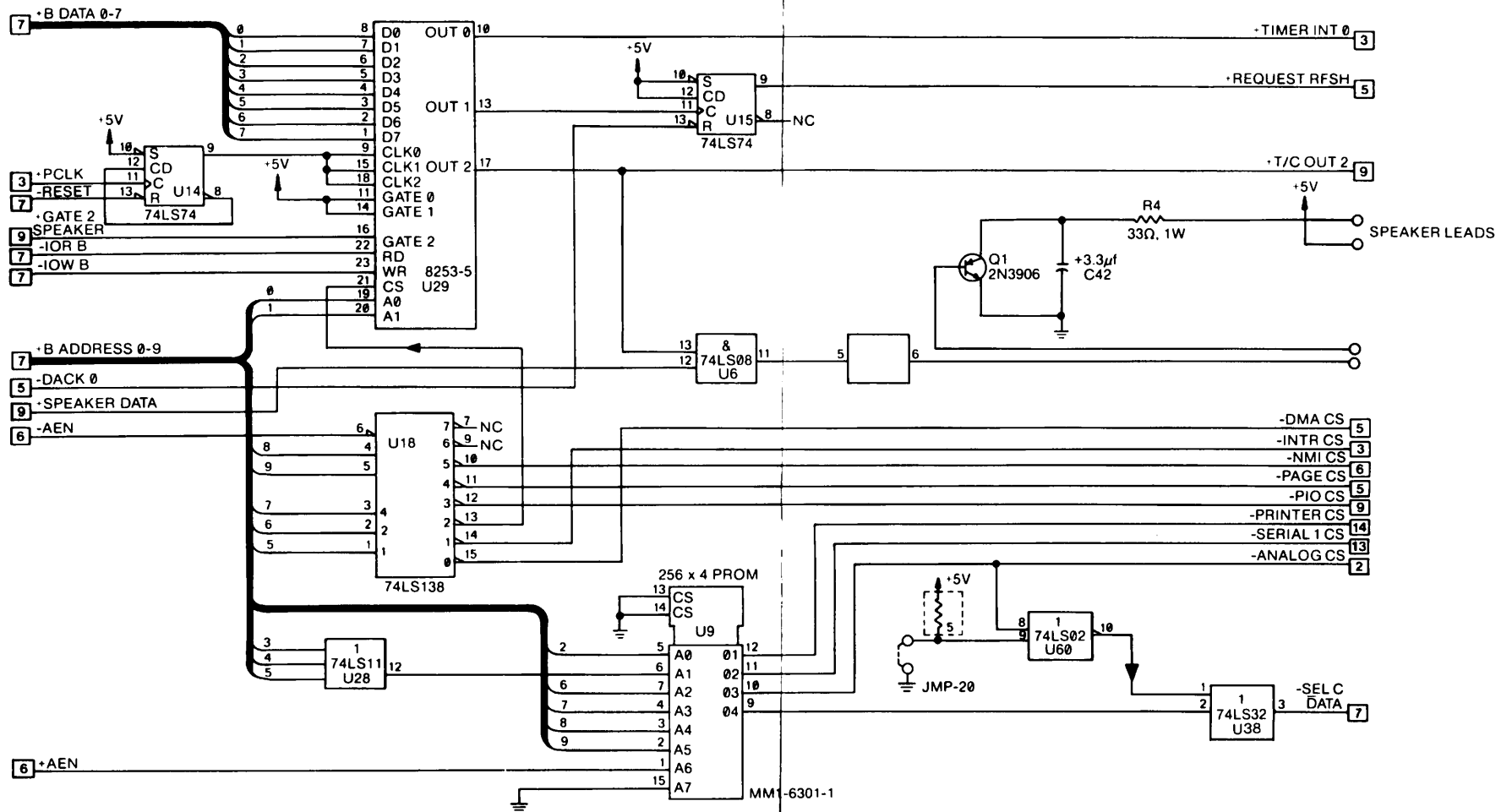
Main Processor Board (6 of 15)

CONNECTION AND LOGIC DIAGRAMS

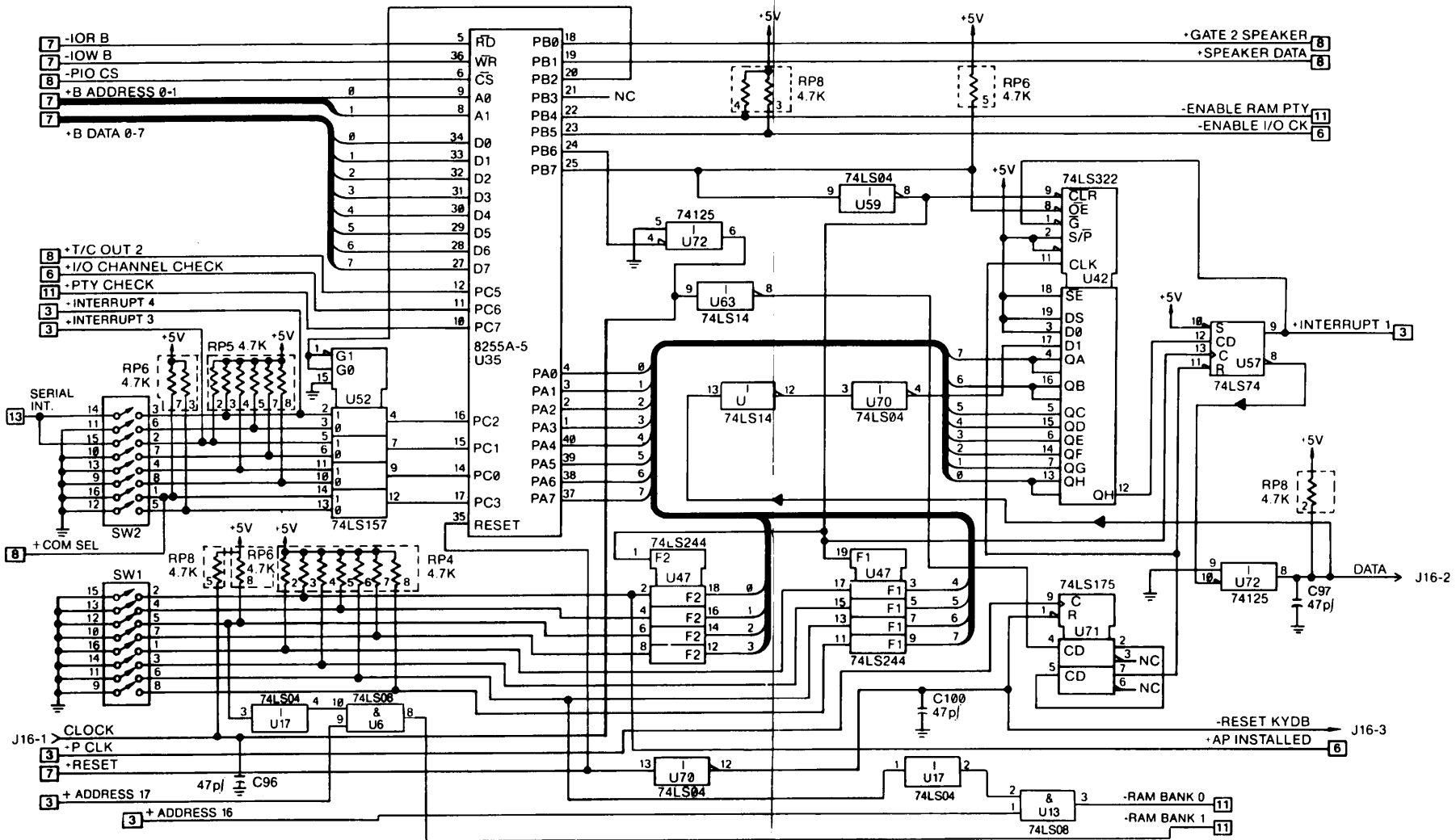


Main Processor Board (7 of 15)

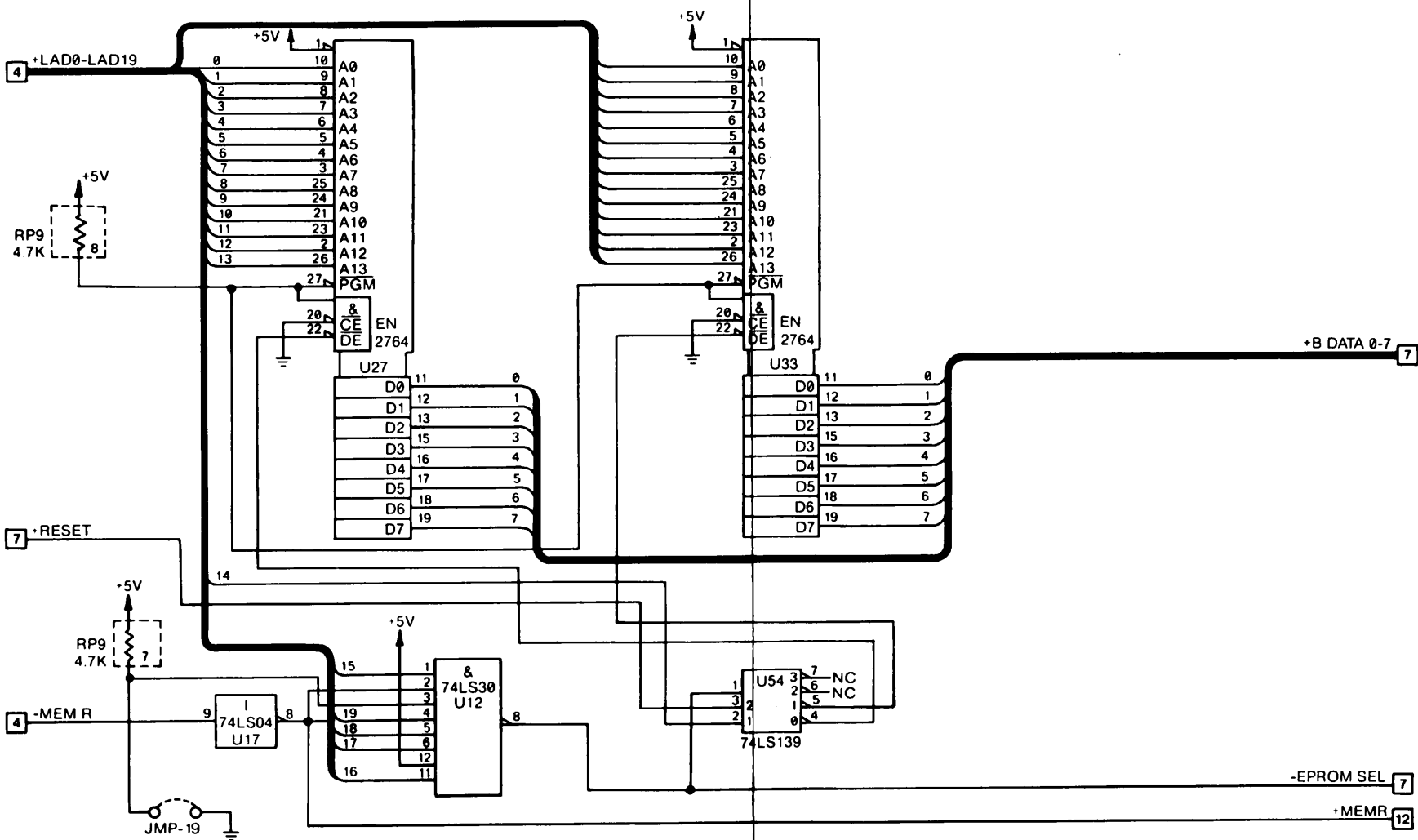
CONNECTION AND LOGIC DIAGRAMS



Main Processor Board (8 of 15)

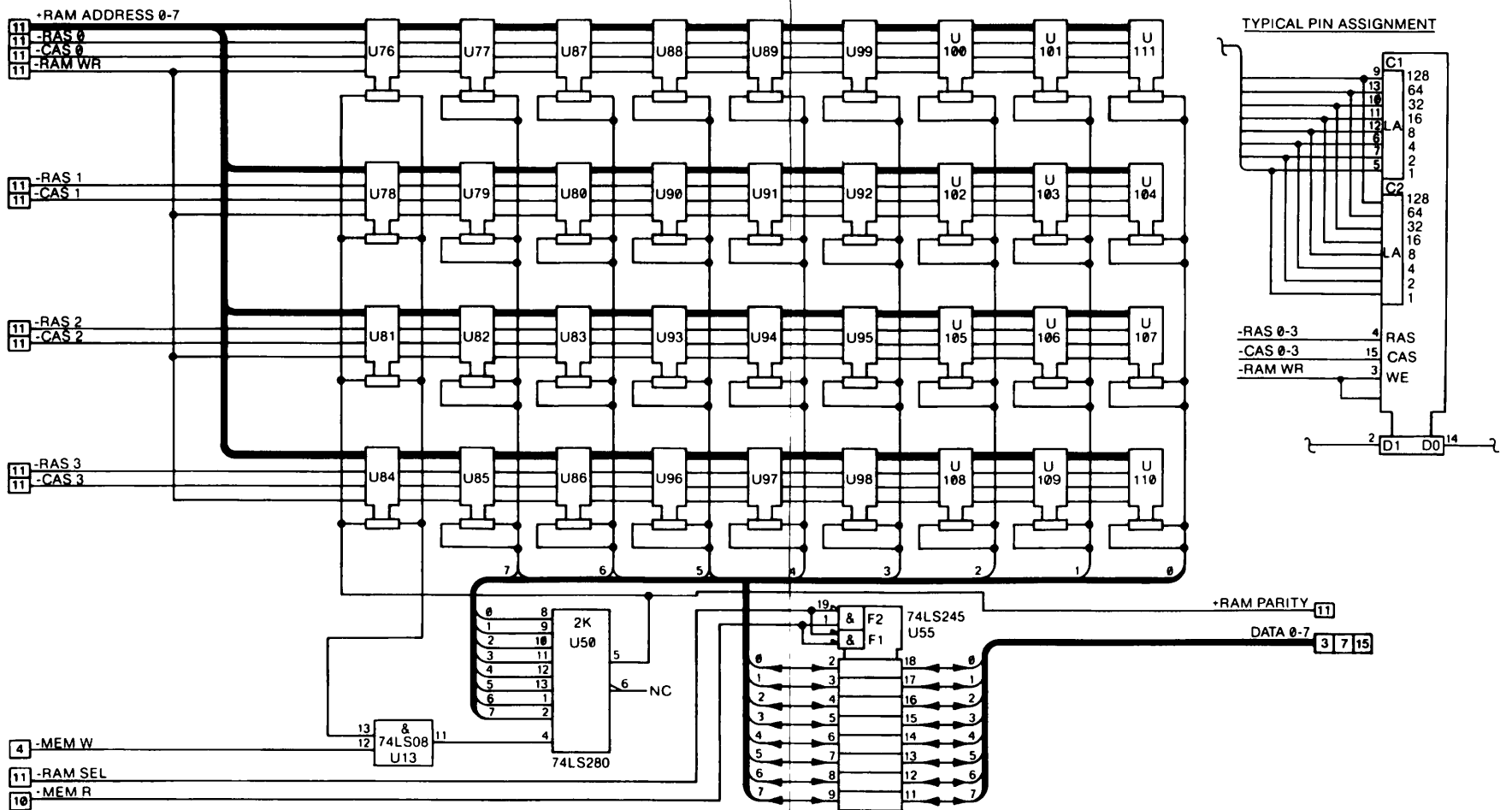


Main Processor Board (9 of 15)

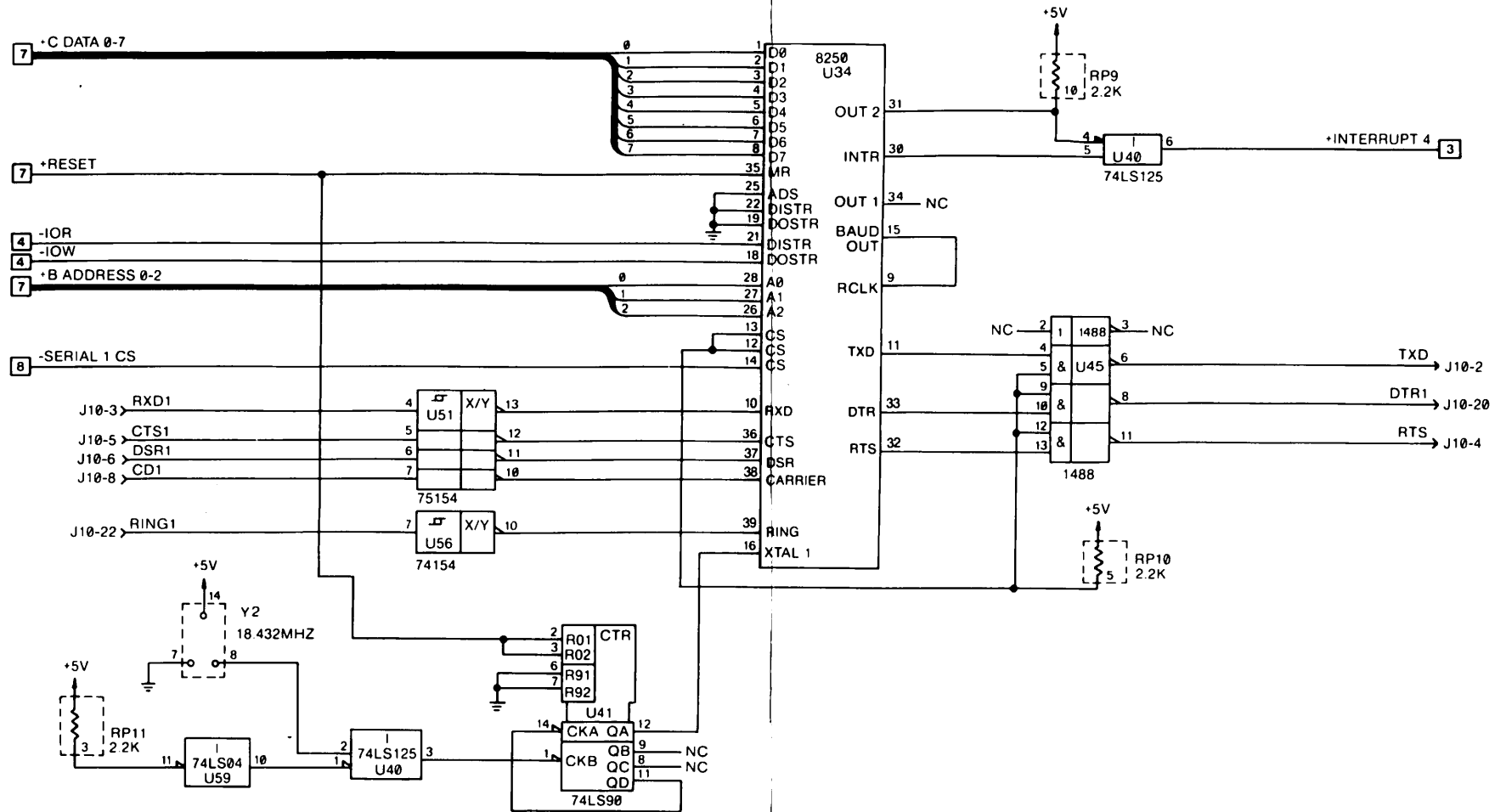


Main Processor Board (10 of 15)

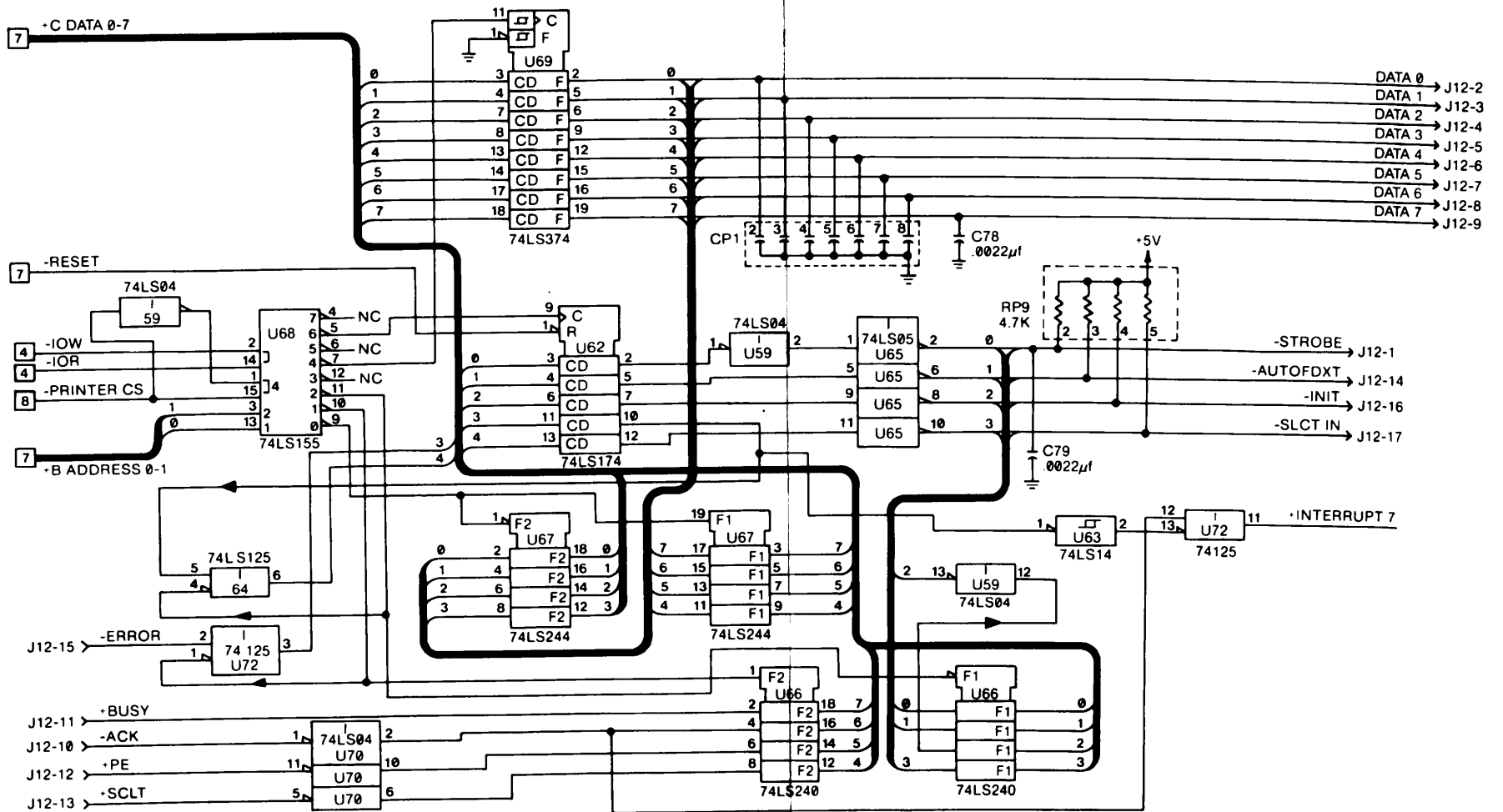
CONNECTION AND LOGIC DIAGRAMS



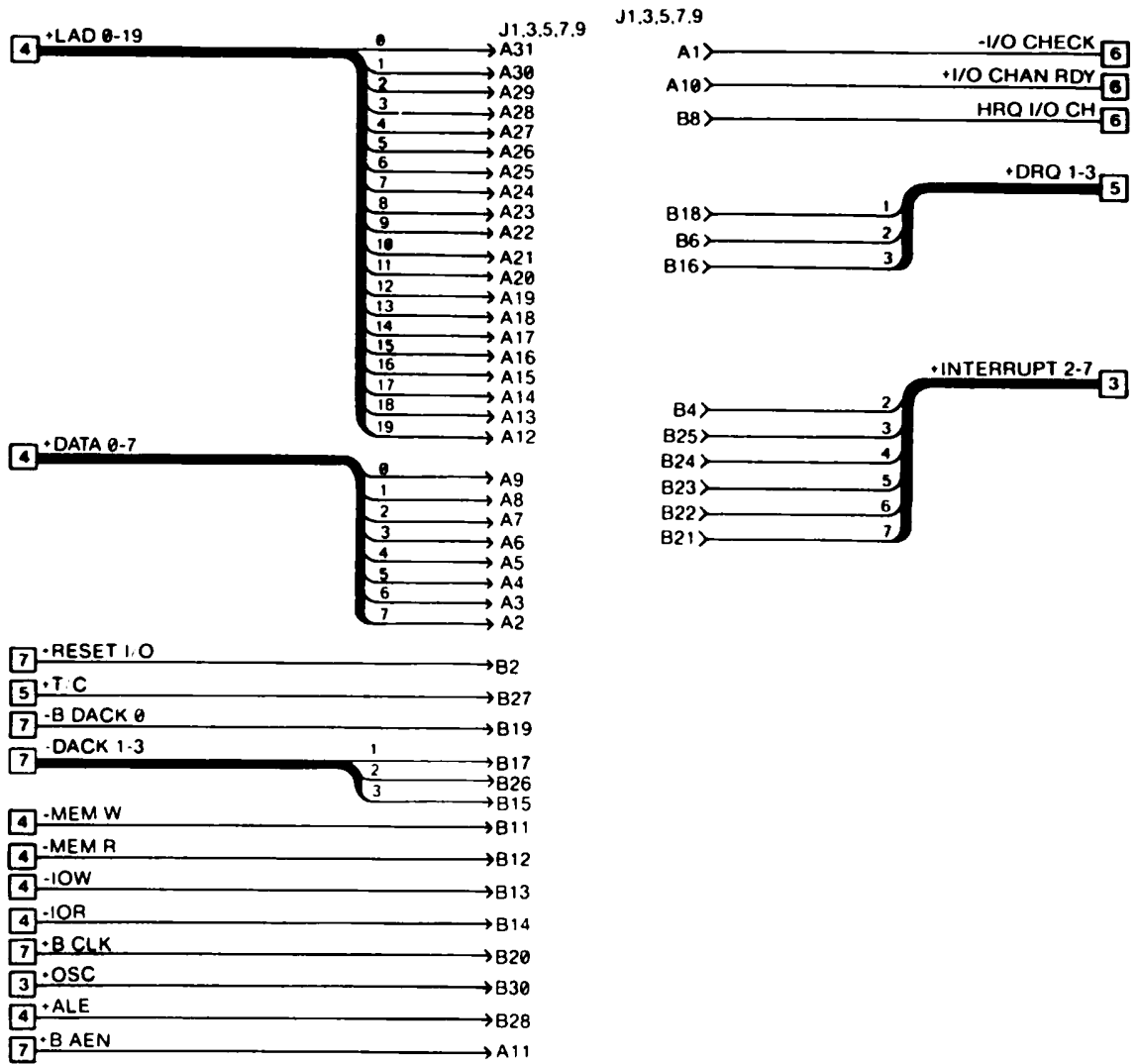
Main Processor Board (12 of 15)



CONNECTION AND LOGIC DIAGRAMS

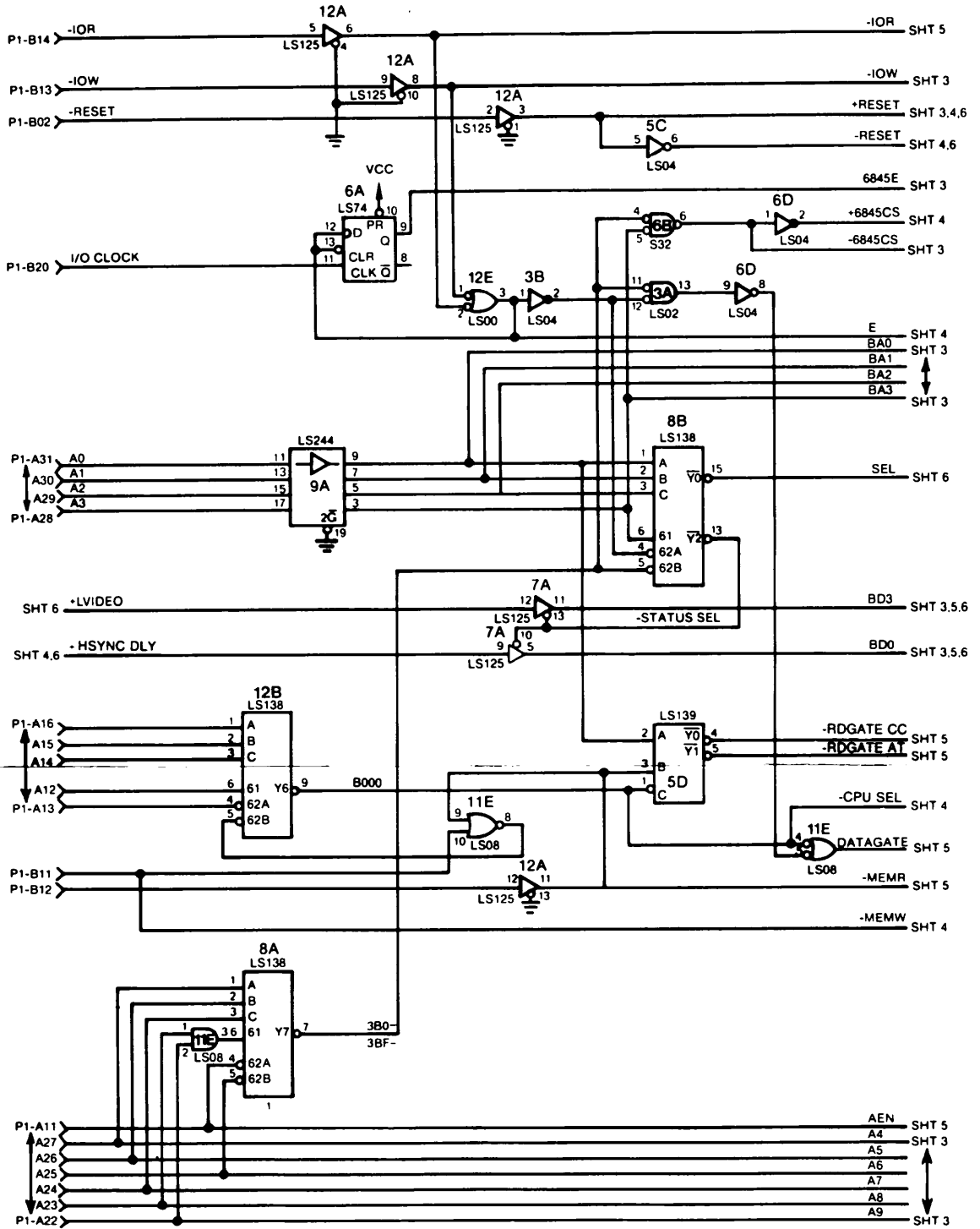


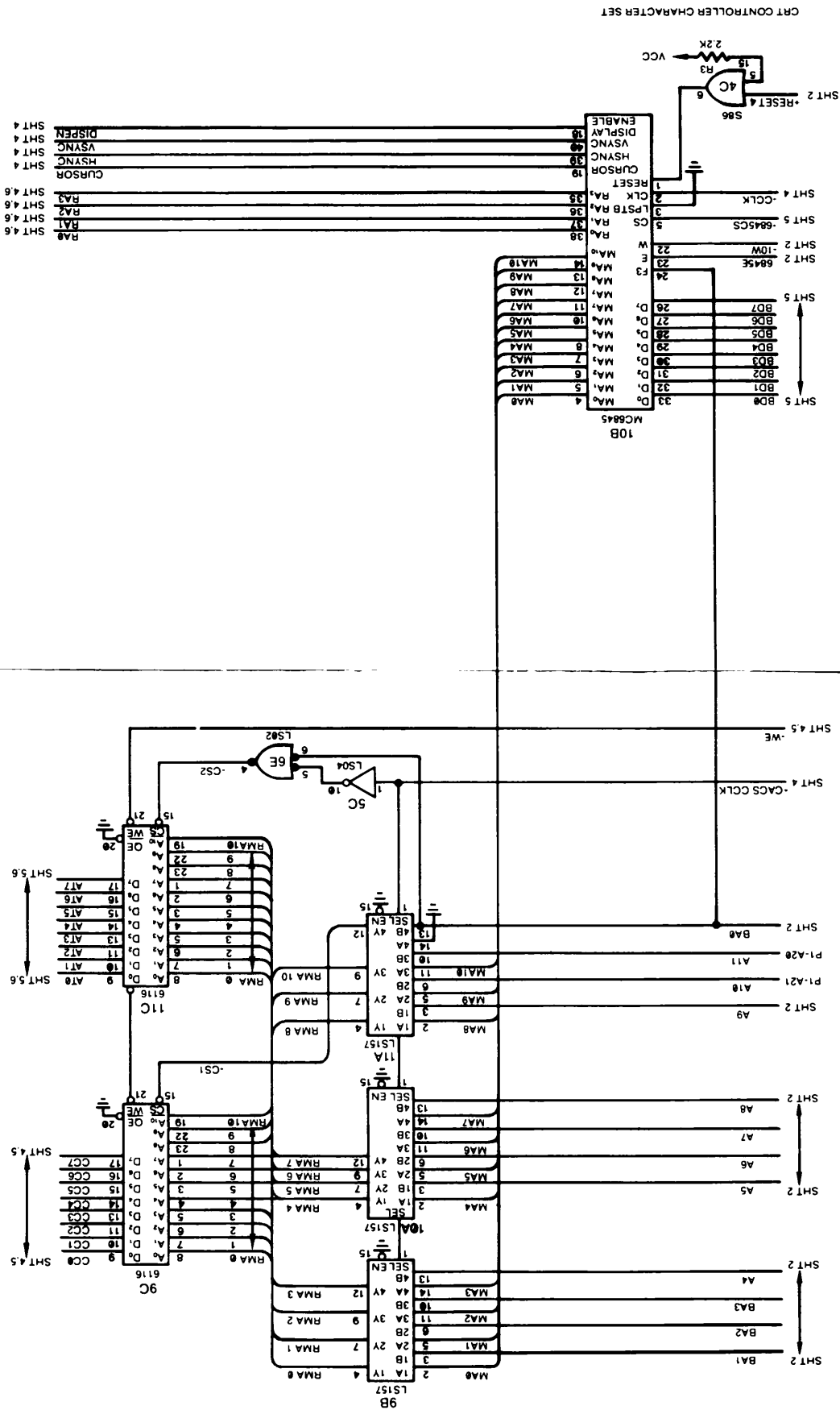
Main Processor Board (14 of 15)



Main Processor Board (15 of 15)

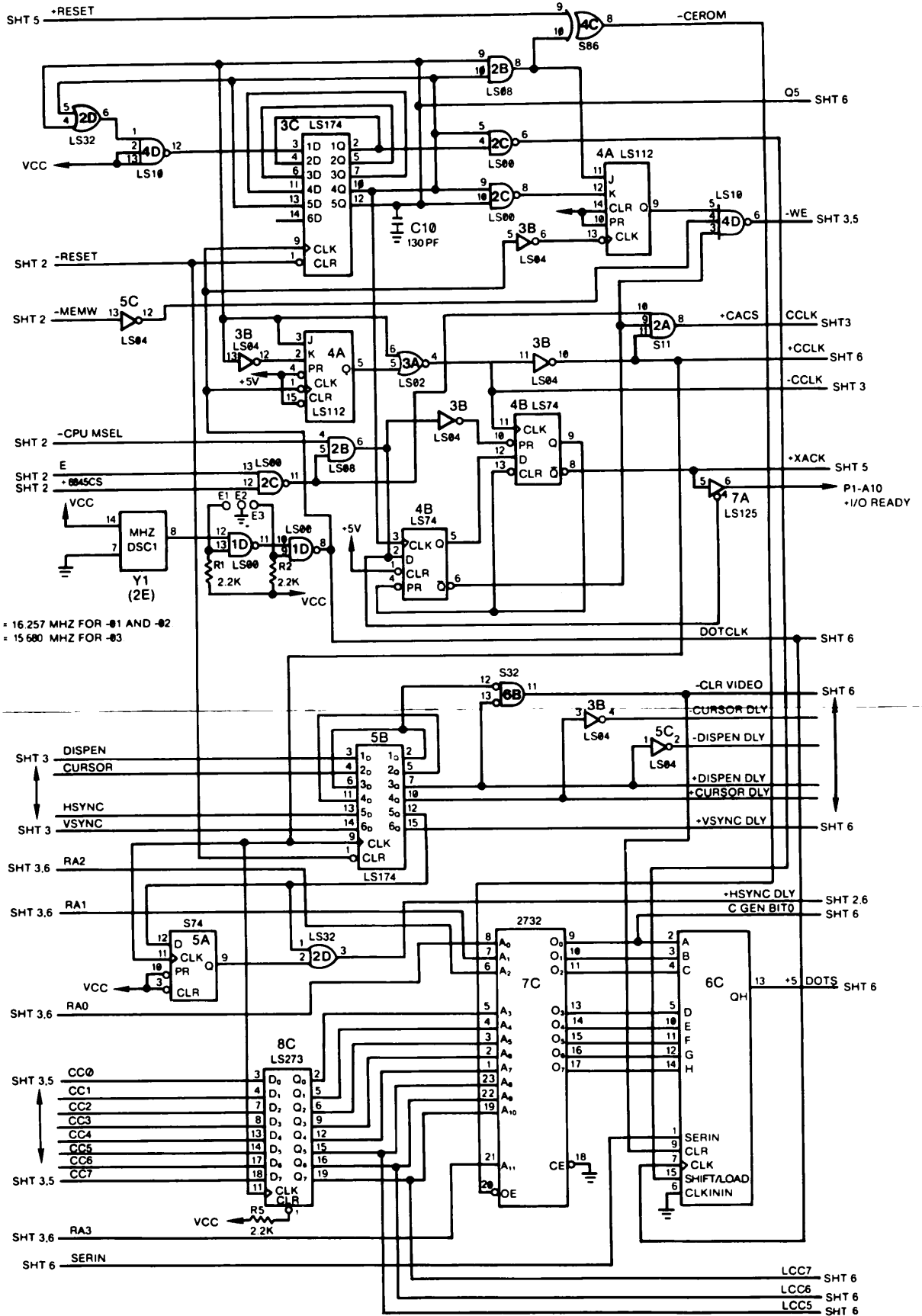
NOTE: Sheet 1 of 6 is Not Used
Monochrome Display Adapter (2 of 6)



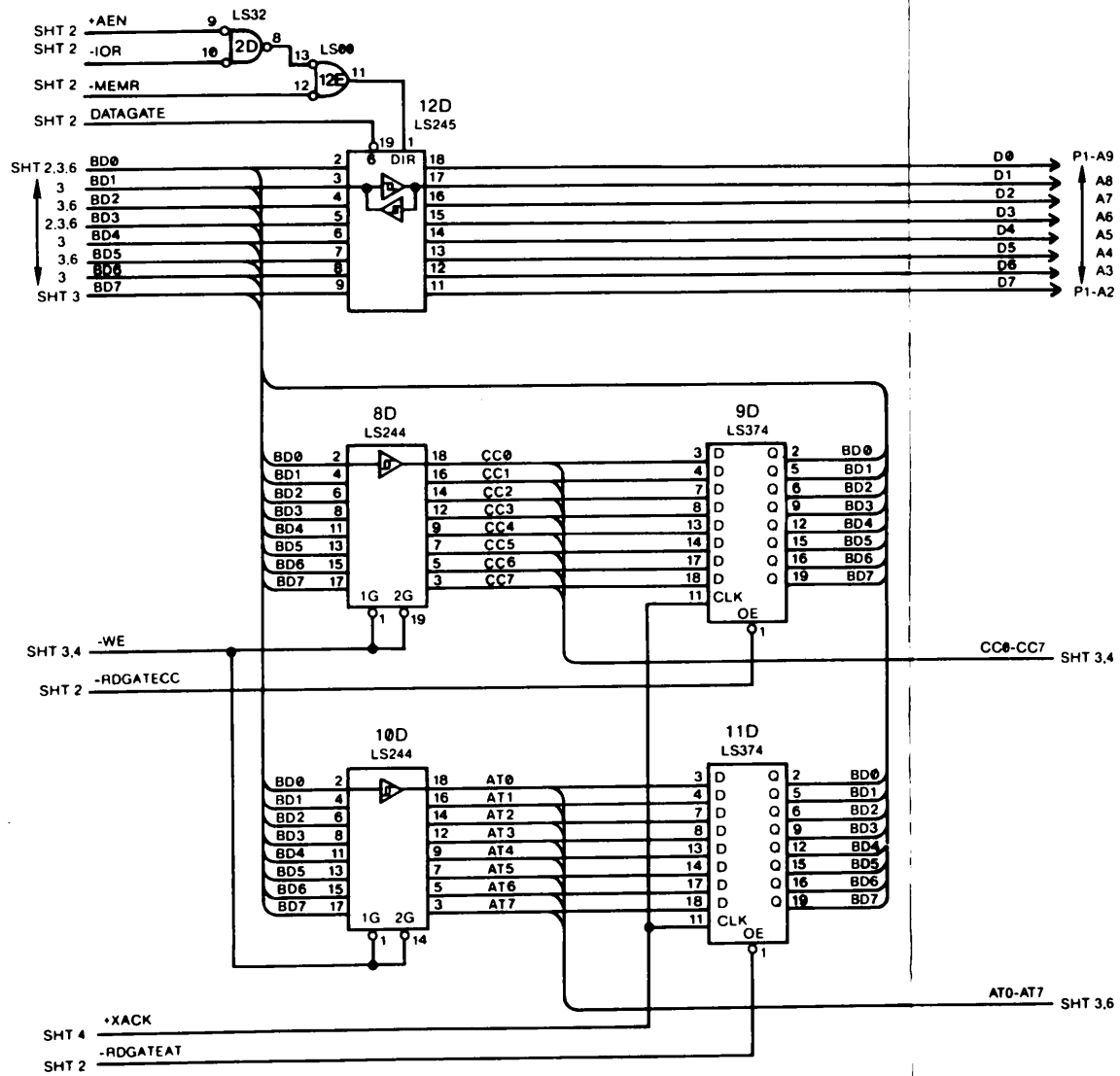


NOTE: Sheet 1 of 6 is Not Used
 Monochrome Display Adapter (3 of 6)

NOTE: Sheet 1 of 6 is Not Used



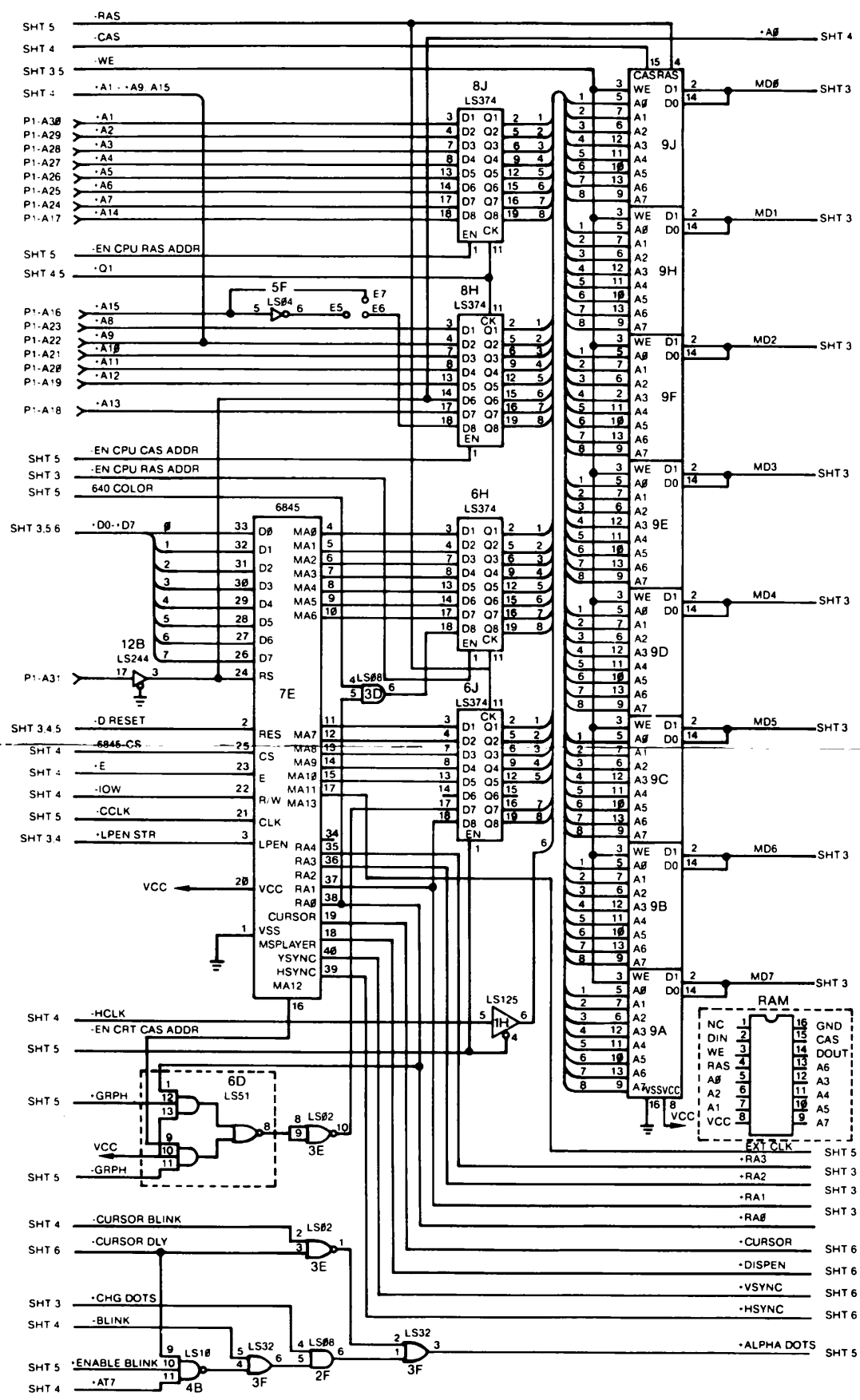
Y1 = 16 257 MHZ FOR -#1 AND -#2
Y1 = 15 680 MHZ FOR -#3



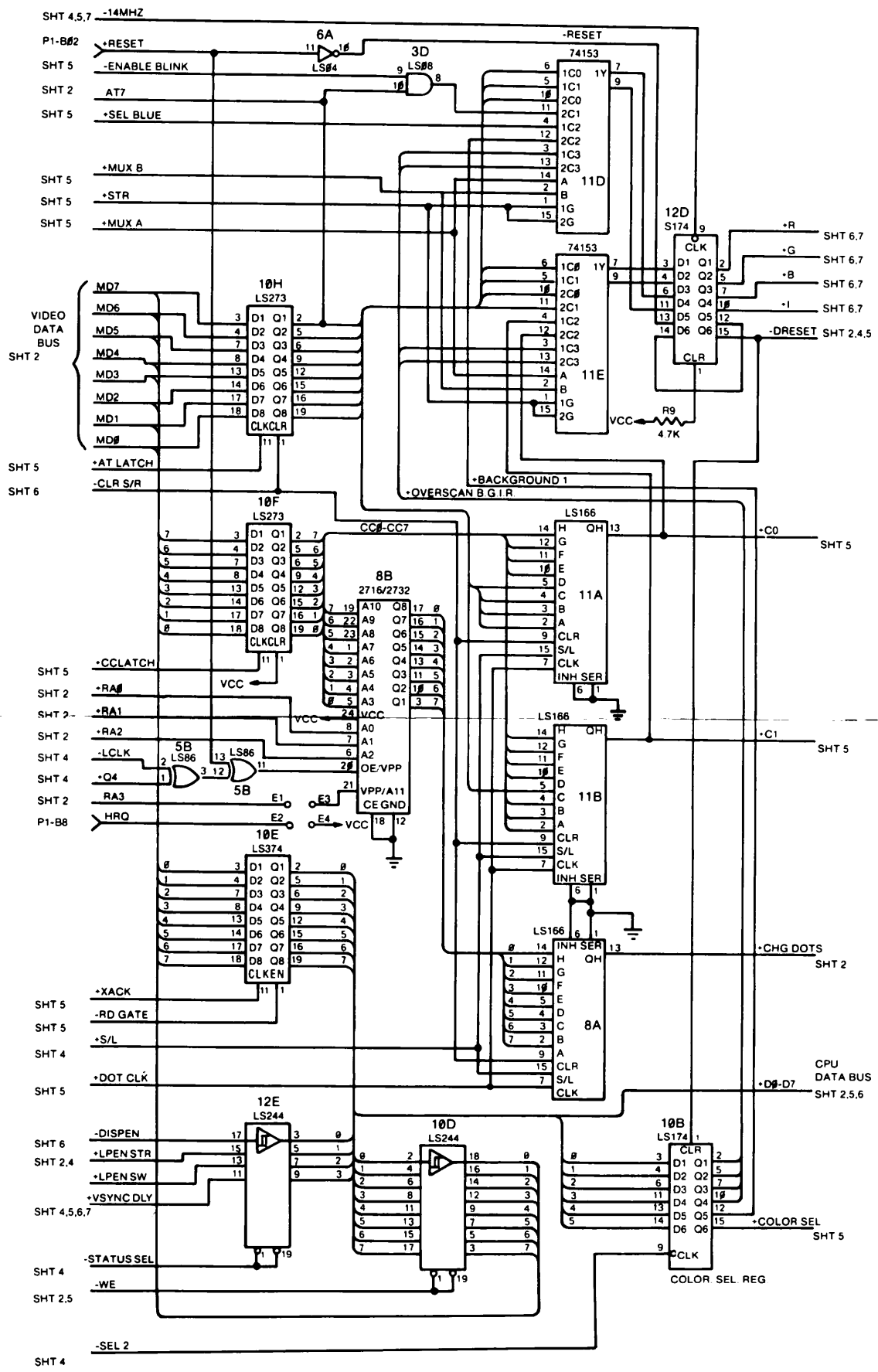
NOTE: Sheet 1 of 6 Is Not Used

Monochrome Display Adapter (5 of 6)

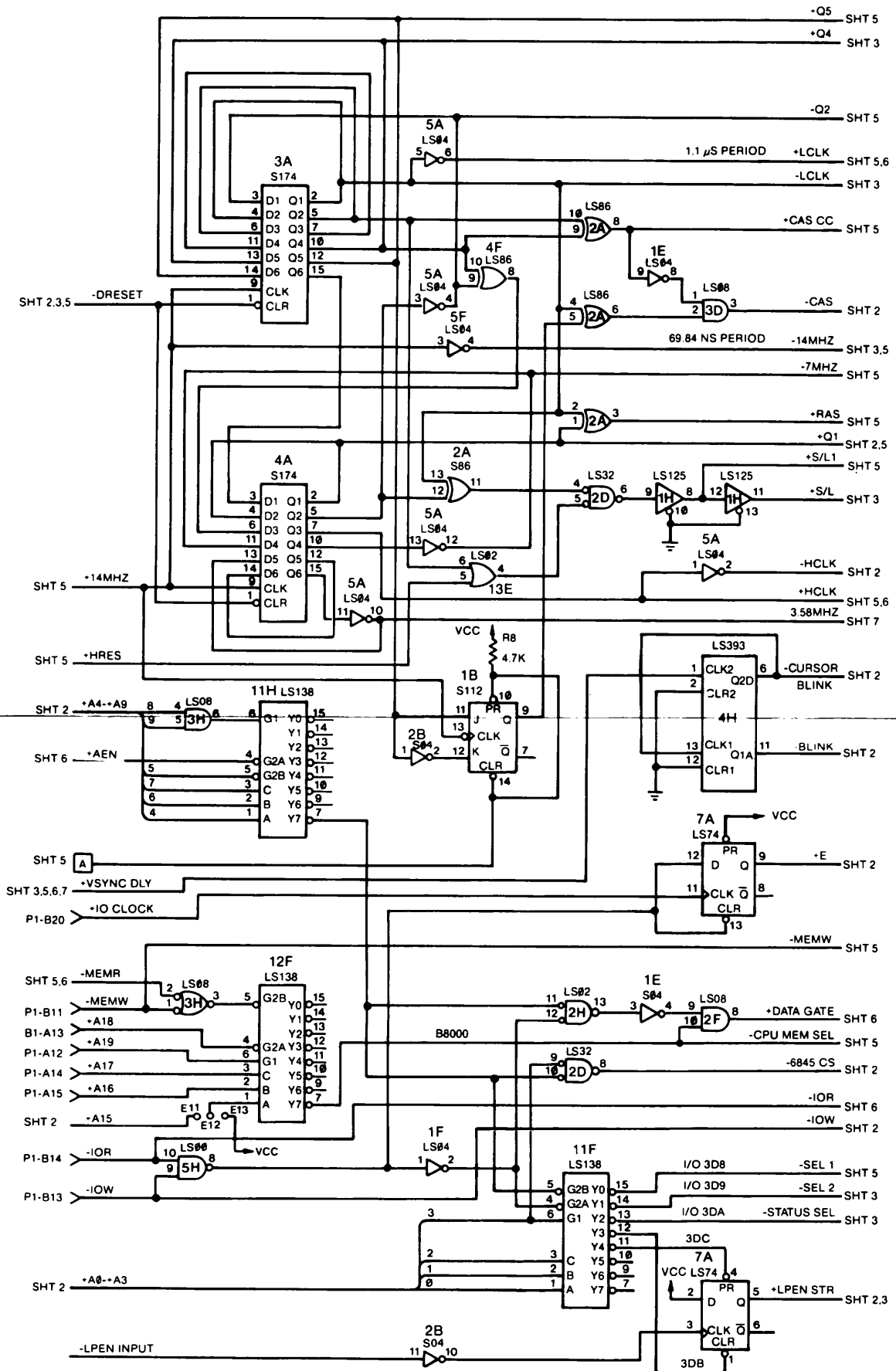
NOTE: Sheet 1 of 7 is Not Used
Display Adapter — Color (2 of 7)



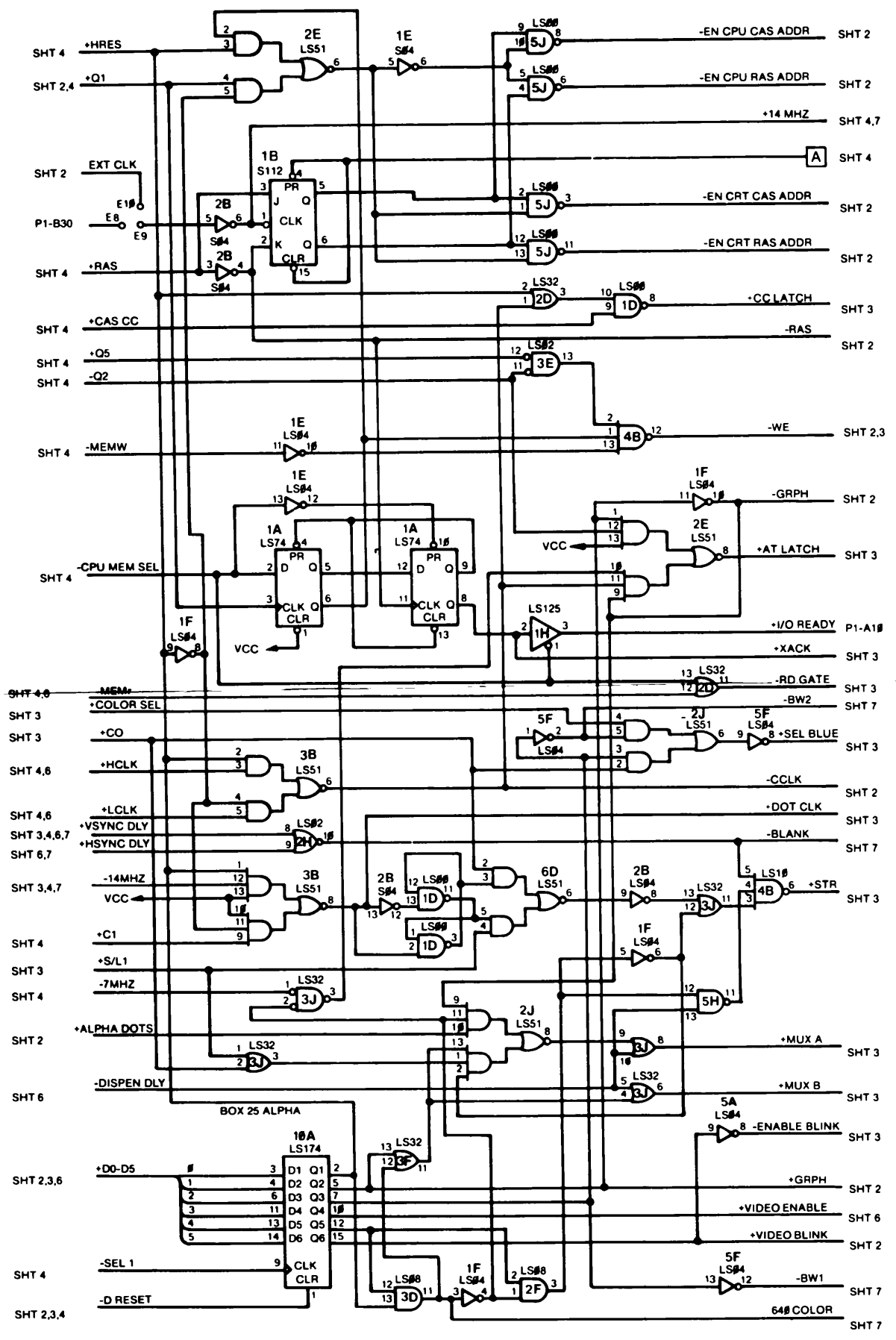
NOTE: Sheet 1 of 7 is Not Used
Display Adapter — Color (3 of 7)



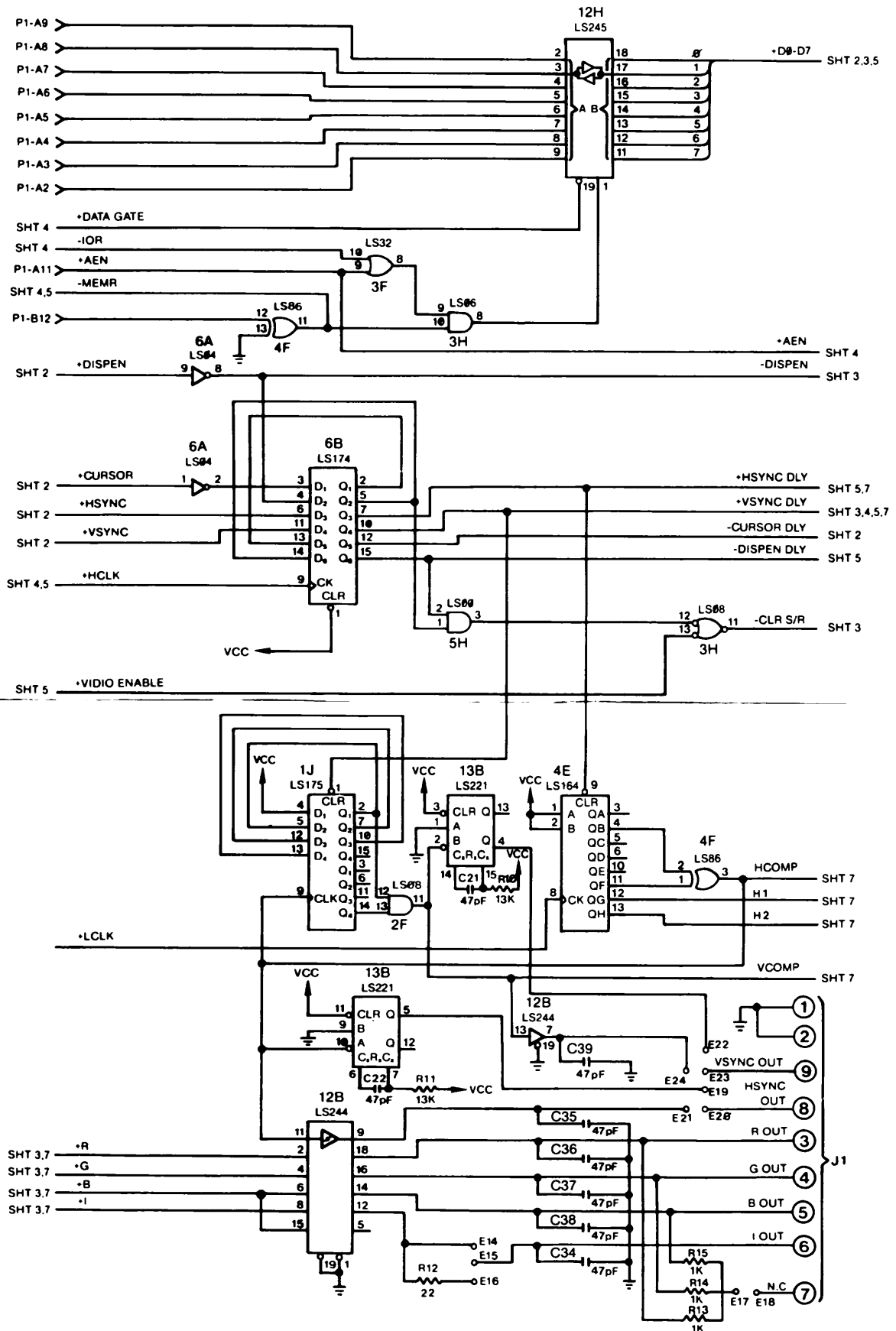
NOTE: Sheet 1 of 7 is Not Used
Display Adapter — Color (4 of 7)



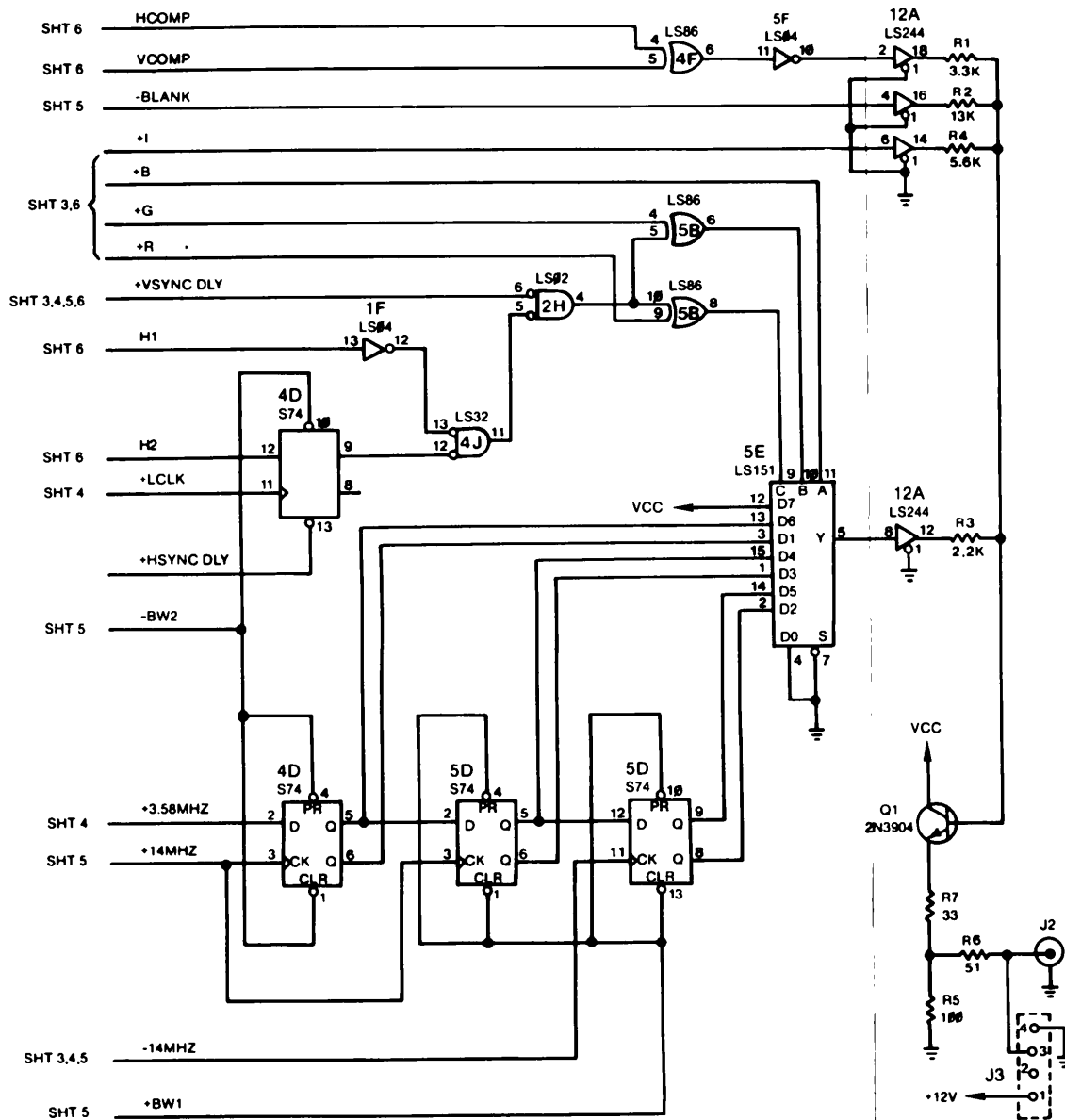
NOTE: Sheet 1 of 7 is Not Used
Display Adapter — Color (5 of 7)



NOTE: Sheet 1 of 7 is Not Used
Display Adapter — Color (6 of 7)

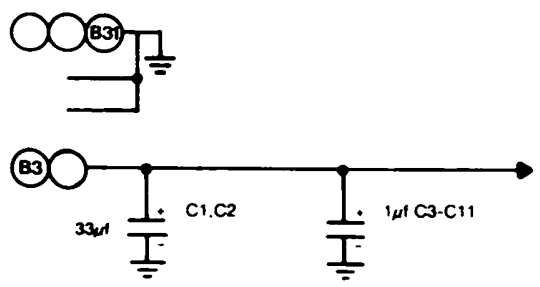
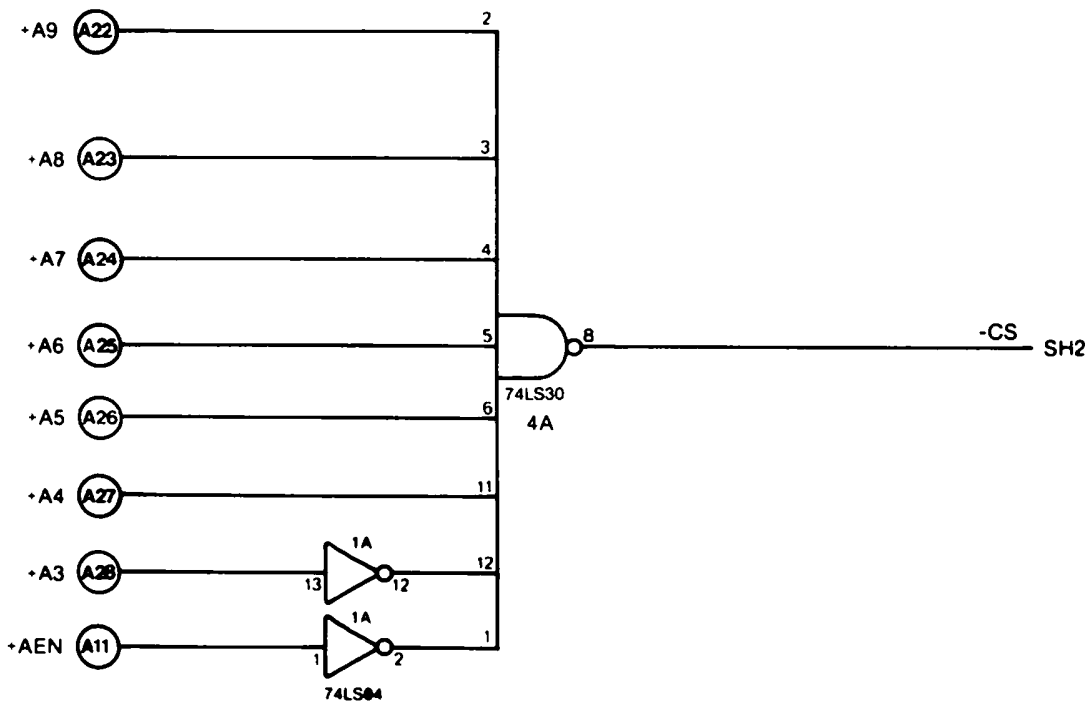
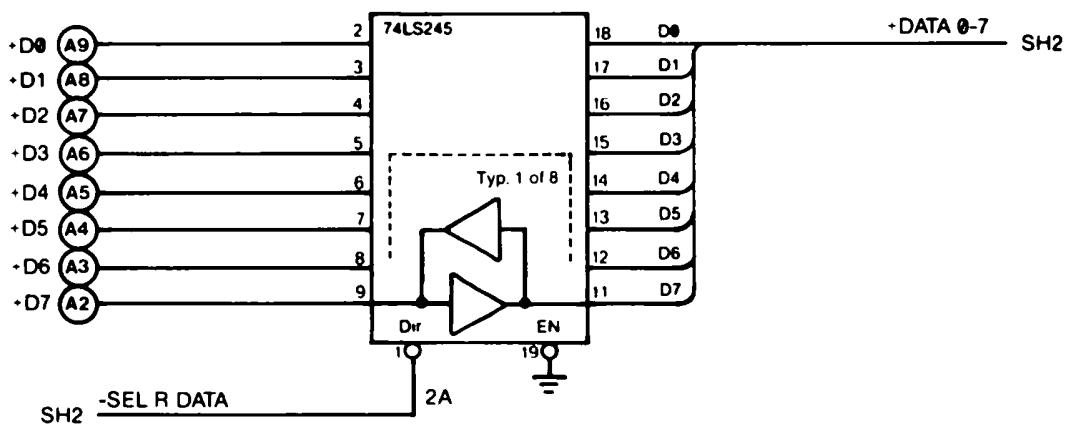


CONNECTION AND LOGIC DIAGRAMS

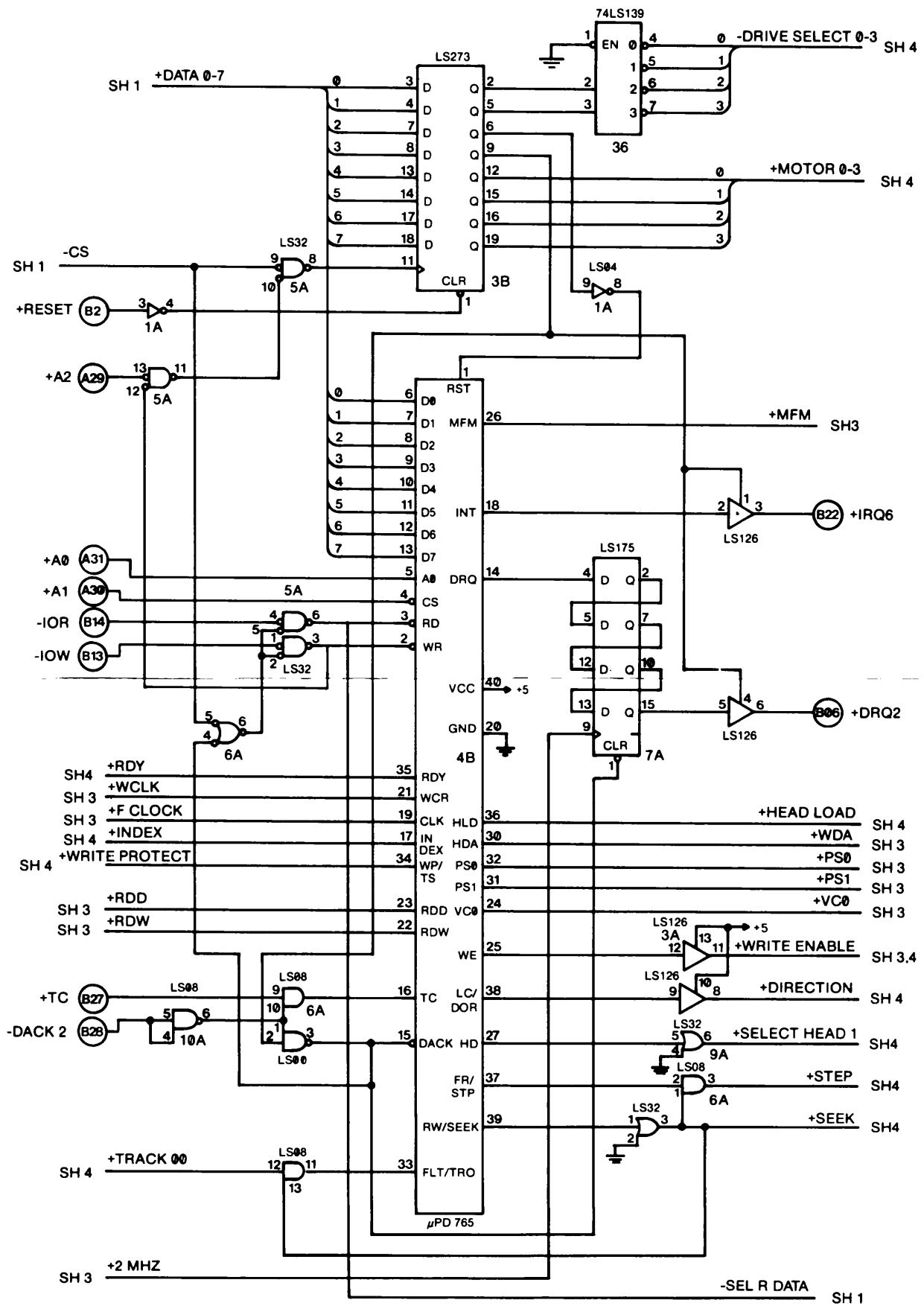


NOTE: Sheet 1 of 7 Is Not Used

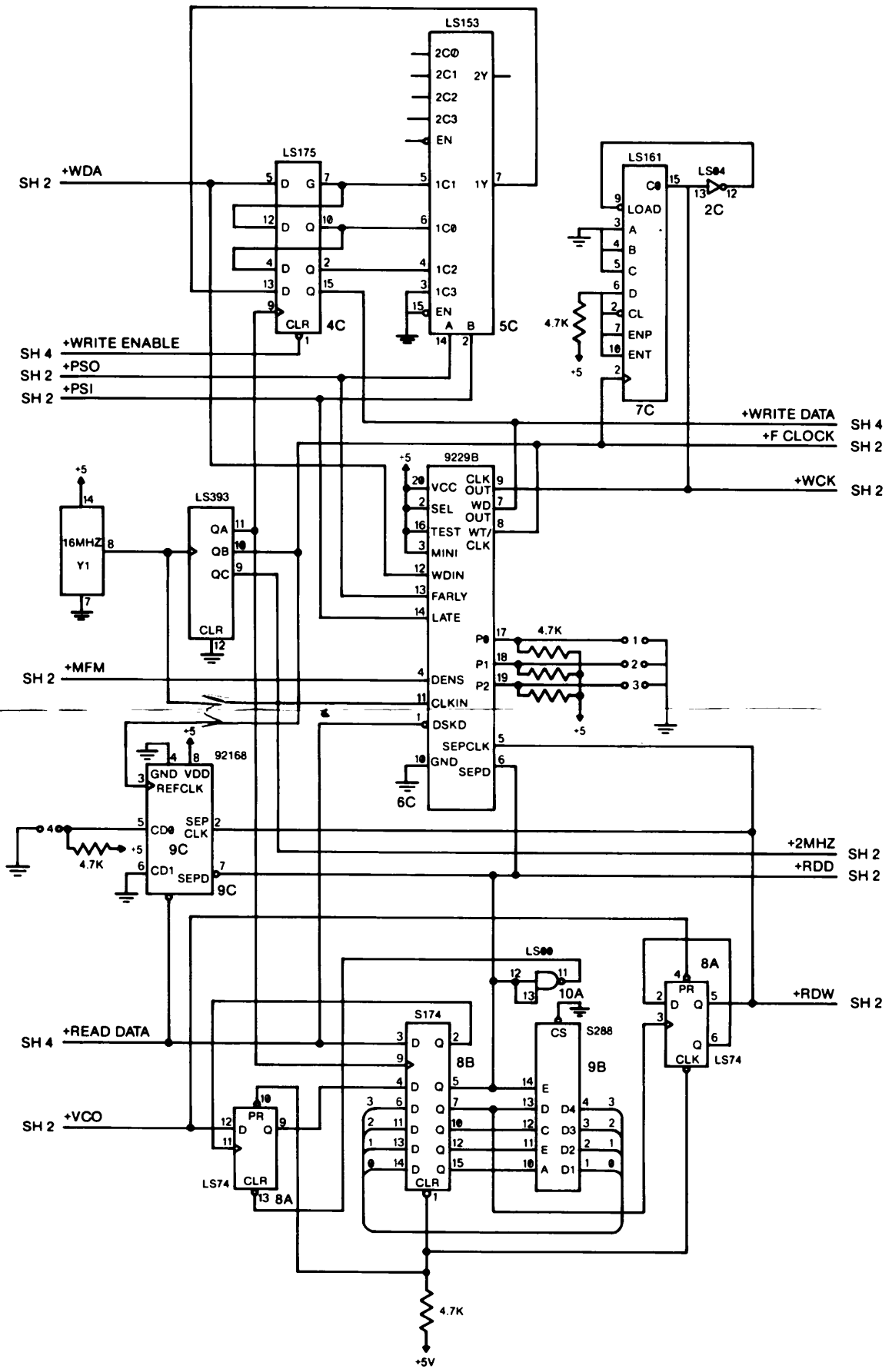
Display Adapter — Color (7 of 7)

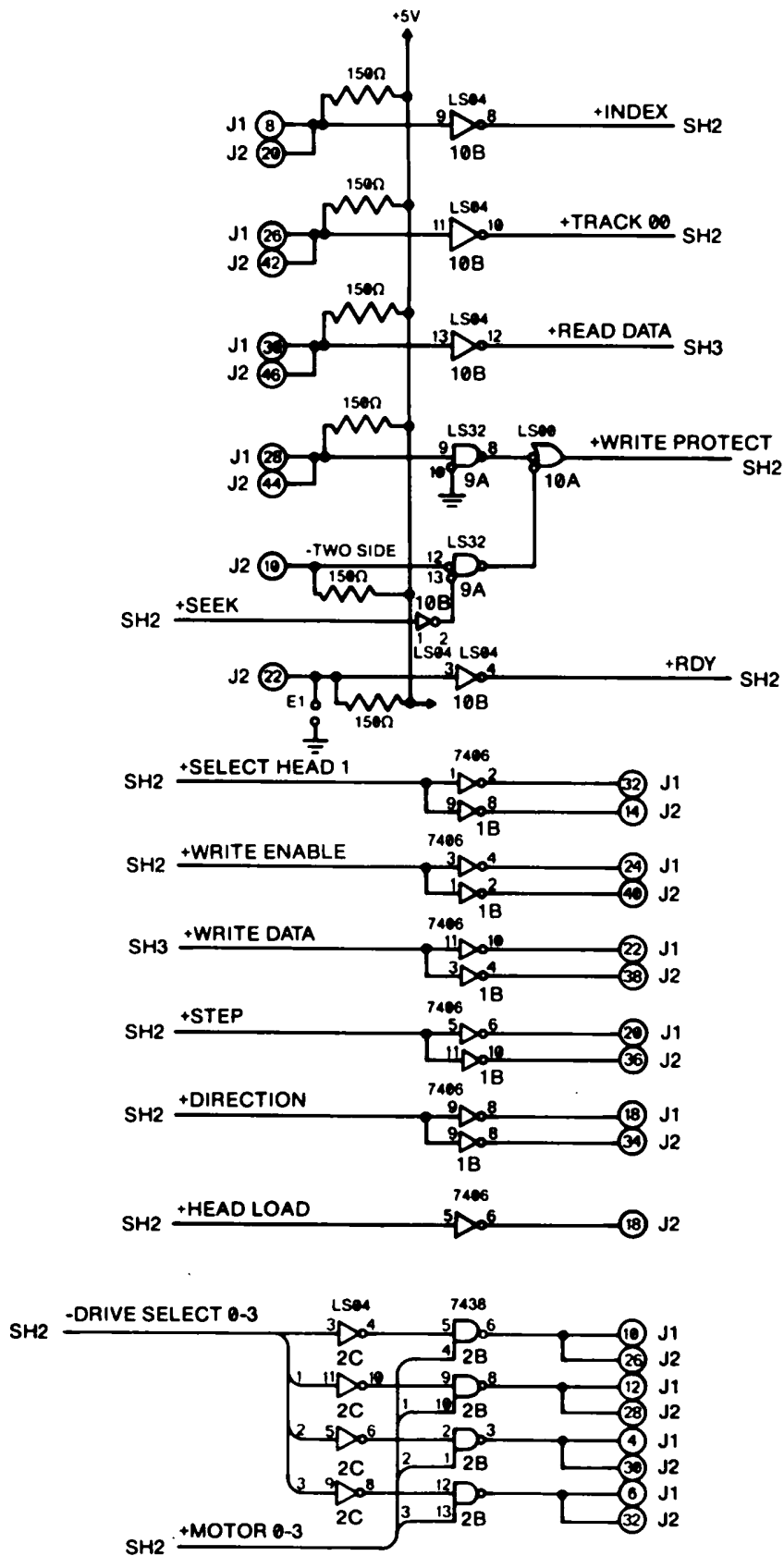


Flex Disk Drive Controller (1 of 4)



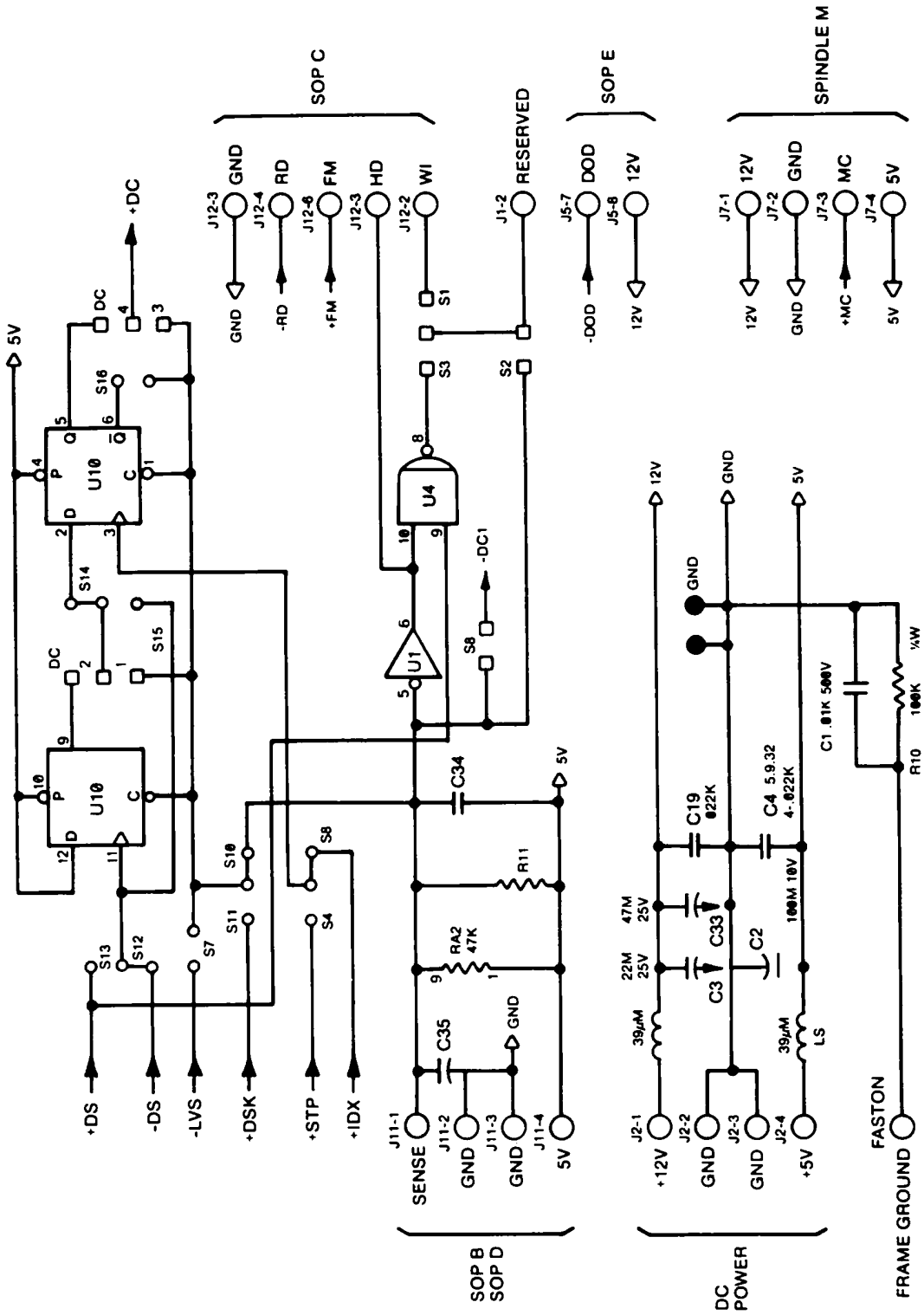
Flex Disk Drive Controller (3 of 4)





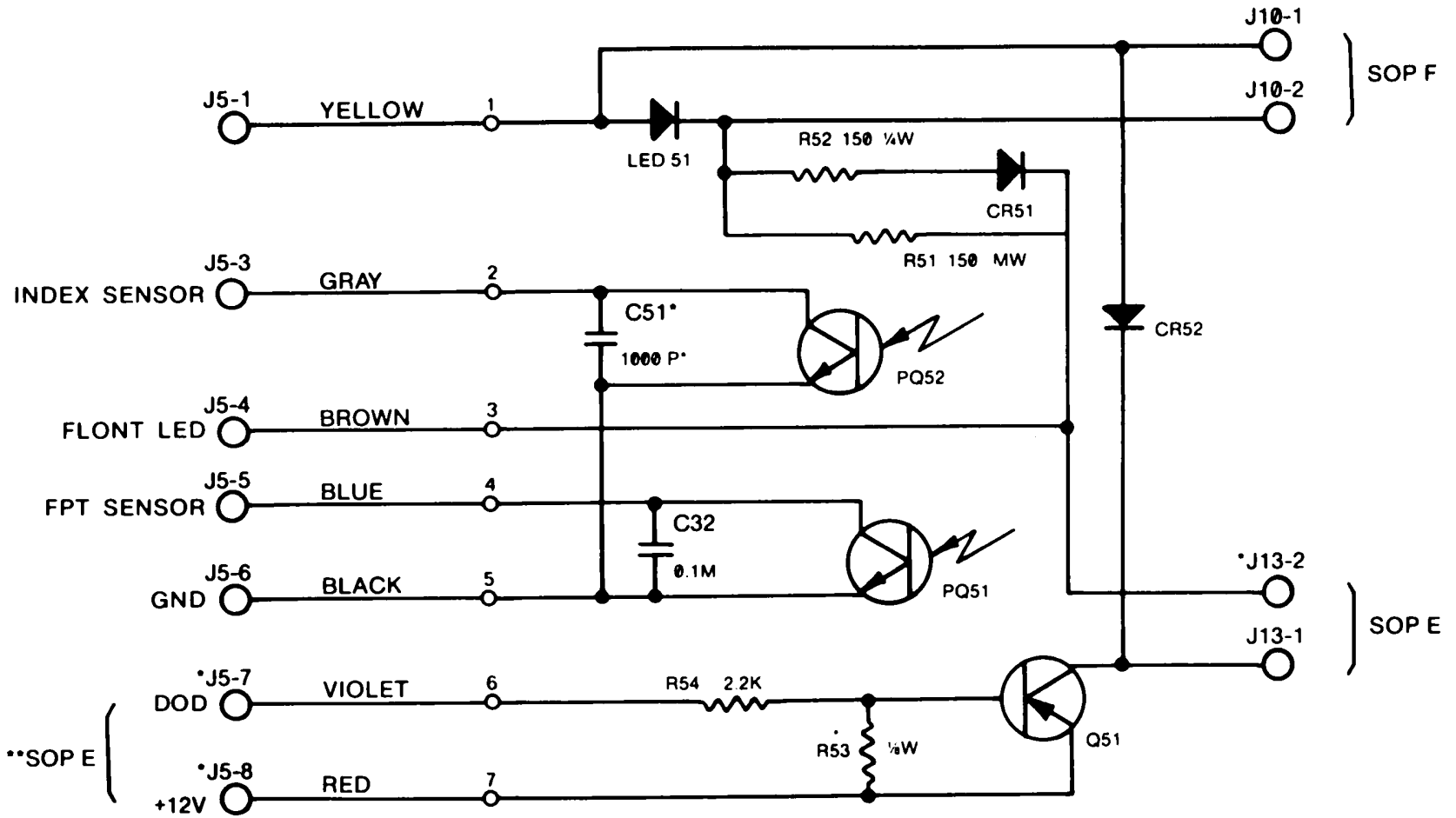
Note: J1 is a 34 pin connector. All odd pins are grounded.
 J2 is a 50 pin connector. All odd pins are grounded.

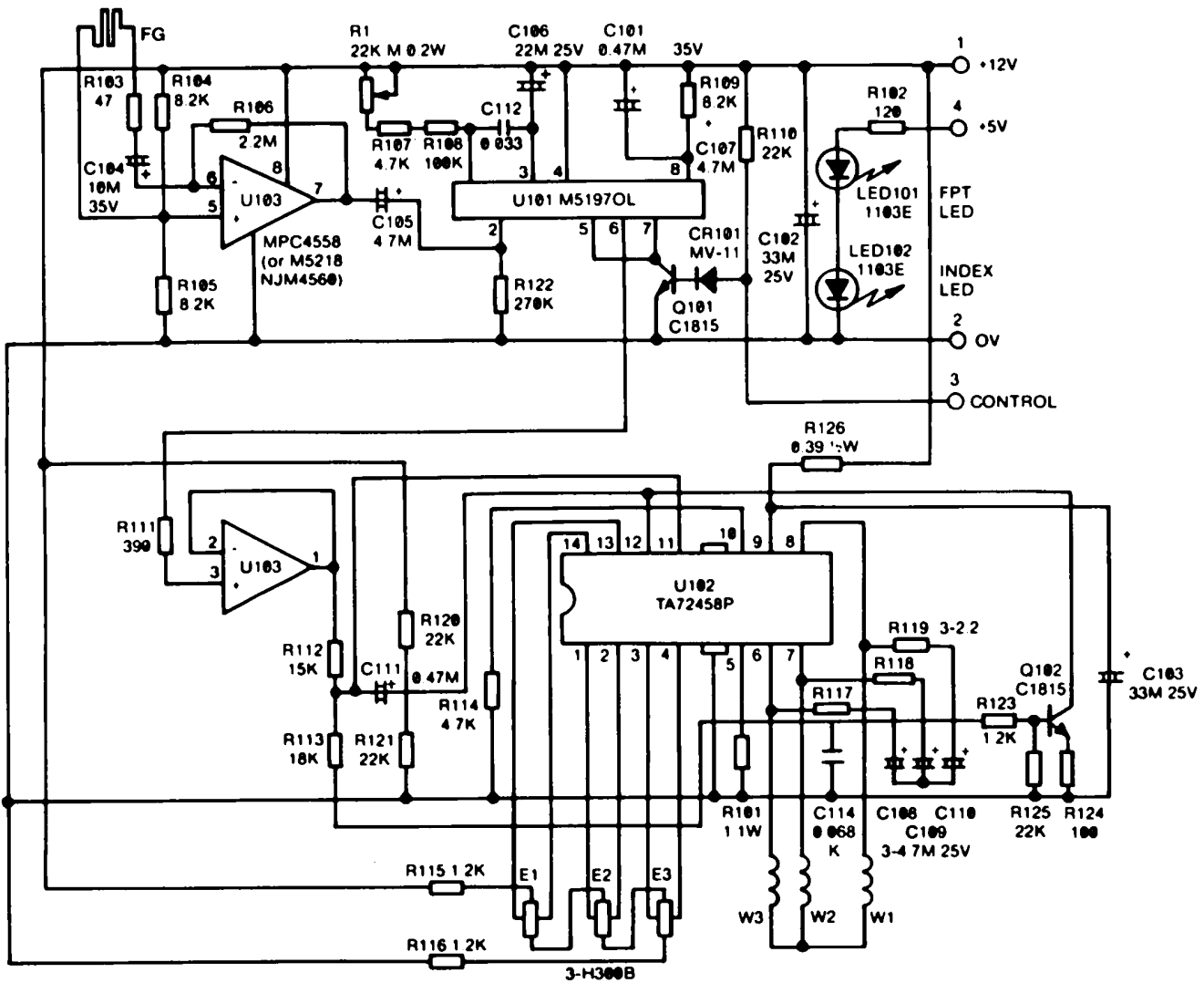
Flex Disk Drive Controller (4 of 4)



Flex Disk Drive (1 of 8)

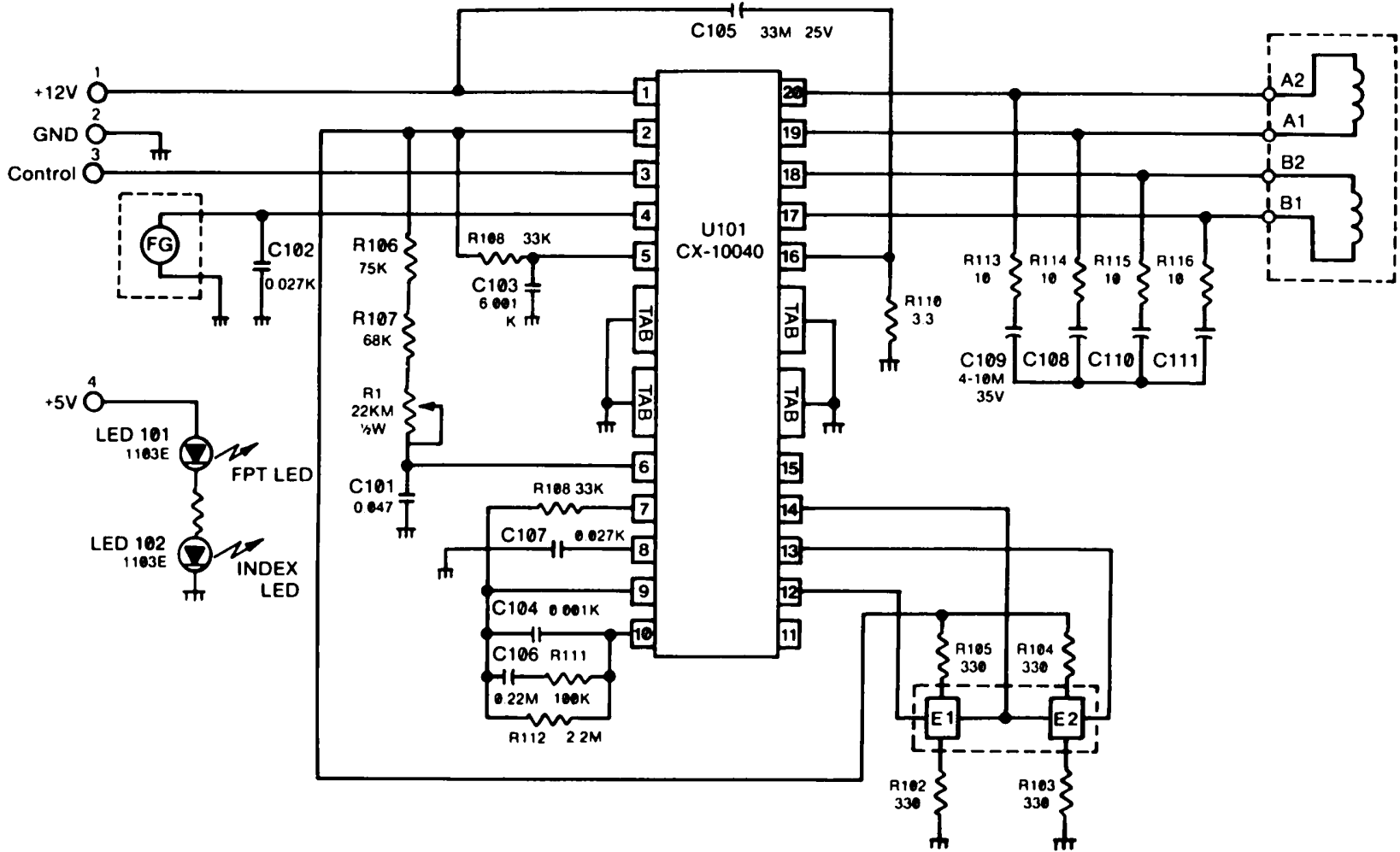
Flex Disk Drive (2 of 8)

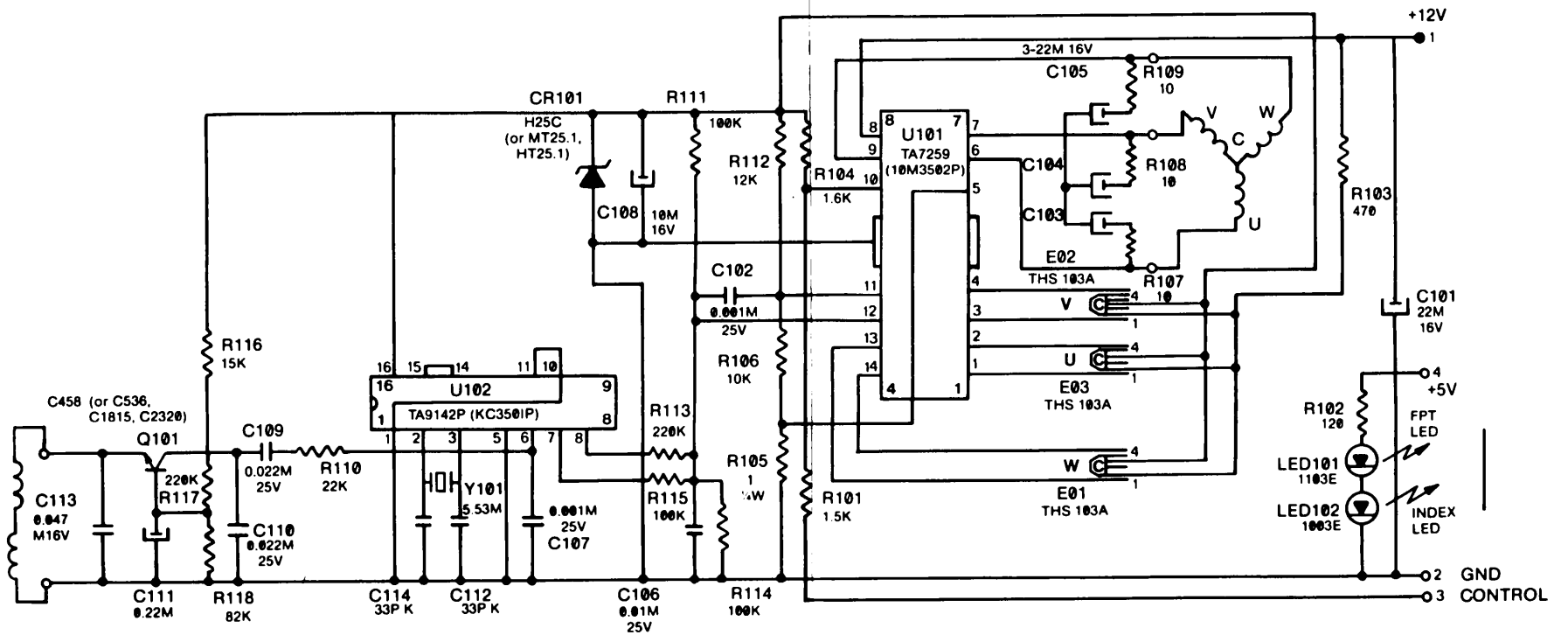




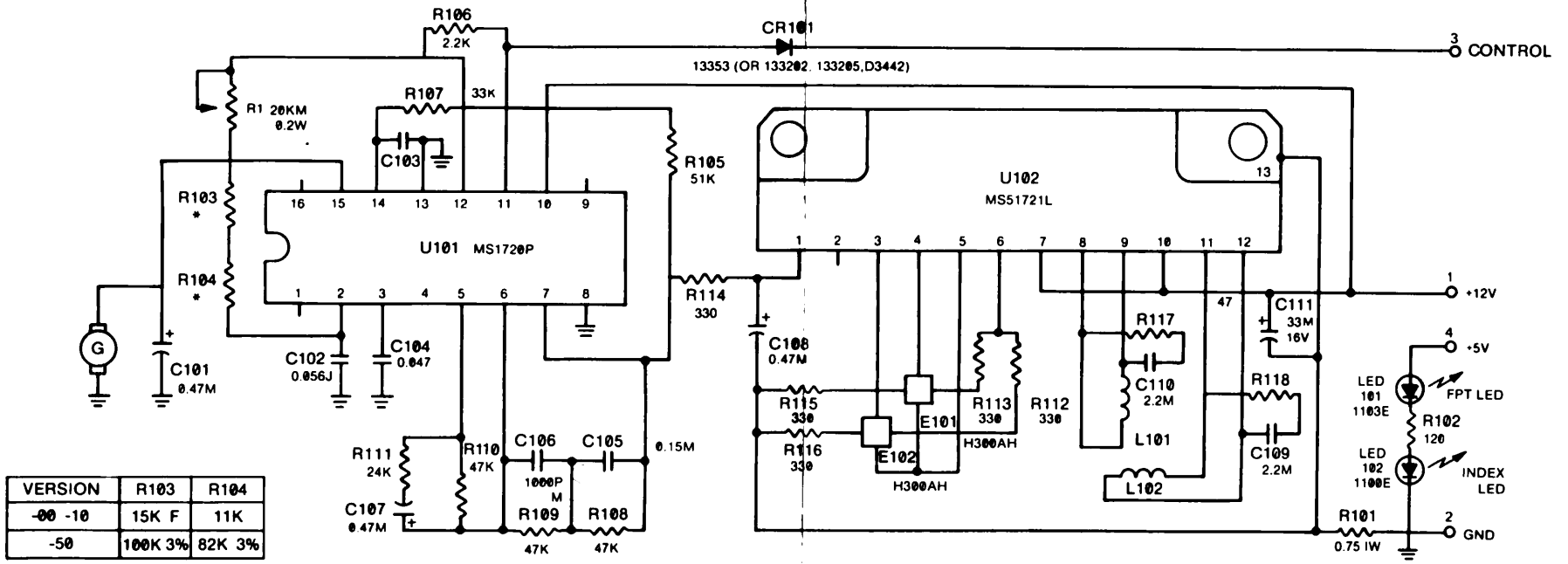
Flex Disk Drive (3 of 8)

Flex Disk Drive (4 of 8)





Flex Disk Drive (5 of 8)



CONNECTION AND LOGIC DIAGRAMS

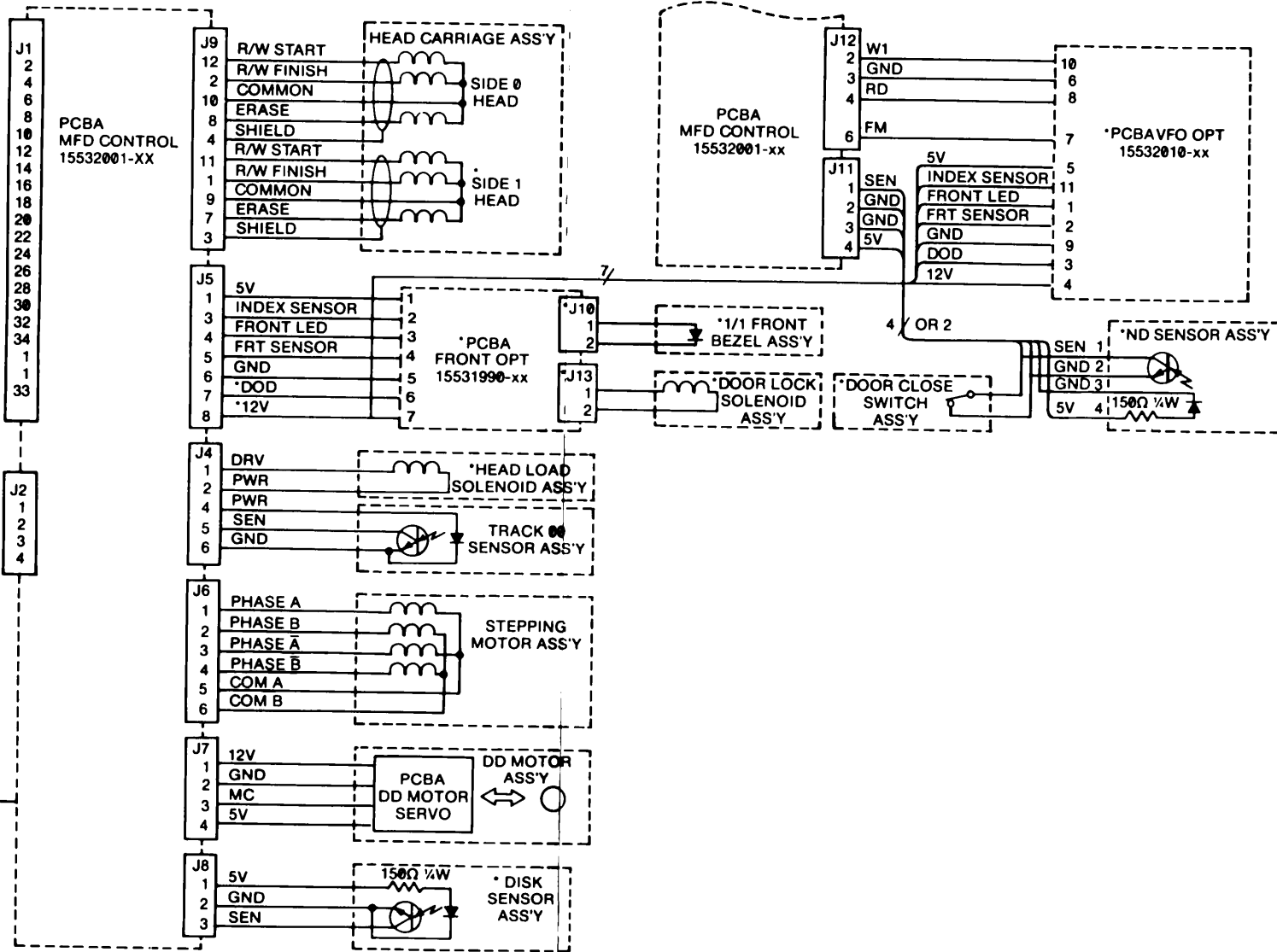
- ** RESERVED
- ** IN USE / HEAD LOAD
- ** DRIVE SELECT 3
- INDEX / SECTOR
- DRIVE SELECT 0
- DRIVE SELECT 1
- DRIVE SELECT 2
- MOTOR ON
- DIRECTION SELECT
- STEP
- WRITE DATA
- WRITE GATE
- TRACK 00
- WRITE PROTECT
- READ DATA
- SIDE ONE SELECT
- ** READY

SIGNAL GND (000 NOS.)

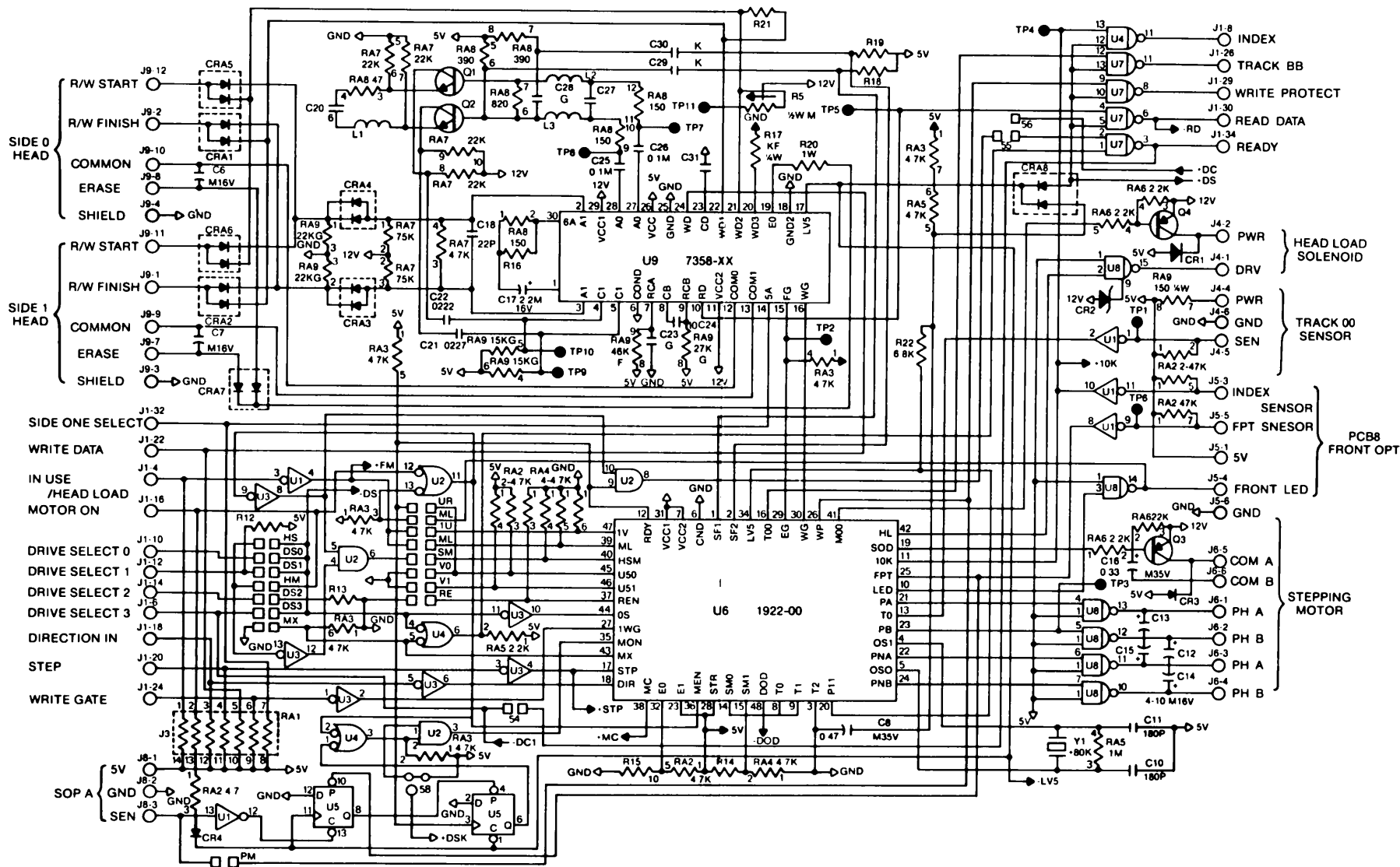
+12V
GND
GND
+5V

FRAME GROUND
(FASTEN TAB)

FRAME

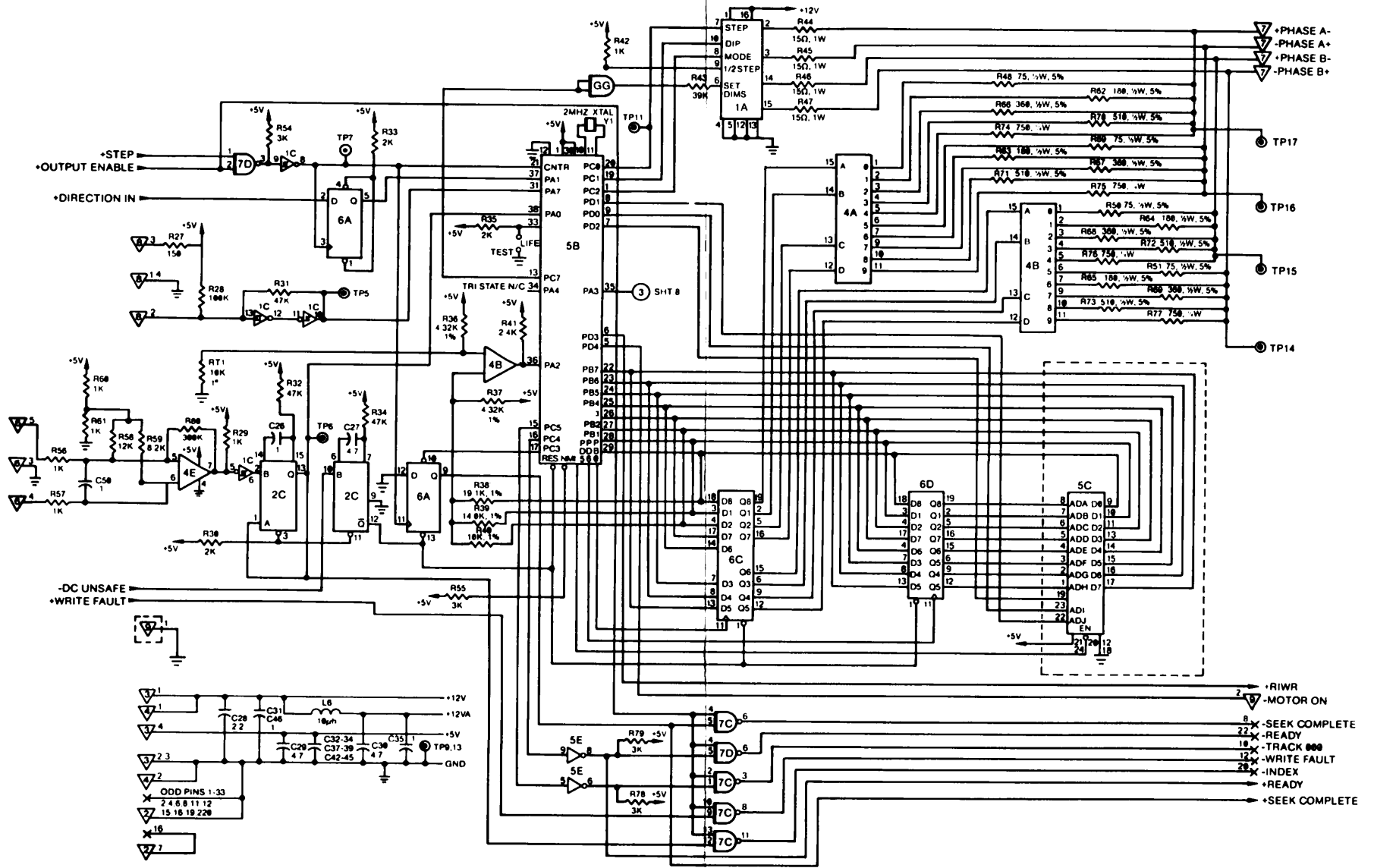


Flex Disk Drive (7 of 8)



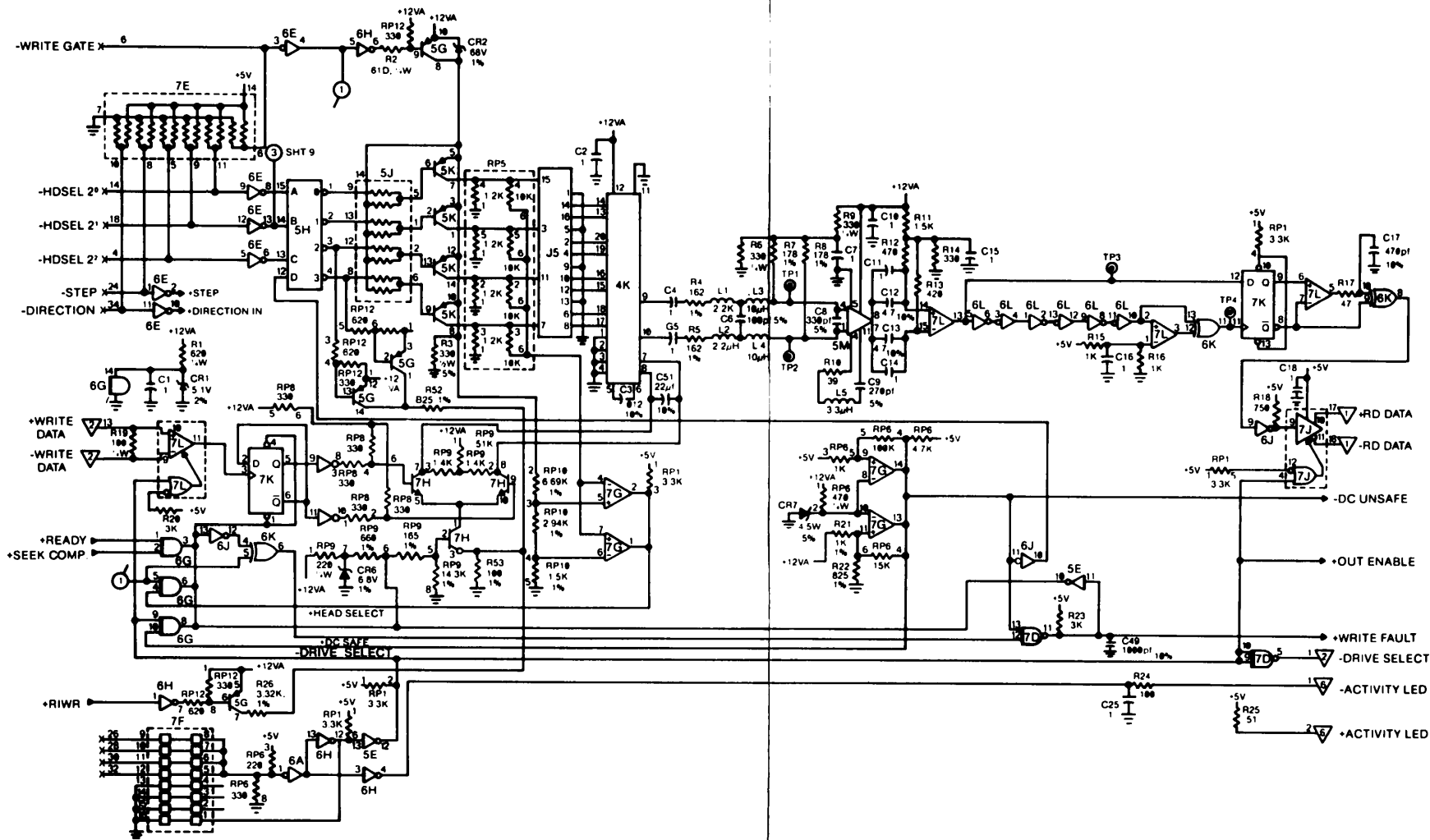
Flex Disk Drive (8 of 8)

CONNECTION AND LOGIC DIAGRAMS

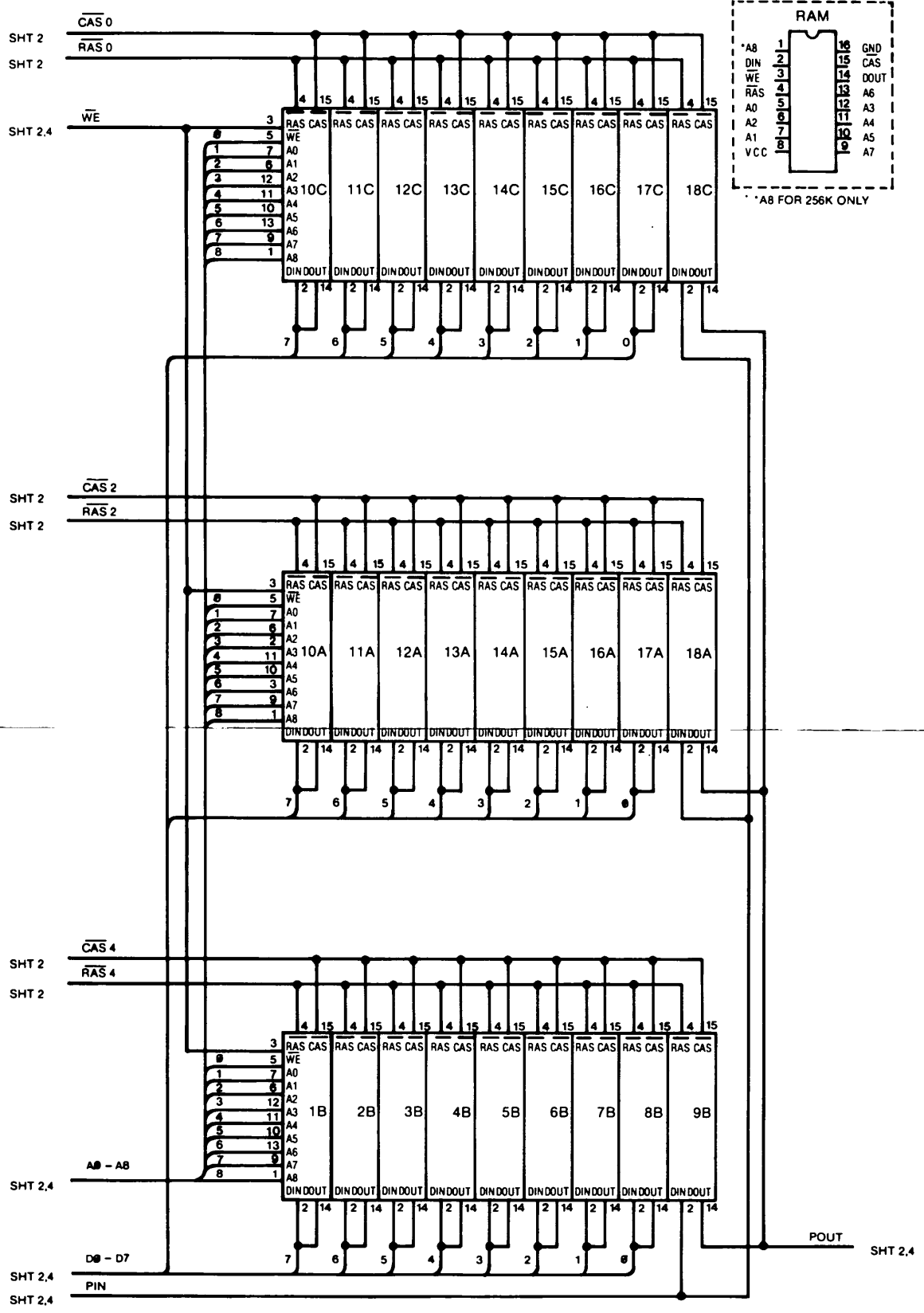


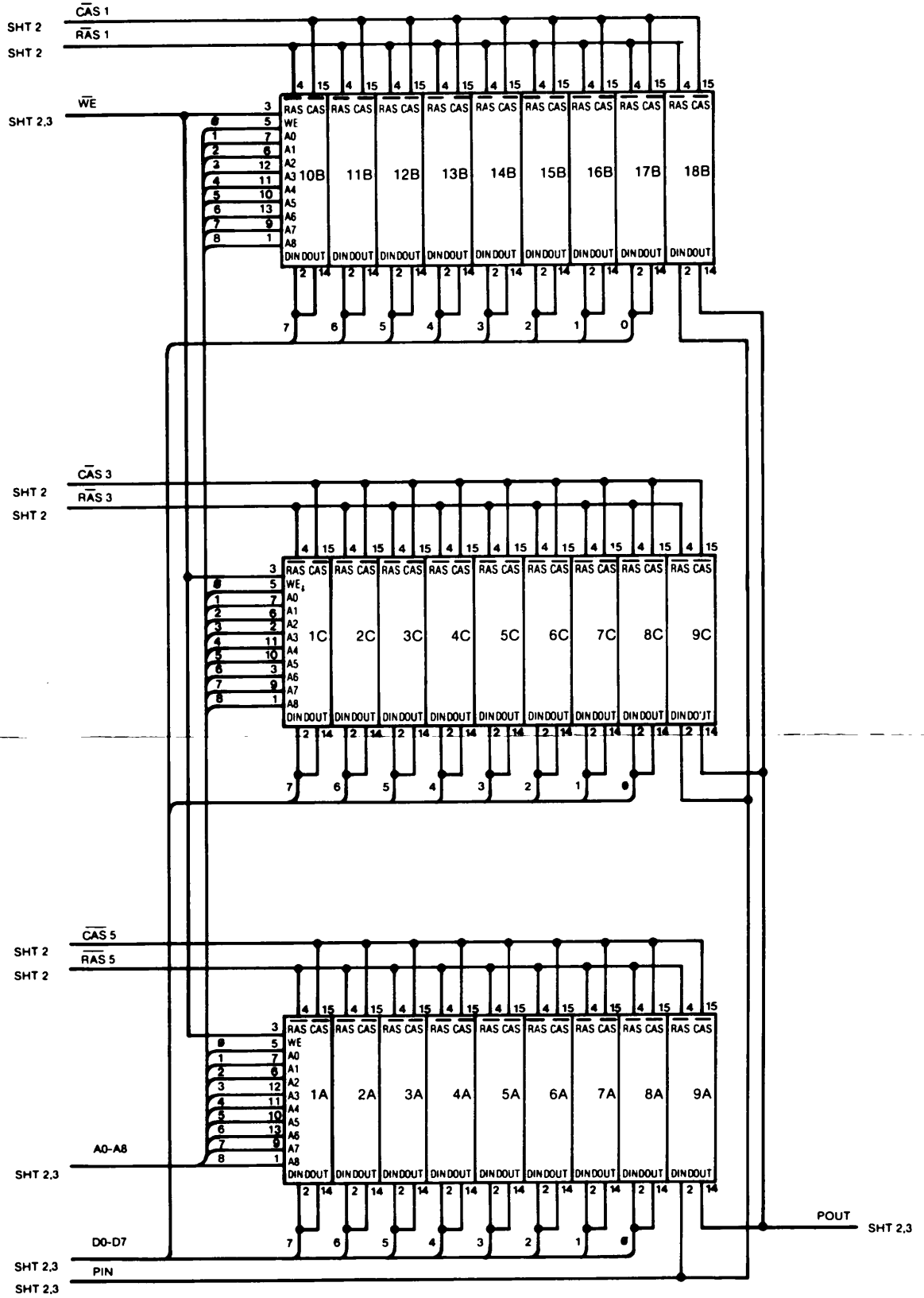
Hard Disk Drive (1 of 2)

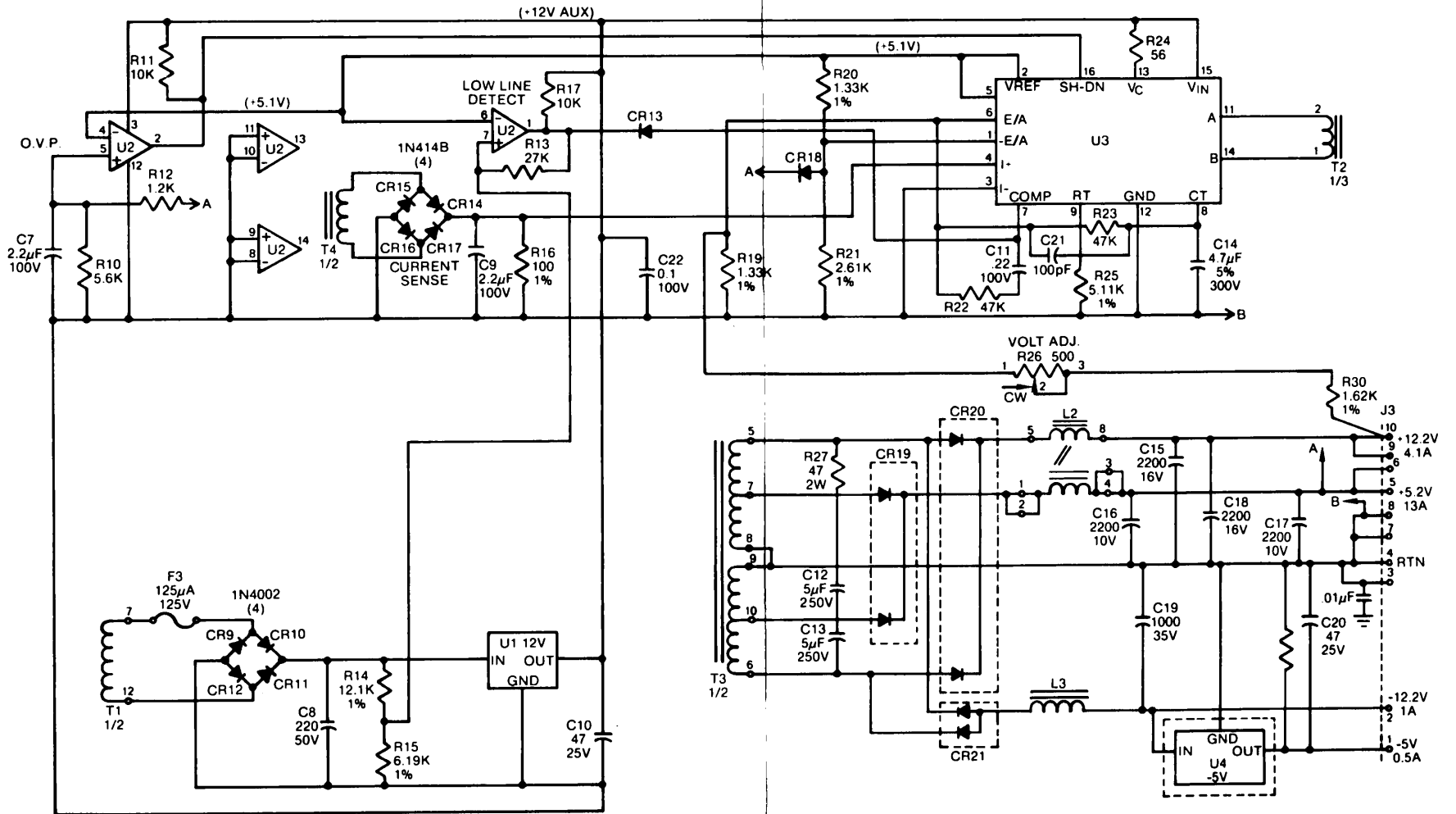
CONNECTION AND LOGIC DIAGRAMS



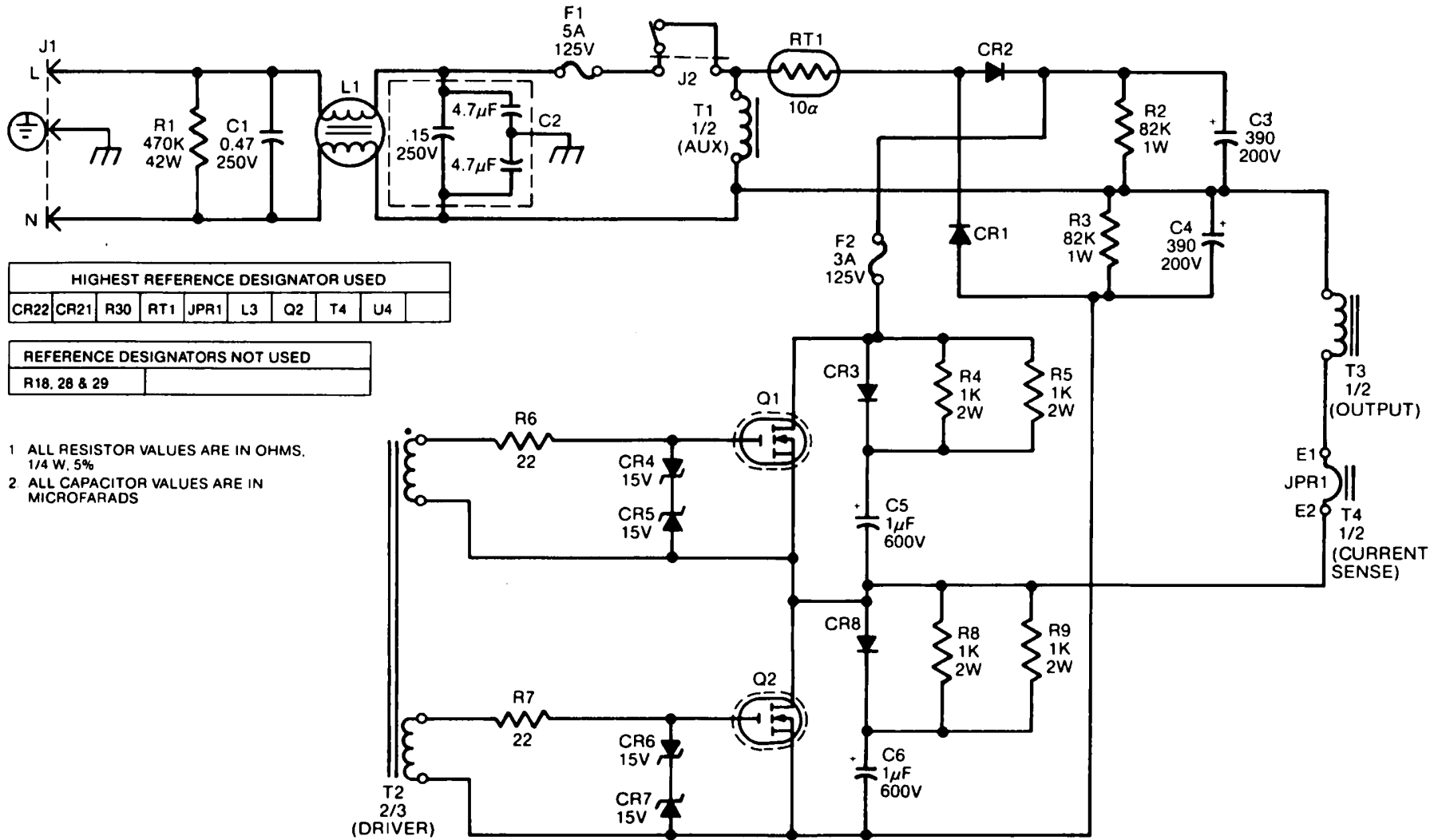
Hard Disk Drive (2 of 2)







Power Supply (1 of 2)



HIGHEST REFERENCE DESIGNATOR USED							
CR22	CR21	R30	RT1	JPR1	L3	Q2	T4

REFERENCE DESIGNATORS NOT USED	
R18, 28 & 29	

- 1 ALL RESISTOR VALUES ARE IN OHMS, 1/4 W, 5%
- 2 ALL CAPACITOR VALUES ARE IN MICROFARADS



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MIRS Stock Number : D1-0163-A

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Company _____

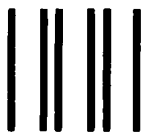
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