

PT68K4

User's Manual

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PERIPHERAL TECHNOLOGY

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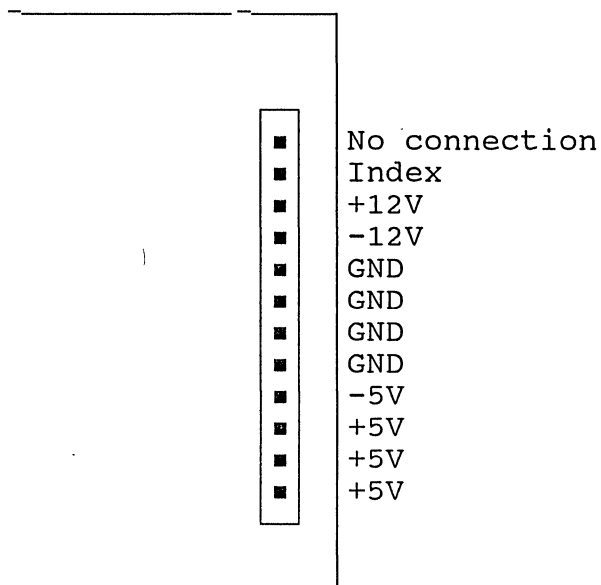
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GETTING STARTED

These instructions assume that you have completed construction of the kit or have purchased an assembled board. Instructions for kit assembly are contained in a separate manual.

POWER CONNECTION

Connect power to the PT68K4 board. The power connector is J12.



Monitor Choice

These types of monitors may be connected to the PT68K4:

1. RS-232 terminal (Connector J18).
2. IBM PC/XT compatible keyboard, monochrome adaptor card and monochrome monitor.
3. IBM PC/XT compatible keyboard, color adaptor card and color monitor.

RS-232 TERMINAL INSTALLATION

Connect a cable between J18 and the CRT. See page 5, "RS-232 Interface" for more information. J18 is the MAIN terminal port. J17, J19 or J20 can be used for other terminals or serial printer ports. The use of J17, J19 and J20 is determined by the operating system. When using this type of terminal it is necessary to press the <CR> key a few times when turning on the system. This allows the HUMBUG monitor to determine the baud rate of your terminal. The terminal should be configured for eight data bits, one stop bit, no parity and a baud rate between 300 and 19,200.

MONOCHROME MONITOR INSTALLATION

1. Install an IBM compatible monochrome adaptor card in one of the IBM compatible I/O slots.
2. Plug a monochrome monitor into the monochrome display adaptor card.
3. Plug an IBM PC/XT/AT compatible keyboard into the keyboard connector port J10. The keyboard must be set to **XT mode** if it has an XT/AT switch position.
4. The HUMBUG monitor initializes the adaptor card on power up and displays a message. See the HUMBUG Monitor Manual for more information on monitor selection.

COLOR GRAPHICS (CGA) INSTALLATION

1. Install a color graphics adaptor (CGA) card in one of the PC/XT I/O slots.
2. Plug a color monitor into the color graphics adaptor card.
3. Plug an PC/XT or AT compatible keyboard into the keyboard connector port J10. The keyboard must be set to **XT mode** if it has an XT/AT switch position.
4. The HUMBUG monitor initializes the adaptor card on power up and displays a message. See the HUMBUG Monitor Manual for information on monitor selection.

Floppy Disk Installation

The PT68K4 computer contains two floppy disk controllers. The WD1772 controller is used for compatibility with the PT68K2 computer. The WD1772 controller will support either 3-1/2" or 5-1/4" drives. Storage capacities are 360K for 40 track drives and 720K for 80 track drives. The WD1772 will not work with 1.2 MEG or 1.44 MEG drives that are sometimes used with IBM AT/clone computers. The drive cable used for the WD1772 runs all connections in parallel and does not twist part of the cable like IBM clone drive cables. Be certain not to use an IBM/clone drive cable. Drives controlled by the WD1772 controller should be connected to header strip J16.

The WD37C65 controller will support two drives of either 3.5 or 5-1/4 sizes. Drive capacities of 360K, 720K, 1.2 MEG and 1.44 MEG are supported. The WD37C65 uses an IBM AT floppy drive cable. This cable has a twist in part of the cable between the A and B drive. Drives controlled by the WD37C65 controller should be connected to header strip J8.

Selection of floppy controller will depend on the use of the PT68K4. If you are upgrading a PT68K2 computer you will probably use the WD1772 controller. If you are building a new computer with the PT68K4 system board you would probably select the WD37C65 controller since it supports high density drives. The final choice of controller may be determined by software support provided by your choice of operating system.

Cable Connection WD1772

Connect a cable between the floppy controller (J16) and the floppy drive(s). Make sure that Pin 1 on the controller end connects to Pin 1 on the floppy drive(s). If the cable is reversed and a non-write-protected disk is in the drive, the diskette may be damaged.

Cable Connection WD37C65

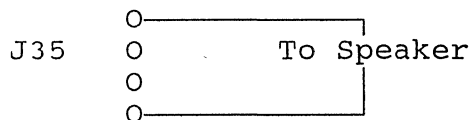
Connect a cable between the floppy controller (J8) and the floppy drive(s). Make sure that Pin 1 on the controller end connects to Pin 1 on the floppy drive(s). All drives connected should be jumpered as drive 2. The position of the drive on the cable determines drive ID. The drive on the end of the cable is drive one (Drive A); the drive in the middle (if present) will be the second drive (Drive B).

Termination Resistors

If you have two floppy drives, you should only have one resistor terminator pack installed. The resistor terminator should be installed on the last drive in the system (the one at the far end of the cable). Some of the newer drives (3-1/2 and 5-1/4 inch) do not contain any terminating resistors, and this step will not apply if you have a newer drive(s).

SPEAKER CONNECTION

Plug the speaker into J35. The speaker wires should be on the outer terminals. Connection of the speaker is optional; however, no bell will be available when using the PC/XT keyboard and monitor unless the speaker is connected. Depending on your choice of software, the speaker may beep on power up after successful completion of system tests.



LED CONNECTION

Most Baby AT cabinets have a panel with three LED's with wires attached. The appropriate wire should be plugged into the appropriate pins on the PT68K4 system board.

J36 - Power

J30 - Test LED (Only used when building kits - should connect to disk LED)

J31 - Halt status

Connect the power LED to J36.

Connect the Turbo mode LED to J31 (HALT STATUS). Note that the HALT LED will light for a second when turning the computer on or when pressing the reset switch.

The LED plugs are not polarized so it may be necessary to reverse the connector if the LED's do not light. Note: the LED's will not be damaged if the plug is installed incorrectly.

RESET SWITCH CONNECTION

Plug the connector from the reset switch to J37.

SYSTEM STARTUP

The sign-on messages and procedures for starting the PT68K4 will vary depending on the operating system(s) that is selected. For SK*DOS refer to the HUMBUG manual. For OS9 see the supplemental installation manual that is included with OS9.

RS-232 INTERFACE INFORMATION

Connectors J17, J18, J19, J20

PIN	DESCRIPTION	
1	No Connection	
2	Received Data	
3	Transmitted Data	(Viewed from component side)
4	Index	
5	Ground	1 0 0 10
6	No Connection	2 0 0 9
7	Clear To Send (CTS)	3 0 0 8
8	No Connection	4 0 7
9	Request to Send (RTS)	5 0 0 6
10	No Connection	

TYPICAL CRT TO COMPUTER CONNECTION

PIN	J17, J18, J19 OR J20	DB-25	PIN
2	○————○	2	
3	○————○	3	
5	○————○	7	
7	○————○	20	

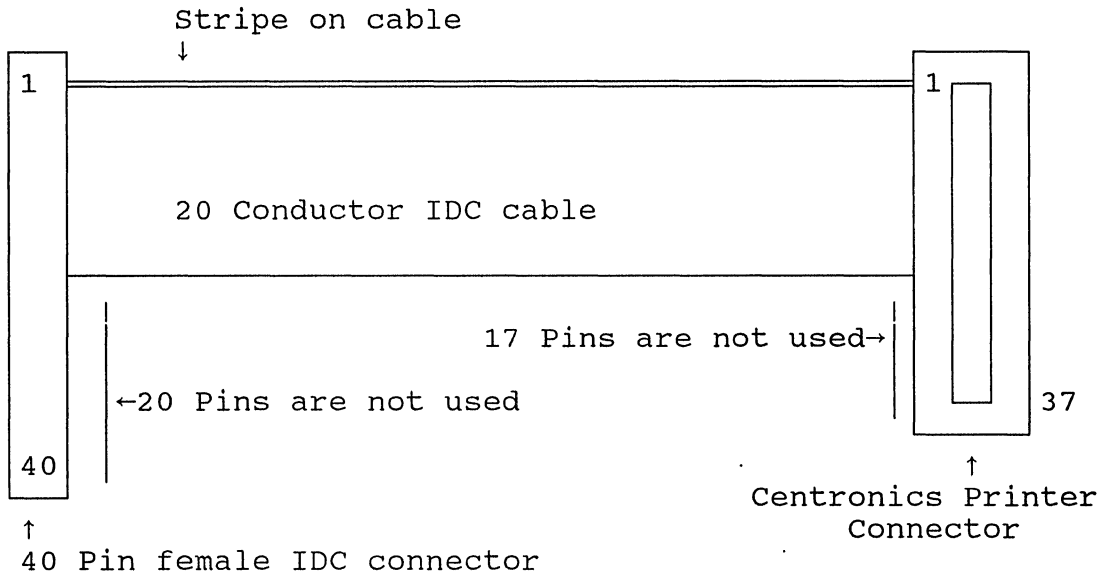
Note: CTS must be connected for the RS-232 interface to work. RTS is not usually required unless interfacing to a modem. CTS should be connected to +12V if no DTR is available from the terminal.

PRINTER INSTALLATION

There are two ways to interface a printer to the PT68K4 computer. One option is to connect a printer to the PIA port (J15) on the PT68K4 computer. The other method is to connect a printer to the printer port of a monochrome or color card.

PIA Printer Port

The PIA port (J15) is arranged to allow IDC connectors to connect between J8 and the printer connector. To construct a cable use 20 conductor cable and follow the diagram below.



40 Pin IDC Connector

The cable should be positioned so that the striped end of the cable starts on the Pin 1 end of the IDC connector. The last 20 pins are not used.

37 Pin Printer Connector

The cable should be positioned on the connector with the striped end of cable starting on the Pin 1 end of the printer connector.

MONO/COLOR Printer Port

If using the printer port of the monochrome or color adaptor card you will need an IBM compatible printer cable. These cables are available from Peripheral Technology as well as other IBM clone computer dealers. The adaptor card uses a male DB-25 connector with a Centronics 37 pin male connector on the printer end.

Hard Disk Interface

The PT68K4 currently supports Western Digital MFM XT type of controllers. Although other brands of controllers which emulate the Western Digital register set should work with the PT68K4, no guarantee is made that these will work properly. Peripheral Technology only supports Western Digital hard disk controllers. As of the date of this manual the GEN2 card is the current Western Digital card. Older Western Digital half-size MFM cards may be also be used with the PT68K4 computer.

WDXT-GEN2 Installation

1. Plug the controller into one of the PC/XT expansion slots.
2. Connect a 34 conductor ribbon cable between J1 of the GEN2 card and the hard drive.
3. Connect the 20 and 34 conductor ribbon cables between the controller card and the winchester drive. Use J2 for the first winchester and J3 for the second winchester drive. Be certain to observe Pin 1 polarization of the cable between the drive and the controller card. **If the cables are plugged in backwards the drive or controller could be damaged.**
4. The drive select jumper on your hard drive should be set for the first hard drive.
5. Connect power to the hard disk drive. Any of the cables from the power supply may be used.
6. You are now ready to format the drive. Consult the 'HDFORMAT' command in the SK*DOS manual for information on formatting the drive. Use a step rate code of '5' for drives that have a buffered step. If you are using OS9 you should refer to the supplemental installation instructions included with OS9.

DRAM Installation

The PT68K4 may contain between 512K and 4096K of onboard memory. Memory may be installed in 512K increments. An optional 8MB card may be installed for additional memory. The PT68K4 uses 256Kx4 DRAM's. Memory speed should be 100ns.

MEMORY	BANK	CHIPS
0- 512K	1	U32, U43, U62, U76
512-1024K	2	U33, U44, U63, U77
1024-1536K	3	U34, U45, U64, U78
1536-2048K	4	U35, U46, U65, U79
2048-2560K	5	U36, U47, U66, U80
2560-3072K	6	U37, U48, U67, U81
3072-3584K	7	U38, U49, U68, U82
3584-4096K	8	U39, U50, U69, U83

CONFIGURATION OPTIONS

- J1 - J7 PC/XT I/O Expansion Slots
- J8 - High Density Floppy Drive Connector
- J9 - ALT86 Interface Connector
- J10 - PC/XT Keyboard Connector
- J11 - Test LED Probe (Educational Kit only)
- J12 - Power Connector (See Page 1 for pin definitions)
- J13 - Enable IRQ Level 7, DRQ from WD1772 (Shorted = enabled)
- J14 - Enable WD37C65 Floppy Controller (Shorted = enabled)
- J15 - Printer Port (MC68230P)
- J16 - WD1772 Floppy Controller
- J17 - COM 4 Port
- J18 - COM 1 Port
- J19 - COM 2 Port
- J20 - COM 3 Port
- J21 - Enable IRQ Level 3 from IBM Ports (Shorted = enabled)
- J22 - Enable IRQ Level 4 from IBM Ports (Shorted = enabled)
- J23 - Enable IRQ Level 5 from IBM Ports (Shorted = enabled)
- J24 - Enable IRQ Level 6 from IBM Ports (Shorted = enabled)
- J25 - Enable IRQ Level 7 from IBM Ports (Shorted = enabled)
- J26 - EPROM Select (1=27128 or 27256, 2=27512)
- J27 - 2Kx8 or 32Kx8 SRAM Select (1=2K, 2=32K)
- J28 - EPROM Select (1=27128, 2=27256 or 27512)
- J29 - 2Kx8 or 32Kx8 SRAM Select (1=32K,2=2K)
- J30 - Test LED Indicator (Education kit only)
- J31 - Halt LED Indicator
- J32 - Enable Manual Switch IRQ Level 7
- J33 - IRQ Level 7 Interrupt Switch
- J34 - Memory Expansion Connector
- J35 - Speaker Connector
- J36 - Power LED Indicator
- J37 - External Reset Switch
- J38 - System Configuration
 - Position 1 - DRAM enabled
 - Position 2 - DRAM disabled, EPROM is mapped to address 0
- J39 - Speed Selection (Position 1=8MHZ, 2=16MHZ)

Note: J30, J31 and J36 will drive LED's directly.

PT68K4 SPECIFICATIONS

MC68000 Processor, 16 MHZ Clock, No wait state DRAM - uses 100NS RAM

000000-3FFFFFFF	DRAM (4096K)
400000-BFFFFFFF	DRAM (8192K) Optional Memory Board
FF0000-FF0FEF	SRAM (4K) Battery Backed-up RAM (When using 2Kx8 SRAM)
FF0000-FFFFFFF	SRAM (64K) (When using 32Kx8 SRAM)
FF0FF1-FF0FFF	Clock Registers (MK48T02)
F80000-F9FFFF	EPROM (128K)
FA0001-FBFFFF	IBM Slot I/O Ports (odd bytes)
C00001-DFFFFF	IBM Slot MEM Read/Write (odd bytes)
FE0001-FE003F	MC68681 DUART
FE0041-FE007F	MC68681 DUART
FE0081-FE00BF	MC68230 PIA
FE00C1-FE00FF	WD1772 Floppy Drive Select
FE0101-FE013F	WD1772 Floppy Disk Controller
FE01C1-FE01FF	IBM Keyboard

FE0101-Drive Select Register	BIT 1	BIT 0	
	0	0	- Drive select 0
	0	1	- Drive select 1
	1	0	- Drive select 2
	1	1	- Drive select 3
	Bit 5	-	0=Single density 1=Double density
	Bit 6	-	0=Side 0 1=Side 1

Note: The first 8 locations of EPROM are mapped to address 0 after a reset. After four "AS" strobes RAM is restored to the first eight locations.

Board can use 27128, 27256, or 27512 EPROM (250NS or faster).

Each I/O decode is 64 bytes. This results in some of the I/O devices being multiple mapped within their I/O blocks.

WD1772 supports up to four DS/DD 40 or 80 track drives. Drives may be 3.5 or 5-1/4 size. Does not support 1.2 MEG or 1.44 MEG drives.

WD37C65 supports up to two drives. Drives may be 3.5 or 5-1/4 and densities of 360K, 720K, 1.2M or 1.44M.

The clock (MK48T02) has a lithium battery mounted in the chip. The expected life of the battery is approximately 5 years. The battery will supply 31,000 hours of operation.

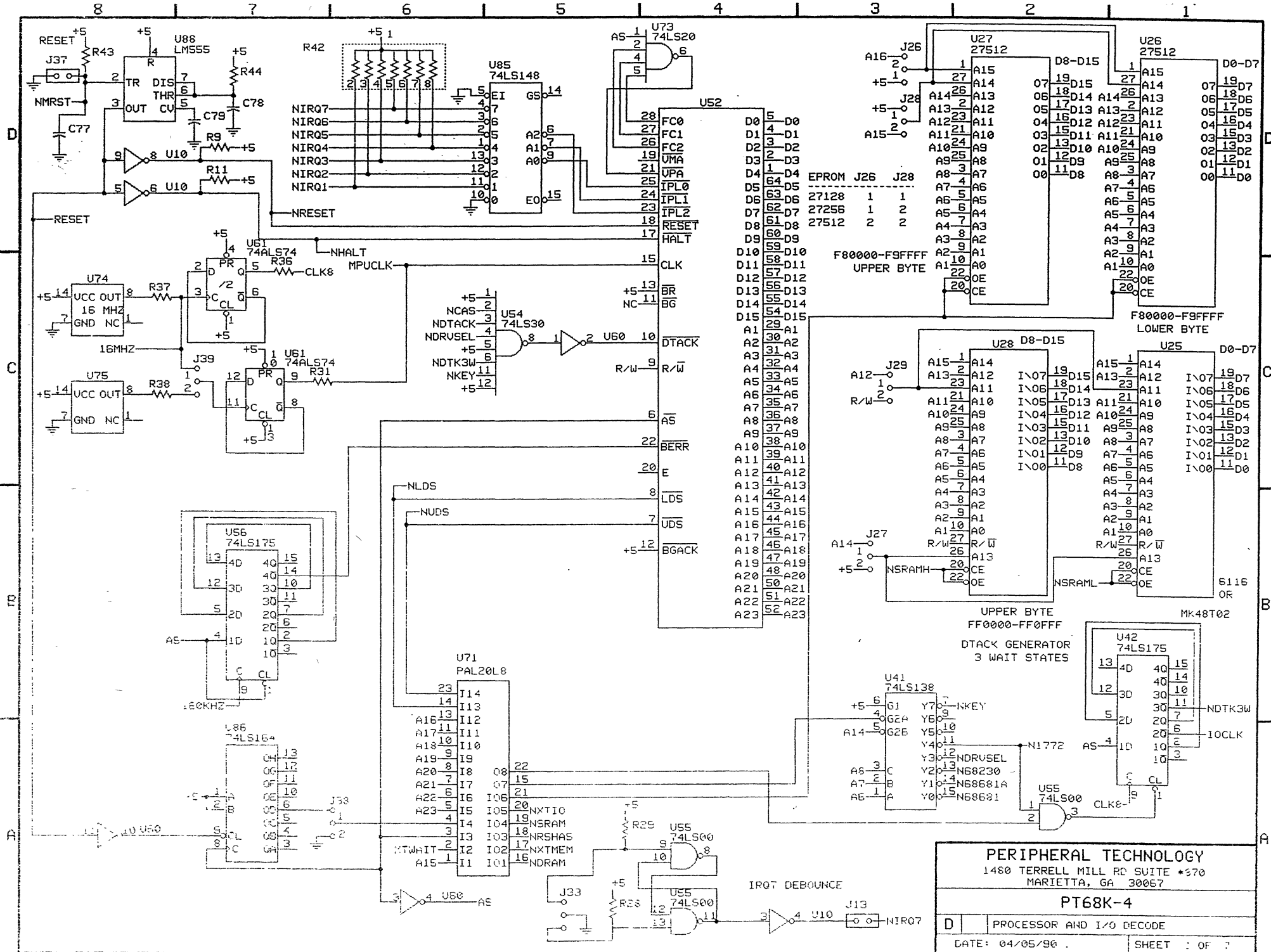
The PC/XT expansion slots will allow the use of an IBM PC/XT keyboard, monochrome monitor and hard-disk interface card (WD-GEN2).

Parts List PT68K4

1	U1	14.318 MHZ Oscillator
1	U2	3.686400 MHZ Oscillator
1	U3	9.6 MHZ Oscillator
1	U4	WD37C65
2	U5,U61	74F74
4	U6,U9,U42,U56	74LS175
3	U7,U10,U14	7406
1	U8	74LS322
2	U11,U53	PAL16L8
1	U12	MC68230P
1	U13	7442
1	U15	WD1772
3	U16,U17,U18	74F373
1	U19	74LS245
2	U20,U23	MC1489
2	U21,U22	MC68681P
2	U24,U29	MC1488
1	U25	MK48T02
2	U26,U27	27256
1	U28	2Kx8 SRAM (6116)
3	U30,U31,U41	74LS138
32	U32-U39,U43-U50 U62-U69,U76-U83	256Kx4 DRAM (100ns)
1	U40	PAL22V10-15 or PAL20X10-20
3	U51,U70,U84	74F257
1	U52	MC68000P16
1	U54	74LS30
1	U55	74LS00
1	U57	DDU66-100 100 NS Delay
1	U59	74LS74
1	U60	74LS04
1	U58	74ALS74
1	U71	PAL20L8-15
1	U72	74LS32
1	U73	74F20
1	U74	16MHZ OSC
1	U75	32MHZ OSC
1	U85	74LS148
1	U86	74LS164
1	U87	74LS390
1	U88	555
7	J1-J7	62 Pin Card edge
2	J8,J16	17x2 Header

Parts List PT68K4

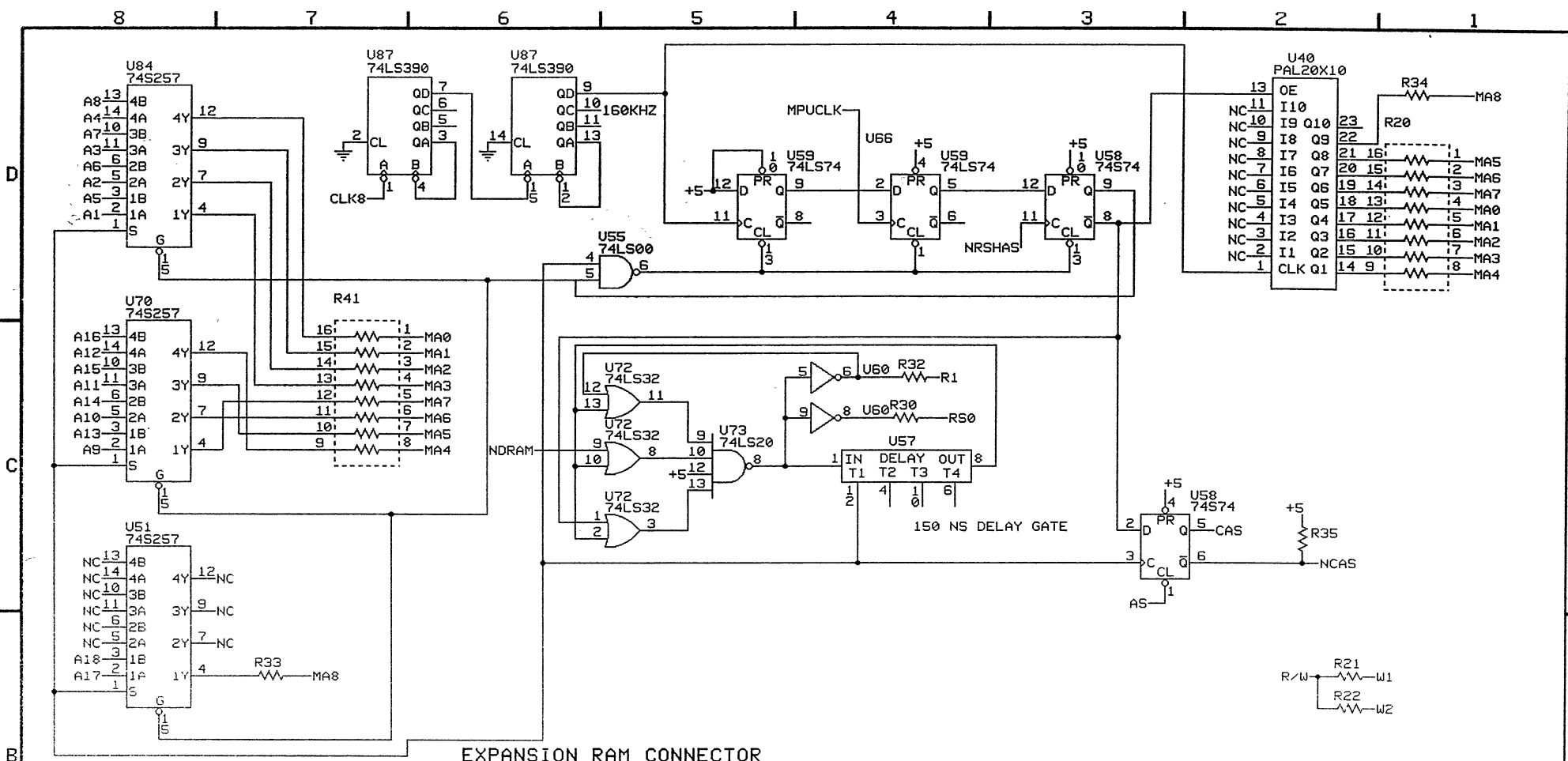
1	J9	5x2 Header
1	J10	5 Pin DIN Connector
8	J11,J13,J14 J30-J32,J36,J37	2x1 Header
2	J12	6x1 Power Connector
1	J15	20x2 Header
4	J17-J20	5x2 Header
1	J21-J25	5x2 Header (No index pin)
7	J26-J29,J33,J38,J39	3x1 Header
1	J34	44 Pin Edge Connector
1	J35	4x1 Header
7	R1,R8,R10,R12,R27-R29	10K Ohm 1/4W Resistor
10	R2-R6,R15-R19	150 Ohm 1/4W Resistor
1	R7	4.7K Ohm 1/4W Resistor
3	R0,R9,R11	2.2K Ohm 1/4W Resistor
3	R13,R14,R39	330 Ohm 1/4W Resistor
2	R20,R41	33x8 DIP Resistor
16	R21,R22-R26 R30-R38,R40	33 Ohm 1/4W Resistor
1	R42	10Kx7 Pin SIP Resistor
2	R43,R44	1M 1/4W Resistor
41	C2-C3,C8-C24 C33,C42-C45 C54-C58,C60-C62 C71-C77,C79	0.1uF Capacitor
32	C25-C32,C34-C41 C46-C53,C63-C70	0.33uF Capacitor
2	C4-C5	47pF Capacitor
3	C1,C7,C59	10uF Tant Capacitor
1	C78	1uF Tant Capacitor
1		8 Pin IC Socket
17		14 Pin IC Socket
13		16 Pin IC Socket
39		20 Pin IC Socket
2		24 Pin IC Socket
5		28 Pin IC Socket
4		40 Pin IC Socket
1		48 Pin IC Socket
1		64 Pin IC Socket
1		PT68K4 Board



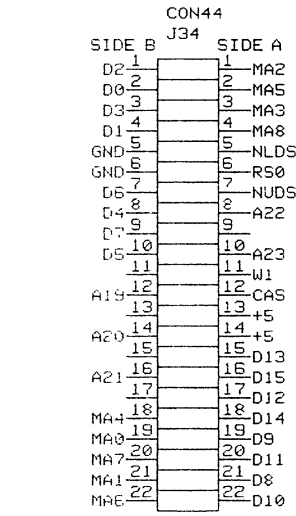
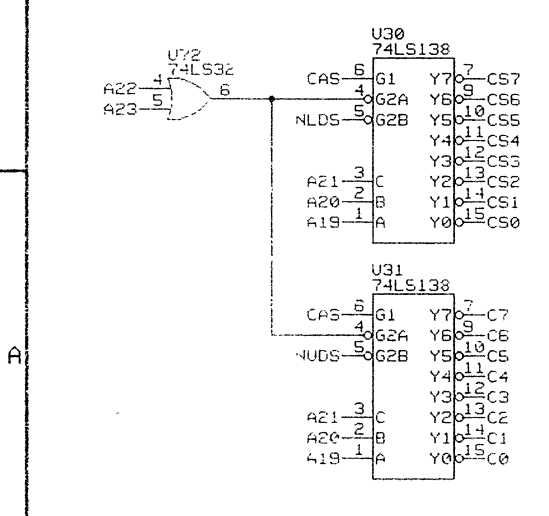
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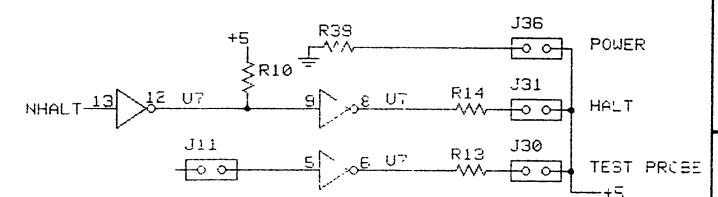
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EXPANSION RAM CONNECTOR



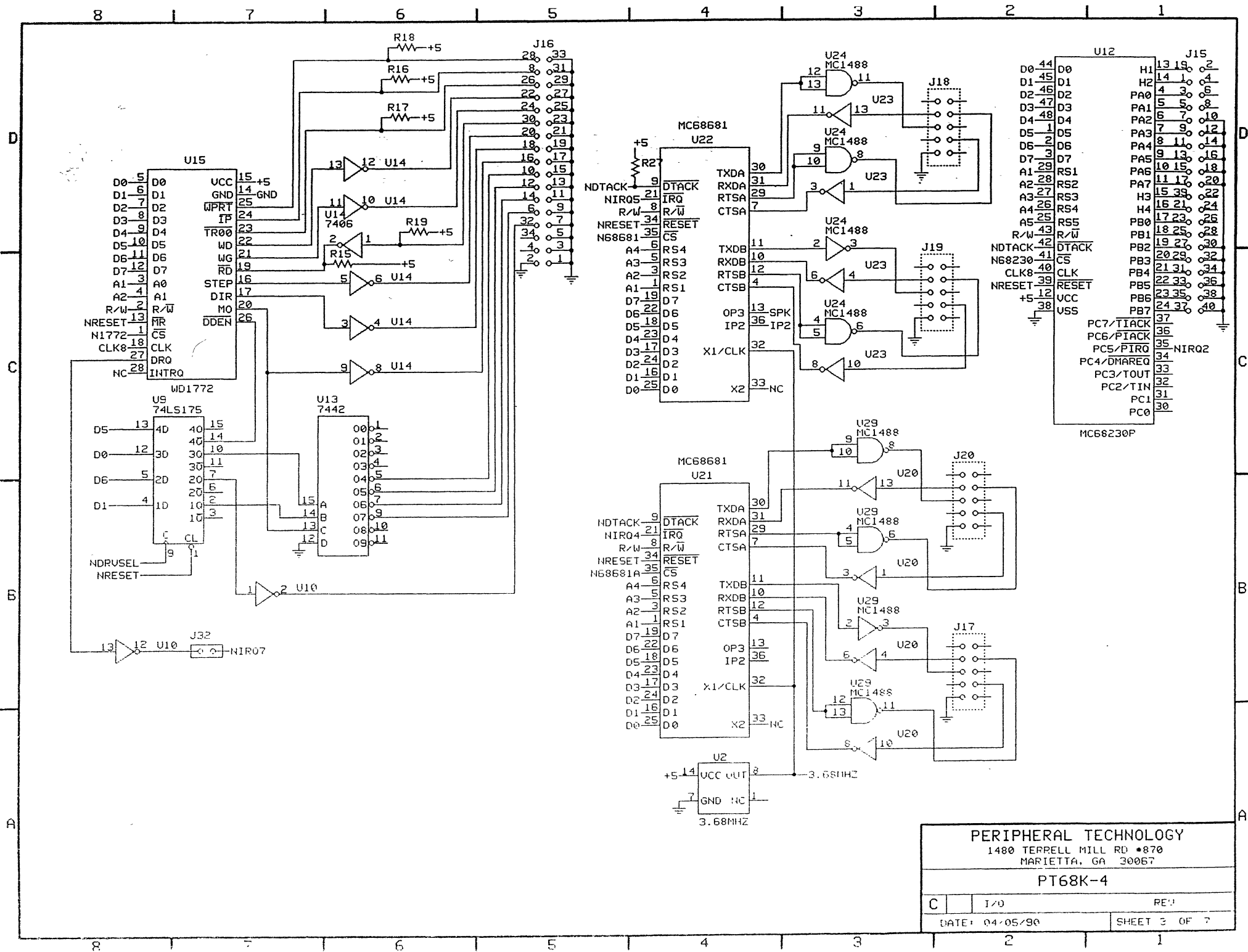
LED INDICATORS



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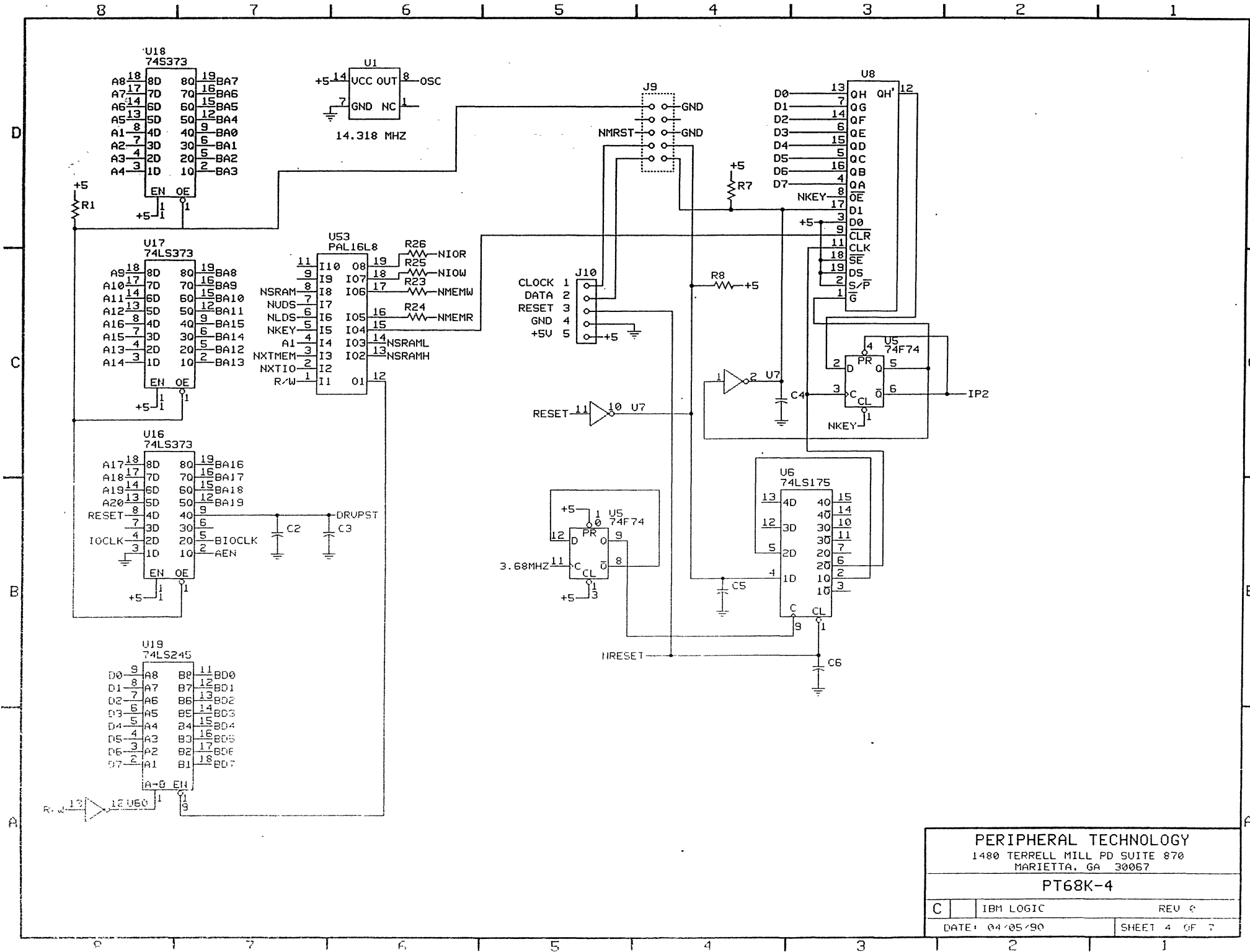
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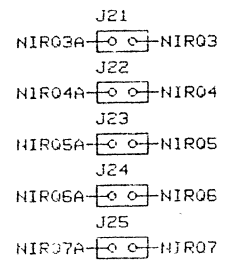


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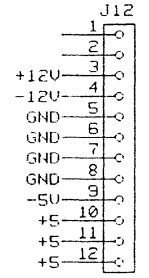
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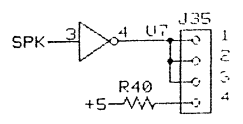
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	SIDE B J1		SIDE A J2		SIDE B J3		SIDE A J4		SIDE B J5		SIDE A J6		SIDE B J7		SIDE A	
	GND 1		1 IOCHCK	GND 1	1 IOCHCK	GND 1		1 IOCHCK	GND 1		1 IOCHCK	GND 1		1 IOCHCK	GND 1	
	RSTDRV 2		2 BD7	RSTDRV 2	2 BD7	RSTDRV 2		2 BD7	RSTDRV 2		2 BD7	RSTDRV 2		2 BD7	RSTDRV 2	
	+5 3		3 BD6	+5 3	3 BD6	+5 3		3 BD6	+5 3		3 BD6	+5 3		3 BD6	+5 3	
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	NDACK2 26		26 BA5	NDACK2 26	26 BA5	NDACK2 26		26 BA5	NDACK2 26		26 BA5	NDACK2 26		26 BA5	NDACK2 26	
	TC 27		27 BA4	TC 27	27 BA4	TC 27		27 BA4	TC 27		27 BA4	TC 27		27 BA4	TC 27	
	BALE 28		28 BA3	BALE 28	28 BA3	BALE 28		28 BA3	BALE 28		28 BA3	BALE 28		28 BA3	BALE 28	
	+5 29		29 BA2	+5 29	29 BA2	+5 29		29 BA2	+5 29		29 BA2	+5 29		29 BA2	+5 29	
	OSC 30		30 BA1	OSC 30	30 BA1	OSC 30		30 BA1	OSC 30		30 BA1	OSC 30		30 BA1	OSC 30	
	GND 31		31 BA0	GND 31	31 BA0	GND 31		31 BA0	GND 31		31 BA0	GND 31		31 BA0	GND 31	



POWER CONNECTOR



SPEAKER

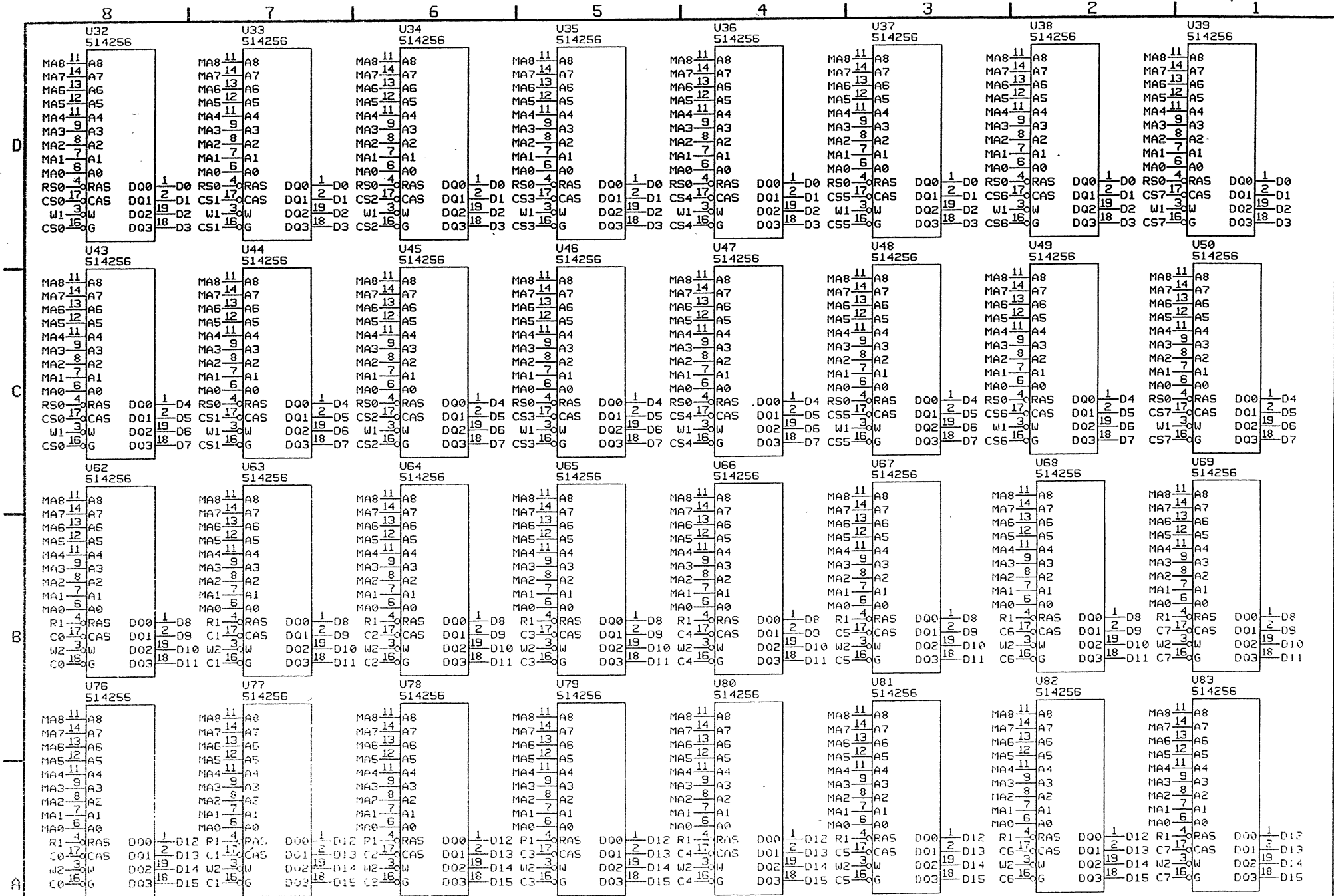


PERIPHERAL TECHNOLOGY
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 MARIETTA, GA 30067

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C	XT BACKPLANE	PE11
DATE: 04/05/90		SHEET 5 OF 7

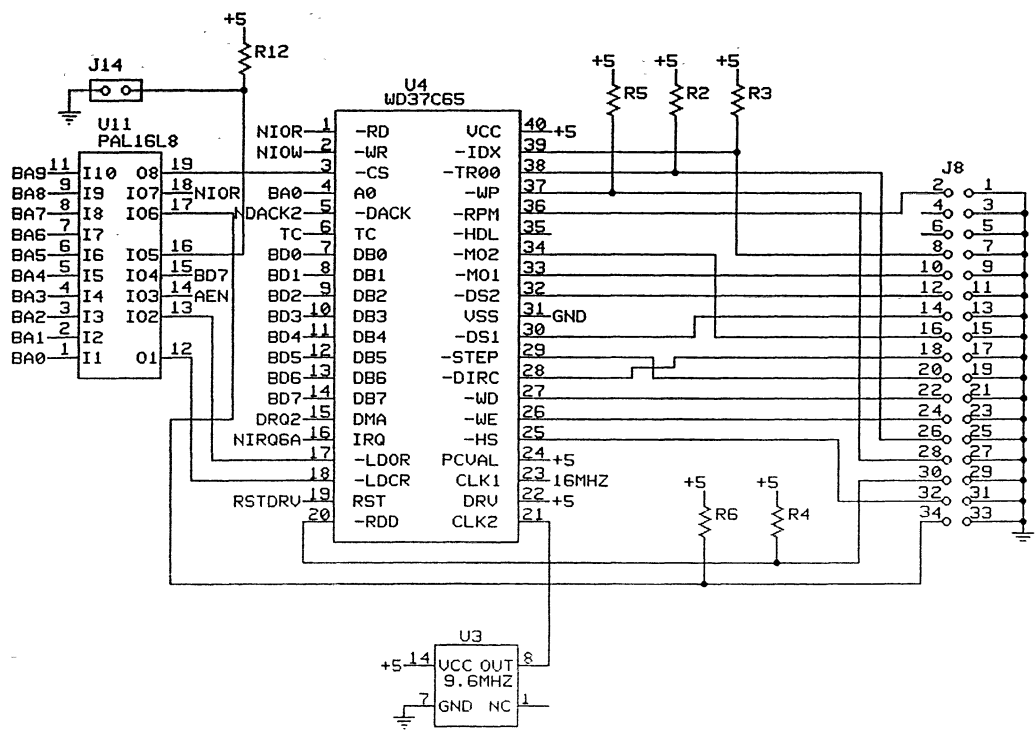
GND



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MEMORY		
C	MEMORY	REV
DATE: 04.05.90		SHEET 6 OF 7

8 7 6 5 4 3 2 1

D
C
B
A



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HD XT FLOPPY CONTROLLER	
C	REV
DATE: 04-05/90	SHEET 7 OF 7

8 7 6 5 4 3 2 1