PT68-1

User's Manual

09/14/24

Introduction

Peripheral Technology's first single board computer was 6809 based, but had we made one back in the 70's this is what it might have looked like. This board is modernized to use the iTX form factor and is powered by ATX power supplies. This provides many options for a case and power supply. The memory map of the PT68-1 is the same as a SWTPC computer. The same floppy and HD images that boot on a SWTPC 6800 will boot on the PT68-1 with no changes. One additional feature the PT68-1 has over the SWTPC is an additional IDE controller. With the MOVPAR program a user may backup IDE partitions to the second IDE port or copy them to another partition on either IDE port.

PT68-1 Specifications

MC68B02 Processor - 1MHZ or 2MHZ - Jumper selectable
48K RAM
8K EPROM
2 RS232 Serial Ports - MC68B50
Main Serial Port can be RS232 or use a VGA monitor and PS2 Keyboard
1 Parallel Port - MC68B21
Parallel Printer Port - Centronics type - Uses half of the parallel port
1 Time of Day Clock with battery backup - MC146818
1 Floppy Disk Controller - supports double sided/double density drives - WD2797
2 IDE ports - One port is intended for use by the OS with the other for backup of data

Memory Map

0000-7FFF RAM

8000-8001 ACIA (6850) - Slot 0 SWTPC 6800
8004-8005 ACIA (6850) - Slot 1 SWTPC 6800
8008-800F IDE Port 1 - Slot 2 - SS30-IDE SWTPC 6800
8010-8013 RTC (146818) - Slot 4 SWTPC 6800
8014 FDC Select - Slot 5 SWTPC 6800
8018-801B 2797 - Slot 6 SWTPC 6080
801C-801F PIA (6821) - Slot 7 SWTPC 6800
8028-802F IDE Port 2

8040-DFFF RAM
E000-EFFF EPROM
F000-FFF7 RAM
FFF8-FFFF 8 locations at top of EPROM mapped for reset/IRQ vectors

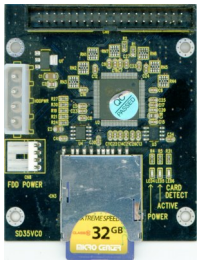
Diskette Drives

It is recommended to use a GoTek floppy emulator with FlashFloppy firmware. You may use a real floppy and a GoTek if you wish to transfer images between drive types. For most this will not be necessary unless you are copying or backing up old diskettes. You might look into buying GreeseWeazle to copy old diskettes since it gives you a better chance to recover old diskettes.

Hard Disks

Use an SD to IDE adapter. These can be found on AMAZON or EBAY and other places. Select one with the 40 pin IDE interface. There are many sellers of the same unit. It should look like the picture below. While you can use a mechanical IDE drive, (It must support LBA mode.) it is better to use the SD solution. It is inexpensive and the SD memory cards can be backed up on a PC. PC utilities allow you to add files to the SD from downloaded internet images. Floppy maintenance is the utility that does this and it is a free program. The program can be downloaded here.
http://www.swtpcemu.com/swtpc/downloads/FloppyMaintenanceSetup.zip
Because this is not a well known program most virus programs will complain about it. Some virus programs may even flag it as a virus. You may have to override your Anti-Virus program to download this program.

SD/IDE Adapter



PT68-1 with Corsham SD/Shield

Corsham SD Shield

An adapter board is available that allows the Corsham SD shield to be used as a plug and play choice. Unless you already have the SD shield, this choice doesn't make a lot of sense. The cost of the SD shield and Arduino is greater than the cost of a GoTek floppy emulator and SD/IDE adapter. There is no advantage in ease of use. Programs may be added to either storage solution with equal ease by the use of the PC program Floppy Maintenance. Load times are many times faster using the onboard IDE compared to the Corsham/SD shield. If you wish to use the SD shield, the Corsham 6800 software runs unchanged on the PT68-1. Inserting a shunt will remap the IO so the MC6821 is at the same address as in the Corsham system.

Terminal Connection

There are two options to connect a terminal to the PT68-1. The usual way in the past had been to connect a serial terminal to your computer. Standalone RS232 terminals are rare today. Today most use a terminal program on a PC to accomplish the same task. There are many programs available today, but here are two free programs we use.

http://www.swtpcemu.com/swtpc/downloads/TV950Setup.zip This terminal runs on a PC and is Televideo 950 compatible.

https://github.com/TeraTermProject/teraterm/releases This one is called Tera Term.

Each program has advantages and disadvantages. I use both of them on a regular basis. Tera Term allows you to scroll back and see what ran off the page. Both will allow you to log to a file, but cut and paste from TeraTerm's scrolling screen is more convenient. TV950 emulates a Televideo 950 so in some cases it will be the preferred terminal to use with programs already configured to work a Televideo. However most programs that require cursor addressing can be modified to work with other terminals. TeraTerm emulates versions of the VT100, which was not a popular choice back in the day.

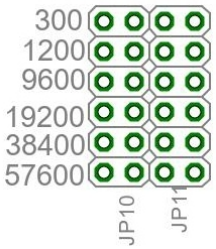
When using RS-232 mode a terminal is connected to the DB-9F marked TERM. This is the middle DB connector on the back of the PT68-1. The pin outs of the connector are such that a USB to RS-232 converter will directly plug in and connect to a PC. One such adapter can be found at AMAZON by searching for OIKWAN 763383543006. There are many similar cables that will work.

VGA PS/2 Keyboard as Terminal

There is a second option for a terminal. By switching a jumper you can feed the output of the TERM port ($E004) to a VGA monitor for output and a PS/2 keyboard for input. This is selected by placing JP27 in the VGA position. The other position is for RS232 and jumper strip is marked RS232 and VGA.

Setting the Baud Rate

The baud rate is set by JP10 and JP11. JP10 is for the TERM port and JP11 is for the serial port at E000. Baud rates of 300, 1200, 9600, 19200, 38400 and 57600 may be selected. If you use the VGA terminal, you must also the baud rate in **Terminal setup**.



JP10 - TERM - E004
JP11 - ACIA - E000

Connectors and CONFIGURATION OPTIONS

```
JP1  - External reset switch - momentary
J2   - POWER CONNECTOR - ATX power supply
JP2  - OPEN - EPROM E000-EFFF  Shorted = EPROM E000-FFFF
JP3  - CPU SPEED - 1MHZ or 2MHZ
JP4  - Color for VGA. RBG - At least one should be jumpered
JP5  - Shorted = enable U1 Programming by PICKIT 3
JP6  - ICSP - programming connection (PICKIT 3 Programmer)
JP7  - LED - Indicates Programming Mode for U1
JP10 - Baud rate selection TERM - 8004
JP11 - Baud rate selection RS232 - 8000
JP13 - MC146818 Test point - clock out
JP14 - Optional external battery connection
JP15 - Floppy Interface
JP16 - Power Switch - momentary - controls ATX power supply
JP17 - Connection for Power LED
JP18 - SHORTED = TEST POSITION 2797
       Jumper JP18 must be open for the 2797 to function
JP19 - IDE Port 1
JP20 - IDE Port 2
JP21 - Test point - 1000ns and 125KHZ - active when JP18 shorted
JP22 - PIA OUTPUT CONNECTOR
JP23 - Parallel Printer Interface
JP24 - Printer Interface - Shorted=enabled
JP25 - IRQA 6821 Short = enable
JP26 - IRQB 6821 Short = enable
JP27 - VGA  or RS232 for TERM (8004)
JP28 - LED - IDE Activity Port 1
JP29 - LED - IDE Activity Port 2
JP30 - EPROM selection - REV 2 and higher
JP31 - EPROM selection - REV 2 and higher
      JP31 JP30
2764    1    1
27128   0    1  0000-1F00 mapped to E000-FFFF
27128   1    1  2000-3FFF mapped to E000-FFFF
27256   0    0  0000-1F00 mapped to E000-FFFF
27256   1    0  2000-3FFF mapped to E000-FFFF
27256   0    1  4000-5FFF mapped to E000-FFFF
27256   1    1  6000=6FFF mapped to E000-FFFF


X1 - RS-232 PORT - ADDRESS 8004  Standard TERM port
X2 - RS-232 PORT - ADDRESS 8000
X3 - VGA Monitor
MiniDin6 - PS/2 compatible keyboard
```

DB-9F Pin outs
2 - TX Data
3 - RX Data
5 - GND
7 - CTS

VGA Terminal

In VGA mode the MC6850 at $E004 is connected to an onboard terminal. The user need only supply a VGA monitor and PS/2 keyboard to communicate with the computer much like connecting a VGA monitor and keyboard to a desktop PC.

The MC6850 at E004 is connected to an MX270F256B-I/SP programmed to act as an RS232 terminal using a VGA monitor and PS/2 keyboard. The terminal currently emulates a VT100.

The terminal will enter setup mode by pressing the Control ALT DEL - the "DEL" key is the one in the Insert/Home/PageUP group. The other "DEL" keys don't work.

You must run setup before you can use the VGA terminal.

At a minimum set the baud rate, stop bits (1), parity none and signal level - TTL .

The terminal emulation circuitry is a modification on the terminal design by Peter Hizalev.

The firmware is open source and can be obtained here -
https://github.com/petrohi/terminal
Should the user desire to modify the firmware a Pickit3 in-circuit programmer is required. As of the date of this manual V3.02 is the version used in the VGA terminal.

Features

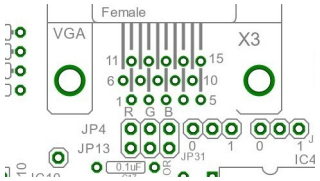
- Compatible with VT-100
- SETUP utility on Ctrl+Alt+Del;
- Configurable UTF-8, ISO 8859 and IBM PC 437 support;
- Configurable VT-220 and PC/Sun keyboards compatibility;
- Blinking and inverted visual attributes;
- VGA output follows 25MHz pixel clock to get 640x480 resolution at 60Hz refresh rate;
- 8x16 characters and 24 or 30 lines screen buffers configurable in SETUP utility;
- Full range of baud rates from 110 up to 1,500,000;
- Scroll-lock and XON/XOFF flow control;
- Monochrome color is selectable with jumpers
- US, UK, DE, SE, FR and BE keyboard layouts are supported

VGA Setup

You must run setup to configure the VGA terminal before it can be used. After completing all of your setup choices press the F12 function key. Your selections will be stored and you will not need to enter them again. On power up the VGA terminal will check for the presence of a PS/2 keyboard and inform you if one is not found, The VGA terminal is only reset at initial power up. Pressing the reset button on the PT68-1 does not reset the VGA terminal. Should you need to reset the VGA terminal and the CTRL,ALT,DEL key won't enter setup, you will need to power down and restart the PT68-1.

Feel free to experiment with the choices. You can always change them back if you don't like the result. Peter Hizalev wrote the firmware used in the VGA terminal and he didn't do a write up on the setup choices.

The text color of the VGA display is determined by jumper JP4. There are three jumpers. The jumper represent red, green and blue. At least one jumper must be inserted. But any combination of jumpers can be used. For instance all three jumper gives a white character.



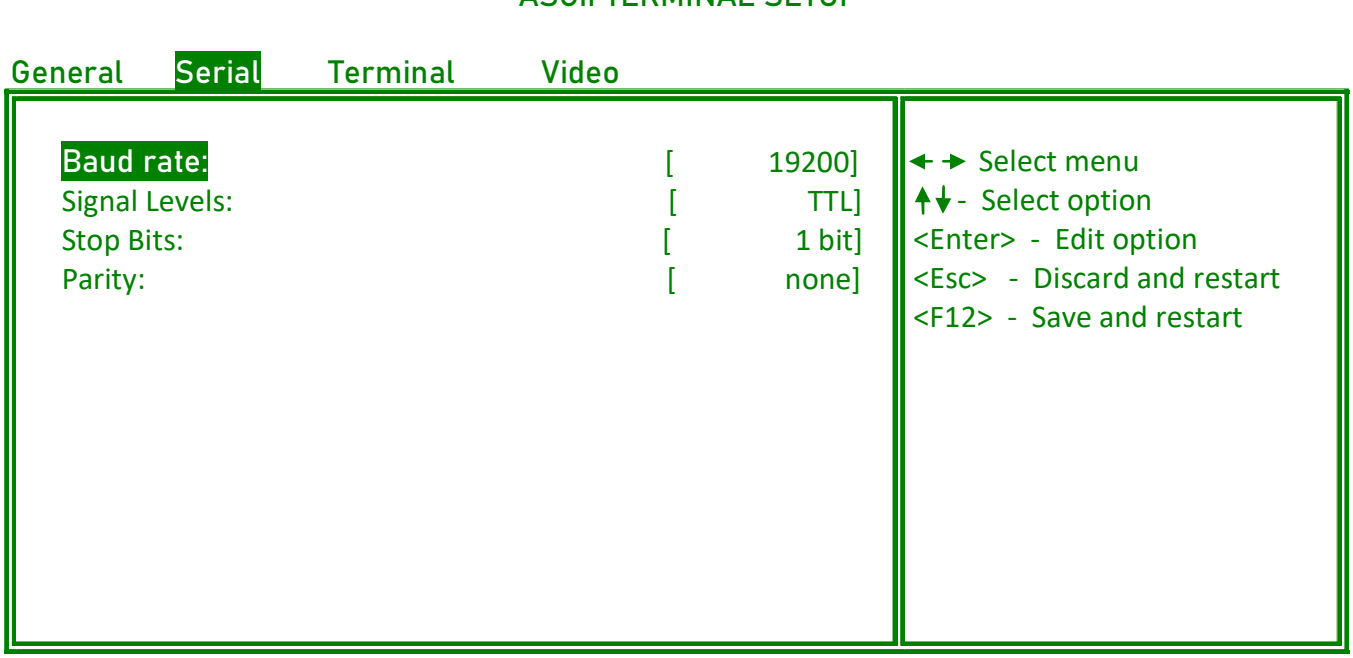
This is the setup screen when pressing the Control ALT DEL key. The left and right arrow keys will move the selection from the "General" to "Video" tab.

ASCII TERMINAL SETUP

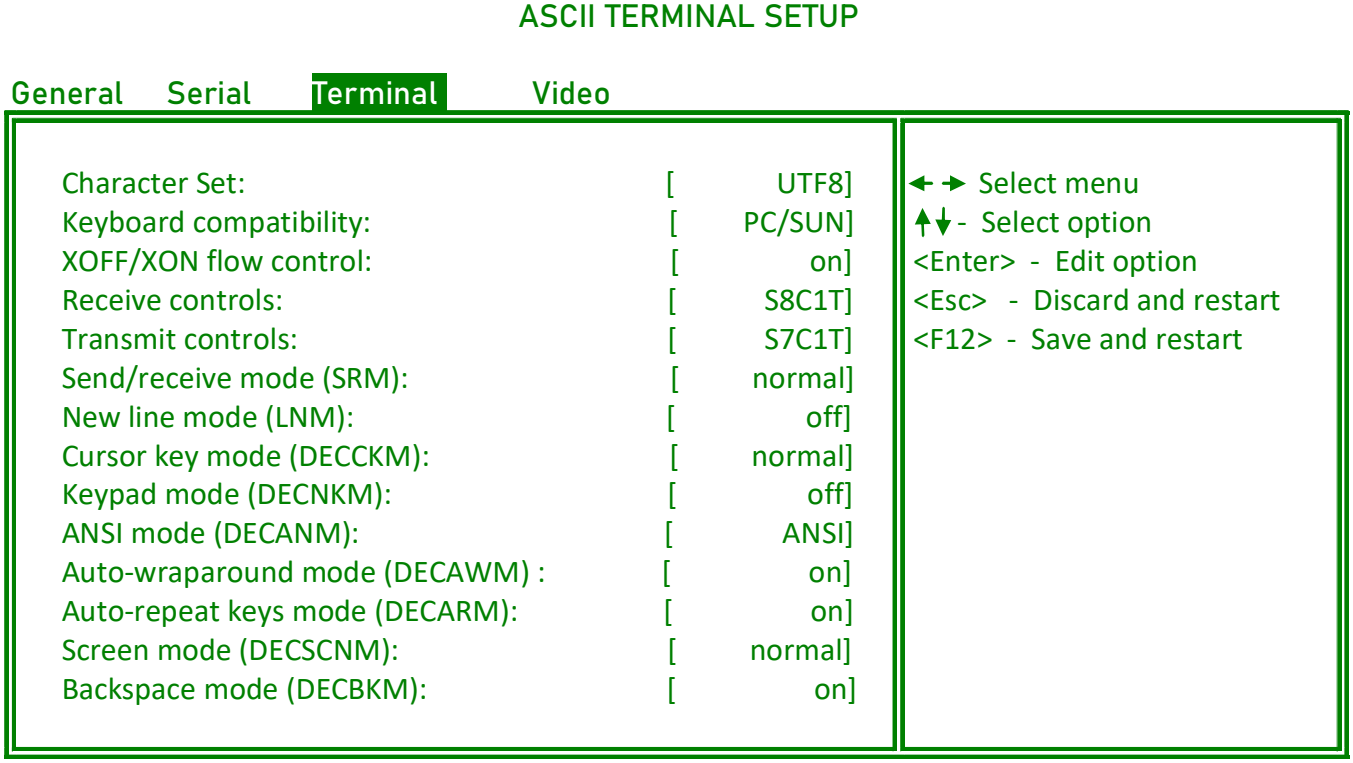
General Serial Terminal Video

Startup	[message]	←→ Select menu
Keyboard layout:	[US]	↑↓- Select option
		<Enter> - Edit option
		<Esc> - Discard and restart
		<F12> - Save and restart

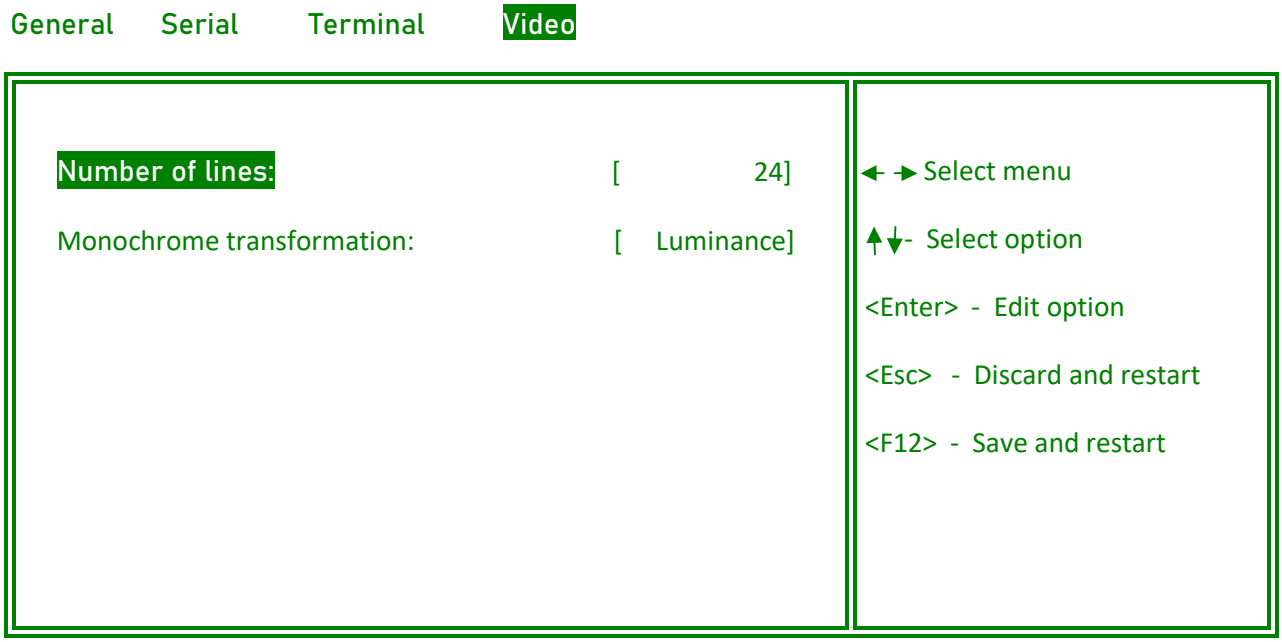
Under the "Serial" tab you will need to set the baud rate. It must be the same baud you selected on the JP10 jumper. Set "Signal levels" to TTL. Stop bits to 1 and parity to none.



Under the "Terminal" tab the default selections should work except for "Backspace Mode". Backspace mode needs to be turned on to erase the character on the screen when you press the backspace key.



Settings on the "video" tab are personal choice. The most notable choice is the option of displaying 24 or 30 lines.



Floppy Controller

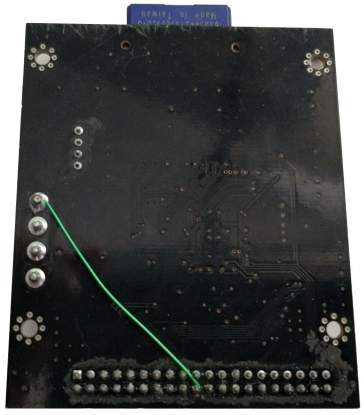
Connect a 34 conductor non-twisted cable between JP15 and your GoTek or floppy drive(s). You will need to configure the drives. Configure the drive for your desired drive select. The drive configured as 0 will be your boot floppy. Depending on the type of drive you may need to remove terminating resister(s). If your drive(s) use them, there can only be one terminating resistor installed and it must be on the last drive on the cable. GoTeks and in general most 3.5" drives do not use terminating resistors. In most cases you should be able to connect a real drive and a GoTek at the same time. It is certainly possible that some combinations of drives may not work. However we have successfully connected a TEAC 3.5" 720K drive and a GoTek drive to the PT68-1. The PT68-1 is capable on controlling up to four drives.

IDE Controller

The PT68-1 has two IDE controllers. At present only one of the controllers is used by the operating system. The other is intended to be used for backup purposes. FLEX as modified for IDE support has 256 partitions. These partitions can be mapped to FLEX drive numbers 0 to 3. The second IDE port is intended to allow one of the partitions on the main SD to be backed up or transferred to another SD memory card or restored from the backup to the main SD card.

Connection of the SD/IDE adapter to the PT68-1 is by a 40 conductor ribbon cable. The PT68-1 feeds +5V through INDEX pin. If you modify the SD/Adapter, you can power it through the 40 conductor cable and you won't need a separate power line to the SD/Adapter. To modify the SD/Adapter you need to remove the solder in the index hole in the 40 pin connector and insert and solder a pin in this hole. Solder a wire from the pin you inserted to the 5V side of one of the power connectors on the SD/Adapter. If this sounds like too much trouble you can just plug a power cable to the SD/Adapter.

Instructions for copying FLEX to the IDE can be found in another section.



SD/IDE Modification

Power feed through 40 conductor IDE cable

This modification uses the INDEX pin to feed +5V

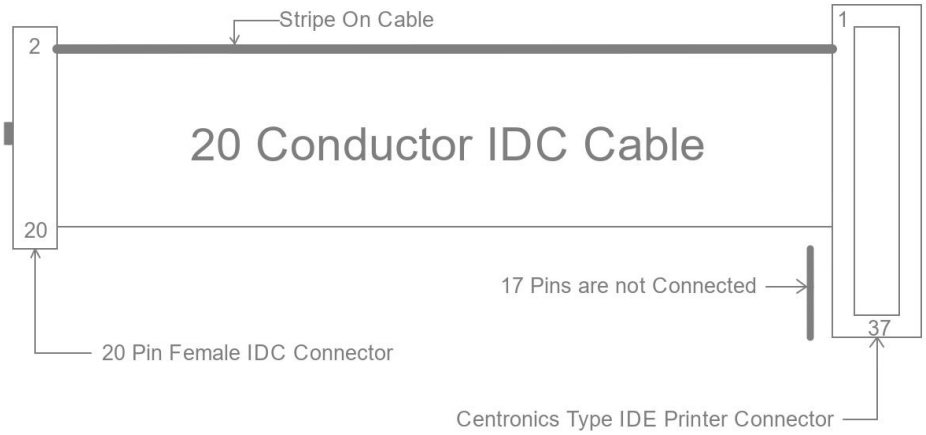
Remove solder from INDEX pin in 40 conductor header

Insert a pin - remove one from a spare connector or from a male header strip and insert it

Run a wire as shown in the photo.

Parallel Printer Port

The Parallel Printer port JP23 is enabled by placing a shunt on JP24. The printer port uses the A side of the MC68B21 PIA chip. This port is intended to be used with a printer using the Centronics type parallel interface. These printers use a 37 pin connector on the printer. The pin out of the connector allows the use of IDC connectors and cable to make the printer cable. You may construct a cable by following the diagram below.



20 Pin IDC Connector end

The cable must be positioned so that the striped end of the cable starts on pin 1.

37 Pin Printer end

The cable should be positioned on the connector so that the striped end of the cable is positioned starting on pin 1 of the printer connector.

PT68-1 SWTBUGA BOOT ROM

The PT68-1 uses SWTBUGA V1.3 for its Boot ROM. SWTBUG is covered in detail other places but there are some additions that will be covered here. There are two boot floppy commands. "D" - This is the standard command for booting from a real floppy. The "D" command loads sector 0. This sector contains a small program that loads the rest of the operating system. The other boot floppy command is -"U" which boots from sector 1.

To allow use of a GoTek the "U" command was necessary because of the unusual arrangement of sectors on track 0 side 0. The sectors were numbered 0,2,3,4,5,6,7,8,9,10. Note that sector 1 is skipped. This caused a problem when using a GoTek floppy emulator that at present can't skip sectors in a track. This made it necessary to have a special format to use with the GoTek which has sector numbering of 1,2,3,4,5,6,7,8,9,10. Note: the first sector is now 1 and there is no sector 0. This allowed GoTek drives to boot and work with FLEX 2.0. This required the Boot ROM to boot from sector 1 and new utilities had to be created. There was the NEWDISKG command to format a GoTek image. There was also a LINK1 command which would link sector 1. These changes allowed the use of a GoTek with FLEX 2.

There is now another GoTek format that will work with the "D" command and boot from sector 0. This format added an extra sector only on track 0, head 0 with numbering from 0 to 10. This means the GoTek format has 11 sectors on Track 0 while a normal FLEX 2 disk has 10. However, this gives the new GoTek format the ability to boot with the "D" command; and unmodified NEWDISK and LINK utilities will work with it. The extra sector, sector 1, causes FLEX 2 no problems. FLEX 2 makes no attempt to use sector 1.

FloppyMaintenance, the utility that allows you to work with GoTek images on a PC, was modified to work with the new GoTek format. FloppyMaintenance allows you to download other floppy images from the internet, export the files to a temporary directory and then you may import them to another disk image. This makes it easy to add new programs to a floppy image.

Partial List - SWTBUGA Commands

D - Boot floppy from sector 0
U - Boot floppy from sector 1
W - Boot IDE Partition 0
Q - Test Memory - Q BBBB EEEE B=Beginning address E=Ending address

V1.3 of SWTBUGA added the ability to enter commands and hex numbers in upper or lower case.

FLEX

The PT68-1 can run FLEX from SWTPC or from TSC. These versions of FLEX were often referred to as FLEX 2 or sometimes 6800 FLEX. FLEX 3.0 from TSC has been ported to the PT68-1 and is the version of FLEX we supply. There is very little difference between the later versions of FLEX2 and FLEX3. However FLEX 3 was the latest version made by TSC so we recommend it. One of the differences is FLEX 3 has a defined place to eliminate the prompt for "Enter Date" when the system boots. We have deleted the prompt and call "SET6818" in the STARTUP file so the date does not need to be entered when you boot the system

SDOS Mini-FLEX FLEX 1

These operating systems have not been tested on the PT68-1. We hope to offer some of them in ready to boot disks at a later date. In theory it should be straight forward to make copies of boot disks and boot them on the PT68-1. After all they would run on a SWTPC 6800 back in the day. Any problems that arise would be due to differences between the WD1771 and WD2797.

Data Separator Adjustment

WD2797

This is necessary for the floppy controller to function properly. An oscilloscope is **required**. It is not possible to adjust by trial and error. Trial and error adjustment has been tried by many customers and was never successful. The floppy controller will never work correctly if the adjustment is not perfect. Should you change the WD2797 controller chip, you must make the adjustments again.

To Adjust WD2797 Data Separator

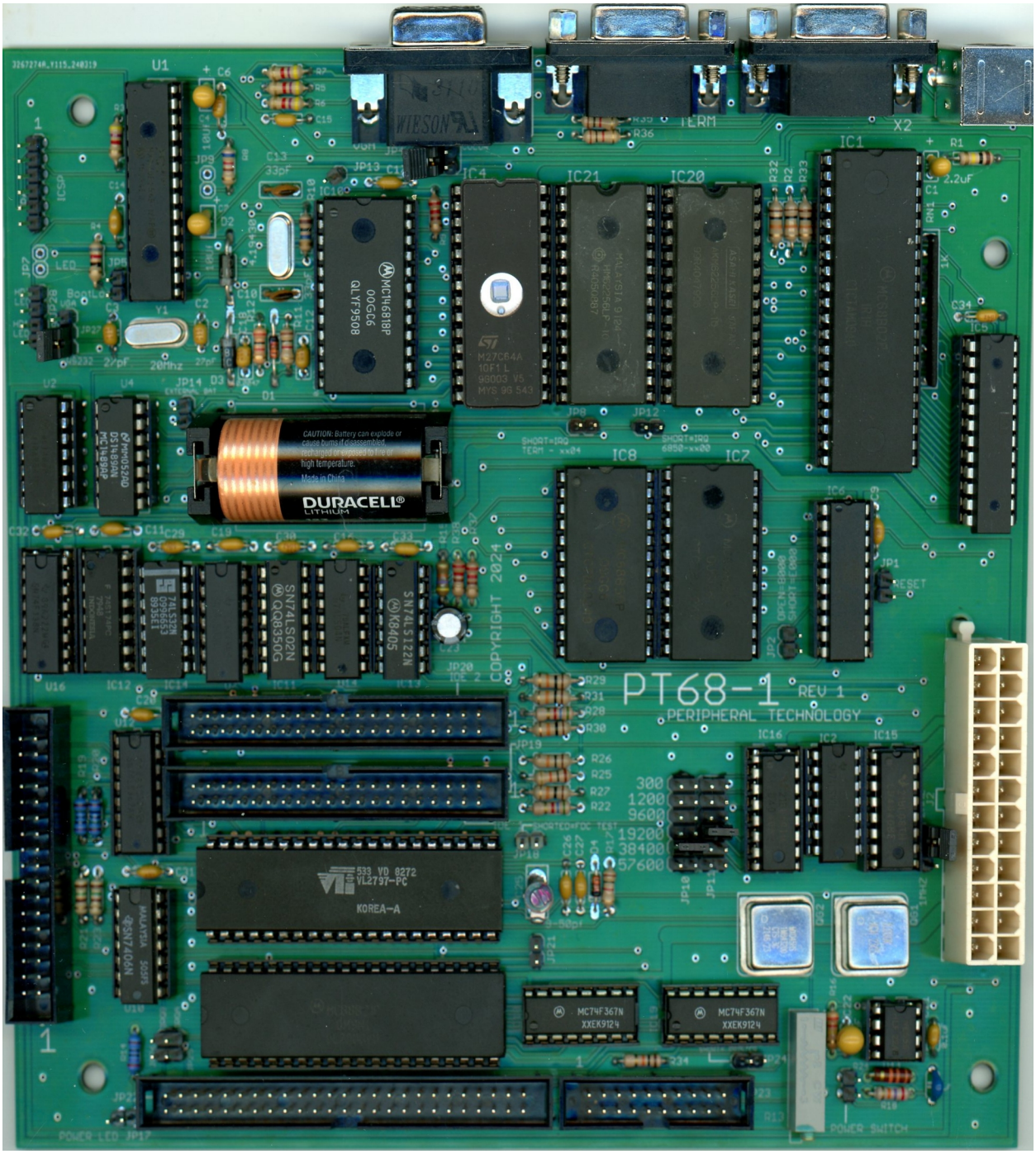
1. Turn power on for the PT68-1. A floppy drive does not need to be connected.
2. Press the reset button.
3. Put a shunt on the test pins. These are marked as JP18 and labeled "Shorted = FDC Test"
4. With a scope connected to JP21-1000ns position adjust R13 for a pulse width of 1000ns.
5. Connect scope to JP21-125 KHZ. Adjust C25 for a wave period of 8us or connect a frequency counter and adjust for a frequency of 125KHZ.
6. Remove the shunt on the test pins.

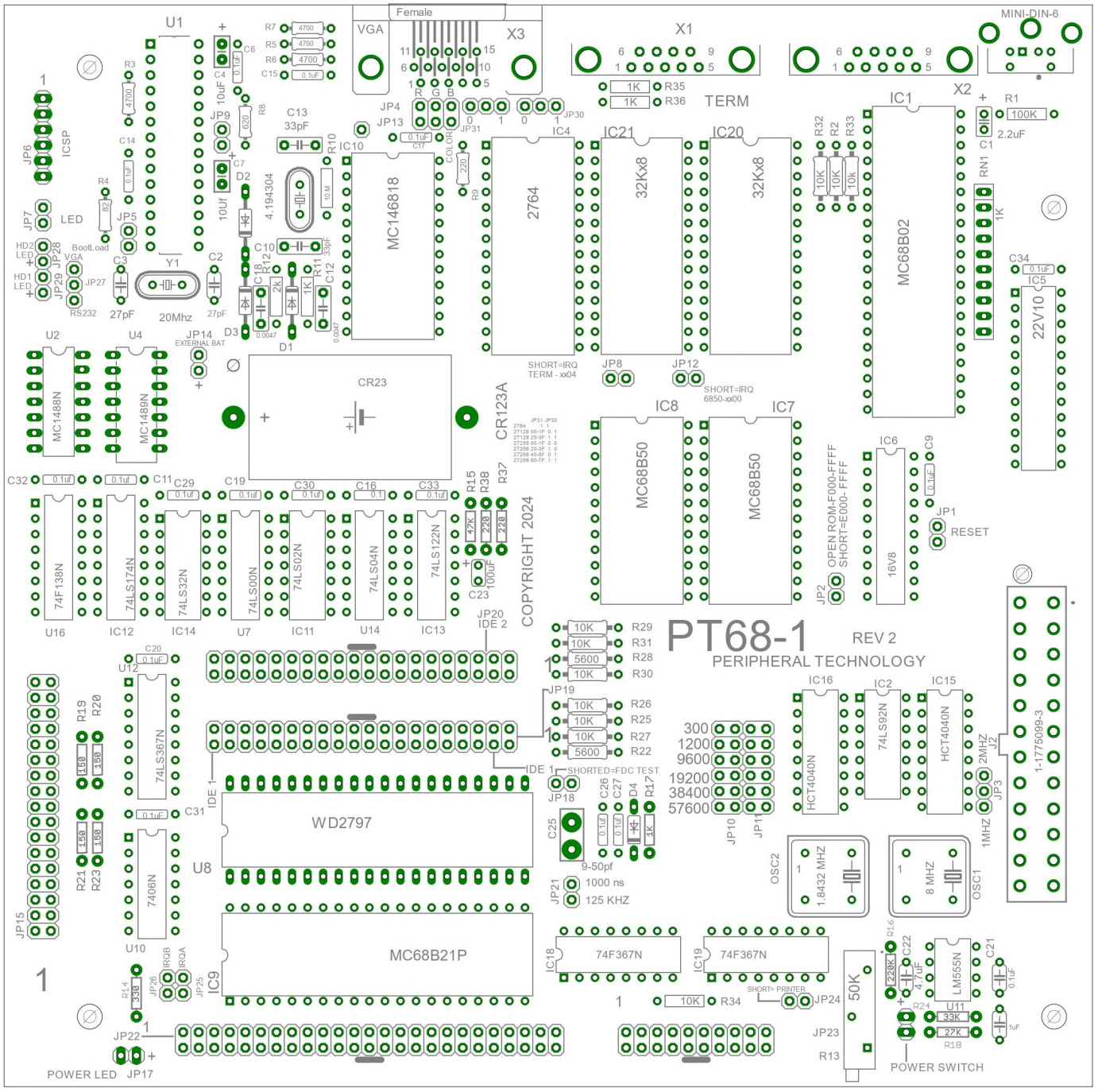
PARTS LIST PT68-1

QUANITY	DESIGNATION	DESCRIPTION
1	IC1	MC68B02
1	U1	MX270F256B-I/SP
1	IC2	74LS92
1	U2	1488
1	U4	1489
1	IC4	2764, 27128 or 27256
1	IC5	ATF22V10C-15PU
1	IC6	ATF16V8B-15PU
2	IC7-IC8	MC68B50P
1	U7	74LS00
1	IC8	WD2797
1	IC9	MC68B21
1	IC10	MC146818P
1	U10	7406
1	IC11	74LS02
1	U11	555
1	IC12	74LS174
1	U12	74LS367
1	IC13	74LS122
1	IC14	74LS32
1	U14	74LS04
2	IC15,IC16	74HCT4040
1	U16	74F138
2	IC18-IC19	74F367
2	IC20-IC21	32Kx8 AS6C662256 , D43256C-12L
1	QG1	HALF SIZE TTL 8MHZ Oscillator
1	QG@	Half Size TTL 1.832MHZ Oscillator
1	RN1	1K 10 PIN SIP TRW 610-1-102G
1	R1	100K 1/4 W Resistor
11	R2,R25-R27 R29-R31 R32-R33,R34	10K 1/4 W Resistor
4	R3,R5-R7	4700 1/4 W Resistor
1	R4	82 1/4 W Resistor
1	R8	620 1/4 W Resistor
3	R9,R37,R38	220 1/4 W Resistor
1	R10	10M 1/4 W Resistor
4	R11,R17 R35,R36	1K 1/4 W Resistor
1	R12	2K 1/4 W Resistor
1	R13	50K POT BOURNS 3006P-1-503
1	R14	330 1/4 W Resistor
1	R15	47K 1/4 W Resistor
1	R16	220K 1/4 W Resistor
1	R18	27K 1/4 W Resistor
4	R19,R20 R21,R23	150 1/4W RESISTOR
2	R22,R28	5.6K 1/4 W Resistor
1	R24	33K 1/4 W Resistor

PARTS LIST PT68-1

QTY	DESIGNATION	DESCRIPTION
1	C1	2.2uF 16V Tant
1	C3	27pF
18	C6,C9,C11 C14-C17 C19-C21,C26 C27,C29-C34	0.1uF Disc Capacitor
2	C10,C13	33pF
2	C12,C19	0.0047uF
1	C22	4.7uF
1	C23	100uF 16V
1	C24	1uF 16V Tant
1	C25	9-50PF Variable Capacitor
2	D1,D4	IN4148 Diode
2	D2,D3	IN60 or BAT42 Diode
1		Battery Holder BH 2/3A-2
1	Y1	20Mhz Crystal
1	Y2	4.194304 Crystal
1	J2	Power Connector AMP 1-1775099-3
2	X1,X2	DB9F
1	X3	DB15F
1		Mini-Din-6 Connector
4	JP3,JP27,JP30,JP31	3x1 Position Jumper Strip
11	JP1,JP2,JP5,JP7 JP14,JP16-JP18 JP21,JP22,JP24	2x1 Header Strip
2	JP10,JP11	6x2 Header Strip
1	JP28,JP29	1x4 Header Strip
1	JP6	1x6 Header Strip
1	JP4	3x2 Header Strip
1	JP25,JP26	2x2 Header Strip
1	JP15	17x2 Pin Shrouded Header
2	JP19,JP20	20x2 Shrouded Header
1	JP22	25x2 Shrouded Header
1	JP23	10x2 Shrouded Header
7		Shorting Plugs
1		8 Pin IC socket
9		14 Pin IC socket
6		16 Pin IC socket
1		20 Pin IC Socket
1		24 Pin Narrow IC socket
3		24 Pin Wide IC socket
3		28 Pin Wide IC socket
1		28 Pin Narrow IC socket
3		40 Pin IC socket


PT68-1
REV 1
PERIPHERAL TECHNOLOGY
COPYRIGHT 2024
DURACELL
LITHIUM
CAUTION: Battery can explode or cause burns if disassembled, not recharged or exposed to fire or high temperature.
Made in China
KOREA-A
MC74F367N
XXEK9124
MC74F367N
XXEK9124
TERM
RESET
POWER SWITCH
POWER LED JP17


PT68-1
REV 2
PERIPHERAL TECHNOLOGY
COPYRIGHT 2024
CR123A
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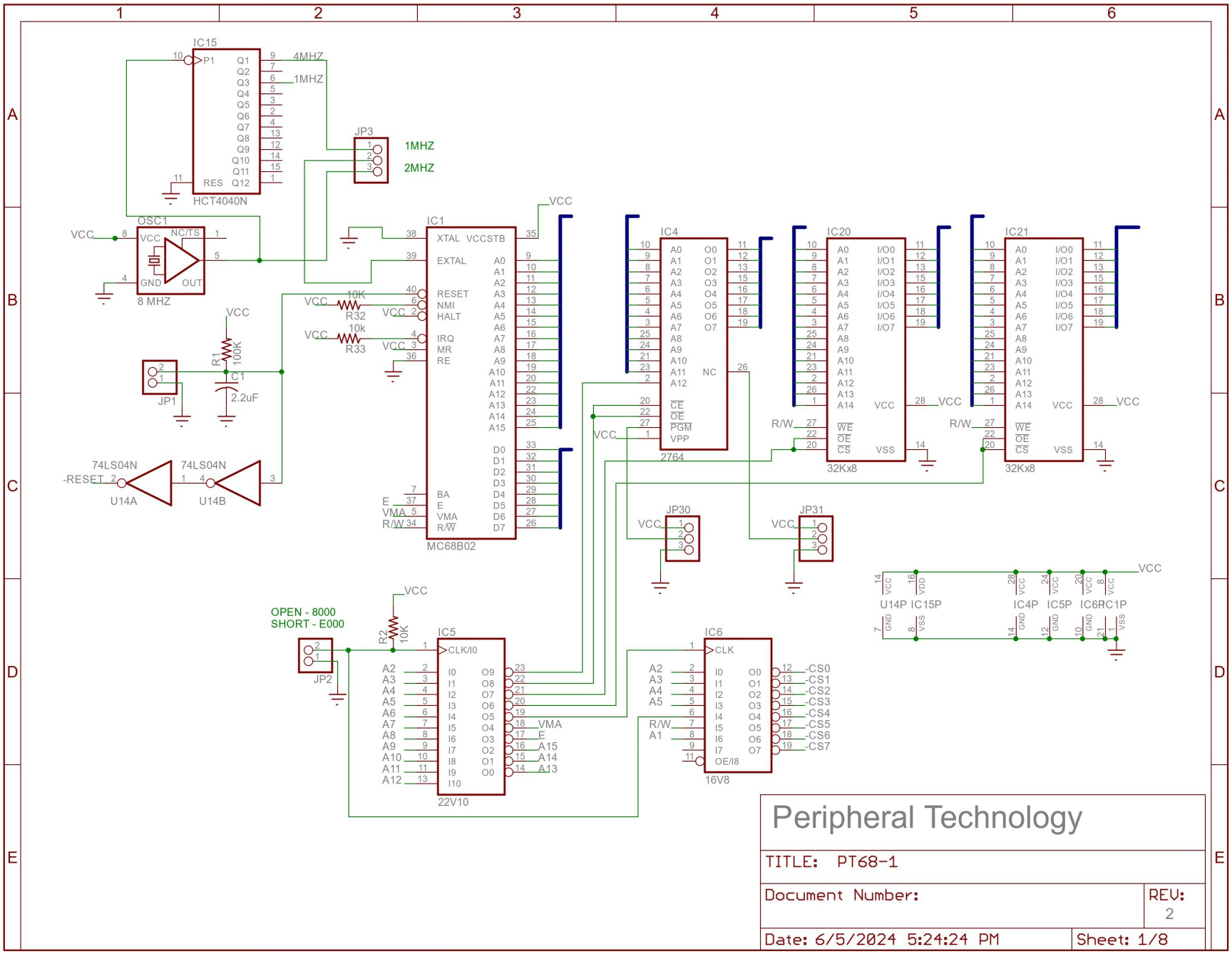
74LS32N
74LS00N
74LS02N
74LS04N
74LS122N
74LS367N
7406N
74F367N
MC1488N
MC1489N
HCT4040N
74LS92N
16V8
22V10
LM555N
1-1775099-3
VGA
Female
MINI-DIN-6
TERM
RESET
POWER LED
POWER SWITCH
OPEN ROM-F000-FFFF
SHORT=E000- FFFF
SHORT=IRQ
TERM - xx04
SHORT=IRQ
6850-xx00
SHORTED=FDC TEST
SHORT= PRINTER
1000 ns
125 KHZ
9-50pf
1.8432 MHZ
8 MHZ
20Mhz
27pF
4.194304
300
1200
9600
19200
38400
57600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1MHZ
JP3
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2MHZ
OSC1
8 MHZ
VCC
IC1
MC68B02
XTAL
EXTAL
RESET
NMI
HALT
IRQ
MR
RE
BA
E
VMA
R/W
R32
10K
R33
10k
R1
100K
C1
2.2uF
JP1
74LS04N
-RESET
U14A
U14B
IC4
2764
IC20
32Kx8
IC21
32Kx8
R/W
JP30
JP31
U14P
IC15P
IC4P
IC5P
IC6P
IC1P
OPEN - 8000
SHORT - E000
JP2
R2
10K
IC5
22V10
IC6
16V8
CLK/I0
CLK
OE/I8
-CS0
-CS1
-CS2
-CS3
-CS4
-CS5
-CS6
-CS7
VMA
E
A15
A14
A13
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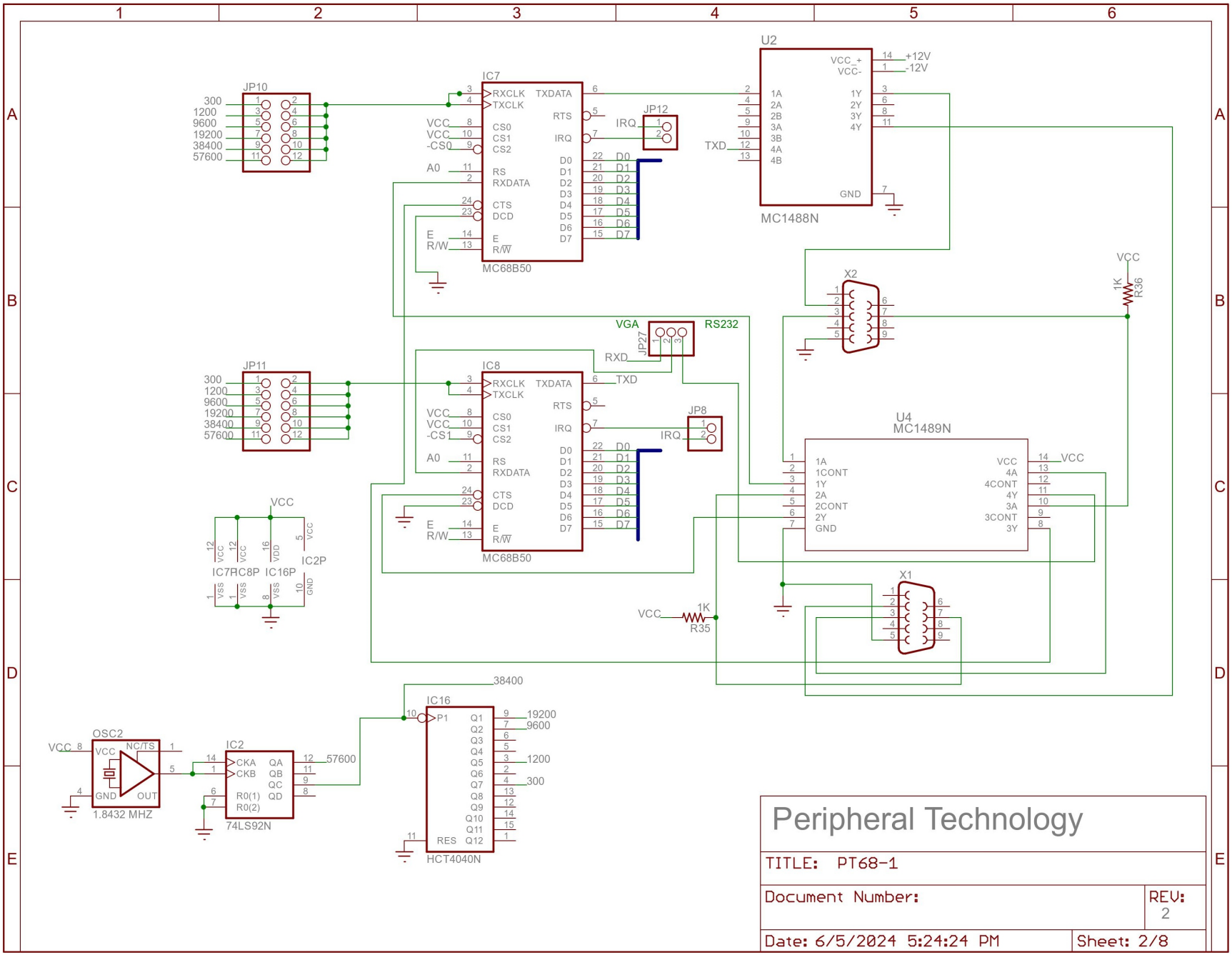

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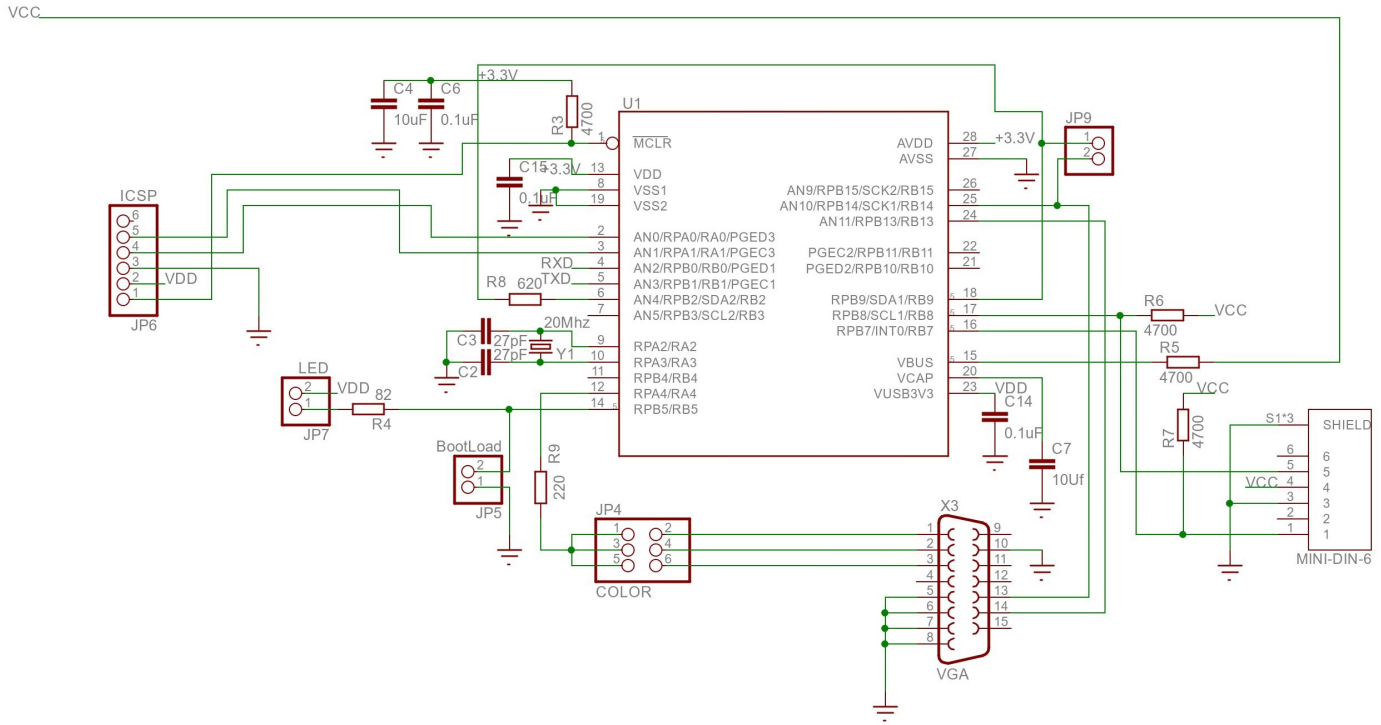

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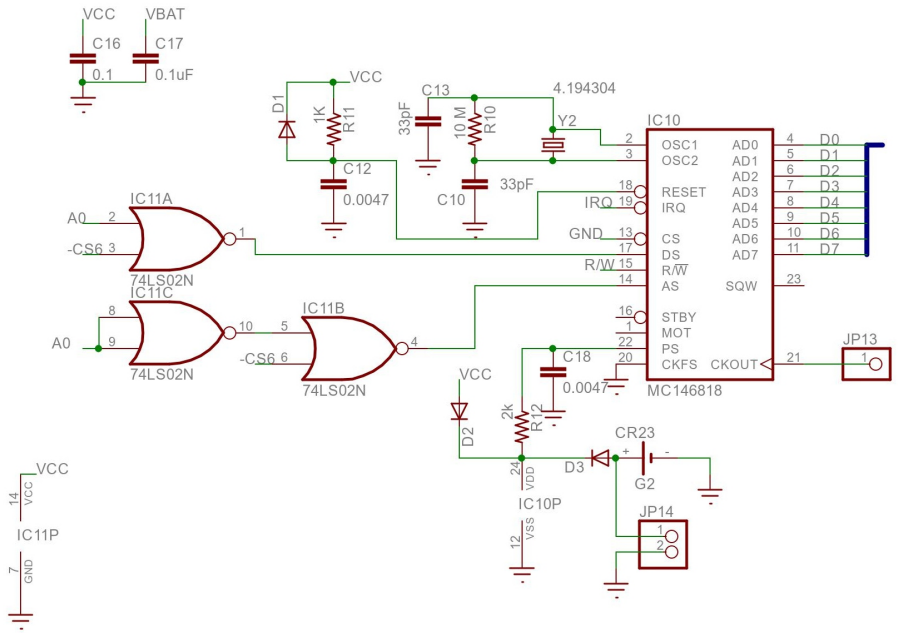

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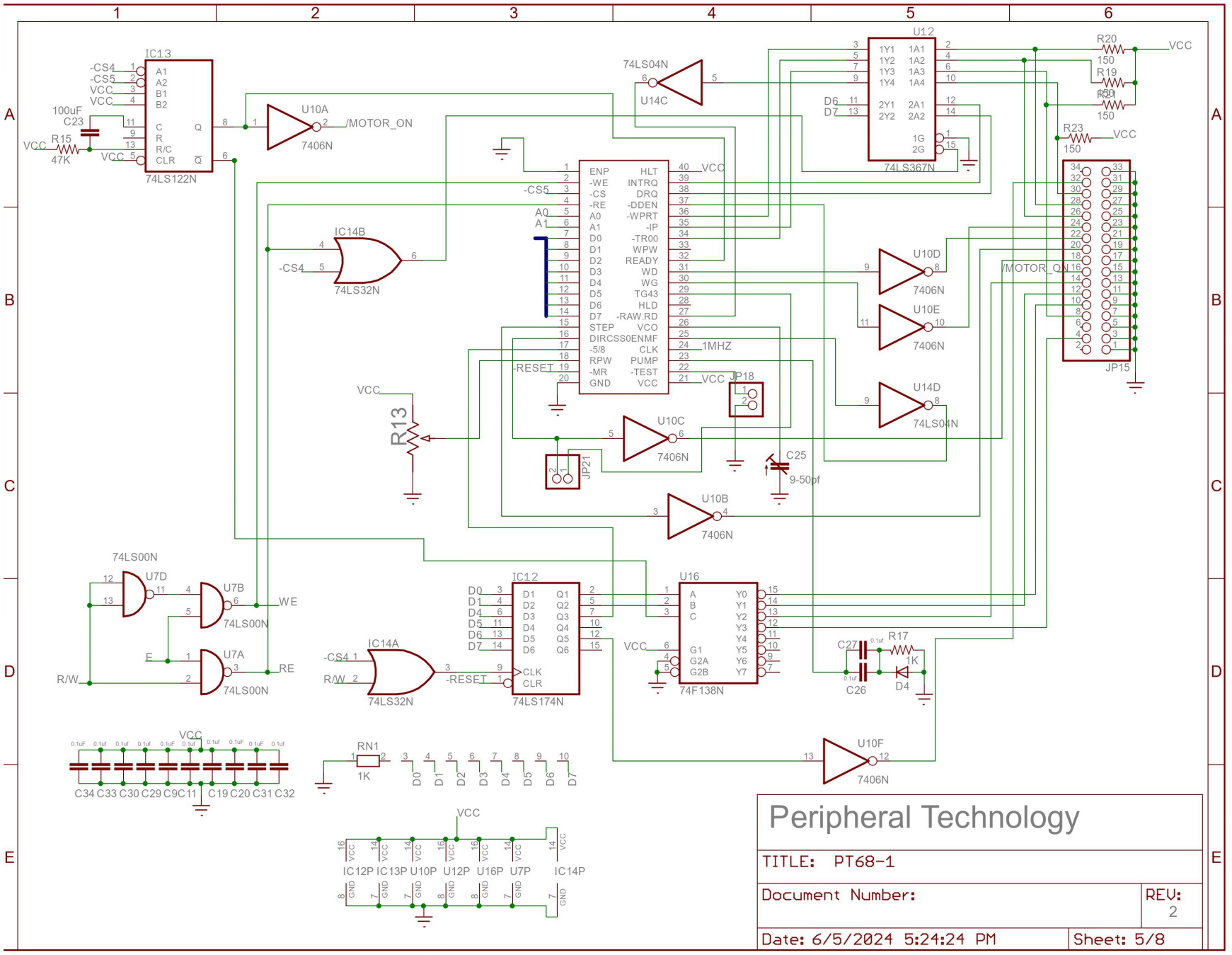
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2
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6
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74LS04N
U14C
U12
74LS367N
R20
R19
R23
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VCC
100uF
C23
R15
47K
IC14B
74LS32N
-CS4
-CS5
A0
A1
-RESET
1MHZ
JP18
JP21
JP15
U10D
U10E
U14D
U10C
U10B
7406N
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R13
C25
9-50pf
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74LS00N
U7D
U7B
U7A
WE
RE
R/W
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IC12
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U16
74F138N
C27
C26
R17
1K
D4
U10F
RN1
1K
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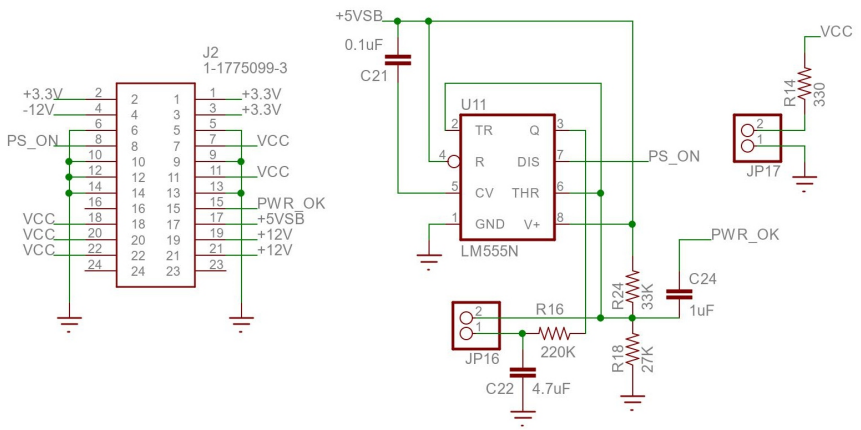

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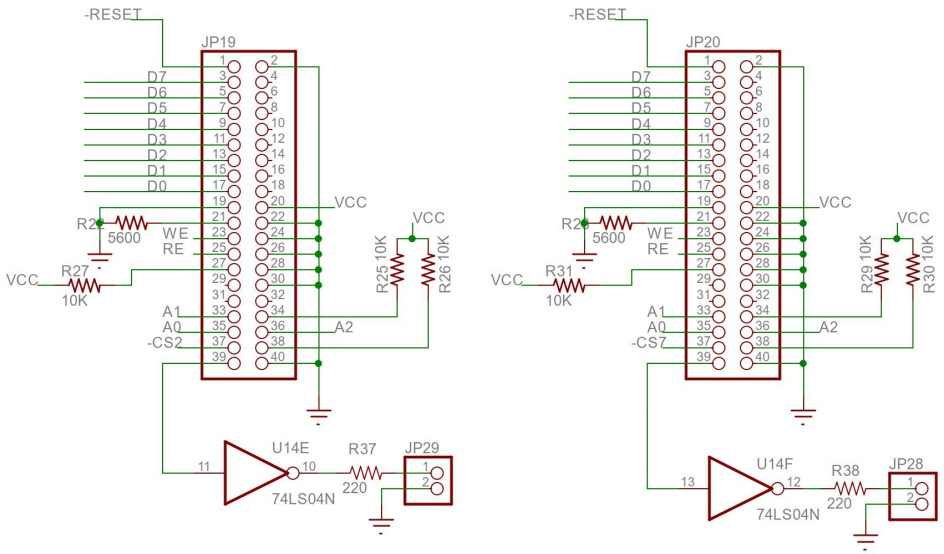

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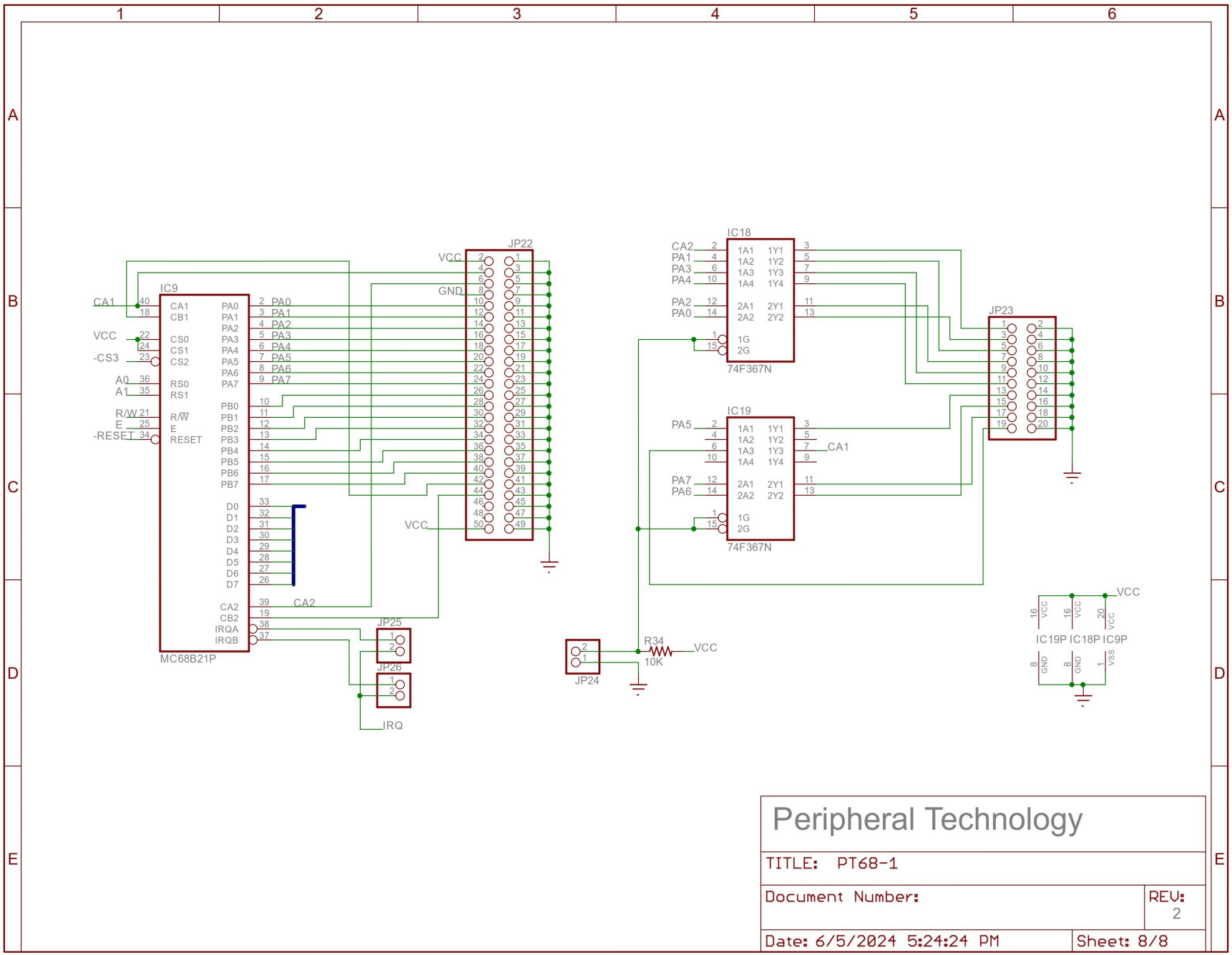
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2
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4
5
6
A
B
C
D
E
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MC68B21P
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CB1
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CS1
CS2
RS0
RS1
R/W
E
RESET
-RESET
-CS3
VCC
A0
A1
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
D0
D1
D2
D3
D4
D5
D6
D7
CA2
CB2
IRQA
IRQB
JP22
GND
JP25
JP26
IRQ
JP24
R34
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IC18
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1A2
1A3
1A4
1Y1
1Y2
1Y3
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2Y2
1G
2G
JP23
IC19
IC19P
IC18P
IC9P
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