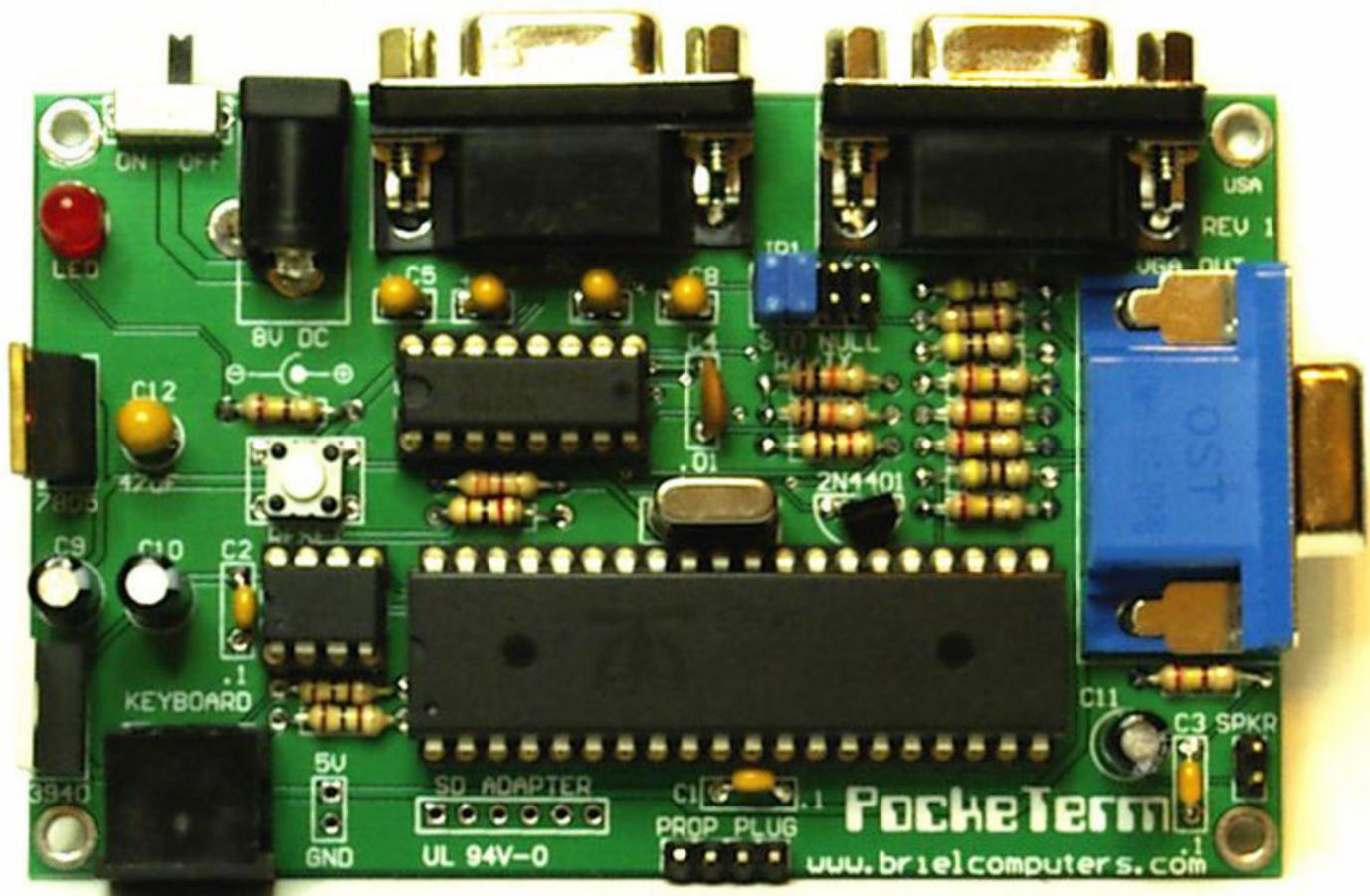# PockeTerm

Setup and Users Manual

FEBUARY 2009 PRELIMINARY EDITION

Briel Computers

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Version 1.0
Published by Briel Computers
5392 Cornell Blvd
North Ridgeville, OH 44039
USA

Forward

Creating a Terminal

Thank you for purchasing your PockeTerm single board advanced terminal. The idea of using a Parallax Propeller chip as a terminal is not an original idea. My goal was to create a terminal that had VT-100 cursor movement compatibility as well as the ability to have data pass through from a PC to the host device. This function is designed for the vintage computer and home hobby computer user that has a PC as a terminal but would like their device to have its own monitor and keyboard. While this seemed simple in theory, it turned out to be more work than I had imagined. Eventually all the obstacles were resolved and the result is a fully functional single board terminal that is more than just a dumb terminal. The compact size allows the user to hide the board inside equipment or hang it behind a monitor. The affordable price makes it a true value. The firmware is still under development but is at a stable revision for release. If you find any bug conditions feel free to email me at vbriel@yahoo.com and report the issue.

I hope that you enjoy the terminal and if you feel like improving the firmware and make changes that are custom to your needs, feel free to share your results on the Briel Computers forum.

Vince Briel

Setup and Users Manual

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Chapter 1: Unpacking and Setting up your PockeTerm

Before you begin setting up your PockeTerm, make sure you have plenty of table space. Do not power up the unit while touching any part of the circuit board and contact Briel computers if you are unsure about any part of the setup process.

Kit Part listing:

1 - PCB (Printed Circuit Board)
1 - Propeller 40 pin IC
1 - MAX232CPE IC
1 - 24LC256 IC
1 - 40 pin machine socket
1 - 16 pin machine socket
1 - 8 pin machine socket
1 - 5MHz crystal
1 - LM3940 3.3V voltage regulator
1 - 7805 5V voltage regulator
2 - 100 ohm resistors
7 - 240 ohm resistors
3 - 470 ohm resistors
2 - 1K ohm resistors
1 - 3.3K ohm resistor
2 - 10K ohm resistors
1 - .01uF ceramic capacitor
3 - .1uF ceramic capacitors
4 - 1uF tantalum capacitors
3 - 10uF electrolytic capacitors
1 - 47uF tantalum capacitor
2 – DB9 female serial connectors
1 – PS/2 keyboard connector
1 – 15 pin VGA connector
1 – 2.5mm power jack
1 – LED red
1 – ON/OFF switch
1 – 4X2 IDC header for cable select
2 – Jumper shunts
1 – RESET switch
1 – 2X1 IDC header for speaker
1 – CD containing this manual and software

You will need the following items to get your PockeTerm up and running:

1. **The PockeTerm board.**
2. **A 7-9V DC wall brick supply positive center.**
3. **Keyboard, a PC PS/2 format**
4. **A VGA monitor that can support 640X480 resolution**
5. **A DB9 serial cable to the Host computer and optional cable to PC**

Place or mount the PockeTerm board so that it is secured. Make sure no metal objects can touch the circuit board or damage could result.

Next, locate your power supply and plug it into the DC power input connector on the back of the PockeTerm as shown. Make sure that your power supply is positive DC center tap with ground outer connector. Do not power up the terminal until you have finished with your setup.

Figure 1: DC wall brick connector (Use 7-9V positive center connection power supply)

Now you can attach your PS/2 style keyboard to the PockeTerm. The flat spot or arrow on the cable connector will be on top. Next, attach your VGA monitor cable to the VGA port on the side of the PockeTerm.

Finally you can connect a serial cable to the PockeTerm. There are many formats you may need but the PockeTerm is a standard DCE device and should only require a DB9M to DB9F (or DB25F) straight through cable. Set the jumper settings at JP1 to STD for standard cabling. If you are going to use a null modem cable, or the device you are attaching it to is setup as a DCE as well, just change the jumper blocks to NULL on the PockeTerm board.

CAUTION: DO NOT CHANGE JUMPERS WHILE THE POWER IS ON, DAMAGE MAY OCCUR

Once you have everything set, you should be ready to use your PockeTerm. The ON/OFF switch is on the back left and the power LED is nearby to alert you that the board is turned on.

Chapter 2: Assembling the PockeTerm kit

Tools required for assembly:

Soldering iron, light duty solder, wire cutters, needle nose pliers, and a multi-meter

Reading and identifying resistors:

This manual is designed to help newcomers to kits learn to identify the parts and read their values. Resistors have 4 colored bands on them that are used to identify the value. The first 3 are the value and the 4th colored band is to identify the tolerance of the resistor. The 4th band is usually silver for 10% or gold for 5% tolerance. Here is how to read the other three to get the value:
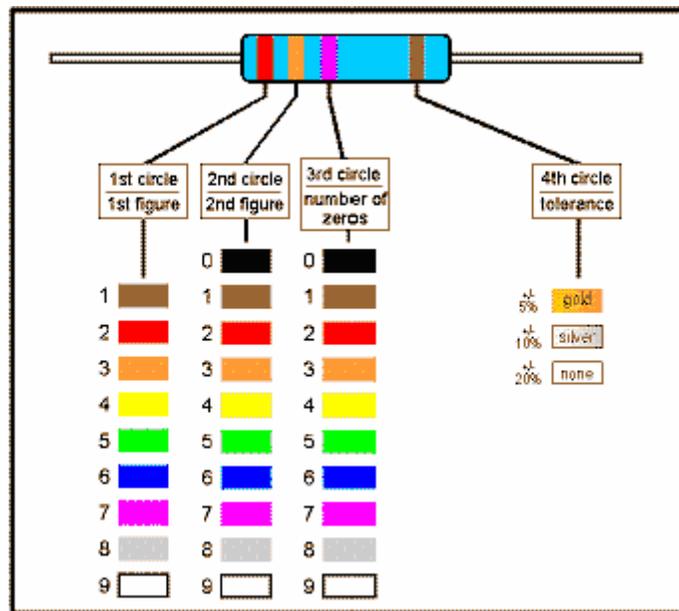

Figure 2: Resistor color code chart

Let's assume the resistor you are trying to identify has the colors orange, and then another orange, then a red band followed with a gold band. So, to read the resistor, find the gold or silver band, that identifies the 4th band. Hold the resistor so the 4th band is on the right side and read the first color on the left.

The first color is orange which has a value of 3 according to the chart above. The second color is also orange which also has a value of 3. The 3rd number indicates how many zeros follow the first two numbers. So, red is 2 zeros. This gives your resistor a value of 3, 3 and 2 0's (00) or 3300=3.3K. This may take some practice but look through all the resistors and identify them without a meter if you need practice.

Reading and identifying capacitors:

It takes less time to read the values of the capacitors than to read the values of the resistors. The key is to understand and read the numbers correctly.

Larger capacitors may have the values clearly printed on them. For example:

10uF = 10 Micro Farads

Smaller capacitors however, may only have 2 or 3 numbers on them. For example, the 22uF capacitors say 22J. .1uF capacitors have the value 104 on them. This is similar to the resistor codes where the first 2 numbers are actual numbers and the 3rd number is the multiplier code. So 10 X 4 is 100,000 and the value is in pico Farads (pF). Converting it to a proper numbering format gives us the value .1uF. To make things easier, here is a list of the values on the capacitors used and the numbers printed on them.
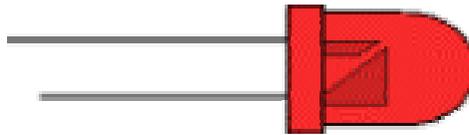
Power LED:

Figure 3: LED pin internal diagram

Looking at the LED there are two connectors, the Anode is longer and has the smaller connector inside. The cathode is the negative side. It has a shorter lead and a larger part inside the LED. The cathode is the negative post. Connecting is simple on the PockeTerm. The LED silkscreen on the PockeTerm has the positive + marked. Simply put the longer anode connector into the positive side when installing.

Before you begin:

Make sure you have proper working space and that you heat your iron before beginning the assembly. This kit is not for first time soldering and Briel Computers assumes that you have some prior experience with soldering circuit boards. If you have never soldered circuit boards before or don't feel you are ready, you should build other kits of a smaller, less complex nature before building your PockeTerm. Unpack your kit and place the parts in neat piles so that you can access them easily.

Step 1: The Resistors

Resistors are not polarized so they can be installed either direction. I like to start with the 100ohm resistors and work my way up to the 10K ohm resistors.

100 ohm - brown black brown (QTY2)
240 ohm – red yellow brown (QTY 7)
470 ohm – yellow violet brown (QTY 3)
1K ohm – brown black red (QTY 2)
3.3K ohm – orange orange red
10K ohm – brown black orange

Bend the metal wires at a 90 degree angle on each side of the resistor body. Place the resistor into the resistor location until it is flush with the PCB. Turn the board over holding the resistor in its place and bend the wires outward just slightly so the resistor can not back out of the holes. While the bottom of the board is facing up flat on your workspace, solder each of the two wires on the resistor. Make sure your solder stays only on the resistor wire and the hole. Cut the excess lead off the resistor. Repeat this procedure for all of the resistors.

Step 2: The RESET switch

Place switch onto the board in its location. While holding the switch, flip the board over and set down on your workspace. Make sure the switch is still seated in the board and solder one tab. Turn the board over showing the top and double check that it is sitting flush. If not, you can heat the single tab and push it flat onto the PCB. Solder the other 3 tabs of the switch.

Step 3: The power switch

Install switch into its location. Make sure the slide part of the switch faces away from the PCB. When flush with the PCB, turn over holding the switch from falling out and place on your workspace. Solder down all 5 posts making sure no solder flows across to the other tabs.

Step 4: The IC sockets

On the shorter edge of the socket is a notch showing you the direction to install the socket. Place the 40 pin large socket flush onto the PCB. Holding the socket, flip the board over and set on your workspace. Solder 2 pins on opposite corners and turn the board over and make sure the socket is flush with the PCB. Heat and adjust if needed. Solder the other 38 pins. Check for completeness of all the pins. If you accidentally install the socket backwards, it will still work just correctly. Just remember when you go to install the chips that the notch is at the wrong end. Repeat for the other 2 sockets.

Step 5: The crystal

The crystal is not polarized and can be installed in either direction. Install flush with the PCB, hold the crystal and bend the leads apart slightly to keep the crystal from falling out. Turn the board over and solder the leads. Cut the excess lead length off flush with the PCB.

Step 6: The transistor (Do not install if you plan to use the Prop Plug in place of PC Port)

The transistor is labeled 2N4401 and is black with 3 pins, a half circle shape with one flat side. On the PCB match the shape outline with the transistor and install the pins through the holes. You may need to spread the pins apart to make them line up correctly with the board. Bend the two outer pins a little so the transistor will not fall out and turn the board over. Solder the 3 pins of the transistor and cut the excess lead off.

Step 7: .1uF capacitors

Install the three .1uF (C1-C3) caps into their locations. The caps are labeled 104 and are not polarized so they can be installed either way. Fit as flush as possible, bend the 2 wires apart a little so the capacitor does not fall out, turn the board over and set it on your workspace. Solder the leads onto the PCB and cut away the excess lead length.

Step 8: .01uF capacitor

Install the .01uF capacitor C4 into its location. The capacitor is labeled 103 and is not polarized so it can be installed either direction. Fit as flush as possible, bend the 2 wires apart a little so the capacitor does not fall out, turn the board over and set it on your workspace. Solder the leads onto the PCB and cut the excess lead length.

Step 9: 1uF tantalum capacitors

The 1uF capacitors C5-C8 are polarized and must be installed correctly. They are labeled 1u and have a + on the positive lead. Match that lead with the PCB + when installing. As with the other capacitors, after soldering cut away the excess leads.

Step 10: 47uF tantalum capacitor

The 47uF capacitor C12 is polarized and caution must be taken to install correctly. There is a + on the capacitor and the + pin is slightly longer then the other pin. Place flush onto the PCB and bend the leads slightly apart to keep it from falling out of the PCB and turn over. Solder the two leads and cut the excess lead lengths away.

NOTE: We will solder the C9, C10 and C11 later on, do not install them yet.

Step 11: Jumper connectors

The speaker connector and the 4X2 cable select jumper pads go into their locations. Place into the PCB and while holding the jumper, turn the PCB over and place on your workspace. Solder into place. With the 4X2 you may want to solder only one post and turn over and inspect that it is flush. You can heat the post and adjust to get it flush on the PCB. Install the jumpers into either the STD or NULL locations vertically. This determines what type of cable you have. You can always change them later.

Step 12: LED

The LED is polarized and caution must be taken to install correctly. The easiest way to tell the + lead of an LED is that one lead is longer than the other. Place that lead into the + pad on the PCB (it is a square pad) and push the LED flush onto the PCB. Next, bend the tabs apart slightly so the LED will not fall out when you turn the board over. Turn over the PCB and solder the leads onto the PCB. Cut the excess leads flush with the board.

Step 13: DC power jack

Install the jack flush with the PCB, hold jack from falling out and turn board over. Place on workspace and solder onto PCB.

Step 14: DB9 serial connectors

They look like the VGA connector but only have 2 rows of pins. Carefully place into PCB until flush. Use caution when installing not to bend any pins. Turn over the board while holding connector and solder onto board. Inspect that all pins are soldered correctly and the connector is flush with the PCB then solder the two larger holding tabs onto the PCB for added support. Repeat for the 2nd DB9 serial port connector.

Step 15: VGA connector

The VGA is nearly the same as the DB9 serial port except it has 3 rows of pins. Insert flush with PCB, turn and solder the inside row first, followed by the outer 2 rows. Check your work, and then solder the support tabs down.

Step 16: 10uF electrolytic capacitors

The capacitors C9, C10 and C11 are polarized and must be installed correctly. They are cylinder shaped and both leads protrude from the same side and are labeled 10uF. There are two ways to tell the + and - leads. First, looking at the leads, the + is longer than the – lead. Secondly, there is a large white arrow pointing to the - lead. Install flush with the PCB and bend the two leads slightly apart from one another. Turn the board over and solder onto the PCB. Cut the excess lead and repeat for the other 2 capacitors.

Step 17: PS/2 keyboard connector

Place connector flush onto the PCB and hold while turning over to keep it from falling out. Place on workspace and solder onto the board. You may wish to solder just the large tab first and check to make sure it is flush before soldering the other pins down.

Step 18: Voltage regulators

The voltage regulators are polarized and must be installed correctly. Also, make sure you install the correct one in the correct location or the board will not function correctly. The 7805 is a 5V regulator and is properly labeled. Install the 7805 so the large metal heat tab faces out away from the PCB. Turn over and solder onto the board. Cut the extra lead length off and repeat with the 3940 3.3V voltage regulator. It is installed the same as the 7805.

Step 19: The cleanup

Before you power up your board, wash off the excess flux and check for any missed solder connections. I like to clean with plain water and a soft tooth brush. Run under the tap water for a minute washing off excess flux. Dry immediately with a blow dryer on low heat. You can also use canned or compressed air in place of blow dryer.

Step 20: Initial power test

Plug in your power supply, making sure that it is 7-9V with a positive center polarity and turn on your board with **no** chips installed. Turn on the board and make sure that your power LED comes on.

Step 21: Final test

Install the IC chips; connect a keyboard and VGA monitor. Power on your PockeTerm and you should get text at the bottom of your screen. You can change your BAUD by pressing CTRL and F1 at the same time to cycle through all the options. Your settings are automatically saved for when you power off.

You are now ready to attach the PockeTerm to your Host computer and begin using your terminal. The goal of Briel Computers is that ALL PockeTerm kits get completed successfully. If you are having a problem, please feel free to ask for help.
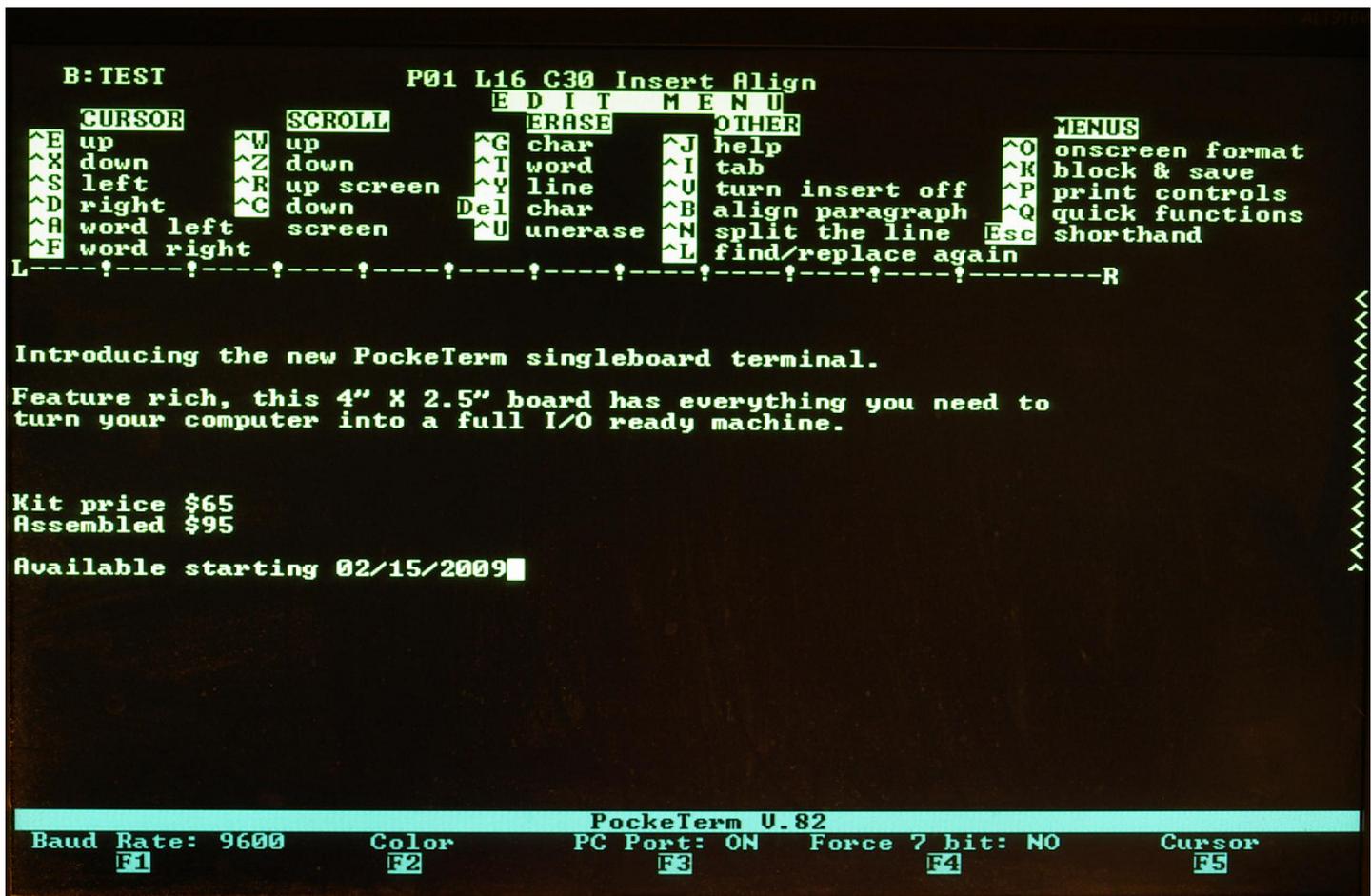
Chapter 3: Programming the Terminal

Figure 4: PockeTerm screen shot

There are currently 5 Function keys that are made to change settings on the PockeTerm. The function key must be pressed with the CTRL key in order to change the setting. Settings are automatically saved.

CTRL-F1 Selects Baud Rate

CTRL-F2 Changes text color of the main display section

CTRL-F3 Turns on/off the 2nd serial port that connects to a PC.

CTRL-F4 Force incoming data to 7 bit ASCII. Strips the 8th bit, required for some systems

CTRL-F5 Change cursor type. Choose from underscore, solid block, or none. Also, choose from blinking or solid.

Chapter 4: Configuring the Serial Interfaces

Your PockeTerm is equipped with two serial I/O ports. The main port connects to your HOST computer that you will being doing all your work from. The other port is designed to attach to a PC to transfer data to/from your HOST machine. The serial port to your PC should be a standard DB9F to DB9M straight through cable. Because the PockeTerm is firmware upgradeable, this port can not be reconfigured. However, the HOST port has the flexibility to use either a standard cable DB9F to DB9M or a NULL modem cable where the TX/RX lines are reversed. Most users will find the STD jumpers are what you need to use. Please be sure you to know what type of cable you have before attaching it to your HOST device and the PockeTerm.

NOTE: To use the Prop Plug connector, the PC Serial port transistor circuit needs to be removed first. The circuit causes interference with the prop plug.
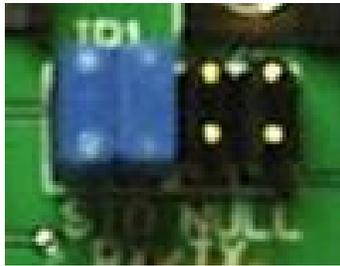

Figure 5: Cable type select jumper

Locate the 4X2 jumper block labeled JP1 near the serial ports. This jumper block will help you select the proper cable type that you have going to your HOST computer. If you are using a standard DB9F-DB9M cable, then set the jumpers as shown in figure 5. If however, you are using a NULL modem cable, put the jumpers vertically on the 2 NULL modem cables.

Caution: Before installing cables, or changing jumpers, make sure power is turned off on your PockeTerm and your HOST computer

Power on your PockeTerm and test your system. Make sure your BAUD rate is correctly set.

Chapter 5: Troubleshooting

If you have just built your PockeTerm and are now having problems getting it running, here are some tips on what to check:

Dead: Check your power source to make sure it is functioning properly. Is the LED on? If not, you have no 5V coming off the 7805 voltage regulator. Measure the voltage on the two outer pins of the 7805 voltage regulator. One should be the voltage matching your power supply; the other should be almost 5V exactly. If you have the input voltage but not the output voltage, either you have a bad voltage regulator or it is installed backward. The large flat metal piece should be toward the edge of the board.

No response from the keyboard: Make sure serial cable is attached properly, proper cable choice NULL or STD is selected correctly and that your host device is functioning correctly.

Data characters dropping on screen: This is caused by dual serial ports being on. Turn off PC serial port to fixed dropped character issue.

The Briel Computers forums at http://www.brielcomputers.com/phpBB2/ are a good source for information when troubleshooting. We want every kit that gets sold to operate properly, so email vbriel@yahoo.com for help.

Chapter 6: Other Uses for the PockeTerm

The PockeTerm is based on the Parallax Propeller© demo board with changes that focus on the board being used as a terminal. This was done intentionally so that it could be used for other purposes. If you want to learn more about the propeller or want to use the PockeTerm to run a program that works on the Parallax demo board, feel free to experiment. Most programs designed for the demo board will work on the PockeTerm. This gives you the ability to use the PockeTerm as a Propeller learning board as well. Visit the Parallax website for a current copy of the Propeller Tools programming software.

Figure 6: Parallax Propeller Demo Board

PORT PIN	PHYSICAL PIN	DESCRIPTION
P0	1	DO on SD card adapter
P1	2	CLK on SD card adapter
P2	3	DI on SD card adapter
P3	4	CS on SD card adapter
P10	15	Sound output port
P16	21	VGA Port
P17	22	VGA Port
P18	23	VGA Port
P19	24	VGA Port
P20	25	VGA Port
P21	26	VGA Port
P22	27	VGA Port
P23	28	VGA Port
P24	33	HOST Tx Pin
P25	34	HOST Rx Pin
P26	35	PS/2 Keyboard Data
P27	36	PS/2 Keyboard Clock
P28	37	EEPROM SCL
P29	38	EEPROM SDA
P30	39	PC Port Tx Pin
P31	40	PC Port Rx Pin

Figure 7: PockeTerm Pin Usage Chart

If you have used a Propeller chip in the past, most of these pins will be familiar for you. The HOST device uses P24 & 25 because the HOST device can not be the same as the PC device that gets programmed. The rest of the pins are the standard pin settings used in both the proto board and the development board.

NOTE: The Prop Plug connection is identical but can not be used if the PC Port is set up with the transistor programming circuit.

For vintage computer enthusiasts I recommend searching for the PropAltair program. While it can not use the onboard keyboard or VGA display, it is a great program showing the full power of the Propeller chip.

Appendix A: Bill of Materials

PART NUMBER	DESCRIPTION	VENDOR
PROPELLER	MICROCONTROLLER	PARALLAX
24LC256-I/P	EEPROM	DIGIKEY
698576	MAX232	JAMECO
41136	40 PIN SOCKET	JAMECO
37402	16 PIN DIP	JAMECO
51626	8 PIN DIP	JAMECO
X051-ND	5MHZ CRYSTAL	DIGIKEY
LM3940IT-3.3-ND	3940 3.3V VOLTAGE REGULATOR	DIGIKEY
51262	7805 VOLTAGE REGULATOR	JAMECO
690620	100 OHM RESISTORS (QTY 2)	JAMECO
690718	240 OHM RESISTORS (QTY7)	JAMECO
690785	470 OHM RESISTORS (QTY 3)	JAMECO
690865	1K OHM RESISTORS (QTY 2)	JAMECO
30672	3.3K OHM RESISTOR	JAMECO
691104	10K OHM RESISTORS	JAMECO
15229	.01uF CAP C4	JAMECO
25523	.1uF CAPS (QTY 3) C1-C3	JAMECO
154860	1uF Tantalum CAPS (QTY4) C5-C8	JAMECO
198838	10uF CAPS C9, C10, C11	JAMECO
94123	47uF Tantalum Cap	JAMECO
104952	DB9F (QTY 2)	JAMECO
119474	PS/2 CONNECTOR	JAMECO
DMRH-15SI-BT4PB	VGA CONNECTOR	NEBRASKA
101179	DC POWER IN JACK 2.5MM	JAMECO
94511	LED RED	JAMECO
588220	ON/OFF Switch	JAMECO
53532	4x2 HEADER	JAMECO
112442	JUMPER SHUNTS (QTY 2)	JAMECO
P8006S-ND	RESET SWITCH	DIGIKEY
53532	2X1 HEADER FOR SPEAKER	JAMECO
PT1010	PockeTerm Blank PCB	BRIEL
CD	CD MANUAL FOR POCKETERM	BRIEL

Appendix B: VT-100 Supported Commands

This is the current list of VT-100 commands that work with the PockeTerm

COMMAND	DESCRIPTION
ESC[m	Turn off character attributes
ESC[0m	Turn off character attributes
ESC[1m	Turn bold character on (reverse)
ESC[7m	Turn reverse video on
ESC[nA	Move cursor up n lines
ESC[nB	Move cursor down n lines
ESC[nC	Move cursor right n lines
ESC[nD	Move cursor left n lines
ESC[H	Move cursor to upper left corner
ESC[;H	Move cursor to upper left corner
ESC[line;columnH	Move cursor to screen location line, column
ESC[f	Move cursor to upper left corner
ESC[;f	Move cursor to upper left corner
ESC[line;columnf	Move cursor to screen location line, column
ESCD	Move/scroll window up one line
ESC[D	Move/scroll window up one line
ESCL	Move/scroll window up one line (undocumented)
ESC[L	Move/scroll window up one line (undocumented)
ESCM	Move/scroll window down one line
ESCK	Clear line from cursor right
ESC[0K	Clear line from cursor right
ESC[1K	Clear line from cursor left
ESC[2K	Clear entire line
ESC[J	Clear screen from cursor down
ESC[0J	Clear screen from cursor down
ESC[1J	Clear screen from cursor up
ESC[2J	Clear entire screen

SAMPLE BASIC PROGRAM TO CLEAR SCREEN AND MOVE CURSOR TO 1 DOWN 1 ACROSS

```
10 E$=CHR$(27)
15 REM LINE 20 CLEARS SCREEN CURSOR STAYS IN CURRENT POSITION
20 PRINT E$+"[2J"
25 REM LINE 30 MOVES CURSOR TO 1 DOWN ; 1 ACROSS
30 PRINT E$+"[1;1H"
```

Warranty
(Applies to factory assembled circuit boards only)

Briel Computers hereby warrants each of its products, and all components therein contained, to be free from defects in materials and/or workmanship for a period of thirty (3O) days from date of purchase. In the event of the occurrence of malfunction or other indication of failure attributable directly to faulty workmanship and/or material, then, upon return of the product to Briel Computers, at 5392 Cornell Blvd, North Ridgeville, Ohio 44039 (postage prepaid), Briel Computers will, at its option, repair or replace said products or components thereof, to whatever extent Briel Computers shall deem necessary, to restore said product to proper operating condition. All such repairs or replacements shall be rendered by Briel Computers, without charge to the customer. The responsibility for the failure of any Briel Computers product, or component thereof, which, at the discretion of Briel Computers, shall have resulted either directly or indirectly from accident, abuse, or misapplication of the product, shall be assumed by the customer, and the Briel Computers shall assume no liability as a consequence of such events under the terms of this warranty. While every effort, on the part of Briel Computers, is made to provide clear and accurate technical instruction on the use, implementation, and application of its products, Briel Computers shall assume no liability in events which may arise from the application of such technical instruction, nor shall Briel Computers be held liable for the quality, interconnection, or application of peripheral products, which may have been recommended by Briel Computers, but which have not been supplied as part of the product. This warranty contains and embodies the limits of responsibility of Briel Computers, with regard to its products, and no other liability is expressed, implied, or should be assumed by the purchaser, and in no event shall Briel Computers be held liable for the loss of time, effort, or transportation costs, nor for loss of potential profits or other consequential losses which might arise from the purchase, assembly, use, application, or subsequent sale of the products of Briel Computers, nor from any instructions and/or technical information thereto related.