# Palm Cradle DTR Hack

***Disclaimer:***
*This hack should be performed by someone who is skillful in soldering. This information is provided on a as-is basis. I am not responsible for any damages nor loss for the use of this information.*



The following table shows the Palm Organizer serial connector.

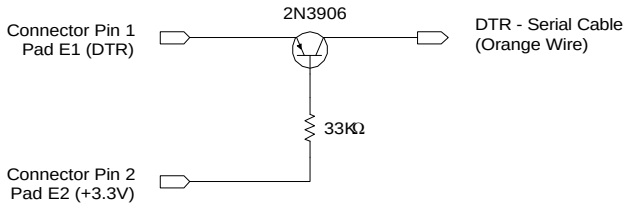
| Pin | Signal | Direction | Description |
|---|---|---|---|
| 1 | DTR | Out | Data Terminal Ready - Level shifter V+ output (330Ω series resistor) |
| 2 | VCC | Out | +3.3V (330Ω series resistor) |
| 3 | RD | In | Receive Data |
| 4 | RTS | Out | Request to Send |
| 5 | TD | Out | Transmit Data |
| 6 | CTS | In | Clear to Send |
| 7 | GPI1 | In | General Purpose In,"Hot Sync" |
| 8 | GPI2 | In | General Purpose In, "Modem Sync" |
| 9 | Unused | | |
| 10 | SG | 0V | Ground Reference |

Due to the fact that the RS232 level shifter chip they used in the Palm has only 2 output pins, the DTR pin is simply the output of the level shifter chip (SP385ACA or LTC1385CG) charge pump output. This pin is +3.3V when the serial port is disable and about +6.6V when the serial port is enabled.

This is a non-standard signal. According to the RS232 specification, any voltages ≥3V should be treated as a high. As a matter of fact, my Aopen 56K modem treats the +3.3V on the DTR as asserted high.

Further more, since this pin always has power on it, whether the serial port is enabled or not. This causes a power drain via the DTR signal when the Palm is in its cradle connected to a PC or some other external device. What this hack does is to disconnect the DTR line except when the serial port is enabled by the Palm software.

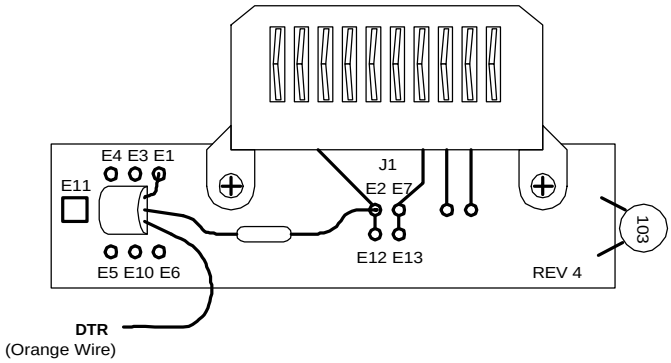
The 2N3906 PNP transistor in the schematic diagram is biased from the +3.3V. When the serial port is enabled, the DTR is at a higher potential (around +6.6V). The 33KΩ resistor limits the current flowing to the B-E junction to about 80μA. The transistor is turned on allowing current to flow to the DTR pin on the serial cable. When the serial port is disabled by software, the DTR line drops to +3.3V. There is no current flowing through the B-E junction of the transistor, hence the transistor is off disconnecting the DTR line. The internal resistance of the DTR receiver in your PC or serial device would provide the necessary pull down resistor.




Palm Cradle DTR Hack Schematic

**Part List**
2N3906 (or generic PNP silicon transistor)
33KΩ 1/4W resistor
Heat shrink tubing

The following shows the hack installed in the top side of the circuit board inside the Cradle. The orange wire (DTR) is desoldered from pad E1and  instead connect it to the Collector of the transistor.  Put a heat shrink tubing around the lead and junction to provide necessary insulation. The Emitter of the transistor is soldered to pad E1. Connect the resistor between pad E2 and the Base of the transistor. Reassemble the cradle.




You can test this circuit by connecting a multimeter between the DTR pin and the GND pin on the serial cable. Disconnect the serial cable from external device. With the Palm in the cradle, press the Hot Sync key to trun on the serial port. You should see about +6.6V on the DTR line. When the Palm is switched off, the DTR line should drop to 0V.

If you are not getting this, you might want to check the voltage across the 33K resistor. It should be about 2.4-2.6V when the serial port is active and should be 0V when it is not. Change the transistor if the output is not at 0V. You really want a transistor with low leakage current.

Now you can leave your Palm on the Cradle all the time without having to worry about the batteries being drained. My Aopen 56K external modem now no longer have the DTR light on except when the serial port on my Palm is "opened".