Wiring of a Jaycar null model cable: first results

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Abstract:

I completed the null modem cable testing apparatus that I described in https://vixra.org/abs/2208.0032 (for recovery of the old 1990s e-mails from Dr Michael Lennon: https://vixra.org/abs/2201.0097) and used it to attempt to discover the exact wiring of the null modem cable from Jaycar. It appears that I succeeded! My results are published here. **However, a word of warning: I have not checked these results thoroughly. I would like to re-check these in the near future. If readers think that any particular part of these results is wrong, PLEASE TELL ME!**

Introduction:

Acknowledgements:

I am very grateful to Dr Keith Wansbrough for his ongoing technical assistance with this project, as mentioned in [3].

I also appreciate the ongoing interest of Professor Tava Olsen in this, and her financial support (mainly just the cost of some of the parts and travel costs so far, bit still greatly appreciated), as mentioned in [3].

I appreciate the feedback from Mr (or maybe Dr) Wolfgang Sturm (of CECOM in Hamburg, Germany, I think: [4]) that he submitted to the viXra website for [3]; I also corresponded with him by email, and Professor Tava Olsen corresponded with him by e-mail. However, I can't see any clear evidence to substantiate his claims that cheap devices for reverse-engineering RS232 cables in this way are already on the market; the devices that he explicitly mentions seem to me to be more for testing RS232 cables that are already in use (mainly for diagnosing problems, I think). But I do agree that his more rough and ready proposed method of testing the wiring of a null modem cable *would* be appropriate if the data involved was not particularly valuable.

Introduction itself:

I completed the "smart end" of my cable testing device described in [3]. I had a few unexpected bureaucratic issues with finding a place where it is clearly legal to use a soldering iron here in Auckland: I would prefer not to solder in my apartment because of the history of excessive fire alarms in the building, the fire hazard and the mess issue. It turns out that the legality of soldering in a public place, either with a gas or electric soldering iron, here in Auckland is questionable, presumably because of fire safety laws. I was given the use of a room for soldering (with tools

provided: I appreciate this) on the North Shore temporarily, but the cost of transport to there and back and the risk of accidentally damaging my apparatus when carrying it around on busses (I had not originally intended it to be mechanically robust) were issues.

Hence, I have not yet had the chance to complete the “dumb end”; instead I just put a “raw” (with no backshell, no wires soldered to its terminals) DB9 connector onto the appropriate end of the null modem cable, and touched the power supply wire to each terminal of the DB9 connector in turn. I would still like to be given the opportunity to complete the dumb end if I can.

I describe the results that I obtained here; **however, a word of warning: I have not checked these results thoroughly. I would like to re-check these in the near future. If readers think that any particular part of these results is wrong, PLEASE TELL ME!**

For the record, as I said in [3], if I remember rightly, the Jaycar catalogue number for the null modem cable in question is WC7511.

Change of usage of display segments:

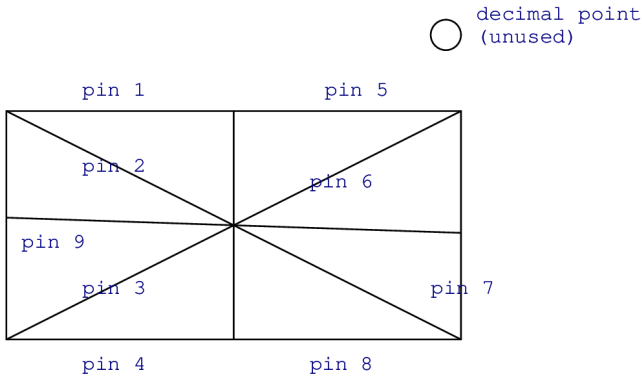
Unfortunately, since I published [3], I had a slight problem with my apparatus: two display segments short circuited together so that both lit up whenever current was applied to either of them. My fault for choosing too small a breadboard in the first place: also my soldering skills are not fantastic!

The associated breadboard traces were too badly damaged (overheated during soldering I think) for me to continue using the associated segments, so I had to change the mapping of DB9 connector pins to display segments to get around the problem. The new mapping is:

screw number	segment(s)
1	top left -
2	left \
3	left /
4	bottom left -
5	top right -
6	right /
7	bottom right |
8	bottom right -
9	middle left – only

So now each pin corresponds to exacly one display segment for all pins.

This diagram should clarify things (sorry, I know that the middle “horizontal” line is not perfectly horizontal, but I didn’t have the patience to try to draw a very good quality diagram):



Results from single end of NM cable:

Thanks to Mr / Dr Wolfgang Sturm for implicitly reminding me to test for “locally bridged” pins, to use his terminology. To do this, I plugged one end of the null modem cable into my “smart end” (leaving the other end of the null modem cable not connected to anything) and tried touching the power supply wire to each of the screws connected to pins (in the smart end) in turn to see what lit up!

I got the following results:

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Smart end pin screw powered up	Display segments lit up in response
1	both pins 1 and 6
2	pin 2 only
3	pin 3 only
4	pin 4 only
5	pin 5 only
6	both pins 1 and 6
7	pin 7 only
8	pin 8 only
9	pin 9 only

pins 1 and 6 are data carrier detect and data set ready, respectivly I think. These are both inputs to the DTE (data terminal equipment, i.e. PC at each end of the null modem cable) it appears [5].

Swapping around the two ends of the cable and doing the same tests again gave exactly the same results, as I believe it should have done.

Results from both ends of NM cable:

Now trying putting current from one end of the cable to the other:

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Quasi dumb end terminal powered up	Smart end display segments lit up in response
1 (DCD I think)	4 only (DTR I think)
2 (RD I think)	3 only (TD I think)
3 (TD I think)	2 only (RD I think)
4 (DTR I think)	1 and 6 (DCD and DSR I think)
5 (signal ground I think)	5 only (signal ground I think)
6 (DSR I think)	4 only (DTR I think)
7 (RTS I think)	8 only (CTS I think)
8 (CTS I think)	7 only (RTS I think)
9 (RI I think)	nothing lit up

These seem plausible to me, but I would be happy to hear the opinions of others on these:

a) pin 1 (DTR: which is an output from the PC if I remember rightly: I think that in some old 1980s modems it controlled the relay that connected and disconnected the modem from the line, and was sometimes pulsed on and off in order to pulse dial phone numbers) goes to the PC inputs (if I am right) DSR and DCD both ways in the null modem cable, which we have already established are locally bridged at both ends of the null modem cable (pins 1 and 6).

b) pins 2 and 3 (RD and TD) are crossed over, as I would expect in a null modem cable.

c) pin 4 (DTR) goes to pins 1 and 6 one the other end, as we discussed in (a).

d) pin 5 (signal ground) is wired straight through, as I would expect in a null modem cable.

e) pin 6 (DSR) is locally bridged to pin 1 and connected through to pin 4 as we discussed in (a).

f) pins 7 and 8 (RTS and CTS) are crossed over, so the null modem cable DOES appear to have the flow control wires: **HOORAY!**

g) pin 9 (Ring Indicator) is connected to nothing; this is reasonable IMHO.

I would appreciate feedback from others on these results.

References:

1: *Recovery of 1990s emails from Dr Michael Lennon:* https://vixra.org/abs/2201.0097.

2: https://www.jaycar.co.nz/

3: *Testing Wiring of a Null Model Cable:* https://vixra.org/abs/2208.0032.

4: https://www.army.mil/cecom

5: Wikipedia article “RS-232”, and probably lots of other places online. I can put in a proper reference for this if readers want it.