ELECTRICAL ENGINEERING

CAN/FD over UTP / modular connector

Asked 3 years, 8 months ago   Modified 3 years, 8 months ago   Viewed 606 times

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Is it possible to run a CAN/FD bus over UTP (CAT 5+)?

If so, are there conventions for which modular connector pins to use?

can

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asked May 30, 2021 at 14:44

Burt_Harris
398   2   14

It might be possible, but is it allowed by the specs? What would you do to the mismatch of the bus characteristic impedance? CAN requires 120 ohms bus and termination, your CAT5 cabling is 100 ohms. – Justme May 30, 2021 at 16:36

I would guess it might be possible to simply adjust the bus terminators to 100 ohms to match the cable. I'm not sure that's a big deal to the transceivers. – Burt_Harris May 31, 2021 at 1:48

I find references saying: "Increasingly, RJ45 connectors are used for CAN communication. The pinning is also recommended in CiA 303-1." Does anyone have access to that spec? – Burt_Harris May 31, 2021 at 2:00 ✎

The CANopen spec is actually quite flexible when it comes to termination, allowing different values depending on bus length, mOhm/m and diameter. CiA 303-1 gives some examples on page 7. Now what CAN transceivers can handle is another story, I suppose different kinds may be more or less picky with impedance. – Lundin May 31, 2021 at 7:49

@Burt_Harris Remember that simply using an RJ45 (actually, their real name are 8P8C) or any other connector does not mean using 100 ohm CAT5 wiring, the wiring could still be standard 120 ohm CAN wiring. – Justme May 31, 2021 at 14:59

2 Answers

Sorted by: Highest score (default) ⇕

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The ISO standard for "high speed CAN" doesn't cover connectors. Therefore the CANopen standards have become the most canonical source instead. The relevant one being CiA 303-1, which contains standardization for RJ10, RJ45 and lots of other common connectors. You can download the document for free from the non-profit organization *CAN in Automation* that maintains CANopen, if you just register on their site.
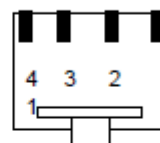
For your convenience, here are the relevant parts from CiA 303-1:
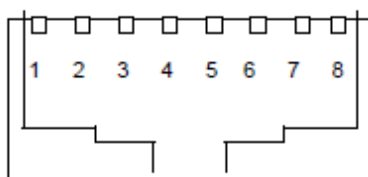
6.3 RJ10 connector
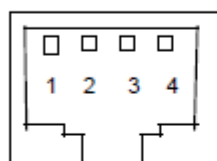
Female

Male

Pin	Signal	Description
1	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and optocouplers, if galvanic isolation of the bus node applies)
2	CAN_H	CAN_H bus line (dominant high)
3	CAN_L	CAN_L bus line (dominant low)
4	CAN_GND	Ground / 0 V / V-

6.4 RJ45 connector

Female

Male

Pin	Signal	Description
1	CAN_H	CAN_H bus line (dominant high)
2	CAN_L	CAN_L bus line (dominant low)
3	CAN_GND	Ground / 0 V / V-
4	-	Reserved
5	-	Reserved
6	(CAN_SHLD)	Optional CAN Shield
7	CAN_GND	Ground / 0 V / V-
8	(CAN_V+)	Optional CAN external positive supply (dedicated for supply of transceiver and opto-couplers, if galvanic isolation of the bus node applies)

The bus node provides the female pins of the connector. Often used with 4 and 8 twisted pair cabling. By using this cables pin 3-6 and 1-2 are twisted pairs.

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edited May 31, 2021 at 9:22

answered May 31, 2021 at 7:41

Lundin
22.6k   1   31   83

I found details for CAN pinouts at http://www.interfacebus.com/Can_Bus_Connector_Pinout.html. These included both 4p4c and 8p8c modular connectors (sometimes misnamed RJ10 and RJ45).

For the 4p4c version, the pin assignments are

Pin 1: CAN V+, Pin 2: CAN_H, Pin 3: CAN_L, Pin 4: CAN_GND

Somewhat surprisingly, the pinout recommended for 8P8C does not put the same signals on the center 4 pins.

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answered May 31, 2021 at 2:17

Burt_Harris
398 2 14

Why would RJ10 and RJ45 be "misnamed"? The proper canonical source for these pinouts is CANopen CiA 303-1 and even that one calls them RJ10 and RJ45. – Lundin May 31, 2021 at 7:35

@Lundin The real name for the connectors really are 4P4C and 8P8C. RJ45 is not a name for any connector, it is a name for a standardized telecommunication network interface, which defines how an 8P8C connector is used with it, but RJ45 also defines a lot of other things. RJ10 is not even a code name for any standard, but for some reason that name is applied to 4P4C connectors. – Justme May 31, 2021 at 15:30

The RJ prefix stands for Registered Jack, it actually has legal/regulatory use. The FCC regulates telephone uses under "Part 68" regulations. When a connector is used for say ethernet, it is not used in a way that Part 68 applies. For the Full Monty, see law.cornell.edu/cfr/text/47/part-68. – Burt_Harris Jun 4, 2021 at 20:44 ✎

The 4P4C connector used between a telephone and it's handset is NOT subject to FCC regulation, and that's why the so-called RJ10 is not really a correct term, but people understand what you mean because it looks like a registered jack. – Burt_Harris Jun 4, 2021 at 20:49 ✎