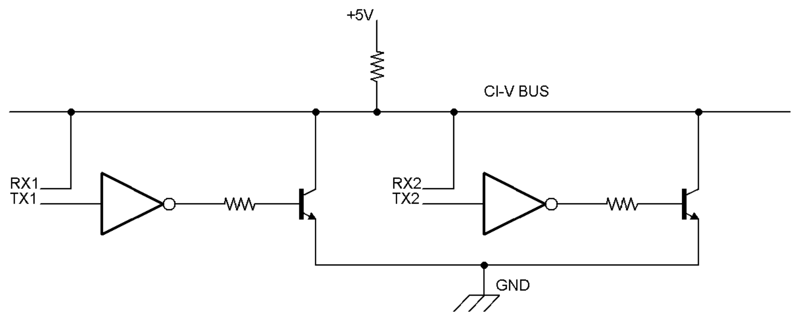
ICOM® CI-V Electrical Interface

James Michener K9JM

One problem with the ICOM® CI-V communication bus, is that they never defined the electrical specifications for this interface. In the most basic terms, the bus is a single wire, which when active is pulled low.



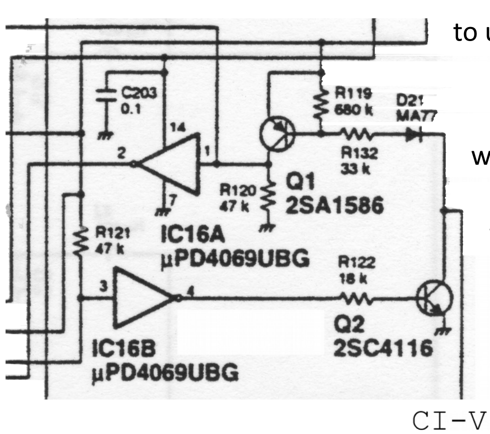
Conceptually, the above schematic shows two items connected to the single wire bus. To be properly defined, the minimum set of specification that should be give are:

Vih = Voltage at which the CI-V bus is considered high by all devices
Vil = Voltage at which the CI-V bus is considered low by all devices

Then for each connected device:

Iol = Current an output can sink when active to achieve Vciv = Vil
Ioh = Current supplied by the output when not active when Vciv = Vil

Iih = Current flow to the input when input is high Vciv=Vil
Iil = Current flow to input when input is low Vciv=Vil

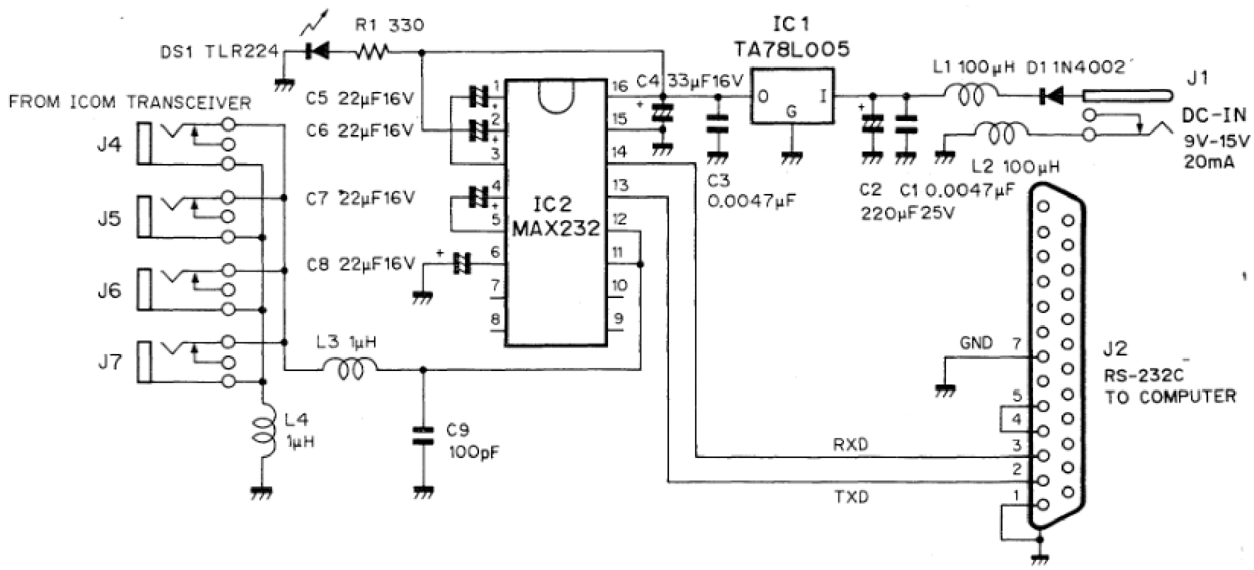


To try to understand Icom's think about the CI-V bus, we will look at one of the interfaces within a radio. The schematic is to the left. The emitter of Q1 and pin 14 of IC16A is 5 volts when operational.

The input threshold voltage Vih = Vil is about 5v - 2 * Vbe = 3.6v
The output sink current is dependent on the Beta of Q2, R122 is 18K, so the base current is about 240 microamps,

if we assume a saturated Beta of 50, that means it can sink 12ma.   The pull up current, when the Vciv = 0 is about 110 microamps.

Another data point is the ICOM® CT-17



Here they do what appears to be the insanity of shorting pin 11 to pin 12 to the CI-V bus, which are in input and the output of the level translator.   Looking at the datasheet for the MAX232, this part has Vih=2 and Vil = .8 volts.   Combining this with that of the radio, Vil = .8 volts and Vih = 3.6v The Max232 also has an output source current of 1ma, and an output sink currrent of 3.5 ma. Because the input is connected to the output, the CT17 can only sink a maximum of 2.5ma, which is far less than the current sinking capabilities of the radio.

The conclusion so far is that Vih = 3.6v and Vil = .8 volts and that a CI-V should be able to sink only 2.5ma.

The Acom® 2000A - Or how not to do an CI-V interface

The Acom® 2000 tries to make a CI-V interface out of an RS232 interface. Acom® uses the MC1489 RS232 line receiver, and an MC1488 RS232 line driver, where they place a 510 resistor in series with input and output.   On the input of the MC1489, there is a 27K ohm resistor to the -12v.   The input high current for the MC1489 is about 1ma, the low current is about 500 microamps.   Vih = 2v, Vil=.8v for the input. The output sources nearly 10ma when Vciv = Vil, of which about a half ma is taken by it's own input. As an interface the Acom® sources nearly 9.5 ma when another device is pulling low.

The result is that the ICOM® CT-17 doesn't have enough current sink capability to pull the CI-V bus low. The radio does, but only when the transistor Beta > 50, so it may not work a low temperatures, or for low Beta transistors.
As a result, any other talkers on a bus with the Acom® may not have enough current sink capability to actually drive the bus low.

> Note: The K9JM CI-V Router has the ability to sink over 100ma of current, 40 times that of the ICOM® CT-17. It has no problems driving the Acom® CI-V interface.

Recomendation:

If you have access to an oscilloscope, make sure the CI-V bus is transitions between Vil and Vih.

If you have a current meter, place the meter across the CI-V bus. If it is more than 2.5 ma, then find what device is pulling up hard on the interface.