

The TTL-232 card can easily be tested using the Dynamic Debug Tool from Innovation First, Inc. This may be helpful in troubleshooting the Robot Controller to CMU Cam2 interface. This document is being provided as a courtesy, and therefore is not guaranteed to be supported by Innovation First, Inc.

1. Dynamic Debug Tool installation
 - a. Go to the IFRobotics.com web site and download the Dynamic Debug Tool (DDT): [FRC DDT Code v2.2/v2.4](http://www.ifrobotics.com/docs/frc-code-ddt.zip) (<http://www.ifrobotics.com/docs/frc-code-ddt.zip>) from the Robot Controller page. Extract all of the files from the above zip into a known directory.
 - b. Connect the Robot Controller (RC) to your pc. Push/hold the RC's Prog button until the Program State led turns yellow, then release.
 - c. Using the IFI loader, download the extracted hex file FrcCode_default_DDT.hex into the RC.
 - d. Close the Terminal Window and open up the Dynamic Debug Tool per the unzipped directions. Do the Read All and verify successful communications.
 - e. Proceed only if the above steps have passed.
2. Robot Controller TTL Serial Port Test
 - a. To test the RC's TTL Serial Port in loopback mode, first disconnect the TTL-232 board if present. Jumper across the two middle pins of the 4-pin TTL Serial Port of the RC.
 - b. Configure the RC's Serial Port 2 as regular IO by selecting RCSTA2 under Reg Set1 in the Port x Dynamic Debugger Window.
 - c. RCSTA2 should be displayed in the FSRL box in the lower left hand corner of the DDT.
 - d. In the Data box in the lower right hand corner, change bit 7 to a 0. Select "W" to write the new value. Serial Port 2 has now been changed to regular IO instead of a serial port. You may select "R" to read back the register and confirm that bit 7 is a 0.
 - e. In the Tris G box of the DDT, set/confirm that bit 1 is a 0 and bit 2 is a 1. Select "W" to write the new value. You may select "R" to read back the register and confirm that bit 1 is a 0 and bit 2 is a 1. The "0" in the Tris (tristate) register means the pin is an output. If a "1", then it is an input. Pin RG1 (TTL TX) will now be an output and pin RG2 (TTL RX) will now be an input.
 - f. In the Port G box, select "R" to read in the register. Bit 2 should be the same as Bit 1. Change bit 1, select "W" to write the new value, then select "R" to read the register. Bit 2 should change to be the same as bit 1.
 - g. If this test passes, you have verified the TLL serial port pins of the RC are functional.
 - h. Proceed to the next step only if the above steps have passed.
3. TTL-232 Card Serial Port Test
 - a. Remove the jumper from the RC. Install it across the two header posts of the TTL-232 card's three post header that is furthest from the BLK silkscreen.
 - b. Insert the TTL-232 card into the RC's 4-pin TTL Serial Port connector, justifying the B mark on the TTL-232 card to the B mark on the RC.
 - c. In the Port G box of the DDT, select "R" to read in the register. Bit 2 should be the same as Bit 1. Change bit 1, select "W" to write the new value, then select "R" to read the register. Again, bit 2 should change to be the same as bit 1.
 - d. If this test passes, you have verified the TTL and RS-232 ports of the TTL-232 card by loopback testing.