# Unit Testing/Demonstration

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| --- | --- | --- | --- | --- | --- |
| Test Case ID | Component | Purpose | Conditions | Expected output | Actual Output |
| EUSART\_TC\_0 | USB-Serial USB 340 Adapter | To determine if PC recognizes Serial Port | All adapter lines are unconnected  USB is plugged into PC | Device manager recognizes new COMx Port | Device manager recognizes new COMx Port |
| EUSART\_TC\_1a | PIC16 MCU | To determine if a character can be transmitted to over Serial connection | Simulator instruction frequency set to 0.5MHz and RC Oscillator frequency set to 2 MHz  Uart IO is enabled in window mode from simulator  ‘A’ is loaded into TXREG | ‘A’ is outputted on the serial connection. | ‘A’ is outputted in the UART IO window |
| EUSART\_TC\_1b | PIC16 MCU  USB-Serial USB 340 Adapter | To determine if a character can be transmitted to PC over Serial connection | ‘A’ is loaded into TXREG  PuTTy is configured to open a serial connection on COMx to MCU | ‘A’ is displayed in Serial connection window | ‘A’ is displayed in Serial connection window |
| EUSART\_TC\_2a | PIC16 MCU | To determine if a string of characters can be transmitted to over Serial connection. | Simulator instruction frequency set to 0.5MHz and RC Oscillator frequency set to 2 MHz  Uart IO is enabled in window mode from simulator  send\_string is called with “axE” | “axE” is displayed in Serial connection window | “axE” is outputted in the UART IO window |
| EUSART\_TC\_2b | PIC16 MCU  USB-Serial USB 340 Adapter | To determine if a character can be transmitted to PC over Serial connection | “axE” is loaded into TXREG  PuTTy is configured to open a serial connection on COMx to MCU | “axE” is displayed in Serial connection window | “axE” is displayed in Serial connection window |
| EUSART\_TC\_3a | PIC16 MCU | To determine if an integer can be converted to a string and then transmitted to over Serial connection. | Simulator instruction frequency set to 0.5MHz and RC Oscillator frequency set to 2 MHz  Uart IO is enabled in window mode from simulator  itoa is called with 123 as the params which is passed to a call of send\_string | “123” is displayed in Serial connection window | “123” is outputted in the UART IO window |
| EUSART\_TC\_3b | PIC16 MCU  USB-Serial USB 340 Adapter | To determine if a character can be transmitted to PC over Serial connection | itoa is called with 123 as the params which is passed to a call of send\_string  PuTTy is configured to open a serial connection on COMx to MCU | “123” is displayed in Serial connection window | “123” is displayed in Serial connection window |
| OSC\_TC\_0 | 2MHz Crystal Oscillator | To determine whether 2MHz is being output from the oscillator when driven from 5Vdc | Oscillator is connected as shown in Fig x. | Multimeter measures 2MHz at output | Multimeter measured 1.999MHz |
| PWRSUP\_TC\_0 | L7805CV | To determine if a 5Vdc regulated output is obtained from the regulator | Power supply circuit is set up as shown in Fig x. and capacitors are used as a safety feature in case there are manufacturing problems in the battery that do not appear at first test. | 9Vdc is measured across Vin and GND  5Vdc is measured across GND Vout | 8.9Vdc is measured across Vin and GND  5Vdc is measured across GND Vout |
| RANGSYS\_TC\_0a | 2 Photoresistors | To determine the resistances in light conditions of each photoresistor respectively. | The resistance of both photoresistors are measured in well light room while connected to a breadboard so it doesn’t move | The resistance of both photoresistors in light should be the same value but this value should be very different from the value under dark conditions | Both resistors were approximately 10KΩ |
| RANGSYS\_TC\_0b | 2 Photoresistors | To determine the resistances in dark conditions of each photoresistor respectively | The resistance of both photoresistors are measured in dark room while connected to a breadboard so it doesn’t move | The resistance of both photoresistors in dark should be the same value but this value should be very different from the value under well lit conditions | Both resistors were approximately 1.5KΩ |
| RANGSYS\_TC\_1 | HCSR05 Sensor  PIC16 | To determine whether the HCSR05 sensor works accurately | A measuring tape is placed next to the sensor in the valid measurement range.  A 60us pulse is sent to the TRIG pin and the ECHO pin is connected pin 4 on port B on the PIC16  The target is placed at 50cm,  The distance is value is sent to the PC via the serial connection. | The distance is outputted within 1-2 cm of test position. | Tests were not conducted  Ref. Fig x |
| RANGESYS\_TC\_1b | HCSR05  PIC16 | To determine the accuracy of the measurement over the valid range specified in the datasheet. | A measuring tape is placed next to the sensor in the valid measurement range.  The target is placed at 50cm, connection 100cm, 250cm, 350cm and 400cm respectively for 2 second intervals.  The distance is value is sent to the PC via the serial connection | The distance is outputted within 1-2 cm for each test positions | Test not performed |
| RANGESYS\_TC\_2 | HCSR05  PIC16  LCD  USB-Serial CH340 | To determine if distance is displayed on LCD |  |  |  |
| MOTORSYS\_TC\_0 | 2N4401 NPN Transistor | To determine if the transistor operates according to the datasheet |  | X amps is measured through Re | X amps was measured through Re |
| MOTORSYS\_TC\_1 | 2N4401 NPN  5V 0.11 A BLDC Motor | To determine if the BLDC Motor operates | --- | BLDC Fan operates properly. | Test not performed |
| MOTORSYS\_TC\_2 | 4 Dip Switch | To determine if the 4 Dip switch operates properly | Circuit set up as seen in Fig X. | 2.5Vdc is measured at each DPSWx point | Approximately 2.5Vdc is measured at each DPSWx point |
| MOTORSYS\_TC\_2b | 4 Dip Switch  PIC16 | To test if LUT on PIC 16 works based DPSWxs input. | Each DPSWx combination from the LUT is tested a well as 2 in valid switch options | The appropriate LUT values based on the DPSW configs are output via the serial connection | The appropriate LUT values based on the DPSW configs are output via the serial connection |
| MOTORSYS\_TC\_2b | PIC16  2N4401  5V 0.11 A BLDC Motor  4BIT DIP SW | To determine if the correct PWM value is output at the FAN SIG pin based on the DPSW value | Each switch configuration is tested for 5s interval. | The correct PWM duty cycle is obtained at the fan sig pin | The correct PWM duty cycle is obtained at the fan sig pin |
| LCD\_TC\_0 | LCD | Test if LCD powers on with contrast adjustment |  |  | **Test not performed** |
| LCD\_TC\_1a | LCD  PIC16 | Test if LCD can display a string on 1st line | -- |  |
| LCD\_TC\_1b | LCD  PIC16 | Test if LCD can display a string on the 2nd line of the display | -- |  |
| INTEG\_TC\_0 | ALL PARTS | Test if angle and distance are displayed on LCD for the target at 30cm and 90 degrees | The target is placed 30cm and oriented at 90 degrees  The motor is not turned on. |  |
| INTEG\_TC\_0a | ALL PARTS | Test if angle and distance are updated on LCD as well as distance over serial connection when the fan speed is varied. | The target is moved between 30 and 50cm over 5 cm increments. |  |
| INTEG\_TC\_1 | ALL PARTS | To determine if system performs well at all distances and target speed by varying the target distance from 50m to 100m and each fan speed is tested at each test location |  |  |

Notes:

1. Include troubleshooting tip to install CH340 drivers
2. Include references to Figures in “Actual Results” column to support testing
3. Ask Radix if anything else need to be included in test table such as more conditions(whether TXIF is raised or not etc.)
4. Doublecheck the value of the photo resistors in both light and dark conditions.