



# Introduction to Controller Area Network

## Building a CAN Node

Intrepid Control Systems, Inc.

### Objectives:

- To understand the pieces of a complete CAN node
- To understand what dominant and recessive bits look like
- To show how signal data is encoded in a CAN message
- To learn how to display signal information graphically with a CAN tool

### Test Equipment Required

- Vehicle Spy and neoVI CAN analyzer
- Oscilloscope
- Digital voltmeter
- Breadboard
- +5 V power supply

### Parts List

- (1) Preprogrammed PICMicro MicroController
- (1) MCP2510 CAN controller
- (1) PCA82C251 dual wire CAN transceiver / physical layer
- (2) 20 Mhz crystal oscillators
- (4) 20 PF ceramic capacitors
- (2) 10 K resistors
- (1) 1-10K pot

### Steps

- 1) Using the schematic, build the CAN transceiver (PCA82C51) on the breadboard. Please call the instructor to verify your wiring before powering up. Then:

- a) Connect +5V to the TX input (Pin 1) and measure with the voltmeter

CAN\_H \_\_\_\_\_

CAN\_L \_\_\_\_\_

- b) Connect 0V to the TX input (Pin 1) and measure with the voltmeter

CAN\_H \_\_\_\_\_

CAN\_L \_\_\_\_\_

- 2) Build the remaining schematic. Please call the instructor when you are complete.
- 3) Now use the oscilloscope to do the following:
  - a) Measure the duration of the CAN message

CAN message duration \_\_\_\_\_

- b) Vary the POT and observe how the CAN message changes. Please comment

Comment \_\_\_\_\_

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- 4) Using Vehicle Spy, build a filter to capture your message and decode the first data byte.
  - a) Set the message value type to “Analog In”
  - b) Enter a Equation with a start bit of 0 and a length of 8
- 5) Next, open the graphical panels and add a meter to display your pot value. Do this by right-clicking on the panel and selecting “Add Meter”. Set the properties as shown in the following figure.

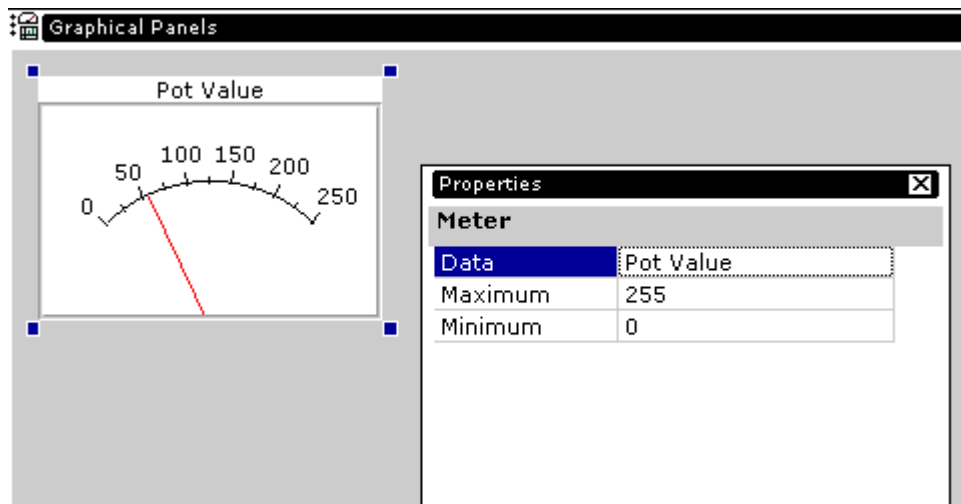


Figure 1 – Add a meter and set the properties as shown above.

- 6) Your CAN node transmits a secret ASCII word. Use the Vehicle Spy help file to determine how to display the messages in ASCII in the Scrolling Message History. Record your secret word and Arbitration ID: If you get stuck call the instructor for some hints.

Secret Word \_\_\_\_\_

Arbitration ID \_\_\_\_\_

- 7) If you have extra time, experiment with other graphical panel objects such a chart or LED. You could also add another message/filter to display you secret ASCII word.

## CAN C Software

```
//-----
// function:   main
// description: Execute the program.
//-----
void main()
{

    // Setup the SPI Bus
    setup_spi( spi_master | spi_h_to_l );

    // setup the ADC
    setup_adc_ports(ALL_ANALOG);
    setup_adc(ADC_CLOCK_INTERNAL);
    set_adc_channel(0);

    // Reset and Configure the CAN Controller
    ResetMCP2510();
    delay_ms( 50 );
    ConfigureMCP2510();
    delay_ms( 50 );
    ConfigureTransmitMessage();

    // endless loop
    for( ;; )
    {

        // Load the CAN Controller with TX data
```

```
WriteRegister( TXB0D0, read_adc());
WriteRegister( TXB0D0+1, 'T' );
WriteRegister( TXB0D0+2, 'E' );
WriteRegister( TXB0D0+3, 'S' );
WriteRegister( TXB0D0+4, 'T' );
WriteRegister( TXB0D0+5, ' ');
WriteRegister( TXB0D0+6, ' ');
WriteRegister( TXB0D0+7, ' ');

// instruct the CAN Controller to TX the message
SendCMMD( BITMODIFYCMMD | 0x01 ); // transmit buffer 0

// wait 50 ms
delay_ms( 50 );
}
}
```