BTN415 CANBus Lab2

Fun with CANBus

This is a “fun lab” that contains 4 brain teasers that need to be solved in order to get the lab exit code. The brain teasers are sequence problems where you have to determine the next number/letter in the sequence provided. Each problem is provided via the CAN Bus using different CAN IDs. The answer to the current problem is the ID value of the CAN Node that contains the next question. Your task is to write software that will allow you to collect, solve and find the exit code for the lab. Good Luck, and have fun.

LEARNING OUTCOMES

Upon successful completion of this lab, you will have demonstrated the ability to:

- Generate and Transmit Data Messages and Remote Terminal Requests on a CAN Bus at 500kbps
- Receive and decode standard Data Messages on a CAN Bus at 500kbps
- Reassemble data message transmitted using multiple CAN Bus frames
- Practice Problem solving and critical thinking skills

SPECIFICATIONS

Download the starting point from the course Github account, compile and verify the correct configuration for the ESD CANBus SDK.

- Instructions on how to accomplish this can be found in CanIF.h as a comment block.

The Game Instructions

The CANBus_BrainTeaser.exe software will communicate on the CAN Bus using IDs 0 and 2. Bus ID 0 will transmit a 1 second sync pulse where the first data byte contains a sync flag represented by alternating 0’s and 1’ followed by 3-bytes of time information (Hour, Second, Minute). Bus ID 2 is programmed to listen and respond to all the brain teaser requests. Communicating with CAN ID 2 uses standard Data and RTR style messages.

(1) Requesting a Problem

To request a brain teaser question on the bus, send an RTR message to the ID you think is the correct answer of the current problem. If the ID is a valid answer CAN ID 2 will respond with a standard Data Message containing the 8-byte brain teaser to solve next. If the ID requested is not valid, no response will be placed on the bus.

(2) Requesting a Hint

To request a hint for the brain teaser you are currently trying to solve, simply send a Data Message to CAN ID 2 with the first data byte set equal to the CAN ID used to get the problem you are trying to solve. For example, if you sent an RTR Message to CAN ID 55 to get the brain teaser, you can send a Data Message to CAN ID 2 with the first byte of the data field set to 55. If formatted correctly, and the ID requested is valid, CAN ID 2 will respond with an English hint using multiple Data Messages, as described below.

(3) Finishing the Game

Once you have completed and solved all 4 problems, send an RTR message on the CAN Bus to the answer of the 4th problem. If correct, CAN ID 2 will provide you with an exit code.

Message Formats

The CANBus_BrainTeaser.exe file communicates with you using standard Data and RTR Messages. When a response from CAN ID 2 is larger than 1 CAN Bus frame (8-bytes), it will break the message up and transmit it via multiple back-to-back messages. The end of a message is signaled by a CAN Bus Data Message that contains "END" in the data field.

All brain teaser problems are transmitted using a single CAN Bus Data Message. Meaning they are a maximum of 8-bytes in length.

The exit code provided by the bus will consist of two CAN Bus Data Messages. The 4-byte exit code to give to your professor, followed by the word "END".

Getting Started

To get started, use your software to send and RTR message to CAN ID 6 on the bus. If formatted correctly, CAN ID 2 will respond with "RTR ID 6 Test Message", following by the first brain teaser problem.

The Implementation Requirements

There are no specific implementation requirements for this lab. You must complete the CANLab.cpp to allow you to control the CAN Bus as follows:

- Generating and Sending Data Messages to specific CAN Bus IDs
- Generating and Sending RTR Messages to specific CAN Bus IDs
- Receiving and displaying standard 8-byte CAN Bus data frames
- Receiving, reassembling and displaying English hints transmitted via multiple standard 8-byte CAN Bus data frames
- Receive and display the sync pulse on the CAN Bus

Running the Lab

In order to run this lab you require the following setup:

- A lab PC connected to an ESD USB CAN controller on a CAN Bus
    - Your software running on a PC communicating on the CAN Bus using the CAN ID specified by the hardware connected to your computer
- A lab PC connected with two ESD USB CAN controllers configured to CAN ID 0 and CAN ID 2
    - The CANBus_BrainTeasers.exe software running on this PC

SUBMISSION REQUIREMENTS

Perform the following Demo to your instructor:

- Provide the lab exit code to the processor to get your demo marks

Once you have completed your lab upload the following files:

- CANLab.cpp source file