Fall 2016

Renesas RX63N—Embedded Systems

Graduate lab – CAN Bus

Learning Objectives:

This lab will test your ability to understand and apply CAN bus using Queues. This lab will introduce receiving and transmitting using CAN bus mailbox and transferring the information to serial port by creating Queues.

This lab will require that you work with one other group.

Background Information:

A CAN bus is a half-duplex, two wire differential bus. In the CAN protocol, nodes communicate data or information through messages termed as frames. The frames transmitted from one node will be received by all the other nodes on the network using message broadcasting. The receiving nodes will only react to the data that is relevant to them. Messages in the CAN are not acknowledged due to an unnecessary increase of traffic. However, the receiving node checks for the frame consistency and acknowledges the consistency.

There are thirty-two mailboxes per channel, along with setup registers in the RX63N processor for configuring the CAN bus. These mailboxes can be operated in either “Normal mode” or “First in First out (FIFO) mode” by setting up the corresponding registers. For this lab, the CAN bus is configured in Normal mode by setting the MBM bit of CTRL register to 0. CAN protocol requires three parameters for every transmission. Create a structure that includes the ID, Data Length and the Data to be transmitted. More details can be found in ***Chapter 10***, ***Advanced RX63N book.***

Assignment:

For this lab, you are tasked to establish CAN communication between RX63N board and transmit the data back to the PC. Both the boards have transmission and receiving mailbox to transmit and receive. The data received will be added to a Queue which is a First-In-First-Out. The data from the Queue will be transmitted to the UART port connected to a PC. At the transmission end the Queue is filled by the data received from the UART port connected to the PC. Finally, there must be a two way communication between PC and the RX63N connected with UART and two RX63N via CAN bus.

1. CAN bus is configured in Normal mode for both Transmission and Reception. (Use single mailbox)
2. A 2-way Communication can be established between the RX63N boards using CAN.
3. Queue is implemented to store the data from the CAN bus
4. Serial communication is initialized using UART
5. Data from the Queue can be sent to the PC through UART
6. Data from PC can be sent to the Queue

To Submit:

- Create a single text file containing all the c and h files that were changed and upload it to Canvas. **Note: Single submission for both the group.**
- Your lab check-off sheet at the demonstration.

Grading will be changed such that 70% is your demonstration and 30% will be your code structure. Your code will be graded based on comments, proper alignment (indentations), function design, proper capitalization of definitions and variables, and design of custom functions.

Embedded Systems Lab Demonstration Validation Sheet

This sheet should be modified by the student to reflect the current lab assignment being demonstrated

Lab Number:	Grad Lab – CAN Bus with Queues
Team Members	Team Member 1:
	Team Member 2:
	Team Member 3:
	Team Member 4:
Date:	

Lab Requirements

Obtain a list of the Lab requirements from the end of the lab handout and type them here, perform a self-review and indicate with an X if you met each requirement or not.

REQ Number	Objective	Self-Review	TA Review
1	CAN bus initialized to Normal mode		
2	Least 2 mailboxes configured for Transmitting		
3	Least 2 mailboxes configured for Receiving		
4	Queue implemented with bounds on full and empty		
5	Serial Communication initialized to TX and RX from PC		
6	Data can be transmitted from a PC to a PC using the communication		
7	Data can be received from a PC to a PC using the communication		
8	2-way communication established between PC to PC		

Code Requirements (will not be graded during lab demo)

REQ Number	Objective	Self-Review	TA Review
9	All code must be commented and indented properly.		