

YEAE USS DSI3 Ultrasonic Sensor Simulator

Introduction and Functional Overview

Modern vehicles have multiple features for driving assistance, one of those features is the Park Assist System (Parktronic) which allows the driver to easily find a free parking space, accurate and safe parking by the help of multiple ultrasonic sensors installed on the front and rear bumpers as well as advanced high technology parking control module that provides this parking feature (Ultrasonic ECU).

The YEAE USS DSI3 Ultrasonic Sensor Simulator can simulate up to 16 ultrasonic sensors using Distributed Systems Interface DSI3 to test the functionality of parking control module.



Key Features

The YEAE USS DS13 Ultrasonic Sensor Simulator has the following features:

- Ability to receive the input scene and objects information of the parking scenario through Ethernet port from the virtual vehicle simulation platform to convert the received UDP packets into proper SPI signal's structure according to the DS13 transceiver requirements in the parking control module, in this way it will be a part of entire Parktronic HIL system.
- User friendly GUI (it can be installed on any windows PC) that allows to set specific object distance value to be simulated for each ultrasonic sensor (for self-testing purposes), as well as it has 16 numeric indicators displaying the objects information received from virtual vehicle simulation platform.

High Level Architecture

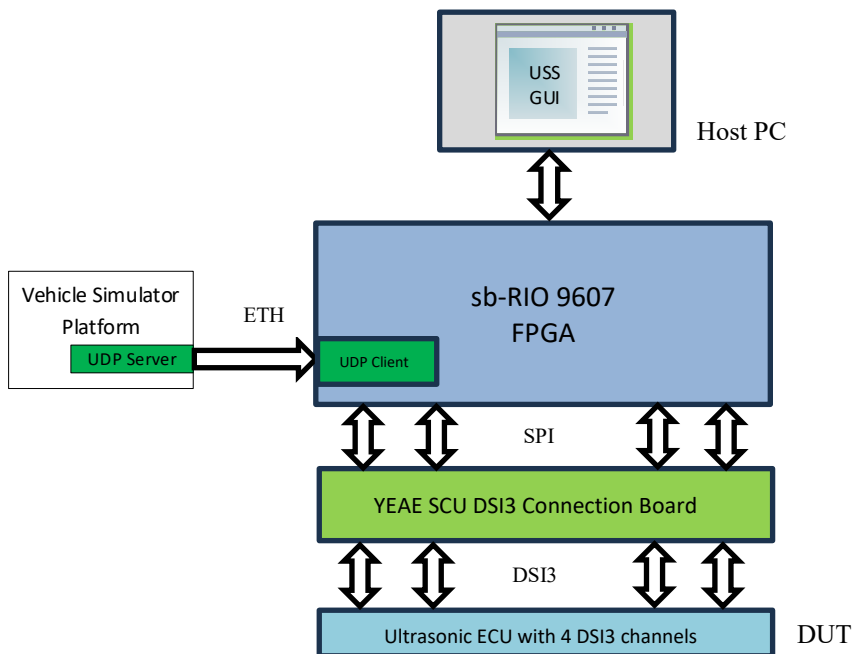


Fig. 1 Ultrasonic Sensor Simulator USS DS3I Block Diagram

The YEAE USS DSI3 Ultrasonic Sensor Simulator has the following components and functionalities:

Hardware:

- NI sb-RIO FPGA module

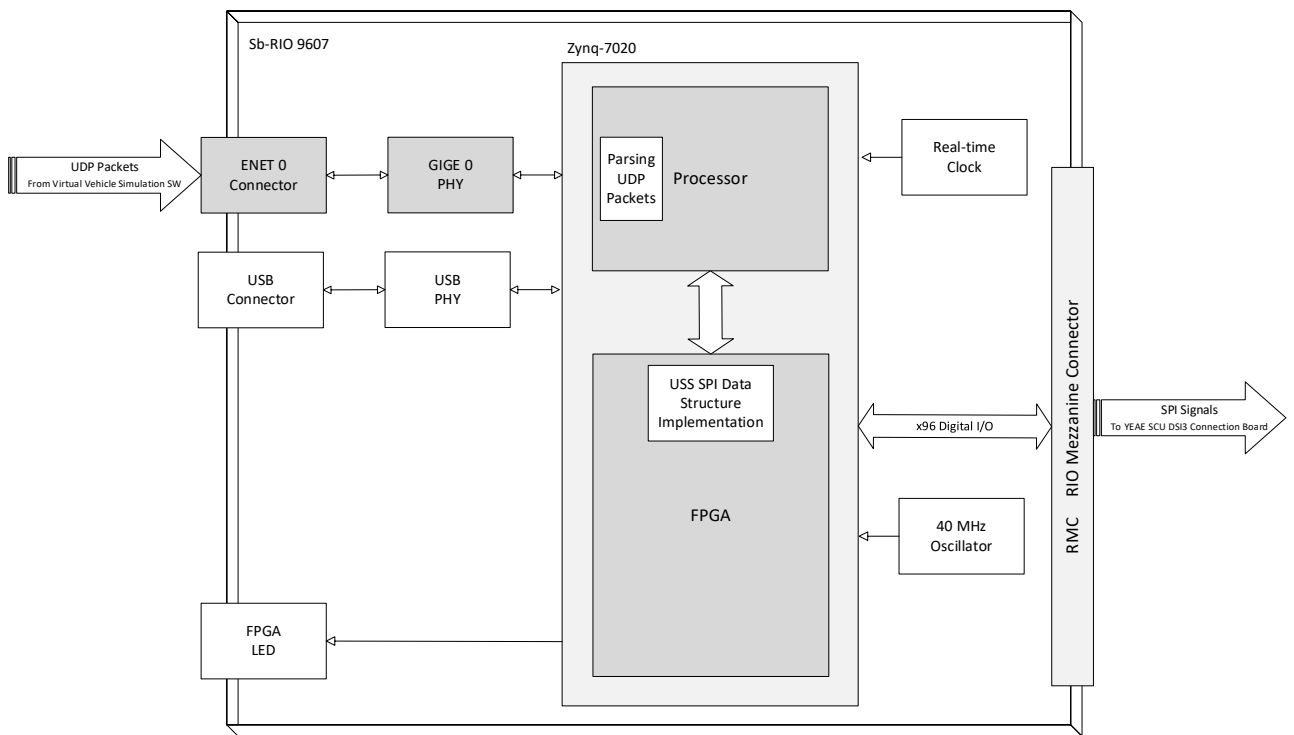


Fig. 2 NI Sb-RIO FPGA module Block Diagram

The physical ultrasonic sensor functionalities are implemented in the FPGA by driving its high-speed digital outputs using SPI protocol to feed the inputs of the YEAE SCU DSI3 connection board which in turns converts those SPI signals into DSI3 similar to the physical sensor output.

YEAE SCU DSI3 Connection Board

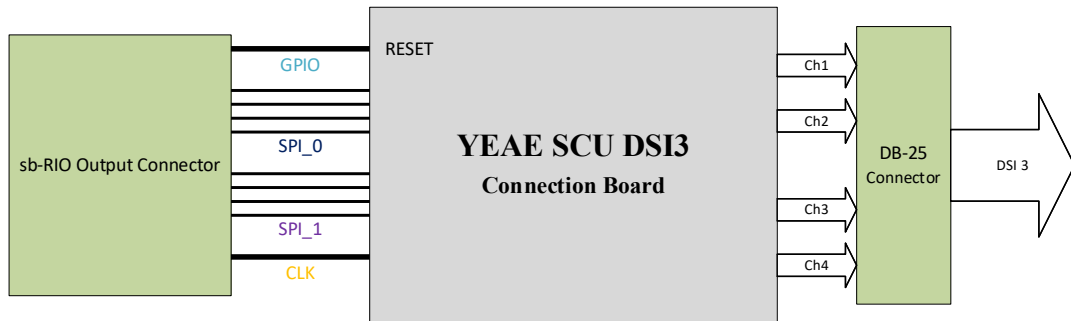


Fig. 3 YEAE SCU DSI3 connection board Block Diagram

As seen in the Figure 3, this board has multiple DSI3 transceivers, each transceiver receives SPI input signals from the NI sb-RIO module outputs converting it into DSI3 signal bus, therefore this connection board has 4 DSI3 output channels available at the DB-25 output connector, each channel can simulate up to 4 physical sensors to be 16 in total.

Software:

The YEAE USS DSI3 Ultrasonic Sensor Simulator ships with following software modules:

- Application Software with user friendly GUI **
- FPGA bit file***
- UDP interface connection documentation (Messages structure)

** The Application software is windows executable.

*** The bit file is compiled by YEAE, for any further modifications please contact YEAE.

Technical Specs

Parameter	Value
Number of DSI3 Channels:	4 channels/DSI3 busses with multiple sensors quantity configuration 2 x 8 sensors 4 x 4 sensors 3 x 4 sensors
Data Transfer mode:	Periodic Data Collection Mode (PDCM)**
Connection to Virtual Environments Systems:	UDP
Simulated ultra sonic sensor model:	Any DSI3 ultrasonic sensor model can be simulated upon requirements***
DSI3 output latency in accordance to the UDP input:	0.2 ~ 1 ms ****
Supply power:	12VDC 1A
Operating Temperature Range:	-15 ~ +50 degrees

** The command and response operation mode can be implemented upon request by getting clear requirements including necessary communication frame interface and structure related to that specific sensor.

*** The Ultrasonic Manufacturer Datasheet should be available.

**** The latency value is defined by the maximum quantity of simulated sensors.