*Project: RMC75E TEST BENCH*

*Module:* DataBuffer*.vhd*

*Author: Satchel Hamilton*

*Company: Delta Motion*

*Date: 7/13/2023*

*Last updated: July 13, 2023*

Contents

[High Level 1](#_Toc141279822)

[Low level 1](#_Toc141279823)

[Simulation 2](#_Toc141279824)

# High Level

**Description:** The "DataBuffer" module is part of the source code for the RMC75E modular motion controller. It serves as a buffer for handling data from different input sources and facilitating data distribution to various output channels.

# Low level

**Inputs:**

* H1\_CLKWR: Input clock signal.
* SysClk: System clock signal.
* SynchedTick: Synchronized tick signal.
* SynchedTick60: Synchronized tick signal with a 60 Hz period.
* AnlgPositionRead0, AnlgPositionRead1: Analog position data inputs.
* ExpA0ReadCh0, ExpA0ReadCh1, ExpA1ReadCh0, ExpA1ReadCh1, ExpA2ReadCh0, ExpA2ReadCh1, ExpA3ReadCh0, ExpA3ReadCh1: Expansion module data inputs.
* WriteConversion: Control signal for write operation.
* S2P\_Addr: Output, 4-bit address for selecting the output channel.
* S2P\_Data: Input, 16-bit parallel data to be written into the buffer.

**Outputs:**

* DataOut: Output, 16-bit parallel data read from the buffer.

**Architecture:** The "DataBuffer\_arch" architecture contains internal signals and instances of the "RAM128x16" component to handle data storage and retrieval.

**Internal Signals:**

* BankSelect: Signal to toggle between two data buffers.
* WriteEnable: Control signal for write operation.
* WriteBank0, WriteBank1: Control signals for writing to specific banks.
* DetectRead: Signal to detect read operation.
* DecrementReadPointer: Control signal for decrementing read pointer.
* ReadPointer, WritePointer: 3-bit read and write pointers for buffer access.
* ReadEnableEncode: 10-bit signal encoding read enable for different channels.
* ModuleSelect: 4-bit signal for selecting the module.

**Functionality:**

1. Data received at S2P\_Data input is written to two separate RAM buffers based on the state of BankSelect.
2. The module handles switching between the buffers on every rising edge of the SynchedTick signal.
3. Data is read from the buffer based on the address specified in S2P\_Addr.
4. The read address is determined by ModuleSelect and ReadPointer, or WritePointer and S2P\_Addr, based on BankSelect state.
5. The output DataOut provides the selected 16-bit parallel data based on S2P\_Addr.

## Simulation

Create a testbench with stimuli for inputs. Verify the DataOut output for correct data retrieval from the buffer based on address selection. Test various scenarios, including buffer switching, write operations, and data reading. Ensure proper functionality and data integrity.