**Verification Report**

Industrial Monitoring System

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**Original Specifications**

**System Functions**

* Two sensors, with A-to-D hardware to read the sensors and output their digital values (eventually) to the fibre interface hardware. For design purposes, the sensors are intended to represent the temperatures of some critical device.
* Time division multiplexing (TDM) of the sensor data with framing information onto a single optical fibre, using a VHDL embedded system development kit
* Framing of data, using basic methods suitable for simple data communication protocols
* Synchronous data communication of frames over plastic fibre optic cable
* Manchester encoding and decoding of frames, and transmission and recovery of an embedded clock signal
* Recovery of the sensor data from the frames, and display of the sensor values on an appropriate hardware device
* Characterization of a wave division multiplexing (WDM) system using a single optical fibre (as a lab)

**Project Management**

* Project Plan and Schedule
* Weekly Status Reports
* Test Plan
* Link Budget
* Verification Report

**Final Product**

All project specifications were met. Slight differences include going above and beyond with a monitor display of sensor data, as well as additional functionality such as changing sample rate, interpolating data points on the display, as well as recording numerous data points to be able to check and compare previous values.

**Testing and Results**

As specified on our test plan, our system testing started with the Fiber Optic system, and then tested each component individually, before adding it to the system and confirming the system still is functioning properly. This allowed us to troubleshoot each individual part to confirm that they worked, as well as testing the system as a whole after each addition to confirm that the components work properly together.

**Results**

**Fiber Optic System**

* Testing the Fiber system was done using a 50% duty cycle signal generator, as with a 50% duty cycle, the transitions constantly, which means the receiver will have the most difficulty keeping up with the transmitted signal.
* We used the green transmitter/receiver to reach up to 250kHz

**Manchester Encode/Decode**

* Going from encoder to decoder was very simple, we were able to get a clear signal up to approx. 7.5Mhz encode/decode clock rate (~235k bit rate)
* Adding the Fiber system caused no issues

**TDM Frames**

* We tested sending directly from one Altera board to the other, using an external clock
* Testing was done using a typical frame, and then frames with errors injected into them
  + We used a slow clock rate to inject errors only on specific bits, in various parts of the frame (sync sequence, sensor data and checksum)
  + Errors were recorded properly and the error frames were discarded
    - Note: Errors in the sync byte (low instead of all high) meant the frame was not received, so no error recorded
* Tests were then done with the Manchester + Fiber Optic circuits in between the two Altera boards
  + System functioned as expected

**Sensors and ADC**

* ADC’s were tested individually, with LED outputs
  + Voltage level varied, and the parallel binary output varied accordingly
* Altera board was connected, and sensor data was displayed from the board to ensure the board was received the ADC values properly
  + Board values matched LED’s, system worked properly
* LED’s were removed and system was set up to transmit frames filled with ADC sensor data
  + System continued to function normally
  + Testing injecting errors into the frames created from ADC also functioned properly

**Conclusion**

Overall I feel our project was a great success. Our implementation matched all the specs and went above and beyond on the receiving data processing and display. We understand all the system concepts and functionality, as well as kept accurate records on our process and project progress. Our team worked well together, and we all contributed to the project deliverables.