**Senior Design Project Description**

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| **Company Name** | *Carrier Corporation* | **Date Submitted** | 4/22/2020 |
| **Project Title** | *Data Acquisition system for Industrial Machines – Phase 3*  **(CARR\_DATA3)** | **Planned Starting Semester** | Fall 2020 |

# Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

|  |  |  |  |
| --- | --- | --- | --- |
| **Discipline** | **Number** | **Discipline** | **Number** |
| Mechanical |  | Electrical | 2 |
| Computer | 3 | Systems |  |
| Other ( ) |  |  |  |

# Company and Project Overview:

Carrier is a world leader in high-technology heating, air-conditioning and refrigeration solutions.

Built on Willis Carrier’s invention of modern air conditioning in 1902, Carrier is a global leader in heating, air-conditioning and refrigeration solutions. In addition to the familiar residential products, Carrier has a vast array of heavy capacity commercial products for buildings and hi-rises of all types. These sophisticated units contain a wide variety of technologies including air handlers, air/water chillers, sensors and building automation controls.

The 9701 Old Statesville Rd Charlotte NC Carrier facility contains design engineering, test engineering and manufacturing operations. Some product examples are shown below:

Carrier 30XA Air-Cooled Screw Chiller (Size 090)AquaEdgeÂ® 19DV Advanced Two-Stage Compression with GreenspeedÂ® Intelligence 

The Fall 2019 CARR\_DATA2 Engineering Senior Design team developed a proof-of concept data acquisition device for communication with industrial controllers to be able to collect data for extended periods of time. In this project, students will take the “Phase II” work and build on it to improve the functionality and reliability.

Background about Intended Use:

Industrial Chillers are controlled using an embedded processor, touch panel display and RS485 communication to various sensor boards. These interfaces are the backbone of the Chillers operation and allow users to interact with and run a Chiller in the most efficient and flexible manner. Today, Carrier uses proprietary & custom hardware controllers to implement these interfaces, which can come at a cost premium and reduce agility of improvements. Carrier is always trying to move towards open platforms and of the shelf solutions to provide more future proof and upgradable products at the lowest cost to our customers.

The UNCC team will be helping Carrier to achieve this goal by incrementally providing a controller system designed using off the shelf parts and software making a flexible and customizable controller.

If desired by students, Carrier engineers will provide initial guidance about component selection, software tools to use, resources to start continue the programming effort from the Phase II starting point.

# Project Requirements:

**Requirements for Phase 3:**

1. The system shall base itself off the work from Phase II to aid in quick and total completion
2. The system shall utilize the Raspberry Pi Compute Module to provide processing and control (starting with the software developed in Phase II as a baseline)
3. The system shall design an interface PCB that will slot the Compute Module and implement measurement circuitry
   1. Team will provide proposal for adding a display interface (HDMI, DSI?)
4. Support Wifi web interface
5. Interface card must utilize 24VAC as a power source and convert to required power.
6. Support the below listed circuitry (open for adjustment based on cost and feasibility):

|  |  |
| --- | --- |
| **Input** | **Output** |
| 10 Resistive Measurements (Thermistor..5-10k Ohm) | 2 0-10VDC |
| 2 0-10VDC  (supporting pressure sensors 0-5V, ideally hardware adjustable DIP switch proposal?) | 2 4-20mA |
| 2 4-20mA | 6 Digital Relays  (24VAC compatible) |
| 6 Digital Relays  (24VAC compatible ideally) | 1 Stepper Motor (NEW DESIGN from Ph.II) |

# Expected Deliverables/Results:

* Bill of materials
* Assembly instruction
* Source Code
* Documentation for the source code
* Working Demo unit
* Collected data for 120hrs
* Test data showing timestamps of the data are real-time along with accuracy measurements
* A method to configure the unit to collect the points

# Disposition of Deliverables at the End of the Project:

Demo system will be provided to the Industry Supporter at the end of the Expo unless the Supporter directs otherwise.

# List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

Design Reviews are required to be held at Carriers 9701 Old Statesville Rd Charlotte location. Other skills that will be utilized:

* Software development
* Serial data communication
* Electronics design
* Electrical design
* Project management