

Sensor Array Communication System

Introduction:

Raytheon Company produces a variety of sensor array types for various purposes. Each sensor array type can be composed of different numbers of differing types of sensors. Regardless of the number of sensors or sensor type, a common problem is to transfer acquired data from each sensor back to a “Base Station” collection point. Given the number of sensors involved and the environment in which they operate it is not possible to individually connect the Base Station to each sensor.

The problem is to design the system shown in Figure 1. All of the interfaces in the Base Station and in Sensors 1 to N are identical and support a single multi-drop, bi-directional data link as shown.

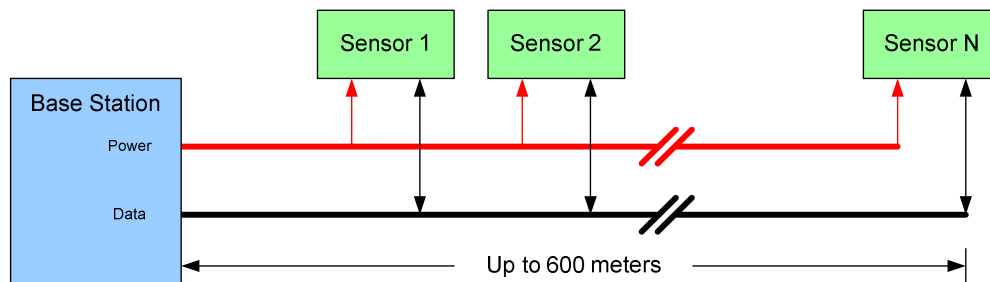


Figure 1

Requirements:

Sensor Size:	< 2 in. ²
Sensor Power:	< TBD.
Number of Sensors:	2 to 26.
Data Bus length:	Up to 600 meters.
Data Bus media:	A single twisted pair; 24 AWG.
Data rate:	1-2 Mb/sec.

All sensors shall be synchronized to a common clock. The phase variation of this clock from any sensor to any sensor should be less than four bit times.

Each sensor will transmit a 16 or 48 bit message to the base station.

Learning Objectives:

- Understand the requirements - *especially* where they are incomplete, inconsistent, or missing!
- Perform trade studies for various design approaches to see which best meets the requirements.
- Design a product and learn a disciplined design process which still allows for creativity.
- Build and test your design.

Project Team and Desired Skills:

This project will require a team of two Electrical Engineering students and one Computer Engineering student. The team should have knowledge of some of the following:

- Communications
- Phase Locked Loops
- Digital & analog electronics
- CPLDs and/or FPGAs
- Transmission lines
- Lab equipment

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