



## Senior Design Project in Electrical & Computer Engineering



# 270' WMEC DCU UPGRADE

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### Project Background

The Data Converter Unit (DCU) aboard the 270' *Famous*-class cutters is used to consolidate the information provided from the anemometer, Doppler speed log, Optical Surveillance System (OSS), gyrocompasses, and fathometer. The DCU takes the different analog signals from these instruments, converts them into a digital sentence read by the Shipboard Command and Control System (SCCS).

The problem with the current DCU is primarily its age. The circuitry is outdated and can no longer easily be repaired. This process is neither time nor cost effective. Also the data word provided by the current DCU is in Naval Tactical Data Standard (NTDS) which is no longer the preferred format. The preferred format for the SCCS is the National Maritime Electronics Association (NMEA) standard, the accepted protocol for the international marine community.

### Project Plan

This project will continue the previous efforts of ENS Ben Norris (CGA '02) working to replace the portion of the DCU that interacts with the OSS. ENS Norris' work focused on the interface from the OSS to the SCCS and generation of a digital sentence containing the LOP bearing information. This work will create directional control signals for the OSS. My objective is to construct a digital NMEA sentence from the SCCS and convert it to an analog signal. The analog signal is used to drive the OSS synchro motors, moving the OSS camera to the desired position.

### SCCS operator console SCCS Equipment



### Old DCU

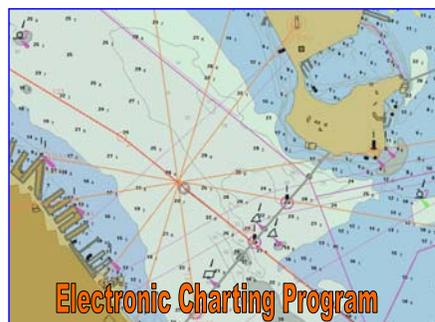


### Impact

Coast Guard cutters and other military vessels must rely on all means of fixing the position of the ship, including electronic, visual, and radar generated fixes. The Optical Surveillance System is a unique system only found aboard the 270' *Famous*-class cutters that automates conventional visual fixes. The OSS works with the cutter's navigation software to quickly mark the visual lines of position (LOPs) when plotting the ship's location on a digital chart. Since several LOPs can be marked nearly simultaneously, the fix position error is greatly reduced when compared to conventional manual methods. The OSS allows one crewmember to perform the job of four or five personnel on a conventionally crewed cutter.

### Project Goals

- Create NMEA strings to be used by SCCS to control the OSS position
- Generate analog signals from the NMEA sentences provided by SCCS
- Implement on 270' *Famous*-class cutter or C2CEN system mock-up



### Solution

- One programmable PROM from BasicStamp© that will be able to turn the NMEA sentence into a digital signal.
- Use two Digital to Synchro Converters to convert the digital signal from the BasicStamp© PROM to an analog signal capable of controlling the elevation and azimuth of the OSS.