NASA CHARGE COUPLED DEVICE (CCD) SPECTROMETER SYSTEM (NCSS)

by

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A small lightweight NCSS has been designed, constructed, and is now being bench tested at Wallops. The unit provides 256, 2.7 nanometer wide channels in the visible spectrum from approximately 400 to 1100 nanometers. The present input slit provides a spectral impulse response of about 10 nanometers. Up to five NCSS sensors may be bused to one data system interface. This bus interface allows near-simultaneous data capture from those sensors.

The NCSS can output Spectra at a maximum rate of 400 per second. The acquired signal amplitude is inversely proportional to the read-out rate. The time-between-spectra is the integration time. This is the time allowed for a charge to build on each CCD element. Longer intervals between spectra yield greater signal and background amplitudes. Roughly one-third of a second integration (three hertz read-out) is typically used over water targets. The host data system controls the integration time.

The NCSS contains a high speed, 16 bit analog to digital converter (ADC) with an integral wide-band sample-and-hold amplifier. The CCD sensor array, signal amplifiers, and the ADC input are located in close proximity to minimize ground loop and EMI noise. A Z80 microcomputer functions as a programmable state generator which controls the CCD sensor array, the ADC, the data

output registers, and data transmission to the host data system. The new programmable state generator and ADC combination allow new and different CCD sensor arrays to be interfaced with minimum engineering.

The NCSS was developed primarily for use with the Airborne Oceanographic Lidar (AOL). A prototype NCSS is presently interfaced to the AOL. This prototype is constructed from an extensively modified Spectron Engineering SE590 CCD spectrometer head.

The AOL will use two new NCSS units onboard the Goddard P-3a aircraft. They will provide the AOL with high resolution sky and ocean spectra. The up-looking NCSS will provide the AOL data system (AOLDS) with down-welling solar radiance, and the down-looking NCSS will provide ocean color spectra. The solar radiance will be used to correct various ocean color algorithms now being researched.

The NCSS is now interfaced to the AOLDS via a specialized parallel high speed Direct-Memory-Access System Expansion Bus interface. We plan to interface the NCSS to the IBM-PC/AT bus in the near future. The PC interface will allow a small portable lightweight ocean/land color data system.

The NCSS optics consist of: 1) a 1.5cm diameter input lens, 2) an entry slit, and 3) a single 2 x 2 cm reflective diffraction grating. The sensor and electronics consists of a Reticon RL-256 CCD linear array detector digitized by a Analogic 826 ADC.

The CCD and the digitizer are controlled by a Z80 microprocessor.

For further information on the NCSS contact Wayne Wright at the GSFC/Wallops Flight Facility.

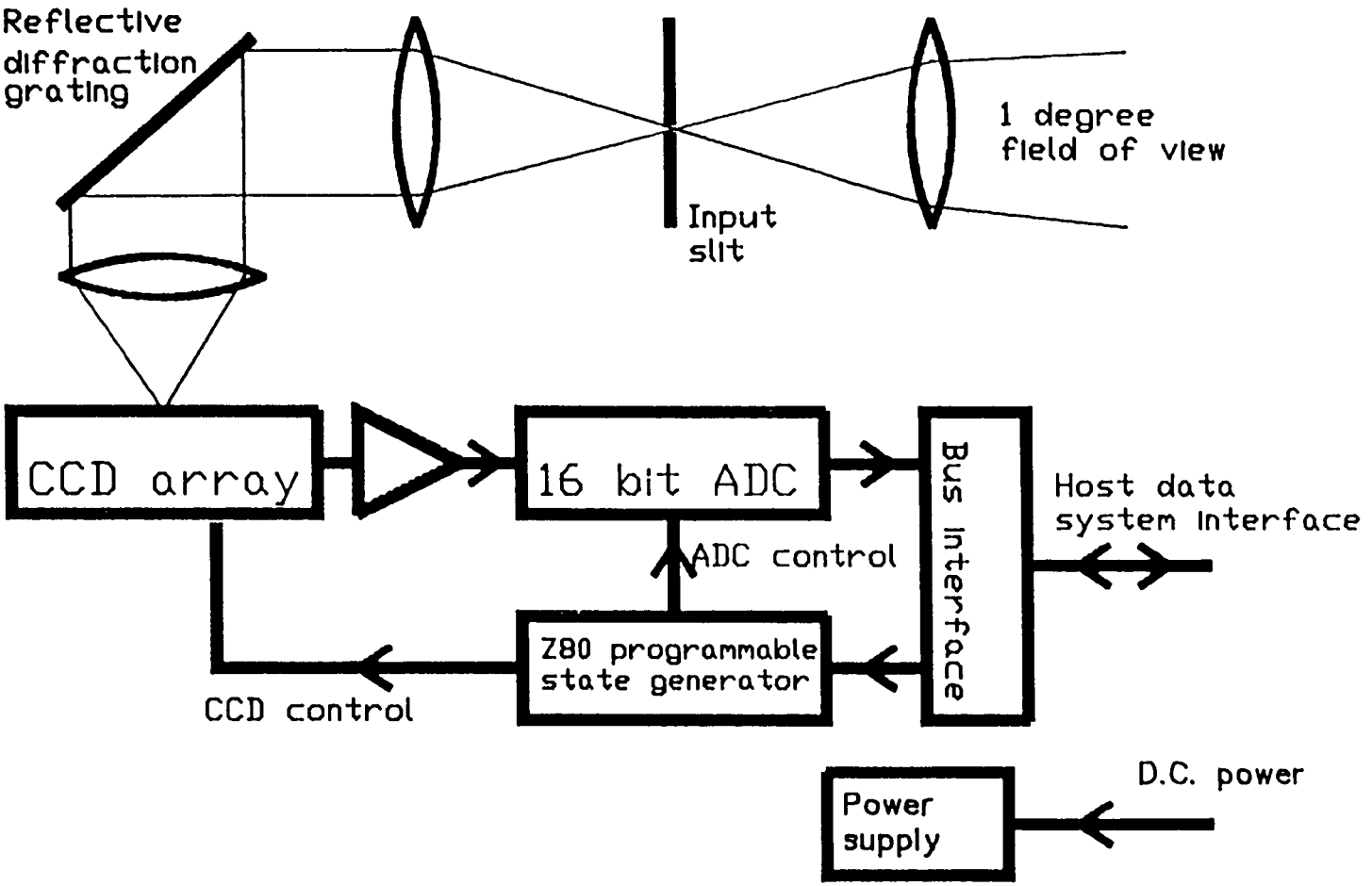

Figure 1. Block Diagram NCSS