A NEW LIDAR SIGNAL PROCESSOR USING DIGITAL TECHNIQUES TO PROVIDE REAL TIME DISPLAY

C. Frush
National Center for Atmospheric Research*
Boulder, Colorado, U.S.A. 80303

ABSTRACT

This paper describes an accurate high speed digital lidar data acquisition system which records lidar data on magnetic tape and features real-time processing of the data by means of a low cost dedicated digital processor. It is designed specifically to handle data requiring range correction and in particular, to display data collected using a monostatic lidar in the form of a ratio of the measured return compared with a typical return, as defined by the experimenter. A programmable read only memory is used to store the typical return, and range correction is accomplished by using a multiplying digital to analog converter with ten bit resolution.

The design incorporates a true differential input gain-switching amplifier with over 60 db common mode rejection at all frequencies below 5 Mhz and over 30 db common mode rejection at frequencies up to 20 Mhz. This allows the gain-switching transients to be canceled to a level less than 0.1% of the signal return even in the range gate immediately following the switch.

The new data acquisition system is designed to accommodate 10 Mhz A/D converters allowing storage of up to 2048 contiguous range gates with spatial separations as small as 10 meters. It incorporates a dual channel front end which can take data from two separate photomultipliers simultaneously, or, operating in the "ping-pong mode," can acquire data essentially continuously over a wide range interval to take advantage of nearly all of the photons detected by the photomultiplier. Signal averaging capability is available in the 24 bit x 2048 word output buffer memory, and provisions to remove the sky background noise digitally allow collection and display of lidar data taken in the daytime.

*The National Center for Atmospheric Research is sponsored by the National Science Foundation.