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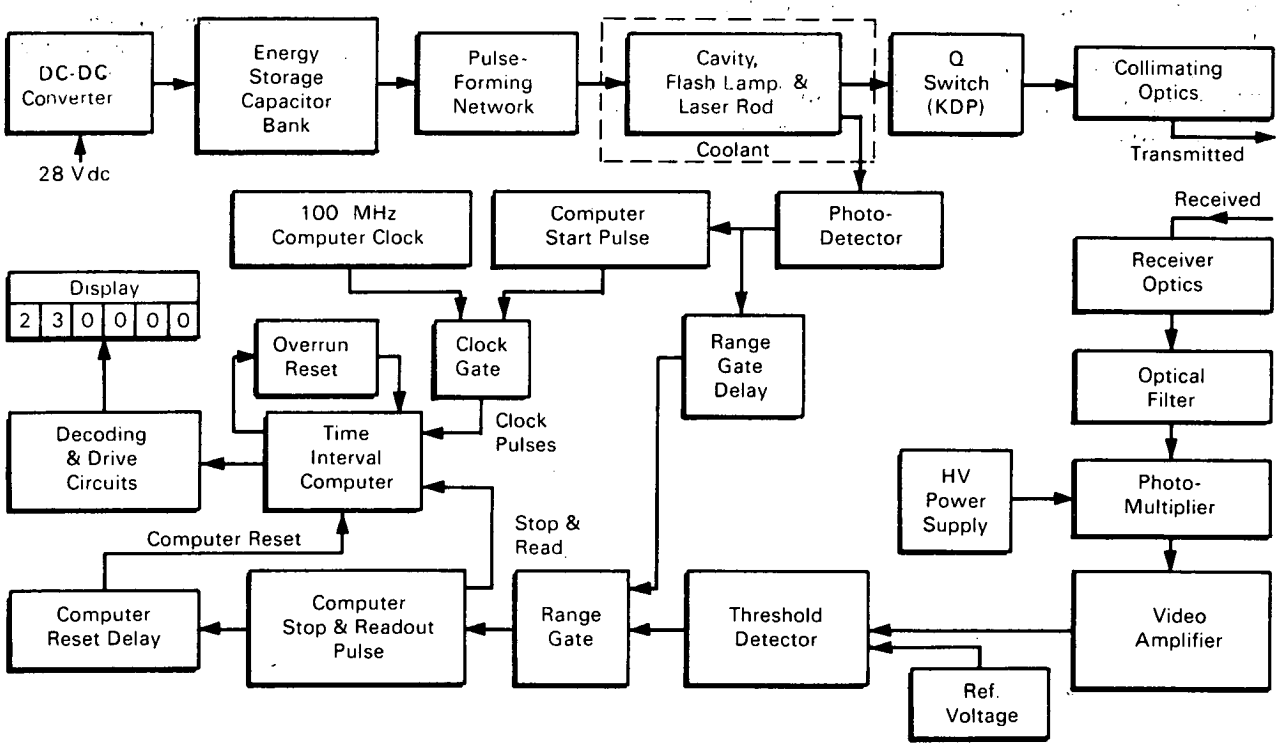
NASA TECH BRIEF

Laser Altimeter



Block Diagram of Typical Laser Altimeter

The problem:

To design a laser altimeter for use in orbital photogrammetry and geodesy. The altimeter, when used in conjunction with a metric camera system, helps provide a highly accurate range measurement to an extremely small area.

The solution:

A ruby laser operating at 6943 Å at the heart of an electronic ranging system.

How it's done:

A review of developed laser systems indicated that the best transmission sources for the specified mission operate at three different wavelengths. Nd-doped lasers operate at 1.06 μ; ruby lasers operate at 6943Å; and frequency-doubled Nd-doped lasers operate at 5300Å. An analysis of these lasers indicated that, at specified altitudes, the ruby laser best performed the altimetry function, both over the ocean and over land.

(continued overleaf)

A block diagram of a typical laser altimeter is shown in the figure. The input voltage level (28 V dc) is raised to 2000 V dc by the dc to dc converter, and coupled to an energy-storage capacitor. The energy is discharged through a pulse-forming network to fire the flash lamp and energize the laser. The laser beam is collimated to approximately 0.1 milliradian, and transmitted. A portion of the beam is used to energize a photodetector, which triggers the 100 MHz clock and sends a pulse start to the time interval computer.

The transmitted signal reaches the target, is reflected, and the returning signal is received by collecting optics with a 1-foot aperture and a 6×10^{-8} steradian field of view. The received signal is passed through a narrow-bandpass filter (20 Å bandwidth, centered on the laser wavelength) into a photomultiplier. After amplification, the photomultiplier output pulse is sensed by a threshold detector, which sends a stop pulse to the computer.

The range is computed from the number of clock pulses received by the computer between start and stop pulses, on a basis of 1.5 m of range per pulse, and is displayed on a decimal scaler, from which it may be read directly, or photographically recorded.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Code A&TS-TU
Marshall Space Flight Center
Huntsville, Alabama 35812
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Patent status:

No patent action is contemplated by NASA.

Source: M. Kolker of
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