duration of up to 20 minutes during which period the satellite navigation message is redundantly received, and a number of integrated doppler frequency shift (doppler count) measurements are acquired. From the navigation message the satellite positions along its orbit are derived. The doppler counts yield measures of range difference between the vessel position and the satellite positions along its orbit. Comparing the doppler shifts of the two carrier frequencies permits elimination of the ionospheric refraction influence. Automatic data editing and an iterative process of fitting computed and measured range differences ultimately result in a correction to the dead reckoned position.

Besides the tasks of navigation and data quality control, the GeoNav computer performs the line and shot control as described in Section B.

2. Detailed Description

Figure 1 is a block diagram of the GeoNav system as configured for GSI. The system employs a Magnavox MX702CA satellite receiver configured for the transfer of doppler counts synchronized with the completion of each line of the satellite message (a line takes 4.6 sec of the 2-min cycle). This permits implementation of the so-called "short doppler" satellite solution whereby the doppler counts are integrated over segments corresponding to an integer multiple of satellite lines.

The satellite receiver also receives both of the two transmitted satellite frequencies, demodulates the signals, and organizes the demodulated bits into 12-bit data words for transfer to the computer. Each 12-bit data word is accompanied by three bits of code which identify the nature of the data being transferred. Also a part of the satellite receiver is a 5-MHz oven-stabilized crystal oscillator which is the reference oscillator for the