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SI3 Theory of Operation

The SI3 is composed internally of two printed circuit boards (S785-300-0 and S785-100-B-0) and a Doppler microwave assembly S757-6T-0

S785-300-0 functions as a power pre-regulator. Unconditioned supply voltage is monitored by U5 Voltage Supervisor. Once the supply voltage reaches design minimums, switches Q2 and Q1 (S785-100-B-0) are turned on. U3 is a 7.6V high efficiency switching regulator with a nominal switching frequency of 340kHz. 7.6V (regulated), GND and Power_Ena lines are sent to the main DSP board S785-100-B-0.

S757-6T-0 is a microwave assembly. At its heart is P450-5D. This is a commercially available integrated Gunn oscillator and microwave detector transceiver. Upon receiving 5VDC power, the Gunn oscillator section of the microwave transceiver generates a 7mW 24.150 GHz (nominal) NON signal. Transmitter frequency is fixed and set by a mechanical tuner (temperature compensated) in the microwave transceiver P450-5D. Some of the microwave energy provides LO pumping for the receiver diodes and the horn/lens antenna radiates the remainder. If the radiated energy happens to strike a moving object, part of the energy will be reflected back towards the antenna. The frequency of the reflected energy is Doppler shifted proportional to its speed. This reflected energy is mixed at the receiver diodes (M1, M2) extracting the Doppler shift information. The placement of the receiver diodes is such that by applying appropriate DSP algorithms the direction of the object may be determined. The low level Doppler analog signals are sent to main DSP board S785-100-B-0.

S785-100-B-0 is the main DSP board. U19 and U20 are 3.3V and 1.9V switching regulators. They are synchronized together and switch at a nominal frequency of 850kHz. Both the DSP processor (U15) and the Stereo A/D Converter (U10) are clocked at 24.576 MHz from X1, clock oscillator. The low level Doppler signals from S757-6T-0 are amplified and presented to U10 Stereo A/D Converter for digitizing. The 5V Linear Regulator (U21) supplies power for the Gunn

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oscillator section of P450-5D in the microwave assembly S757-6T-0. The regulator is under DSP control and is normally enabled at all times. The DSP processor (U15) analyzes the information from the Stereo A/D converter. If qualified targets are found, they reported in a standardized packet of information through RS-232 port. U11 provides level shifting and signal conditioning functions between the RS-232 port and U15 DSP Process. Information is typically sent at 9600 baud from the DSP processor.

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