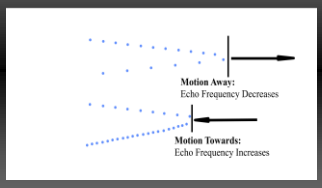
LOCOMOTIVE SPEED SENSOR

Doppler Frequency Shifts



TEST SETUP

VIBRATION TEST

TECHNICAL SPECIFICATION AND DATASHEET OF LOCOMOTIVE SPEED SENSOR

EMD PART NO: 40081692 Gb, PL. NO :18030294

NS PRODUCT CODE: NS1020.07

INTRODUCTION:

A change in the observed frequency of a wave, occurring when the source and observer are in motion relative to each other, with the frequency increasing when the source and observer approach each other and decreasing when they move apart. The motion of the source causes a real shift in frequency of the wave, while the motion of the observer produces only an apparent shift in frequency. Also called *Doppler shift*. Speed sensing Radar uses the principle of Doppler shift to determine the ground speed of the vehicle or other type of equipment. A microwave signal that is transmitted out of the sensor reflects off the target and is received by the sensor. When the target (terrain) is moving relative to the sensor, there is a change in the frequency of the reflected signal (Doppler shift). The ground speed is calculated by measuring the change in frequency.

TECHNICAL DETAILS:

Input Supply	:	72 V Dc Nominal (48 – 88 V Dc)
Output frequency	:	22.5 Hz / Mph
Mounting Angle	:	37.5^0
Radar type	:	K-Band Radar
Antenna type	:	Planner array antenna
Transmission Frequency	:	24.125 GHz
Band width	:	500 MHz
Velocity range	:	0.5 – 180 Km/h

Accuracy:

< ± 3.5 % for (0.5 – 3.0 Km/h)
< ± 1.5 % for (3.0 – 75 Km/h)
< ± 3.0 % for (75 – 135 Km/h)
< ± 3.5 % for (135 – 180 Km/h)

APPLICATION

Actual ground speed monitoring
Direction detection.

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DAMP HEAT

DRY HEAT

FACILITIES

TECHNICAL SPECIFICATION AND DATASHEET OF LOCOMOTIVE SPEED SENSOR

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RADAR SENSOR WORKING

Speed sensing Radar uses the principle of Doppler shift to determine the ground speed of the vehicle or other type of equipment. A microwave signal that is transmitted out of the sensor reflects off the target and is received by the sensor. When the target (terrain) is moving relative to the sensor, there is a change in the frequency of the reflected signal (Doppler shift). The ground speed is calculated by measuring the change in frequency.

The sensor mounts to a bracket on the underside of the vehicle where the sensor may be directed in either the forward or reverse direction.

Carrier frequency:

Standard: 24.125 GHz +/ 50 MHz (K- band ISM frequency)

The frequency of the output signal is proportional to the speed of motion.

The equation for Doppler shift frequency is given by

$$f_d = 2\,V * K\,\frac{(f_0)}{c}\cos\theta$$

Where

f_d Output Frequency

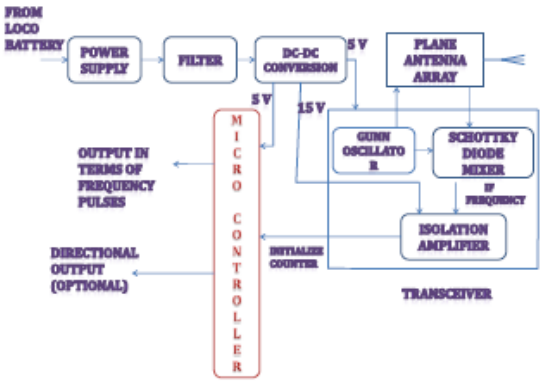
V Velocity of the vehicle

K Scaling Factor

f_0 Gunn oscillator frequency

c Speed of light

BLOCK DIAGRAM



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