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**TECHNICAL FILE
FOR
VOLVO MMS SENSOR**

CEL P/N: 902960
902961
902962

1.0 Introduction

This is a Technical File for VOLVO MMS sensor electronics supplied by CEL to VOLVO.

1.1 Theory of Operation

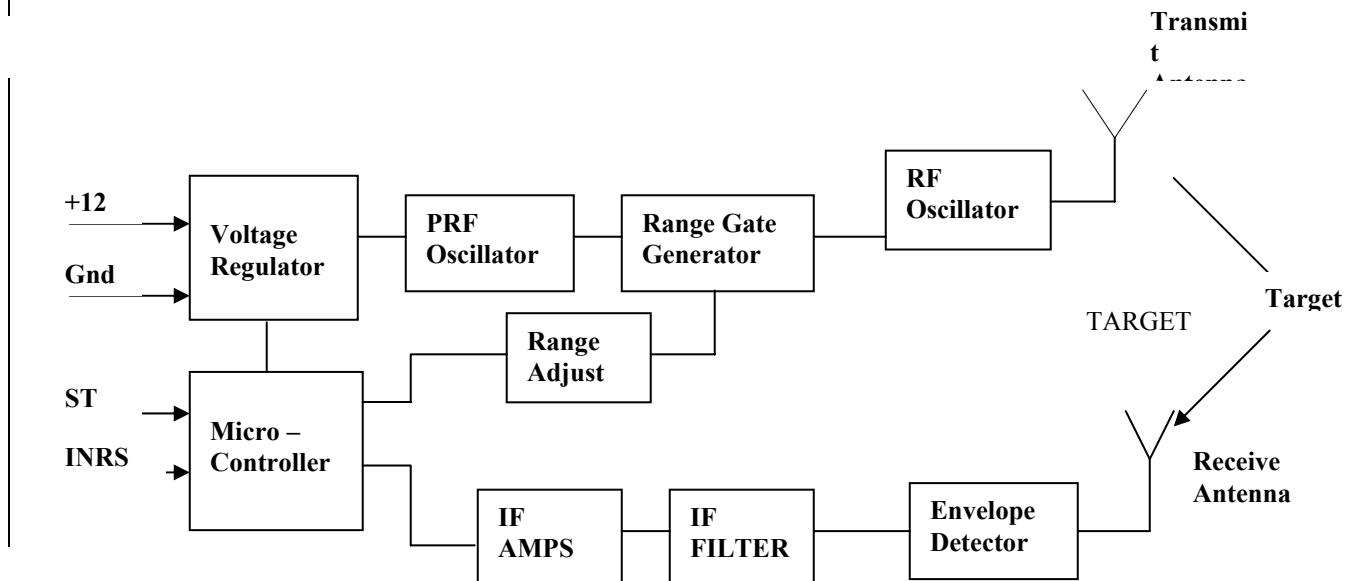
The MDD microwave sensor works on the Doppler principle. The transmit antenna transmits an electromagnetic field into the vehicle. The receive antenna accepts reflections from moving targets and the resulting signals are filtered and amplified before being sent to the microcontroller for evaluation.

The range is adjustable in software. Thus, the range can always be adjusted to fill the vehicle interior, in relation to the shortest distance between the MDD sensor and the windscreens or vehicle roof (the limits of the vehicle passenger compartment). In this way, a hemispherical field is generated within the vehicle as the area to be monitored. If a large enough change in analogue signal amplitude occurs, an analysis of the signal evaluation is started. The microcontroller contains a software algorithm that determines if the signal is a genuine movement or a spurious signal.

If this analysis detects significant characteristics of a movement, an alarm is issued to the PJB via the BUS Interface.

The VCC system uses a combination of sensors comprising a front and rear in order to provide greater cover within the vehicle.

MICROWAVE BLOCK DIAGRAM:



1.2 Operating Modes and influencing factors

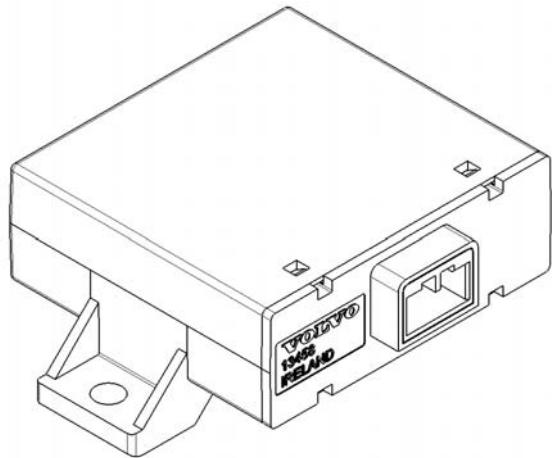
In its non-sensitized condition, the microwave sensor module is set to Sleep-Mode. When sensitized, it is woken by an interrupt on the ST line. The sensitization period for the microwave sensor module, to full functionality, is 30 seconds. The complete alarm system is likewise ready for operation 30 seconds after sensitization of the DWA (anti-theft warning system).

The microwave sensor module operates in impulse mode: that is, like a radar impulse system. An impulse is emitted for a brief period and the reflected signal received is amplified and evaluated. Because the module operates with a very low transmission output, more powerful external frequencies can connect with the receiver side of the device and cause false alarms. The reflected signal is checked in parallel with a suitable EMC protection switching unit and any foreign frequencies are filtered out.

Any real movement in the detection area is recognized by a change in the reflection sample. The module emits a pulsed signal and delays this in accordance with the detection range required. This delayed impulse then controls the receiver section. Only after this delay time is the receiver section opened for a short period, when an associated signal pattern is stored. In reality, the detection range corresponds with a spherical "shell" having a width of ca. 5cm. The signal is stored in terms of amplitude and pattern and is compared with the next signal which is received.

1.3 Physical Construction

Housing:



LENGTH: 65mm, WIDTH: 60mm, HEIGHT: 25mm

FCC ID: (LQN2960 & LQN2961)

PCB: Two layer, Board material FR4

Layer 1: Components and signal tracks

Layer 2: Ground plane

Connector Detail:

Front Connector Type : 5 Way JAE Part Number: IL-AG5-5PK-S3LG

Rear Connector Type : 5 Way JAE Part Number: IL-AG5-5PK-S3LB

Table 1 – Microwave Sensor ECU Connector Pin Detail

Pin	Name	Function
1	Ubat	Positive power supply
2	NC	No connection
3	BUS	BUS connection
4	NC	No connection
5	GND	Negative power supply

1.4 ESC Part Number(s)

CEL Part No.: 902960, 902961 & 902962

1.5 ESC Manufacturers:

CEL

Dunmore Road,

Tuam, Co. Galway,

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2.0 EMC Requirements Analysis

2.1 Potential Sources of Emissions

Signal Source Description	Voltage/Current Level	Frequency	% Duty Cycle (range)	Other
Resonator	3V	4MHz	50%	

3.0 Mode Descriptions

Mode	UBAT	ST Input	INRS (Output)
Armed	+12V	0V	12V (1 sec 0V on Alarm)
Disarmed	+12V	12V	12V

Mode Armed:

In this Mode the ST Input to the Microwave sensor is pulled to ground which ‘Arms’ the sensor i.e. if movement is detected then the INRS (alarm) output is activated (by pulling the INRS output to ground for 1 second).

Mode Disarmed:

In this Mode the ST Input to the Microwave sensor is pulled to UBat which ‘Disarms’ the sensor i.e. the sensor is turned OFF and so should not react to any movements.