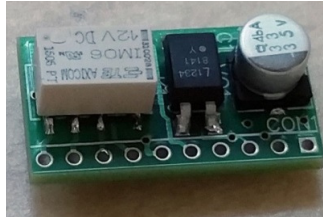


## Locomotive Motion Sensor Installation Instruction Sheet

This document describes the installation and operation of the locomotive motion sensor board. The Locomotive Motion Sensor (LMS) is a small 1" x .55" PCB that is used to perform a variety of switchable actions based on whether the locomotive is moving or stopped. The motion is sensed by monitoring the motor voltage. If there is any voltage on the motor, it is assumed that the locomotive is moving. Conversely, if there is no motor voltage, it is assumed that the locomotive is stopped. A double-pole double-throw relay is switched to provide the output functionality of the board. The LMS requires connections to track power and frame ground as well as to the locomotive drive motor. The output relay connections are application dependent.

PIN #	Description
1	Motor #1 Connection
2	Motor #2 Connection
3	Wheels (frame ground)
4	Roller (center track)
5	#1 Normally Closed Contact (2A maximum)
6	#1 Common Contact (2A maximum)
7	#1 Normally Open Contact (2A maximum)
8	#2 Normally Closed Contact (2A maximum)
9	#2 Normally Common (2A maximum)
10	#2 Normally Open Contact (2A maximum)



Locomotive Motion Sensor BOM					
RefDes	Value	Name	Manufacturer	Pattern	Qty
C1	33uf 25V	EMVA350ADA330MF55G	United Chemi-Con	CAPAE-6.6x6.6h5.4	1
C2	1uf 35V	CL218105KLFVPE	Samsung	CAP_0805	1
C3	0.1	CC06032RY5V98B104	Yageo	CAP_0805	1
CON1		10-pin header	not-fitted	HDR10 2.54/1.0	1
D1, D3	100ma	1SS355VMT-17	Rohm	SOD-323F	2
D2	15V	MMS25245B-TP	M.C.C.	SOD-123	1
K1	Relay	IM06DG	TE Connectivity	GN-A	1
Q1		2N7002-7-F	Diodes, Inc.	SOT23	1
R1	4.7k	RC0805FR-074K7L	Yageo	RES_0805	1
R2	1k	RC0805JR-071K1L	Yageo	RES_0805	1
R3	1Meg	RC0805FR-071ML	Yageo	RES_0805	1
R4	47k	RC0805JR-0747KL	Yageo	RES_0805	1
VO1		LTV-8141S	Lite-On	4-SMD Opto	1

Figure 1 LMS Pin Assignments, Module Appearance, and Bill of Materials

The fact that you have several sets of contacts that reflect the state of the locomotive gives you a variety of functions that you can add to your locomotive. The following diagram is an example of one application that might be typical for a diesel locomotive. In this application we have added three functions to a standard TMCC locomotive.

- Rule-17 Lighting for front and rear headlights.
- Cab light control, on with stopped, off when moving.
- Smoke volume control, lower smoke level when stopped.

This is just one example to illustrate the application of the LMS; any function you'd like to switch based on the movement of the locomotive can be performed. Examples might be a strobe light that only operates when the locomotive is moving, or ground lights that only operate when the locomotive is stopped.

Note that there is a limitation of maximum current through the relay contacts of 2 amps, exceeding this limit will no doubt result in damage to the LMS module. An optional relay is available to increase the limit to 5 amps. The LMS functions on track power between 12 and 20 volts AC. Lower track voltages may result in failure of the relay to activate when the locomotive starts moving.

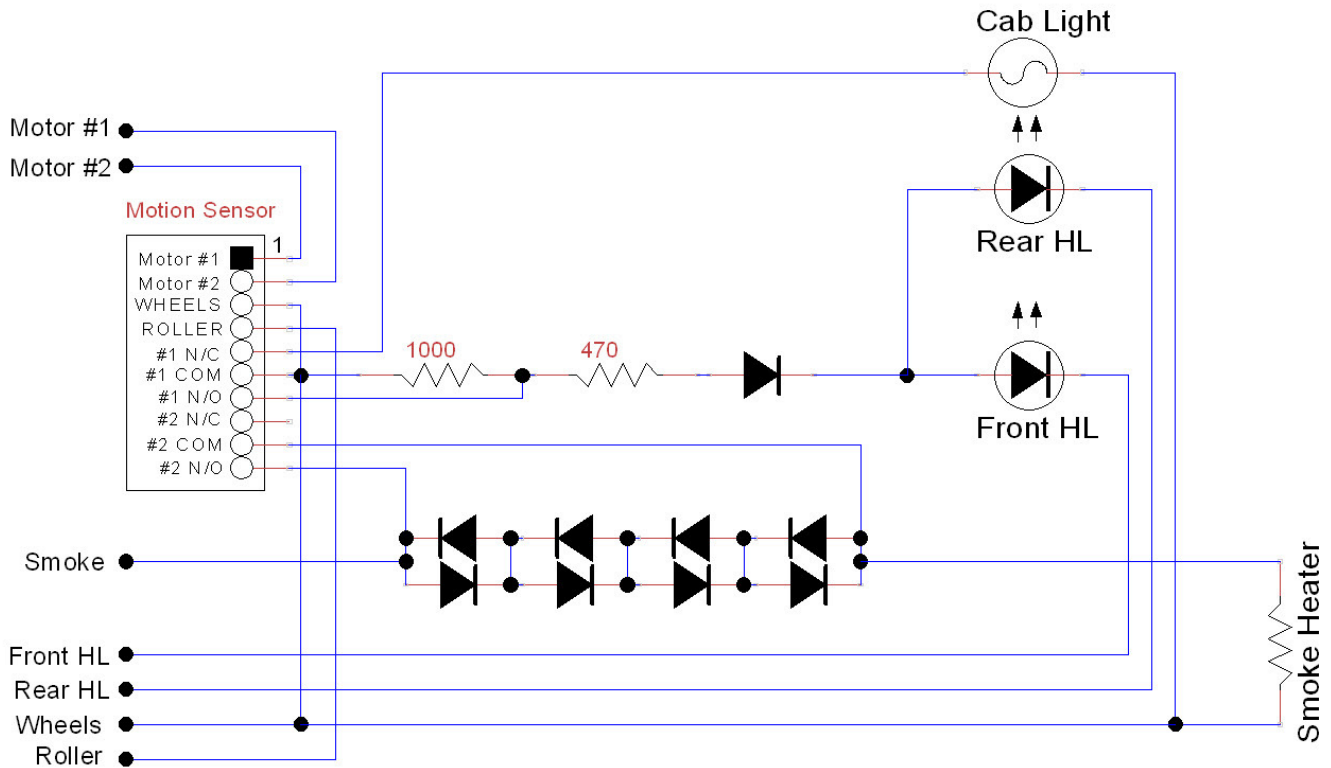


Figure 2: Example of Usage of the LMS in a Diesel Locomotive