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Application Note

ECE 480

Design Team 4

Rapid Prototyping Environment for Climate Control Development

ILSS SENSOR

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Executive Summary

The purpose of this document is to describe the functionality and proper user guide constraints on how to apply the ILSS (Indicator, Light, and Solar Sensor) with the use of a micro-autobox and Matlab.

Background

The ILSS is a control unit that is located in the middle of a vehicle's windshield and it is applied closely. This sensor has the ability to monitor and influence the temperature of a specified setting without manual intervention. The ILSS is a great importance to the optimal climate being an integrated part of any climate control system, it measures, and perceives according to its environment. The sensor is therefore to be placed on locations with the most prevailing settings.

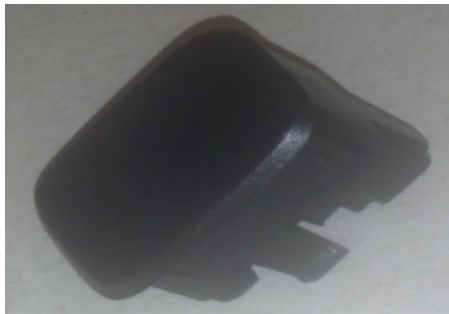


Figure 1

Indicator Light
and Solar
Sensor



Figure 2

MicroAutoBox connected to computer for testing virtual designs that are applicable to the ILSSS sensor for testing, reconfiguring, and data diagnostics

ILSS Components

- Overhead Ambient Light Sensor
- Temperature Sensor
- Solar Intensity Sensor
- Elevation and Azimuth determination
- Indicator control electronics
- Analog/LIN interface electronics
- General Electronics
- Body with integrated connector and attachment tabs
- Top cover
- Criteria for IP attachment interface
- Criteria for sensor and indicator visibility requirements

Figure 3



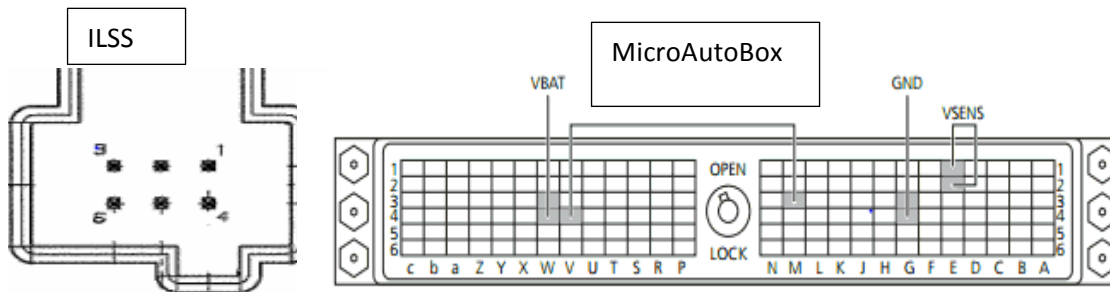
Inside Components

Procedure

Connecting ILSS to MicroAutoBox

The ILSS sensor has pin assignments that are necessary when applying to the MicroAutoBox. It is required all variants are applied correctly to ensure functionality.

Connector terminal pin number	Type	Function
1	-	No connection
2	BiDir – Serial Data	LIN Serial Data
3	-	No connection
4	-	No connection
5	Input – Pwr	12V battery (+)
6	Output – Pwr	Common Ground (-)



Programming the Indicator, Light, and Solar Sensor

Once connected to the MicroAutobox, the next objective is to identify or develop a design that has a set of parameters that will give the best accuracy results from the ILSS component. With the help of MATLAB, the user is able to use Simulink to evaluate a virtual base model that represents computations that are applicable in real climate control systems.

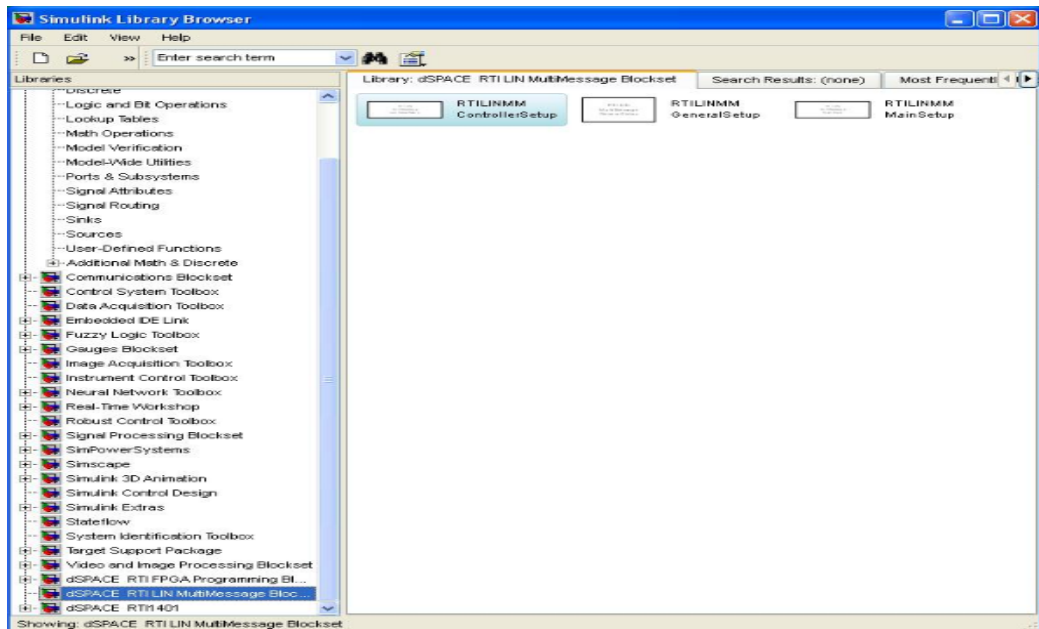
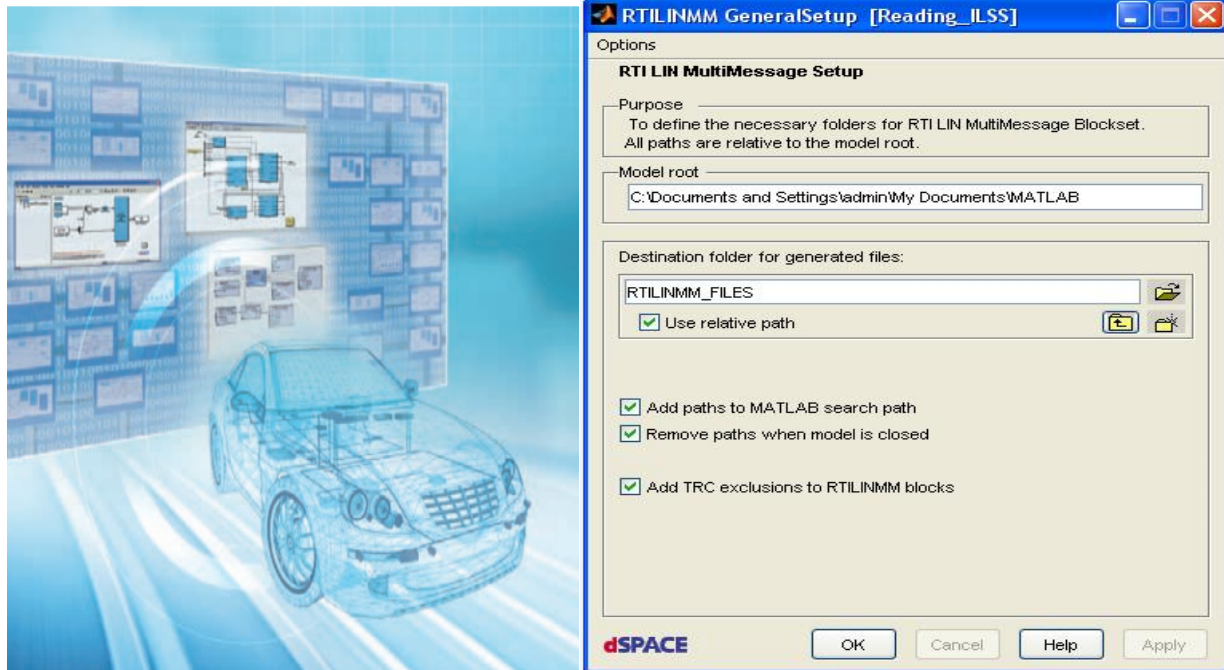
Tutorial on How to setup MicroAutoBox

(Refer to Omar Ali's Application Note)

Tutorial on How to Use Matlab/Simulink

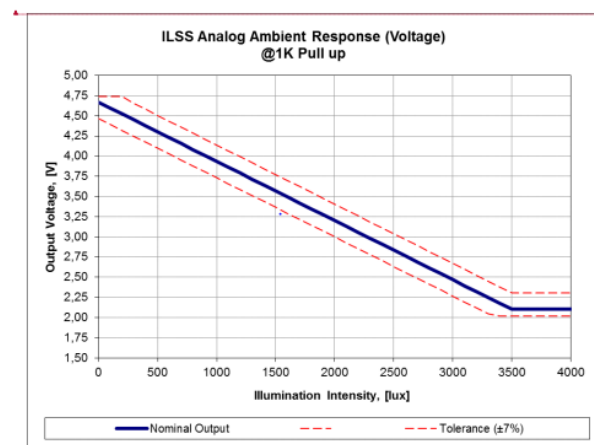
(Refer to Guiseppe Farro's Application Note pg. 2-8)

Examples of sensor blocks <http://www.mathworks.com/help/physmod/elec/sensors.html>



Once comfortable on how to use the following programs the user can now navigate using the necessary tools that are in Simulink to apply real-time workshop settings, and begin building a necessary model. Once RTW has been completed and properly built, MATLAB will verify as successful, and can now be converted into C code and using the Control Desk Software provided by dSPACE you will have the ability to test any design.

Data: Indicator, Light, and Solar Sensor Parameters



Parameters:

After initial wakeup, the ILSS is ready to provide the LIN Master the information transmitted within 100–milliseconds.

ILSS signals are processed as an 8-bit count response over the range from 0w/m² to 765w/m²

Azimuth angle is the angle in the horizontal plane between the sun and driving directions reporting values from -179 degrees to +180.

Max current: shall not exceed 15mA.

Max voltage: powers within a 12V+ circuit provided

ILSS measures irradiation in the visible wavelength range approximately between 400nm – 800nm.

Table 3 - ILSS Sensor Test Cases for LIN Variant

Actual temperature (°C)	Count (N)	Engineering (E) Temperature Value
-40°	0	-40°
0°	80	0°
25°	130	25°
85°	200	85°
87.5°	255	87.5°

References

- 1 .General Motors Users Guide ILSS applications
2. General Motors Users Guide MicroAutoBox
3. www.dSPACE.com (Hardware Installation and Configuration)
4. http://www.atmel.com/images/article_ac7_automotive-lin-bus-driving-sensor-applications.pdf
5. <http://www.mathworks.com/help/physmod/elec/sensors.html>