

1. Introduction

Covid-19 travel restrictions preventing holidays abroad in 2020.

Auto-trader confirm a 17% rise in motorhome adverts viewed in 2020 compared to 2019. www.autotrader.co.uk

More people are purchasing motorhomes!

2. Problem Identification

1. Motorhomes are often large - driving and parking is difficult for some.
2. Due to the cold weather in the UK, even in the summer the heating is often required within motorhomes.

3. Aims and Objectives

Aim: Identify if a PLC can be used as a vehicle monitor assist system.

External monitoring system objectives: -

- Improve road safety & be non-distractive to the driver.
- Notify when a vehicle enters blind spot.
- When parking, display approaching objects.
- Feedback data to warning indications and HMI (interactive screen).

Internal monitoring system objectives: -

- The system will control and set the temperature and light level.
- Feedback data to HMI and warning indications.
- Improve efficiency and living quality.

4.1 Method – Parking & Blind Spot Assist

- Parking (ultrasonic) and blind spot (radar) sensors will be fitted to the test rig - connected to PLC.
- As object approaches the test rig, the sensors will flag a warning.
- The PLC will send the feedback to the HMI screen & LED indications.



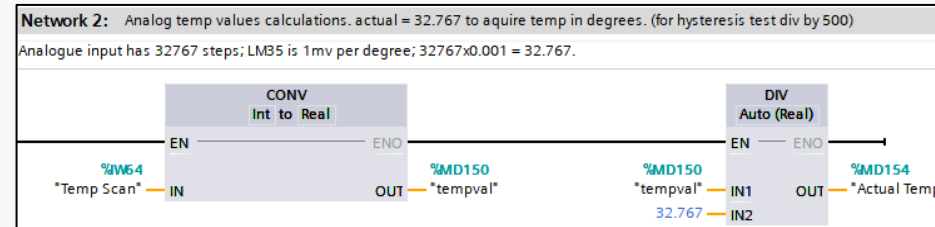
4.2 Method – Smart Heating & Lighting Control

- User will be able to set and change the desired light/temperature levels within the motorhome.
- PLC will turn lights & heater on when light level & temperature drop below the desired setting.
- Operated through the HMI screen.

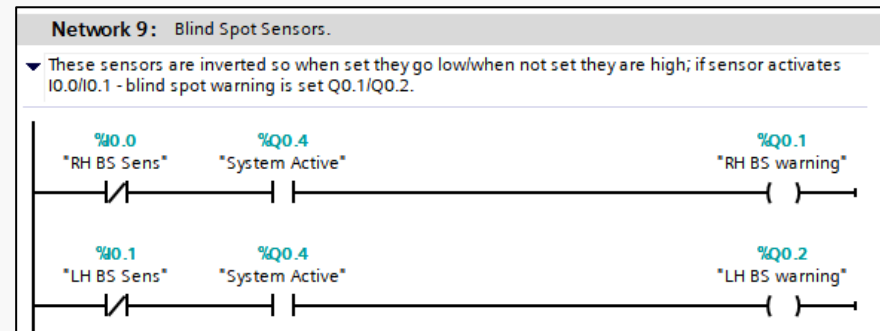
5. Software Design

Siemens TIA V16 software was used to complete the objectives set - 5.1 and 5.2 show examples.

5.1 Temperature Sensor Network

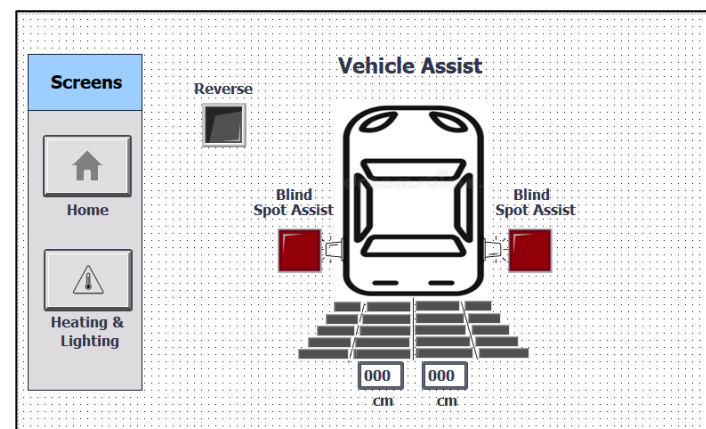
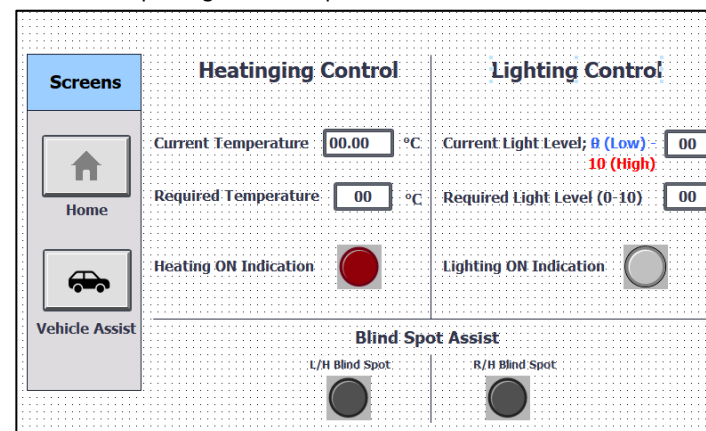


5.2 Blind Spot Sensor Network



6. HMI Design

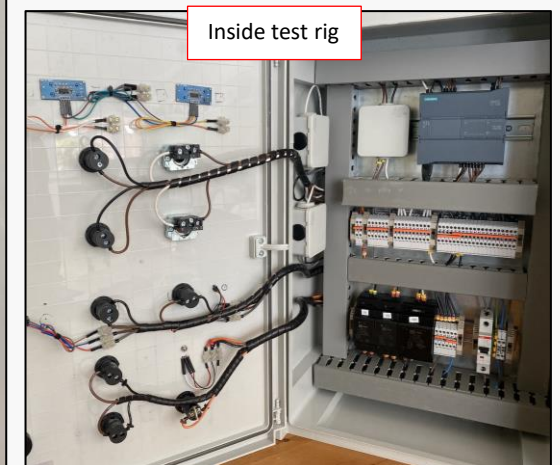
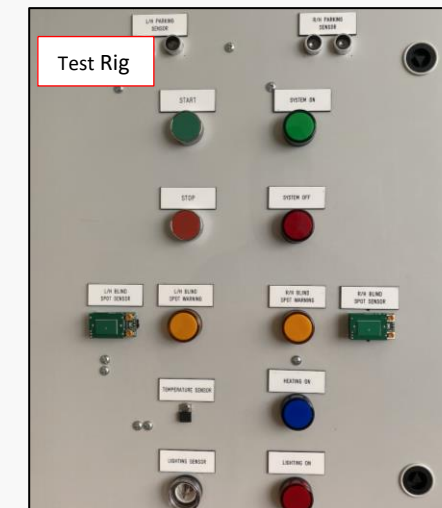
HMI screens are used to set and adjust temperature and lighting requirements and to output parking and blind spot feedback. Shown below.



7.1 Project Testing

- Testing was carried out on the system via the test rig (shown in image below).
- Purpose of the testing is to identify successful and unsuccessful aspects of the project.

7.2 Final Product Images



7.3 Brief Evaluation

Test Parameter	Operates Successfully (Y/N)
Software operates correctly	Yes
User interface works	Yes
Product meets the project objectives & specification	Mostly yes – a small percentage of the specification require further testing for confirmation.
System works as a whole	Yes

8. Conclusion

The theory that this project could be completed was based on the ADAS and Smart technology research and was inspired by the research completed on existing products.

The results indicate that the theory was true, and the test results and analysis support that this was a successful project.

All issues were overcome: - current leakage, PIC requirement, breadboard issues, and LM35 sensor setback.

A small percentage of the objectives have not been able to be proven. The main area of improvements would be further testing to prove or disprove the unknown objectives.

I am overall delighted with the outcome of the project. I accomplished everything I wanted to achieve and successfully overcame every issue along the way.

9. Future Recommendations

Field Testing – To make sure that the points outlined in the evaluation are successful/unsuccessful. (blind spot identification & efficiency).

Battery incorporation – so that the system can be used off the grid.

Size of housing can be reduced - test rig is now redundant - decrease materials costs and will become more attractive.

PCB incorporation would have made the digital sensors easier to connect (breadboard issues).

Wireless connectivity – Bluetooth/Wi-Fi would enhance the product.

Use/creation of an App – could be used to replace the HMI user interface. This would improve useability and reduce costs.

New features – such as emergency stop assist, curb measuring system, automatic headlight control would enhance the product.

Cost engineering - Components purchases in drips and drabs – money could have been saved on the multiple unnecessary delivery charges.