Setting up MicroAutoBox 1401/1501 for Power and LIN Communication

Application Note

Omar Ali

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Design Team 4
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I. Abstract

The purpose of this application note is to describe step by step how to set up the MicroAutoBox 1401/1501 so it can have power and be capable of initiating LIN communication on the LIN bus. The introduction covers the hardware and components of the MicroAutoBox. The subsequent sections cover the configuration of the MicroAutoBox. The purpose of this tutorial is to get familiar with the MicroAutoBox for use with the LIN bus.
II. Keywords

dSPACE – Solution for creating a rapid prototyping system with the use of hardware and software

ECU – Electronic control unit

GND - Ground

I/O – Input/output

LED – Light emitting diode

LIN – Local interconnect network

MicroAutoBox – dSPACE prototyping hardware

RCP – Rapid control prototyping

VBAT – Main power supply

ZIF – Zero insertion force
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III. Introduction

The MicroAutoBox features a rapid prototyping (RCP) system and an electronic control unit (ECU) in one package. This makes it a suitable hardware for dSPACE prototyping in a vehicle. The MicroAutoBox used in this application note is the 1401/1501 variant. The package content for this variant includes three boards in a milled aluminum box. One of those is the DS1401 baseboard and the other two are the DS1501 I/O boards. There is a 156-pin Zero Insertion Force (ZIF) connector for matching the corresponding connector on the MicroAutoBox that is already preconfigured. This provides access to the input and output signals provided by the MicroAutoBox. Also included are the I/O connector pins and dSPACE installation disk. The image in Figure 1 below shows the components necessary for configuring the MicroAutoBox for this tutorial.

IV. Power Configuration

Getting Started

Make sure to install the dSPACE software on your host PC before getting started. This came with the MicroAutoBox package and is used for reading data from the MicroAutoBox. The dSPACE software can be seen in Figure 1 above. You will need administrative rights to install the dSPACE software. Contact dSPACE for more information about system requirements or help with installation at http://www.dspace.com/goto?im
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Wiring
The wire ends should be stripped for 3 to 4 mm. The sizes of the wire that can be connected to the MicroAutoBox are shown in Figure 2 below. The wire colors should be followed when configuring the power as mentioned in Figure 6.

<table>
<thead>
<tr>
<th>AWG</th>
<th>Diameter (mm)</th>
<th>Cross section (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.812</td>
<td>0.518</td>
</tr>
<tr>
<td>21</td>
<td>0.723</td>
<td>0.411</td>
</tr>
<tr>
<td>22</td>
<td>0.644</td>
<td>0.326</td>
</tr>
<tr>
<td>24</td>
<td>0.511</td>
<td>0.205</td>
</tr>
<tr>
<td>25</td>
<td>0.455</td>
<td>0.163</td>
</tr>
<tr>
<td>26</td>
<td>0.405</td>
<td>0.129</td>
</tr>
</tbody>
</table>

Figure 2 – Wire Size

Power Supply Requirements
The MicroAutoBox requires a power supply in the range of 6-40 V (30 W with a 5 A peak). The power supply should operate at 12 V and deliver 5 A peak current. It is highly recommended to insert a fuse into the main power supply or to have a power supply with a fuse already installed in it. For the standard MicroAutoBox a fuse within the range of 8 to 10 A is recommended.

Configuring Power and Ground
To configure the power, W3 and W4 must be connected to the battery. To do this attach the I/O connector pins to the end of two wires and then solder the wires together to a single wire. Cover up the connection with shrink-wrap as shown in Figure 4. For ground pin G3 and G4 are used. The same process that is done for power can be done for ground as well. The other end of the wires will then be connected to the proper terminal as shown in Figure 3. Refer to Figure 5 for a detailed description of the pins for power and ground. Refer to Figure 6 to see the pre-configured pins for power and ground fixed by dSPACE.
Switching on the MicroAutoBox

To turn on the MicroAutoBox when it is connected to the battery, connect a wire from the REMOTE signal (pin M3) to pin V4. Remember to attach an I/O pin to both ends of the wire. In Figure 4 the yellow wire shows how the connection looks like. When the power and ground is connected to the battery the LED located in the top left corner should light. If the LED is red, then the MicroAutoBox is in reset state, power supply is switched on but no application is downloaded to the real-time processor. If the LED is green then application is running.

![Image showing pin connections and LED status](image-url)
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<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>W3, W4</td>
<td>VBAT</td>
<td>Main power supply input (red wire)</td>
</tr>
<tr>
<td>G3, G4</td>
<td>GND</td>
<td>Main power supply return line (black wire)</td>
</tr>
<tr>
<td>M3</td>
<td>REMOTE connected to V4 (VBAT)</td>
<td>MicroAutoBox starts automatically when power is supplied (yellow wire). For the meaning of the REMOTE signal, refer to Basics on Connecting to Power Supply on page 74.</td>
</tr>
<tr>
<td>E1 connected to E2</td>
<td>VDRIVE connected to VSENS</td>
<td>Selects TTL-compatible logic levels at the input/output signals (green wire).</td>
</tr>
</tbody>
</table>

Figure 6 – Pre Configured pins by dSPACE

V. Connecting to a LIN Bus

Configure MicroAutoBox as the LIN Master
By default the MicroAutoBox is configured as a LIN slave in a LIN network. To configure it as the LIN master a diode in series with a 1 KΩ resistor must be soldered together as shown in Figure 1. The circuit must then be wired in parallel to the LIN transceiver by wiring one of the empty VBAT (Power) pins shown in Figure 5 to the pin for LIN (U3) also shown in Figure 5. The MicroAutoBox should now be configured as the LIN master.

Connecting MicroAutoBox to PC
With the MicroAutoBox turned off (i.e. not connected to the battery) connect the pin end of the crossed-over patch cable to the MicroAutoBox and the Ethernet end to one of the DS821 adapter cables shown in Figure 7 that came with the dSPACE package. The card should be inserted in the other end of the adapter cable and then connected to the host computer’s 32mm PCI card slot. The PCI card slot should look similar to Figure 8. Make sure the pins match correctly when inserting into the PC. See Figure 7 description for information about the indicator LED status for the adapter.

Figure 7 – DS821 Adapter Cable
Figure 8 – PCI Card Slot
VI. Conclusion
The MicroAutoBox should now be configured for using the LIN bus and communicating with a host PC. If the steps were followed correctly, a green LED should light when opening dSPACE software and running an application. This means that data is being sent/received between the host PC and the MicroAutoBox. The next step is to create a model of a system that uses the LIN bus and connect any controllers, actuators, or sensors onto the LIN bus to monitor their interaction with the modeled system.
VII. References