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Section 1
Introduction

Congratulations on your purchase of the ATAVRAUTO300 board. This board includes all necessary elements for designers to quickly develop code related to LIN communication implementing the ATmega88 and for prototyping and testing of new designs.

1.1 Overview

This document describes the ATAVRAUTO300 dedicated to the ATmega88 AVR microcontroller. This board is designed to allow an easy evaluation of the product using demonstration firmware.

To increase its demonstrative capabilities, this stand alone board has numerous onboard resources (LIN, push buttons).

Figure 1-1. ATAVRAUTO300
1.2 ATAVRAUTO300 features

The ATAVRAUTO300 provides the following features:

- ATmega88 QFN32
- AVR Studio software interface\(^{(1)}\),
- Power supply
  - Regulated 5V
  - From LIN connector (LIN network power supply)
- JTAG connector:
  - for on-chip In Situ Programming (ISP)
  - for on-chip debugging using JTAG ICE
- Serial interface:
  - 1 LIN interface 1.3 and 2.0 compliant (Software library available on the Atmel website for LIN 1.3).
- On-board resources:
  - 1 LIN transceiver with internal regulator
  - Joystick (4 + 1 ways)
- System clock:
  - Internal RC oscillator
- Dimension: 45 mm x 45 mm

Notes: 1. The ATmega88 is supported by AVR Studio, version 4.12 or higher. For up-to-date information on this and other AVR tool products, please consult our web site. The newest version of AVR Studio, AVR tools and this user guide can be found in the AVR section of the Atmel web site, http://www.atmel.com.
Section 2

Using the ATAVRAUTO300

2.1 Overview

Figure 2-1. Board Overview

Figure 2-2. Block Diagram
2.2 Power Supply

The on-board power supply circuitry is supplied through the LIN connector.

2.2.1 LIN powered

The LIN connector power line is used to provide VBAT to the ATAVRAUTO300 LIN transceiver.

A LIN network has to be connected to have your LIN interface working (Input supply from 8 up to 18V DC, see Figure 2-3 on page 5).

2.3 Oscillator Sources

The ATAVRAUTO300 allows only one oscillator source:

- Internal RC oscillator

Note: The “Divide by 8” Fuse is configured by default. The first step in the demonstration application is to clear the prescaler to have the internal RC oscillator running at 8MHz:

```
CLKPR = (1<<CLKPCE); // Clear Prescaler
CLKPR = 0;
```

2.3.1 Internal RC oscillator

A LIN Slave node with a run-time oscillator calibration can be used with the internal RC oscillator.

At ambient temperature and normal Vcc, the internal oscillator is precise enough to be compliant with LIN 1.3 and 2.0 specifications. For wider temperature and/or power ranges, a run-time calibration of the internal RC oscillator can be used as explained in the application note “AVR140 ATmega48/88/168 family run-time calibration of the Internal RC oscillator” available on the ATMEL website.

2.4 On-board resources

2.4.1 LIN & Power supply

The LIN screwed connector allows the user to select his own connector.

Note: The LIN power supply input is reverse voltage protected.

LIN transceiver control is realized by the microcontroller. Network management depends on the micro controller's ports configuration.
### Table 2-1. LIN resources

<table>
<thead>
<tr>
<th>Function</th>
<th>Port</th>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN_NSLP</td>
<td>PD2</td>
<td>Low</td>
<td>LIN transceiver in Sleep mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>LIN transceiver in normal mode</td>
</tr>
<tr>
<td>NRES_LIN</td>
<td>PC6</td>
<td>Low</td>
<td>Perform MCU reset when NISP Jumper is inserted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>No Action</td>
</tr>
</tbody>
</table>

### Figure 2-3. LIN transceiver and power supply

**Note:** The LIN transceiver under voltage protection can be disabled by removing the jumper NISP.

**Note:** The NISP jumper has to be removed when programming.

#### 2.4.2 Joystick

The 4+1 ways joystick offers an easy user interface implementation for DC, BLDC, stepper motor and LED applications in the ATAVRAUTOEK1 Evaluation Kit.

Pushing the push-button causes the corresponding pin if the micro controller is to be pulled low, while releasing (not pressed) causes a high state on the pin of the microcontroller.

### Figure 2-4. Joystick schematic

---

**Note:** The LIN transceiver under voltage protection can be disabled by removing the jumper NISP.

**Note:** The NISP jumper has to be removed when programming.
2.4.3 LED

The ATAVRAUTO300 includes one green LED implemented on one I/O pin. It is connected to the “PortD Pin3” of the ATmega48/88/168. To turn On the LED, the corresponding port pin must drive a low level. To turn Off the LED, the corresponding port pin must drive a high level.

*Figure 2-5. LED schematic*

2.4.4 BOOT

An additional jumper (BOOT) has been added. This jumper is available for custom use. For example: the BOOT jumper can be used to switch from the application to the bootloader by firmware (Not implemented in the example) by reading pin 5 of PortD.

*Figure 2-6. BOOT Jumper*

2.5 In-System Programming

The ATmega88 can be programmed using specific SPI serial links. This sub section will explain how to connect the programmer.

The Flash, EEPROM memory (and all Fuse and Lock Bit options ISP-programmable) can be programmed individually or with the sequential automatic programming option.

*Note:* If debugWire fuse is enabled, AVR ISP can’t be used. If debugWire fuse is disabled, JTAGICE mkII have to be used in ISP mode to enable debugWire fuse.

*Note:* When programming, the NISP jumper has to be removed.
2.5.1 Using the ATAVRAUTO900 adaptor

The AVR ISP programmer is a compact and easy-to-use In-System Programming tool for developing applications with ATmega88. Due to the small size, it is also an excellent tool for field upgrades of existing applications. It is powered by the ATAVRAUTO300 and an additional power supply is thus not required.

The AVR ISP programming interface is integrated in AVR Studio®.

An additional adaptor has to be used to program the board using ISP or JTAG mode. The 10 pins connector is used for the JTAGICE mkII device and the 6 pins connector is used for the AVRISP device. To plug the ATAVRAUTO900 connector to the board, the arrow (on the adaptor) has to be in front of the point (on the board).

Figure 2-7. ATAVRAUTO900 Connection.

Table 2-2. ICE Connector

<table>
<thead>
<tr>
<th>PIN</th>
<th>Function</th>
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<tr>
<td>1</td>
<td>TCK</td>
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<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>TDO</td>
</tr>
<tr>
<td>4</td>
<td>VCC</td>
</tr>
<tr>
<td>5</td>
<td>TMS</td>
</tr>
<tr>
<td>6</td>
<td>NRES</td>
</tr>
<tr>
<td>7</td>
<td>VCC</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
</tr>
<tr>
<td>9</td>
<td>TDI</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
</tr>
</tbody>
</table>
2.5.2 Programming with AVR ISP Programmer

The AVR ISP programmer is a compact and easy-to-use In-System Programming tool for developing applications with ATmega88. Due to its small size, it is also an excellent tool for field upgrades of existing applications. It is powered by the ATAVRAUTO300 and an additional power supply is thus not required. The AVR ISP programming interface is integrated in AVR Studio. To program the device using AVR ISP programmer, connect the AVR ISP to the adaptor (ATAVRAUTO900) and connect the adaptor to the connector of the ATAVRAUTO300.

Note: See AVR Studio on-line documentation for more information.

2.5.3 Programming with AVR JTAGICEmkII

The ATmega48/88/168 can be programmed using specific JTAG link: 3-wire debug-WIRE interface. To use the AVR JTAGICEmkII with an ATAVRAUTO300 the ATAVRAUTO900 adaptor has to be used. Then the JTAG probe can be connected to the ATAVRAUTO300 as shown in the following Figure 2-9.

To use the JTAGICEmkII in ISP mode the 3 jumpers “SCK”, “MISO” and “MOSI” of the adaptor (ATAVRAUTO900) should be connected.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MISO</td>
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<tr>
<td>2</td>
<td>VCC</td>
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<tr>
<td>3</td>
<td>SCK</td>
</tr>
<tr>
<td>4</td>
<td>MOSI</td>
</tr>
<tr>
<td>5</td>
<td>NRES</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
</tr>
</tbody>
</table>
Figure 2-9. JTAGICE mkII probe connecting through debugWIRE interface

Note: When the debugWIRE Enable (DWEN) Fuse is programmed and Lock bits are unprogrammed, the debugWIRE system within the target device is activated. The RESET pin is configured as communication gateway between ATmega48/88/168 and JTAG. JTAGICE mkII must have control over it.

Note: See AVR Studio® on-line Help for information.
2.6 Debugging

2.6.1 Debugging with AVR JTAGICEmkII

The ATAVRAUTO300 can be used for debugging with JTAG ICE MK II.

Connect the JTAG ICE mkII as shown in Figure 2-9 for debugging, please refer to AVR Studio® Help information.
Section 3

Technical Specifications

■ System Unit
  – Physical Dimensions .................................................. L=45 x W=45 x H=8 mm
  – Weight ........................................................................... 14 g

■ Operating Conditions
  – Internal Voltage Supply ............................................... 5.0V
  – External Voltage Supply ............................................... 7V -18V
Section 4

Technical Support

For Technical support, please contact avr@atmel.com. When requesting technical support, please include the following information:

- Which target AVR device is used (complete part number)
- Target voltage and speed
- Clock source and fuse setting of the AVR
- Programming method (ISP, JTAG or specific Boot-Loader)
- Hardware revisions of the AVR tools, found on the PCB
- Version number of AVR Studio. This can be found in the AVR Studio help menu.
- PC operating system and version/build
- PC processor type and speed
- A detailed description of the problem
Section 5
Complete Schematics

On the next pages, the following documents of ATAVRAUTO300 are shown:
- Complete schematics,
- Bill of materials,
- Assembly drawing.
Figure 5-1. ATAVRAUTO300 schematics
## Bill of Materials

**Source Data From:** LIN Joy.Pjt.Pcb  
**Project:** LIN Joy.Pjt.Pcb  
**Variant:** None

**Creation Date:** 08/11/2006  
**Print Date:** 02-Jan-07 1:57:00 PM

<table>
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<tr>
<th>Designator</th>
<th>Description</th>
<th>Reference</th>
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<th>Fournisseur</th>
<th>Code Commande</th>
<th>Unite de Vente</th>
<th>Quantity</th>
<th>Prix UD V</th>
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<tr>
<td>C1</td>
<td>100nF</td>
<td>XTR 16V</td>
<td>Phycomp</td>
<td>FARNELL</td>
<td>432210</td>
<td>10</td>
<td>1</td>
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<td>Cap 100nF OEO3 XTR 16V</td>
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<tr>
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<td>XTR 16V</td>
<td>Phycomp</td>
<td>FARNELL</td>
<td>432210</td>
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<td>1</td>
<td>0.63</td>
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</tr>
<tr>
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<td>XTR 16V</td>
<td>Phycomp</td>
<td>FARNELL</td>
<td>432210</td>
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<tr>
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<td>XTR 50V</td>
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<td>FARNELL</td>
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<td>FARNELL</td>
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<td>PIN Header 2x5 1.27mm</td>
</tr>
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<td>ATMEG</td>
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<td>RC21</td>
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<td>R6</td>
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<td>1.96</td>
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</table>
Figure 5-3. ATAVRAUTO300 assembly drawing