phyCORE-AT91M55800A

Debugging with JA-001 and JA-002 Application Note

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1 Overview of the JTAG-Adapter JA-001

The JTAG-Adapter JA-001 represents a simple level converter device that translates the JTAG signals from the phyCORE-AT91M55800A Single Board Computer (SBC) to applicable signal levels on the host-PC.

The pin assignment on the host-PC's parallel port depends on the DLL that is used for debugging. The JTAG-Adapter JA-001 has been designed to support debugging with the GDB GNU Debugger.

The JTAG connector (X2) pin assignment on the phyCORE-AT91M55800A is based on the standard defined for ARM modules.

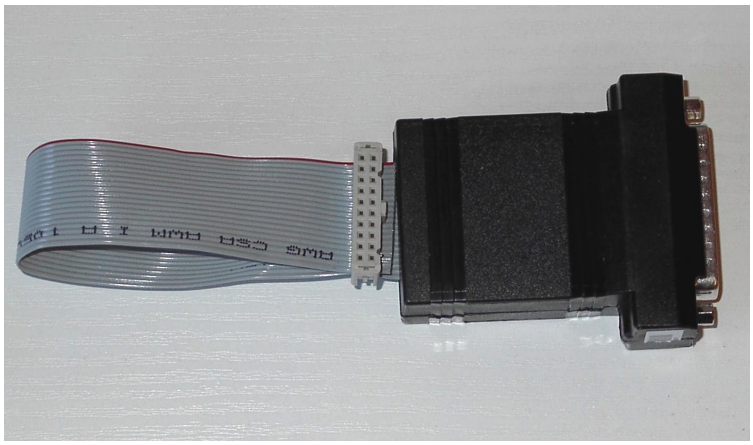

Figure 1: JTAG-Adapter JA-001

2 Overview of the JTAG-Emulator Adapter JA-002

The JTAG-Emulator Adapter JA-002 allows for easy connection of the JTAG interface on the phyCORE-AT91M55800A to standard JTAG emulator or debugger hardware provided by third party tool vendors.

The JTAG connector X2 on the phyCORE-AT91M55800A has been designed in a 2 mm pin spacing. Hence the module-side of the JA-002 adapter provides a 2 mm socket enabling direct connection to X2 on the module.

On the host-side, the JTAG-Emulator Adapter JA-002 features two pin header rows in 2.54 mm spacing that allow for connection to commercially available emulator hardware.

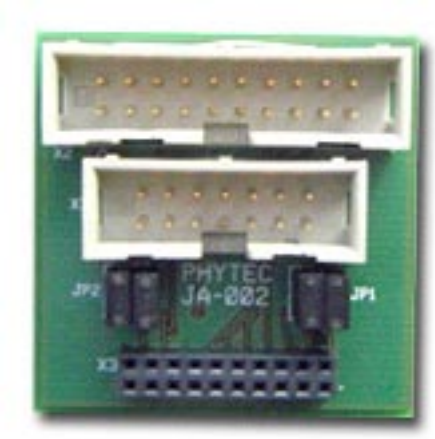

Figure 2: JTAG-Emulator Adapter JA-002

Two insertable jumper blocks are provided on the JTAG-Emulator Adapter JA-002 that enable configuration of certain JTAG signals according to the specification of the connected emulator. With applicable jumper settings the JTAG signals from the phyCORE-AT91M55800A can be adjusted to meet the requirements of the third party emulator hardware.

Table 1 shows applicable configuration options for JP1 and JP2.

JP1	1 + 2*	Signal /JTAGMODE to activate the Boundary Scan mode of the phyCORE-AT91M55800A, connected with pin 19 on the standard ARM connector
	3 + 4*	Signal /BSCAN to activate the CPU Tristate mode and for programming the PLD on the phyCORE-AT91M55800A, connected with pin 17 on the standard ARM connector
	1 + 3	**Not allowed!**
	2 + 4	**Not allowed!**
JP2	1 + 2*	Pin 11 of the 2mm plug connected with pin 11 on the standard ARM connector
	3 + 4*	VCC from the connected phyCORE module connected with pin 2 on the standard ARM connector
	1 + 3	**Not allowed!**
	2 + 4	**Not allowed!**

* : If these functions are not supported by the applicable emulator, the corresponding jumpers must remain open.

Table 1: Jumper JP1 and JP2 Configuration Options

3 Debugging with the phyCORE-AT91M55800A

Due to the different emulator and debugger types, a variety of hardware connections are necessary for debugging source code on the phyCORE-AT91M55800A. The following sections provide a brief overview of possibilities for debugging with the JA-001 and JA-002 adapters provided by PHYTEC.

Debugging with the phyCORE-AT91M55800A requires the correct configuration of the module in question, which must be present with the option PCM-014-x..x-D.

3.1 Debugging with JA-001, JA-002 and GDB GNU Debugger

Initial software development steps for the phyCORE-AT91M55800A can be easily accomplished using the following tools:

- JA-001 and JA-002 adapters
- parallel DB-25 cable
- free parallel port on the host-PC
- GDB GNU Debugger installed on the host-PC

Figure 3 shows the connection of the individual components listed above for debugging source code on the phyCORE-AT91M55800A in conjunction with the GNU environment.

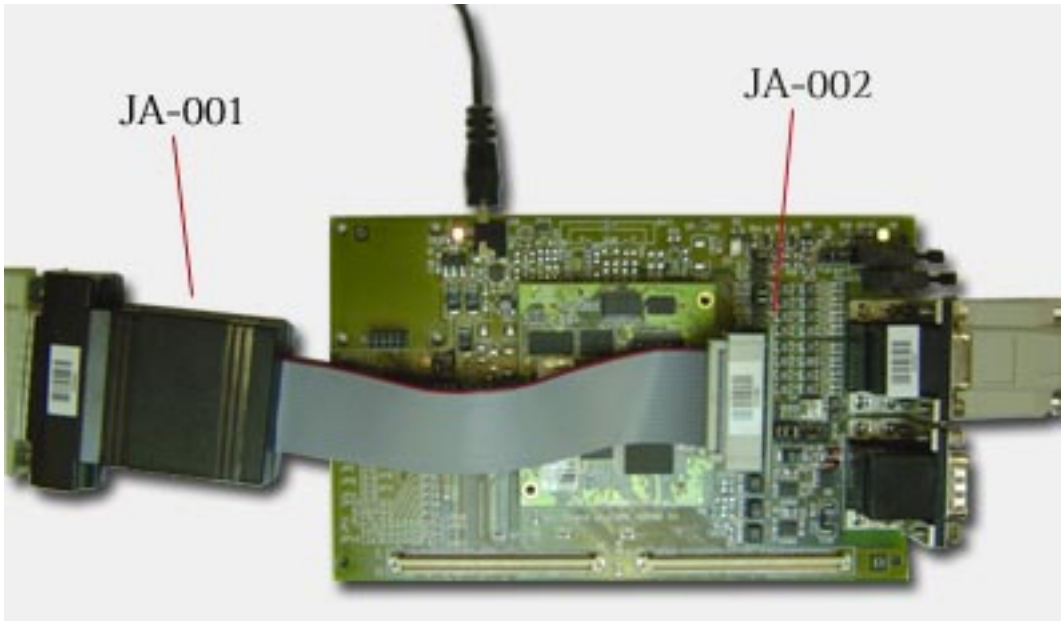

Figure 3: phyCORE-AT91M55800A with JA-001 and JA-002 for Debugging with GDB GNU Debugger

After connecting the phyCORE-AT91M55800A to your host-PC using the setup as described in *Figure 3* you can start debugging your source code. First start the GBD Debugger on your host-PC and select the settings as shown below:

1) Select the *"File->Target Settings"* menu and enter the applicable DLL that is used to control the parallel port using the *"Target"* pull-down menu. Choose the *"OCD Wiggler"* to enable proper configuration of the JA-001 in conjunction with the GDB GNU Debugger.

2) The configuration menu *"More Options"* can be used to specify a configuration file that, when executed, pre-configures additional controller and hardware-specific settings. Using such a configuration file saves additional controller configuration steps when downloading the actual application program. The applicable configuration file for the phyCORE-AT91M55800A is included on the Tool CD-ROM accompanying the Rapid Development Kit.

Figure 4 shows the necessary tool settings in the *"File->Target Settings"* menu.

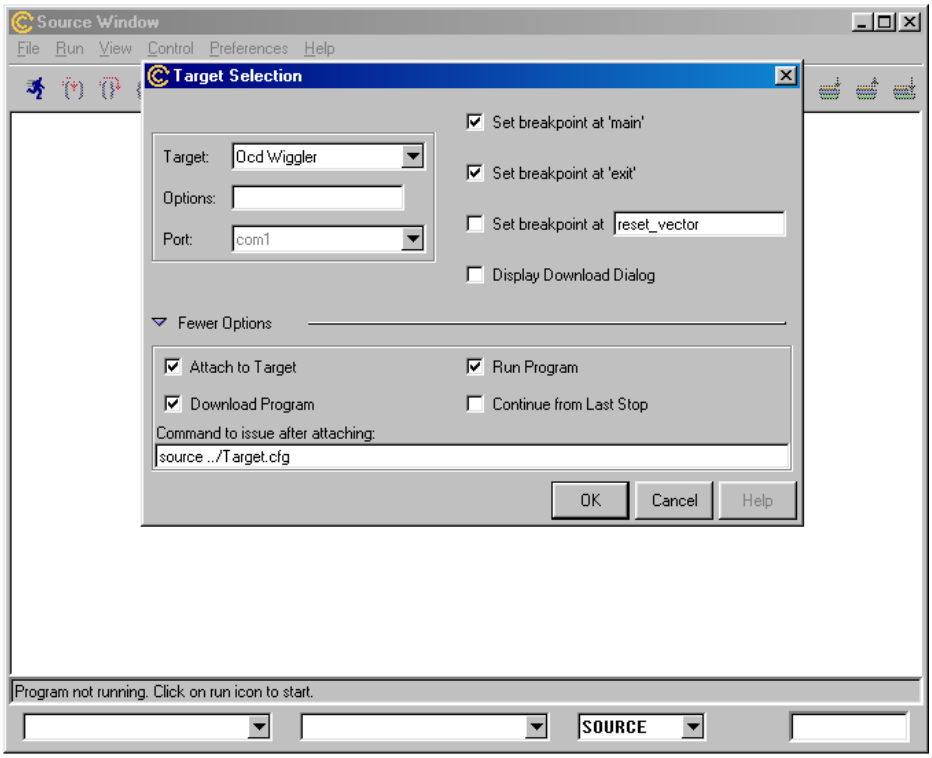

Figure 4: Settings in the "File->Target Settings" Menu of the GDB Tool

Once the settings within the *"Target Settings"* menu have been made and confirmed with *OK*, the speed of the parallel port needs to be adjusted depending on the host-PC's properties. For host-PC's with processors running at a clock frequency up to 200 MHz, no additional settings are required for the parallel port speed. If the host's processing speed exceeds 200 MHz then it has to be reduced by a factor determined using the following formula:

factor = whole number value (host clock frequency/200MHz).

If no contact to the phyCORE-AT91M55800A can be established after setting the parallel port speed, then the factor can be increased as necessary. The calculated factor can be set in the *"Console Window"*.

The *"Console Window"* can be accessed by clicking on the  icon. *Figure 5* shows the command entered in the *"Console Window"* which must be confirmed by pressing the *"Enter"* key.

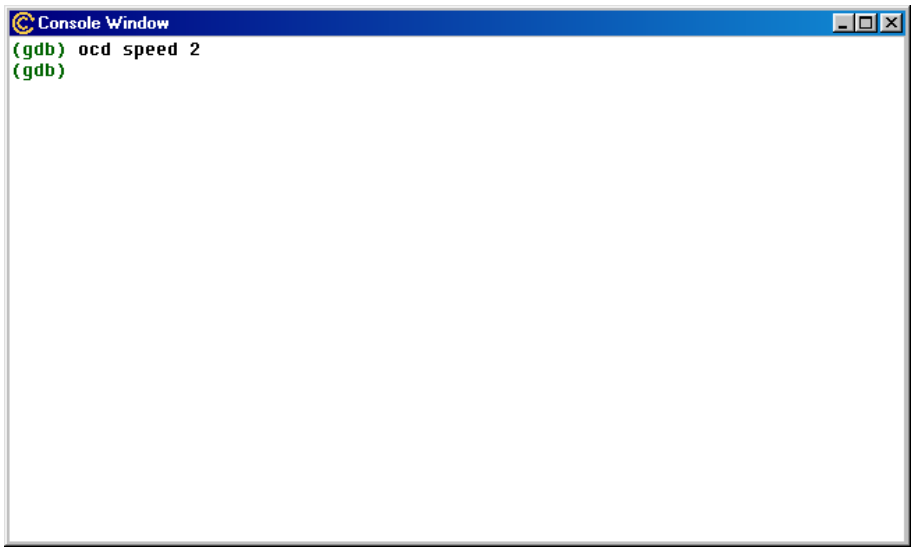

Figure 5: Speed Configuration in the "Console Window"

As the final step, the executable file (*.elf) can be loaded. If the Debugger can locate the correct pathway to the applicable source files, the source code is displayed in the debug window. If the Debugger is not able to locate the source files it will automatically show the assembly version of the files. The following example describes and uses the *Blinky* demo provided on the Tool-CD-ROM.

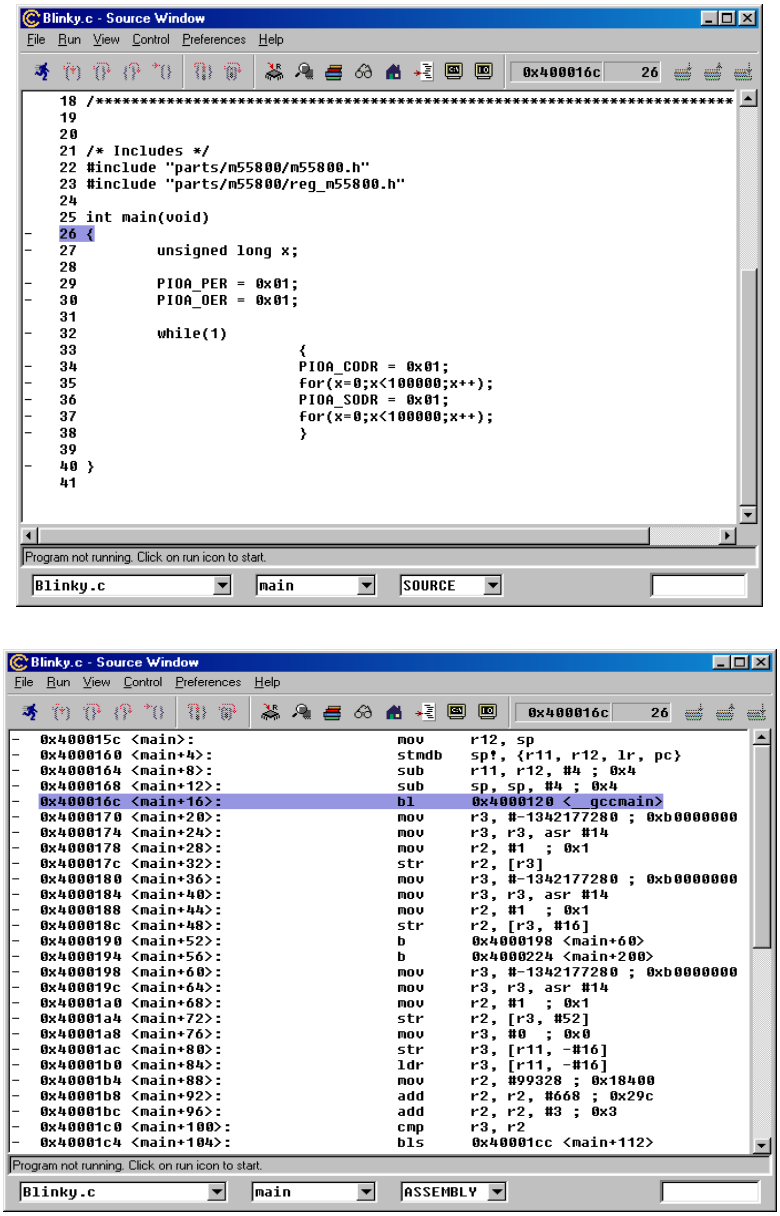

Figure 6: Loaded Executable with and without Source Code

After loading the executable in the Debug environment we can now start downloading the program to the phyCORE-AT91M55800A. Click on the "RUN"  icon to initiate program download.

Figure 7 shows the executable for the *Blinky* example in both C source and assembly version that has been loaded into the RAM on the phyCORE-AT91M55800A and which is now ready for execution.

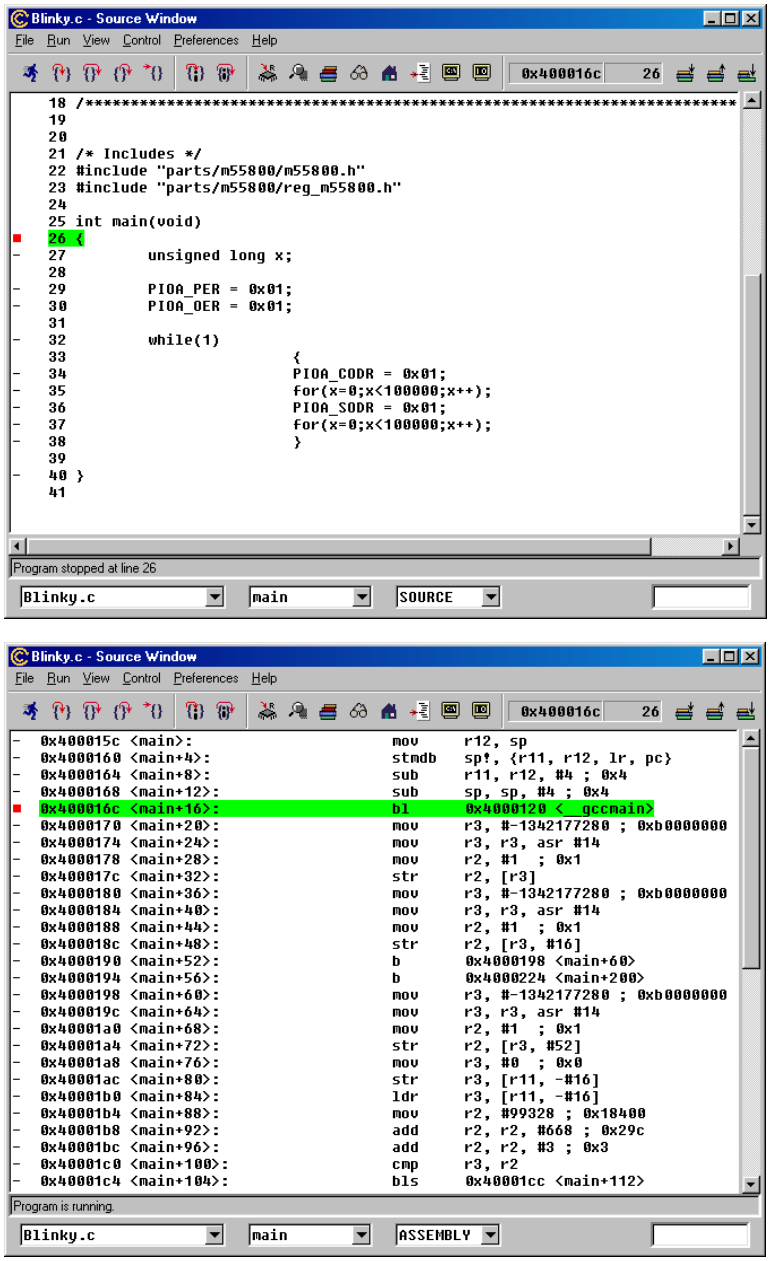

Figure 7: Ready-to-use Executable in Source and Assembly Version after Successful Download

The C or assembly source code can now be debugged using various debug command buttons  provided by the GDB tool.

Please refer to applicable QuickStart and User Manuals provided by the tool chain vendor for further information on using all the GDB GNU Debugger features. These manuals can be found on the GNU tools CD-ROM.

3.2 Debugging with JA-002 and Signum JTAGjet Emulator

Standard emulators and their debuggers can be used for debugging the source code on the phyCORE-AT91M55800A. One example of such an emulator solution, provided by third party tool vendors, is the JTAGjet emulator from Signum Systems (http://www.signum.com/) and its Chameleon PC Debugger environment. The JTAGjet emulator represents a complete debug system for debugging ARM7-based microcontroller systems. *Figure 8* shows the JTAGjet emulator with all necessary cable connections to the phyCORE-AT91M55800A in conjunction with the JTAG-Emulator Adapter JA-002.

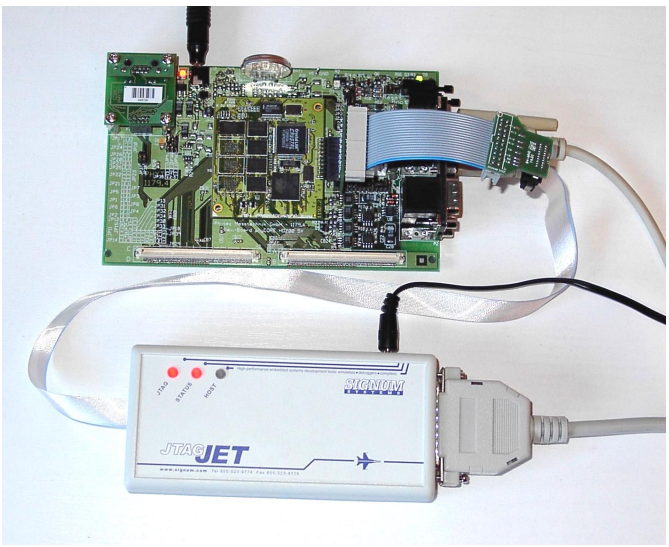

Figure 8: Debugging with phyCORE-AT91M55800A, JA-002 and Signum JTAGJet

Correct configuration of Jumpers JP1 and JP2 on the JA-002 adapter is necessary when using the Signum JTAGjet emulator to debug source code on the phyCORE-AT91M55800A. The following table shows the applicable jumper settings.

Jumper	Position	Function
JP1	open	Signals /BSCAN and /JTAGMODE are not supported by the emulator
JP2	3+4	VCC is connected to the targe hardware in order to recognize the voltage level

Table 2: Jumper JP1 and JP2 Configuration for Use with the Signum JTAGJet

3.3 Debugging with JA-002 and Commercially Available ARM Emulators

For reasons of compatibility, the JTAG-Emulator Adapter JA-002 should be used with all standard emulators for debugging source code on the phyCORE-AT91M55800A. The JA-002 adapter establishes the connection between the emulator connector and the JTAG connector at X2 on the phyCORE module and enables adaptation of the required signals. Please refer to the datasheet of the emulator being used and the description in *Table 1* for correct configuration of Jumpers JP1 and JP2.

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