Embest Emulator for ARM

User Manual

Version 1.0





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1. Overview

As the early product of Embest Info&Tech Co., LTD, Embest Emulator for ARM is a standard JTAG emulator for development series of ARM core CPU. It works at 25Kbyte per second by transmission, and capability stabilization. Together with Embest IDE, you can easily create, download, and test embedded applications on actual target boards based on all ARM7 and ARM9 core processors.



Features

- ✓ Supports in-circuit debugging, working at up to 25KB Per Second.
- ✓ Supports ARM7TDMI, ARM720T, ARM9TDMI, ARM920T, ARM922T, ARM940T now (Others are planned).
- ✓ Run control functions:
 - run / stop
 - single step / line step
 - breakpoints
 - watchpoints
- ✓ Supports Embest IDE for ARM, ADS/SDT and GDB.
- ✓ Supports Windows 98/NT/2000/XP hosts.
- ✓ Status information indicators
- ✓ Upgraded by software without changing any hardware.

2. Hardware Specification and Connecting

2.1 Interface Specification

A standard male-to-female 25-way parallel cable connects the Embest Emulator for ARM to the PC's parallel port.

The connection to the target board is made by a 20pin (or 14pin) female IDC header cable with all pins connected straight through (1-1, 2-2, ... 20-20). There are two types of IDC interface cable: 14-pin and 20-pin, user can choose one to connect emulator to your target board by making the switch pointing to the right pin number . JTAG pins connections are described as figure A–1 and A–2.

Vsupply	1	2	RES
RES	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
RES	11	12	GND
TDO	13	14	GND
nSRST	15	16	GND
RES	17	18	GND
RES	19	20	GND

(Figure A-1) 20 Pin JTAG Connections

Vsupply	1	2	RES
nSRST	3	4	GND
TDI	5	6	GND
TMS	7	8	GND
TCK	9	10	GND
TDO	11	12	GND
RES	13	14	GND

(Figure A-2) 14 Pin JTAG Connections

Note: All GND pins should be connected to OV on the target board.

The following table shows the JTAG pinouts.

Signal	1/0	Description
Vsupply	Input	This is the supply voltage to Embest Emulator for
		ARM. It draws its supply current from this pin via a
		step-up voltage convertor. This is normally fed by the
		target Vdd. Valid power supply voltage is form 2.7V
		to 5.5V.
GND	-	Ground.
TDI	Output	Test Data In signal from Embest Emulator for ARM to
		the target JTAG port. It is recommended that this pin
		be pulled to a defined state.
TMS	Output	Test Mode signal from Embest Emulator for ARM to
		the target JTAG port. This pin should be pulled up on
		the target so that the effect of any spurious TCKs
		when there is no connection is benign.
ТСК	Output	Test Clock signal from Embest Emulator for ARM to
		the target JTAG port. It is recommended that this pin
		be pulled to a defined state.
TDO	Input	Test Data Out from the target JTAG port to Embest
		Emulator for ARM.
nSRST	Output	Open collector output from Embest Emulator for ARM
		to the target system reset. This pin should be pulled
		up on the target to avoid unintentional resets when
		there is no connection.
RES	-	Reserved.

2.2 Power Supply

Power is supplied to the Embest Emulator for ARM via pin 1 of the 20-way (or 14-way) IDC connector. This is normally fed by the target Vdd. Valid power supply voltage is form 2.7V to 5.5V.

Note Emulator cannot work if power voltage out of range, even were badly damaged.

The target interface voltage levels of Embest Emulator for ARM depend on the input voltage levels. It is 3V/5V compatible.

2.3 LED Indicator

LED PWR: power indicator

LED RUN: data indicator, indicate the data transmission between host pc and target CPU.

LED CON: connection indicator

2.4 Connecting

Connect to the PC's parallel port via the Embest Emulator's parallel port using the parallel cable we provide.

Connect to the target board's JTAG port using a JTAG cable we provide, check that the switch is pointing to the right pin number.

That's all; connection of Embest Emulator is over.

3. Debugging in Embest IDE

As the featured product of Embest, Embest IDE can be used together with

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Embest Emulator directly.

With Embest IDE for ARM and Embest Emulator, user can do the full development works based on ARM processors, including project managing, source-code editing, compiling, assembling, linking, in-circuit debugging and flash programming.

When starting to debug in Embest IDE with Embest Emulator, select menus Project -> Settings -> Remote, then select as follow:

Project Settings							×
Project Settings Settings For : Workspace 'All_test_Flash' All_test_Flash files Project Source Files Common Bootloader	Processor Remote d JtagArm7 Embest J Ver: 1122 Speed: Communi	Remote evice : TAG emul 361 cation typ	Debug ator for A e:	Directory	Compiler	Assemb	
		© LPT1			o lpt2	2	
				ОК	С	ancel	_

4. Embest ICE Server for ARM

Embest ICE server is an application that runs on the Windows workstation connecting to the interface unit. It provides support for developers to use Embest's emulators in SDT, ADS and GDB.

Users need to install this software first before debugging with Embest emulators in ADS/SDT or GDB.

4.1 Embest ICE Server Installation

Installation Required:

Computer:	Pentium II or higher
Memory:	64M or higher
Hard discs:	10M is necessary to setup the complete software.
Monitor:	VGA or a monitor with resolution higher than VGA
Driver:	CD-ROM driver
Operation	Microsoft Windows 98, Windows Me, Windows XP,
system:	Serivice Pack 3 or updated Windows NT, Windows 2000.

The installation of the Embest ICE Server is very simple. You can just run the Setup.exe in the installation package, which will guide you through the installation step by step.



According to the installation program by default, the Embest ICE Server will be installed under directory "Program Files\Embest\Embest\Embest Ice Server", and users can specify installation directory by customizing the installation path.

The computer has to be restarted after installation.

4.2 Debugging equipment selection and setting

Right click the ICE Server tray icon ³, and the ICE Server control menu will pop up as shown in the following figure:



Select the submenu Setting... and a dialog box for debugging equipment selection and setting will pop up, as shown in the following figure:

Configuration	X
Remote Device: 🕕	agArm7
Embest JTAG emulati Ver: 1122373	or for ARM7
Debug Speed:	High Speed 🗨
Communication Type	PARALLEL
Parallel Port:	LPT1 💌
	OK Cancel

Remote Device: the pull-down box displays all the debugging equipment supported by the software, and users can select one of them. At the lower part of the pull-down box, the equipment's description and version information will be displayed. At present, select Jtagarm7 or Jtagarm9:

Jtagarm7	Embest Emulator: standard emulator supports ARM7 core processor
Jtagarm9	Embest Emulator: standard emulator supports ARM9 core processor

Debug Speed: to set the download debugging speed of the emulator. This setting is valid only when the emulator supports the debugging download speed. Embest Emulator does not support the option. Communication Type: to set the connection mode between the equipment and the host, and the host communication port connected.

Parallel Port: to be set according to the actual situations.

4.3 Setting of mapping files in storage area

During the software debugging, there may be something abnormal in some processors or target boards when accessing nonexistent storage addresses or other illegal storage areas. If the problem is not solved, software debugging may discontinue, and use of the mapping files (*.map) in the storage area can prevent the problem from happening.

Users can opt whether to set mapping files of the storage area or not according to specific situations, and the steps for setting the mapping files of the storage area are as follows:

Right click the ICE Server tray icon ³, and the ICE Server control menu will pop up as shown in the following figure:



Select the submenu Options... and a dialog box will pop up, as shown in the following figure:

 No map file O Use map file
C Use map file
r\Examples\RMTest_EB40x\eb40a.map

To select "Use map file", the full path name for the memory mapping file has to be set in the edit box at the same time, then reading and writing memory during the debugging process will be done according to the memory scope and attributes set in the memory mapping files.

5. Debugging in SDT

First you should start up Embest ICE Server, and finish all the settings.

Then in the ARM SDT2.50/2.51 software, the debugging setting procedures are as follows:

(1) Start up ARM Debugger

You can directly run the ARM Debugger, or select menus Project -> Debug xxxx.apj to run it in the ARM Project Manager.

(2) Open the dialog box for debugging configuration

In the ARM Debugger, select menus Options→ Configure Debugger, and open the dialog box for ARM Debugger debugging configuration.

File Edit Search View C++ Execute Options Window Help
The Fac Search Ten of Secore Dennis Wingen Teb
Image: Set RDI Log Level ARM ARM Arman Add Search Path Ctrl-A
Total Total Total Total Total 74 MEND Space Change Display Formats Tegrster 75 TMPOPT Disacembly Mode Poly code Feature
77 IMPORT Joggle Interleaving Ctrl+I RAM to ini 78 IMPORT Toggle Interleaving Ctrl+I Id limit of ini 79 IMPORT Change Text Font p initialise
81 IMPORT Ma Profiling Program 82 AREA In Configure Debugger 83 AREA In Configure Embedded/CE
85 ENTRY 86 b ResetHandler ; for debug 87 b HandlerUndef ; handlerUndef 88 b HandlerSWI ; SWI interrupt handler
89 b HandlerPabort ; handlerPAbort 90 b HandlerDabort ; handlerDAbort 91 b ; ; handlerReserved 92 b HandlerIRQ 93 b HandlerFIQ
94 ;****IMPORTANT NOTE*** 95 ;If the H/W vectored interrutp mode is enabled, 96 ;be changed like below, to work-around with H/W 97

(3) Debugging configuration

Remote_A: Select the Target attribute tab in the debugging configuration dialog box as shown in the following figure, and select Remote_A from the combo box Target Environment.

1	Remote_A		
Ĩ	<u>A</u> dd	Remove	<u>C</u> onfigure
	monit cor soi		
	monit cor soi		

Click the "Configure..." button, and the dialog box for Remote_A configuration will pop up.

Select Ethernet for Remote Connection, and input the host IP address for Embest ICE Server running in the edit box. If the Embest ICE Server and the ARM Debugger run on the same host, the loopback IP address 127.0.0.1 can be entered, as shown in the following figure.

C Serial C Serial / Parallel	Heartbeat Disabling heartbeat will disable hos timeout and packet resend.
Ethernet 127	0.0.1
Ports Serial : COM1 Parallel : LPT1	Serial Line Speed Baud Rate:
Enabled	
	<u>A</u> dd

(4) Little and big Endian setting

Select the Debugger attribute tab for debugging configuration, and select Little Endian or Big Endian according to the targets to be debugged, as shown in the following figure:

	Debugger Memory Maps
Pro	file Interval: 100 C Little
Sou	rce Tab Length: 8 C Big
Dis	able
	Splash screen
	Remote Startup warning

6. Debugging in ADS

First you should start up Embest ICE Server, and finish all the settings.

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Then in the ARM ADS 1.2 software, the debugging setting procedures are as follows:

(1) Start up AXD

You can separately and directly run the AXD, or select menus Project \rightarrow Debug to in the CodeWarrior for ADS project management window to open the AXD.

(2) Open target selection dialog box

If no configuration debugging mode is set for the ADS, a prompt dialog box will pop up during startup of AXD. Click the Configure button to open the dialog box for target selection, as shown in the following figure:

atal AXD Error	×
RDI Warning 00159: Could not open specified device port	<u>R</u> estart Configure
	Co <u>n</u> nect mode
	Quit

If debugging mode is configured for the ADS, select menus Options \rightarrow Configure Target to open the dialog box for target selection, as shown in the following figure:



(3) Select target ADP

Select the ADP from the list of the dialog box for target selection.

ose Targe	t			?
Target Env Target	RDI	File	Version	Add
ARMUL	1 1	C:\PRUGRA 1\\Bin\Remote_A.dll C:\PROGRA 1\\Bin\ARMulate.dll	1.2.0.805	Remove
				<u>Ren</u> ame
				<u>S</u> ave As
			<	Configure
i Pleas targe has t	se select et environ to be conf	a target environment from the above ument to the list. Note that a targe figured at least once before it can	list or add a t environment be used.	
		ОК	Cancel	Help

(4) Configure ADP parameters

Click the Configure button in the dialog box for target selection, open the dialog box for ADP configuration, and select Little Endian or Big Endian according to debugging objects.

Remote_A conne	ction		<u>? ×</u>
Remote connect	ion driver		
Name:	ARM ethernet drive	er (Select
Filename:	raetherdriver.dll		
Description:	Remote_A Ethernet ? 1999, 2000 ARM Communications driv	t driver Ltd. iver for use with Angel Debug Monitor	
Configuration:	address: 127.0.0.1		Configure
Heartbeat	<u>7</u> 4	Channel Viewers	
🔽 Enabled		Enabled	
Disabling he host timeout	artbeat will disable and packet resend.		Add
Endian © Little C There is no r endianness	Big need to specify the of Angel targets.		<u>H</u> emove
		OK Cance	el Help

Click the Select button, and a dialog box for selection of usable drive programs will pop up, and select the ARM Ethernet driver, as shown in the following figure:

valiable connection univers	<u>_</u>
ARM serial driver ARM serial/nerallel driver	ОК
ARM ethemet driver	Cancel
	Help
	Browse

Click the Configure button, and a dialog box for network connection will pop up. Enter the host IP address run by the Embest ICE Server. If the Embest ICE Server and the AXD are running in the same host, the loopback IP address 127.0.0.1 can be entered, as shown in the following figure:

etup ethernet connection		? ×
Iarget IP address: 127.0.0.1	\geq	
ОК	Cancel	Help

(5) Cancel Semihosting

Select AXD software menus Options \rightarrow Configure Processor to open the dialog box for processor configuration.



Cancel Semihosting in the dialog box for processor configuration, as shown in the following figure:

Vector catch	2
RUSPDIF Clear All Set All	OA
· · · · · · · · · · ·	Help
LHADIE COMMS CHARMEL VIEW	
Semihosting mode	
Semihosting Semihosting mode C Std semihosting Vector	0x00000008
Semihosting mode C Std semihosting Vector C DCC semihostingHandler	0x0000008
Semihosting mode C Std semihosting Vector C DCC semihostingHandler	0x0000008
Semihosting mode C Std semihosting Vector C DCC semihostingHandler Semihosting SWIs ARM semihosting	0x00000008 0x0000000

7. Debugging in GDB

• Installation required

(1) Install Cygwin.

Cygwin is a Linux-like environment for Windows, it enables you to use GNU tools in Windows. It can be download from the site <u>http://www.cygwin.com</u> for free. (2) Install ARM Development Tool Chains

Download EmbestArmTool.exe from <u>http://support.embedinfo.com</u>, and install this software to the root directory where Cygwin was installed.

(3) Install arm-elf-gdb tool

Locate arm-elf-gdb.exe under this directory "Cygwin/usr/local/ armtools/bin/".

• Steps of debugging programs

Step 1: Start up EmbstICE Server for ARM and finish the settings.

Step 2: Run Cygwin and set the cross compiler executable files directories.

\$ PATH="/usr/local/armtools/bin:\$PATH"

Step 3: Compiling and Linking

\$ arm-elf-gcc -g -c gdb_test_led.c -o gdb_test_led.o. // compile

\$ arm-elf-ld -Tram_ice.ld -g -o gdb_test_led.elf gdb_test_led.o // link

Step 4: Connect GDB to target board.

\$ arm-elf-gdb.exe // Start up GDB

GNU gdb 6.2

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Type "show copying" to see the conditions.

There is absolutely no warranty for GDB. Type "show warranty" for details.

This GDB was configured as "--host=i686-pc-cygwin --target=arm-elf"...

main.c captured_main : before captured_command_loop

main.c captured_command_loop : before current_interp_command_loop

[interps.c current_interp_command_loop : command_loop_proc]

(gdb) target rdi e=192.192.192.22 //Connect GDB to target board Embest ICE Server For ARM V1.2 Embest Info&Tech Co.,Ltd. www.embedinfo.com Released build April 20 2004 Device: Embest Emulator, PowerICE, UNetICE. Connected to ARM RDI target.

Step 4: Initialize target board.Step 5: Download programsStep 6: Debug your programs with all the functions GDB provides.

8. Customer Service

Get support on demand. Connect Customer Service for more information on how to use the Embest's products.

• Web Site

Get the latest information and docs about Embest's products at: http://www.Rorixwell.com

• E-Mail

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