

RTX2040 Unity-II

User Guide



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1 Preface

1.1 About this document

This document describes the RTX Unity target interface unit.

1.2 Intended audience

This document is written for users of RTX Unity on the Windows platform, using the RTX Nexus Debugger debugging environment. It is assumed that you are a software engineer with some experience of the National Semiconductor CompactRISC® architecture, or a hardware engineer designing a product using a processor with a CompactRISC® core.

1.3 Further reading

This section lists publications by thirds parties that are related to this product.

National Semiconductor CompactRISC® home page:

<http://www.national.com/appinfo/compactrisc/>

The Nexus 5001™ Forum:

<http://www.nexus5001.org/>

JTAG technology, IEEE standard 1149.1:

<http://www.ieee.org/>

1.4 Feedback

RTX Telecom A/S welcomes feedback both on the RTX Unity, the RTX Nexus Debugger and the documentation.

The software for the RTX Nexus Debugger and RTX Unity is updated regularly with new features and bug fixes. The latest versions are available free of charge from <mailto:support@rtx.dk>

If you have any problems with RTX Unity, please contact us at <mailto:support@rtx.dk>. To help us provide a rapid and useful response, please give:

- the RTX Unity serial number you are using
- the RTX Nexus Debugger software version you are using (the software for RTX Unity is included with the RTX Nexus Debugger software package)
- a clear explanation of what you expected to happen, and what actually happened
- if possible, sample output illustrating the problem

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2 Introduction

2.1 About RTX Unity

RTX Unity is a target interface unit for National Semiconductor's CompactRISC® architecture. It enables you to debug software running on CompactRISC® cores that include the Serial Debug Interface Plus (SDI+) logic.

RTX Unity unites 5-wire JTAG, 1-wire JTAG, UART and galvanic isolation in a single box, providing the full functionality needed for both National Semiconductor's CP3000 series and SC144xx series processors.

The RTX Unity product comprises:

- An interface unit that connects a USB port of a PC to the JTAG and/or UART interfaces of a processor that includes SDI+ debug capability.
- A standard USB A-B cable.
- A 20-way ribbon cable. This connects RTX Unity to targets with 5-wire JTAG.
- Software available from <mailto:support@rtx.dk>. The software package includes the following components:
 - Virtual COM port driver
 - Debugger interface driver
 - a Dynamic Link Library (DLL) to use with the debugger
 - the RTX Nexus Debugger
- Documentation, including a printed copy of this user manual.

2.2 Availability

RTX Unity is available from RTX Telecom A/S. Contact RTX sales (<http://www.rtx.dk/>) for pricing.

Software upgrades are available free of charge from <mailto:support@rtx.dk>.

2.3 Compatibility

The UART is exposed as a standard COM port on the PC and can be used as any other COM port.

The debugger interface can currently only be used with the RTX Nexus Debugger.

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3 System Setup

3.1 Installation

The software for the RTX Nexus Debugger and RTX Unity runs on Windows 2000, Windows XP or newer.

- 1) **Install software.** Run NexusSetup.exe to install the RTX Nexus Debugger. This also pre-installs the USB drivers needed for RTX Unity.
- 2) **Connect USB cable.** Connect RTX Unity to the PC using a standard USB A-B cable. Windows now automatically installs the USB drivers for RTX Unity. A new COM port also appears.
- 3) **Update Firmware.** Run the RTX Nexus Debugger. If new firmware is available for RTX Unity, it will be updated automatically.
- 4) The system is now ready for use. You can now connect the target (see section 3.3) and configure RTX Nexus Debugger (see section 4).

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3.2 The RTX Unity interface unit

3.2.1 Rear side connectors

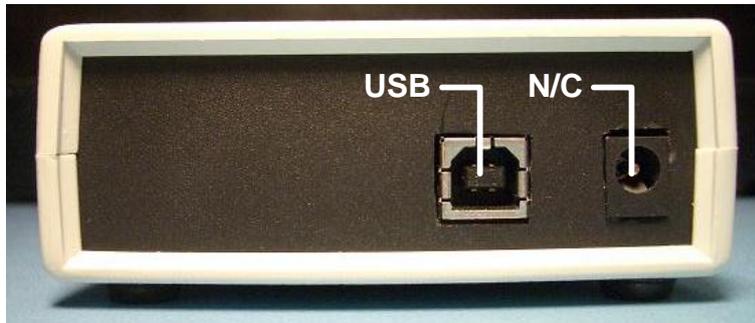


Figure 1. Rear view.

The rear side on the box has a USB connector. It used to connect RTX Unity to a PC using a standard USB A-B cable. The RTX Unity hardware is powered from the USB connector.

The DC-plug (marked N/C) is not used.

3.2.2 Front side connectors

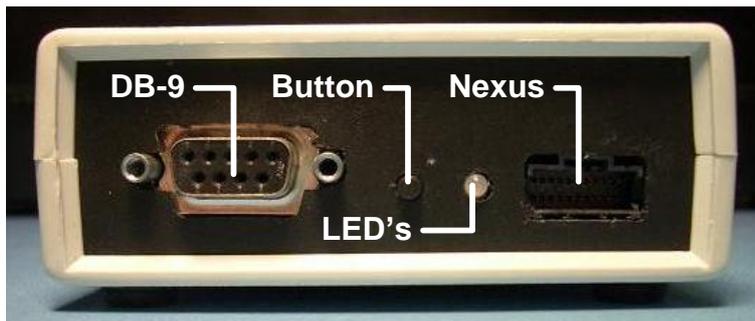


Figure 2. Front view.

The front side has the connectors for the target. These are galvanic isolated from the PC USB connection.

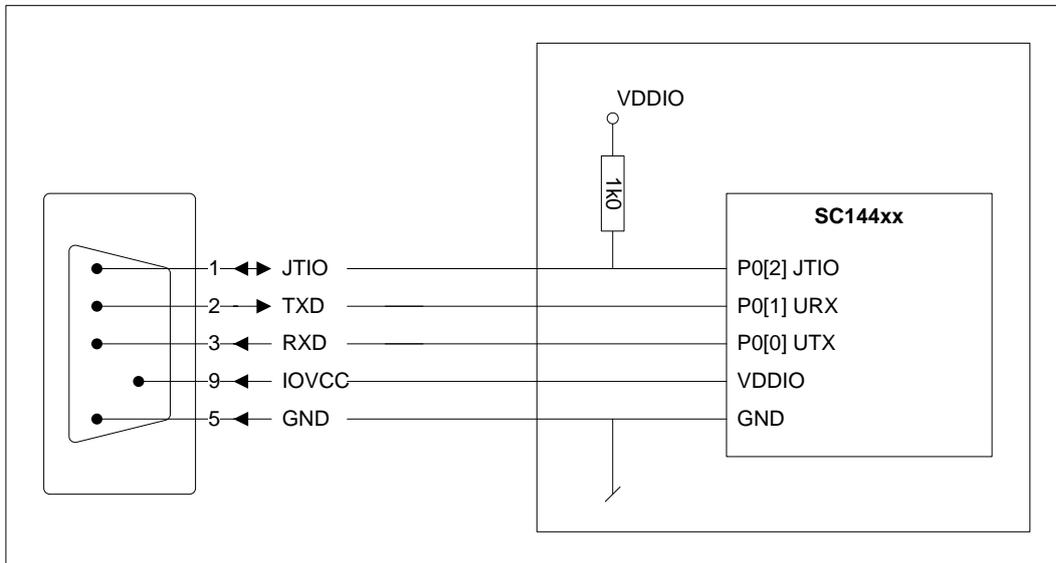
- **DB-9:** I/O ports for UART and 1-wire JTAG. See pin out reference in section 4.1.1.
- **Button:** The JTIO and RXD pins on the DB-9 connector are pulled low while the button is pressed. This used for bringing SC144xx targets into boot mode.
- **Green LED:** On when RTX Unity is powered on. Flashes during JTAG communication.
- **Red LED:** On when COM port is open. Flashes during COM port communication.
- **Nexus:** I/O ports for 5-wire JTAG. See pin out reference in section 4.1.2.

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3.3 Connecting the Target

3.3.1 SC144xx

Connecting a SC144xx target to RTX Unity is straight forward. Ground and IOVCC must always be connected, along with the JTAG and/or UART connections.



RTX Unity pulls JTIO and RXD low when the button is pressed. This used to bring the SC144xx into boot mode. Hold the button on RTX Unity and apply target power. Then release the button.

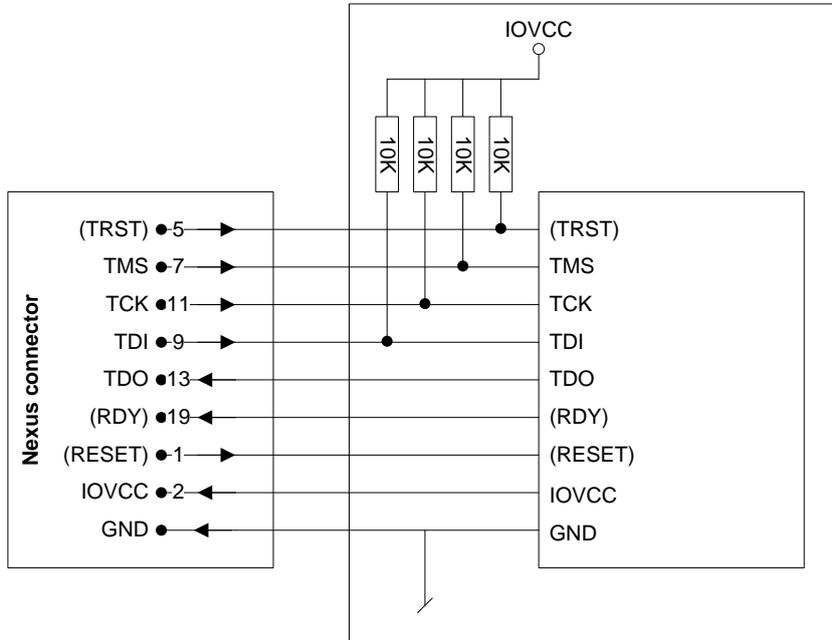


Figure 3. RTX Unity connected to SC14428 target.

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3.3.2 5-wire JTAG

Connecting a target with 5-wire JTAG to RTX Unity is straight forward. Ground and IOVCC must always be connected, and the remaining pin names match. Pins marked with () are optional. Note that the RESET output is connected via JP1 inside RTX Unity.



If the target system has a UART, it can also be connected to RXD/TXD/RTS/CTS on the RTX Unity DB-9 connector.



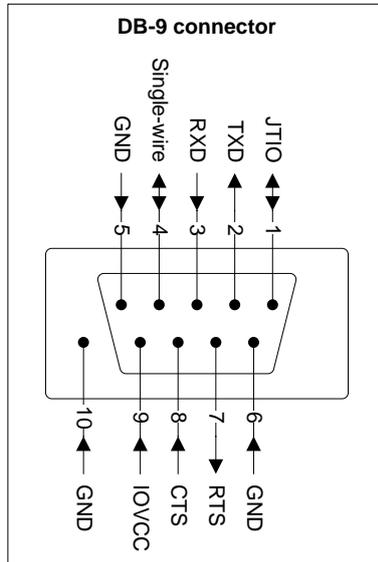
Figure 4. RTX Unity connected to CP3BT10 target.

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4 Reference

4.1 Connector Pin out

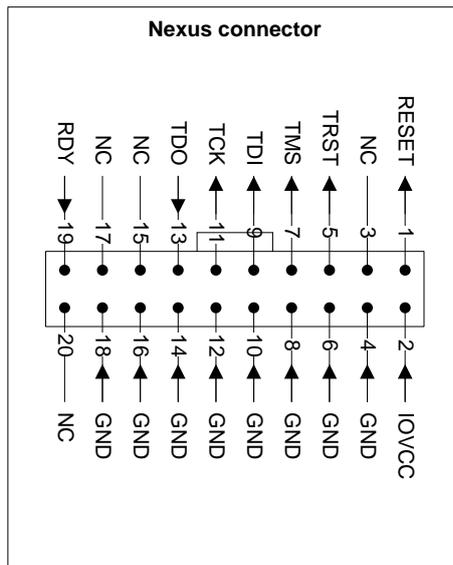
4.1.1 DB-9



#	Pin	Description	SC144xx pin
9	IOVCC	Target I/O voltage input. RTX Unity adapts the voltage for the other I/O ports to the voltage detected on this pin. The supported range is 1V4-3V3.	I/O voltage (2V5 or 3V3).
5, 6, 10	GND	Ground.	GND
1	JTIO	1-wire JTAG I/O pin.	JTIO P0[2]
2	TXD	UART transmit.	URX P0[1]
3	RXD	UART receive.	UTX P0[0]
7	RTS	UART Ready to send.	-
8	CTS	UART Clear to send.	-
4	Single-wire	UART transmit/receive.	UTX P0[0] and URX P0[1]

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4.1.2 Nexus



This is a standard Nexus connector, following “IEEE-ISTO-5001™ - 1999, The Nexus 5001™ Forum Standard for a Global Embedded Processor Debug Interface”, section A.2. This standard is available from <http://www.nexus5001.org/>.

#	Pin	Description
2	IOVCC	Target I/O voltage input. RTX Unity adapts the voltage for the other I/O ports to the voltage detected on this pin. The supported range is 1V4-3V3.
4-18	GND	Ground.
	NC	Not connected.
1	RESET	Target system reset output. This pin is connected via jumper J1 in RTX Unity. This jumper is default not installed.
5	TRST	
7	TMS	Test Mode Select. The TAP controller next state is set by TMS value and its current state. The TAP samples the signal present on TMS on the rising edge of TCK.
9	TDI	The data and instruction serial input. The TAP controller samples the signal present on TDI on the rising edge of TCK.
11	TCK	Test Clock. Provides the shift clock for the TAP controller.
13	TDO	The data and instruction serial output. The signal driven through TDO changes state following the falling edge of TCK.
19	RDY	Nexus specific JTAG transfer ready pin. The RDY pin is asserted by the SDI+ block whenever the synchronization between the TAP controller and the Nexus Debug Module has been completed. RTX Unity uses this pin to speed up data transfers from/to the SDI+ registers.

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4.2 Hardware

4.2.1 RTX Unity concept

The general idea is to provide a set of isolated, level adapted I/O ports that can be used for various purposes.

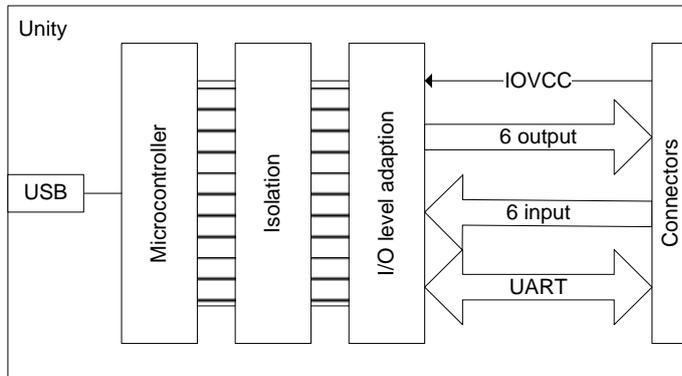


Figure 5. Unity Concept

The microcontroller is a CP3000 series from National Semiconductor. It has a CR16C CPU, flash, EEPROM, RAM, timers, and USB controller onboard. The CR16C RISC core provides 48 MIPS, which is enough for software handling of the signals needed (e.g. the serial bit stream for 1-wire JTAG).

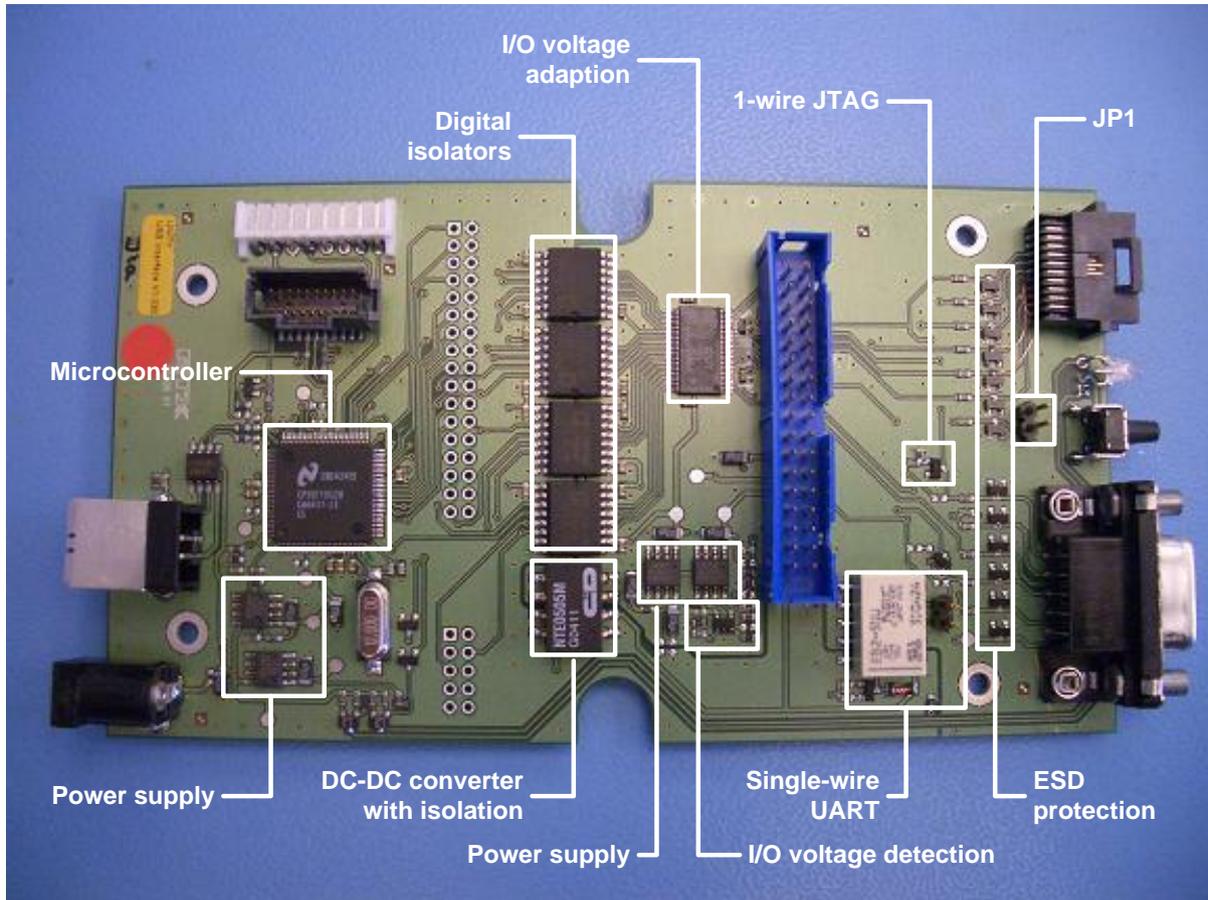
The isolation consists of modern digital isolators with low propagation delay, and a DC-DC converter. The IOVCC from the target device is for adjusting the I/O voltage level. The I/O level adapters are supplied from the DC-DC converter i.e. there is no additional load on the target power supply from RTX Unity.

The connector provides 6 general purpose outputs and 6 general purpose inputs, and 4 UART signals (RXD, TXD, RTS and CTS). The UART signals may also be used as general purpose I/Os.

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4.2.2 PCB Layout

The following picture show the RTX Unity PCB with main components indicated.



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4.3 About SDI+

4.3.1 SDI+ logic

The SDI+ logic is the integrated on-chip logic that provides JTAG debug support for CompactRISC® cores. The SDI+ logic is accessed through the TAP controller using the JTAG interface.

The SDI+ logic consists of:

- eight breakpoint/watchpoint units
- a debug control register
- a debug status register
- registers for accessing CPU registers
- DMA registers

You can program breakpoint/watchpoint units in a variety of ways to halt the execution of instructions by the CompactRISC® core.

4.3.2 How SDI+ differs from a debug monitor

A debug monitor is an application that runs on your target hardware in conjunction with your application, and requires target resources (for example, memory, access to exception vectors, and time) to be available.

The SDI+ debug architecture requires almost no resources. Rather than being an application on the board, it works by using:

- additional debug hardware within the core, that is, parts that enable the host to communicate with the target
- an external interface unit that buffers and translates the core signals into something usable by a host computer.

The SDI+ debug architecture allows debugging to be as non-intrusive as possible:

- the target being debugged requires very little special hardware (usually just a few pull-up resistors) to support debugging
- in most case you don't have to set aside memory for debugging in the system being debugged and you do not have to incorporate special software into the application
- execution of the system being debugged is only halted when a breakpoint or watchpoint unit is triggered, or you request that execution is halted.

End of file.

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