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ARM[®] DSTREAM-ST

Version 1.0

Getting Started Guide



ARM® DSTREAM-ST**Getting Started Guide**

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Release Information**Document History**

Issue	Date	Confidentiality	Change
0100-00	31 March 2017	Non-Confidential	First release

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LES-PRE-20349

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Product Status

The information in this document is Final, that is for a developed product.

Web Address

<http://www.arm.com>

Conformance Notices

This section contains conformance notices.

Federal Communications Commission Notice

This device is test equipment and consequently is exempt from part 15 of the FCC Rules under section 15.103 (c).

Class A

Important: This is a Class A device. In residential areas, this device may cause radio interference. The user should take the necessary precautions, if appropriate.

CE Declaration of Conformity

The system should be powered down when not in use.

It is recommended that ESD precautions be taken when handling DSTREAM-ST equipment.

The DSTREAM-ST modules generate, use, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

- Ensure attached cables do not lie across the target board.
- Increase the distance between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult ARM Support for help.

Note

It is recommended that wherever possible shielded interface cables be used.

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Preface

This preface introduces the *ARM® DSTREAM-ST Getting Started Guide*.

It contains the following:

- [About this book on page 8.](#)

About this book

Describes the DSTREAM-ST debug and trace unit which allows you to debug and optimize your software on ARM® processor-based hardware targets.

Using this book

This book is organized into the following chapters:

Chapter 1 Introduction to ARM® DSTREAM-ST

DSTREAM-ST is a debug and trace hardware unit that enables powerful software debug and optimization on ARM® processor-based targets.

Chapter 2 Setting up ARM® DSTREAM-ST

This chapter contains instructions for connecting your DSTREAM-ST unit to your host computer and target system.

Chapter 3 Working with ARM® DSTREAM-ST

ARM DSTREAM-ST is a comprehensive solution for development and debug of complex SoCs. This chapter explains some of the ways you can use DSTREAM-ST to work with your targets.

Chapter 4 Troubleshooting ARM® DSTREAM-ST

This chapter describes the steps that you need to take when ARM DSTREAM-ST does not function as expected.

Glossary

The ARM Glossary is a list of terms used in ARM documentation, together with definitions for those terms. The ARM Glossary does not contain terms that are industry standard unless the ARM meaning differs from the generally accepted meaning.

See the *ARM Glossary* for more information.

Typographic conventions

italic

Introduces special terminology, denotes cross-references, and citations.

bold

Highlights interface elements, such as menu names. Denotes signal names. Also used for terms in descriptive lists, where appropriate.

monospace

Denotes text that you can enter at the keyboard, such as commands, file and program names, and source code.

monospace

Denotes a permitted abbreviation for a command or option. You can enter the underlined text instead of the full command or option name.

monospace italic

Denotes arguments to monospace text where the argument is to be replaced by a specific value.

monospace bold

Denotes language keywords when used outside example code.

<and>

Encloses replaceable terms for assembler syntax where they appear in code or code fragments. For example:

```
MRC p15, 0, <Rd>, <CRn>, <CRm>, <Opcode_2>
```

SMALL CAPITALS

Used in body text for a few terms that have specific technical meanings, that are defined in the *ARM Glossary*. For example, IMPLEMENTATION DEFINED, IMPLEMENTATION SPECIFIC, UNKNOWN, and UNPREDICTABLE.

Feedback

Feedback on this product

If you have any comments or suggestions about this product, contact your supplier and give:

- The product name.
- The product revision or version.
- An explanation with as much information as you can provide. Include symptoms and diagnostic procedures if appropriate.

Feedback on content

If you have comments on content then send an e-mail to errata@arm.com. Give:

- The title *ARM DSTREAM-ST Getting Started Guide*.
- The number ARM 100892_0100_00_en.
- If applicable, the page number(s) to which your comments refer.
- A concise explanation of your comments.

ARM also welcomes general suggestions for additions and improvements.

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Other information

- *ARM Developer*.
- *ARM Information Center*.
- *ARM Technical Support Knowledge Articles*.
- *Support and Maintenance*.
- *ARM Glossary*.

Chapter 1

Introduction to ARM® DSTREAM-ST

DSTREAM-ST is a debug and trace hardware unit that enables powerful software debug and optimization on ARM® processor-based targets.

DSTREAM-ST lets you connect DS-5 Debugger to an ARM processor-based target using a hardware interface such as JTAG or Serial Wire Debug (SWD). It also enables the collection of narrow-port (4-pin) parallel streaming trace from the device for non-intrusive debug and code optimization.

This chapter describes the DSTREAM-ST hardware.

It contains the following sections:

- [1.1 ARM® DSTREAM-ST box contents on page 1-11.](#)
- [1.2 The DSTREAM-ST unit on page 1-12.](#)
- [1.3 Buy ARM® DSTREAM-ST on page 1-16.](#)

1.1 ARM® DSTREAM-ST box contents

The DSTREAM-ST product box contains the required components to set up and connect your workstation to your ARM architecture-based development board.

The items are:

- DSTREAM-ST unit.
- Power supply unit and associated cables.
- Ethernet cable.
- USB3.0 cable.
- CoreSight™ 10/20-way 0.05" pitch ribbon cable.
- JTAG 20-way 0.1" pitch ribbon cable.
- JTAG 14-way Texas Instruments adapter.
- MICTOR 38 adapter.

1.2 The DSTREAM-ST unit

The DSTREAM-ST unit provides the hardware interface to connect the host computer to your target.

Rear of the DSTREAM-ST unit

The rear of the DSTREAM-ST unit contains ports for connecting to the network, host workstation, and the power source. It also contains the **RESET** button and the **USER IO** port.

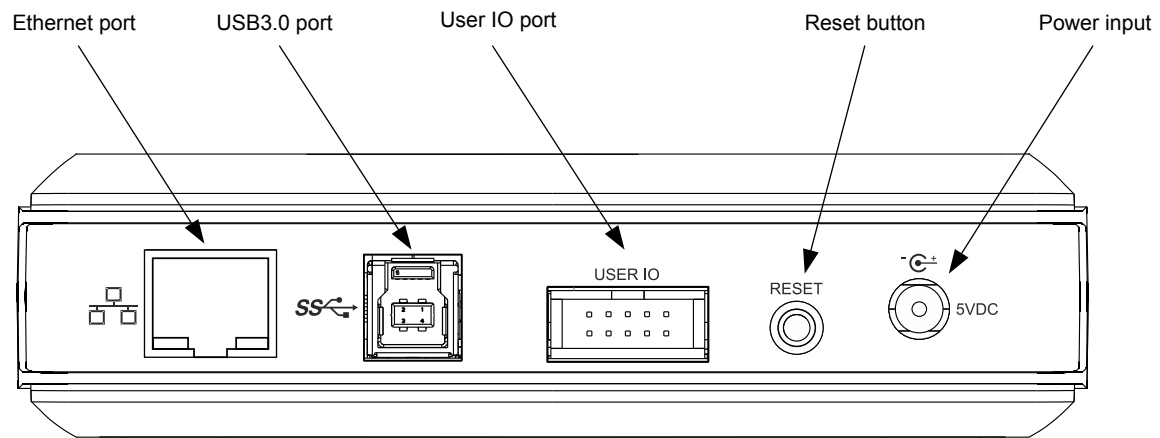


Figure 1-1 Rear of DSTREAM-ST unit

Ethernet port

If you want to access your DSTREAM-ST unit over the local area network, use the Ethernet port.

The green LED indicates that the Ethernet link is up and running. The yellow LED indicates that activity is taking place. Supported speeds are: 10/100/1000 Mbps.

USB3.0 port

If you want to connect the DSTREAM-ST unit directly to your host workstation.

————— **Note** —————

DSTREAM-ST is a USB3.0 device. To achieve USB3.0 data transfer speeds, your workstation must have a USB3.0 port and you must use a USB3.0 data cable.

USER IO port

Use the USER IO port to set up custom input or output connections to your target. See the ARM DSTREAM-ST System and Interface Design Reference Guide for more details.

RESET Button

Press and release the RESET button to reset the DSTREAM-ST unit when required.

————— **Note** —————

If you continue to hold the RESET button for 10 seconds more, the STATUS LED flashes red rapidly. When you release the RESET button after this point, DSTREAM-ST reboots and defaults back to factory installed firmware. Use the **Debug Hardware Firmware Installer** view in DS-5 to update the firmware of your DSTREAM-ST unit.

Power input

Connect the power adapter provided with the DSTREAM-ST unit to this port.

Front of the DSTREAM-ST unit

The front of the DSTREAM-ST unit contains ports for connecting to your target.

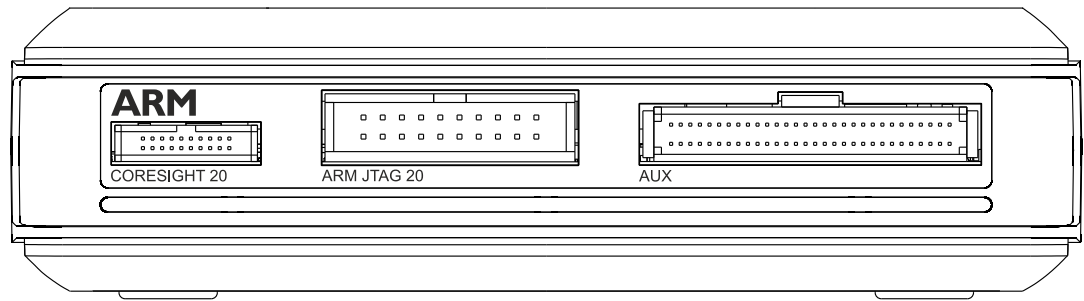


Figure 1-2 Front of the DSTREAM-ST unit

CORESIGHT20

A high-density connector that supports 10-way or 20-way CoreSight standards in addition to a subset of the MIPI debug connection standards. It provides support for Serial Wire and JTAG interface modes in a 20-pin (0.05") connector.

————— **Note** —————

To collect trace data, you must use this port.

ARM JTAG 20

The most commonly used debug connector standard for ARM architecture-based target boards. It provides support for Serial Wire and JTAG interface modes in a 20-pin (0.1") connector.

AUX

This port is included for any potential future enhancement of DSTREAM-ST.

Other connectors

Included with DSTREAM-ST are:

- **Texas Instruments 14-way adapter** - Used in conjunction with the ARM JTAG 20 cable, provides debug access to any target with a TI JTAG 14 header.
- **MICTOR adapter** - Used in conjunction with the ARM JTAG 20 and CoreSight 20 cables, this adapter provides debug and trace access to any target with a MICTOR socket.

————— **Note** —————

To achieve full MICTOR connectivity, you must use both the ARM JTAG 20 and CoreSight 20 cables.

Optional adapters

The following adapters are also available for use with DSTREAM-ST. Each of these allows capture of up to 4-bit wide ETM trace and also allow the use of separate debug and trace power domains.

- **MIPI-34 adapter** - This adapter connects directly to the front panel of DSTREAM-ST and is supplied with a MIPI-34 ribbon cable to provide debug and trace access to any target with a MIPI-34 header.
- **MIPI-60 adapter** - This adapter plugs into a target's MIPI-60 socket and converts it to a MICTOR socket for use with the DSTREAM-ST MICTOR adapter.

Indicator LEDs on the top of the DSTREAM-ST unit

When you power up the DSTREAM-ST unit, various LEDs on top of the unit indicate the status of the unit.

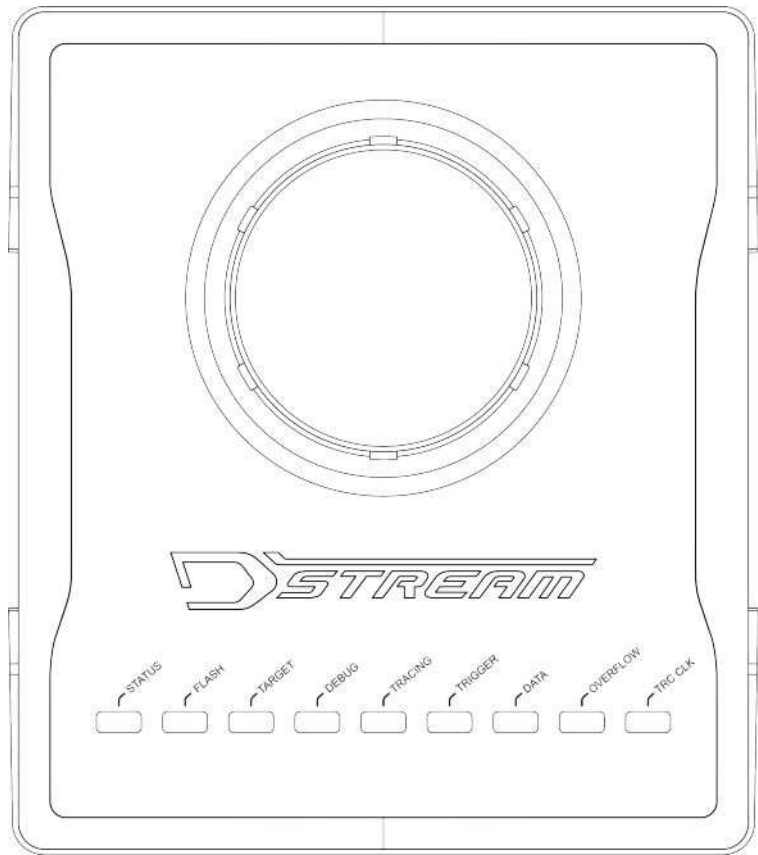


Figure 1-3 Indicator LEDs on the top of the DSTREAM-ST unit

DSTREAM logo

The DSTREAM logo on the top of the unit illuminates and the **STATUS** LED begins to flash when you power up the DSTREAM-ST unit. The DSTREAM logo flashes when you press the **Identify** button in any of the debug hardware tools provided with DS-5.

STATUS

Illuminates to show that DSTREAM-ST is in its ready state. If a critical error is detected, the **STATUS** LED illuminates as continuous red. You must reset the DSTREAM-ST unit to the factory settings before you can continue using it. See [4.2 Restoring a DSTREAM-ST unit](#) on page 4-30 for additional information.

FLASH

Illuminates when the unit is accessing its internal flash storage.

TARGET

Illuminates when a valid target **VTRef** is detected.

DEBUG

Illuminates when debug data transfer takes place.

TRACING

Indicates that DSTREAM-ST is attempting to capture data and synchronize with the trace stream.

TRIGGER

Indicates that a trigger is detected.

DATA

Indicates that trace synchronization is complete and DSTREAM-ST is capturing trace data.

OVERFLOW

Indicates an error condition during trace capture. An error might occur when it has not been possible to stream trace data to the host workstation at appropriate speeds, for example, if the USB port of the host PC is only operating at USB2.0 speeds or if the Gigabit Ethernet (GbE) bandwidth is not sufficient.

TRC CLK

If the **TRC CLK** LED is off, then no trace clock is present.

If the **TRC CLK** LED is green, it indicates that a valid trace clock is detected.

If the **TRC CLK** LED is red and flashing, it indicates that the received trace clock is not within the acceptable range (This LED could also indicate that the clock is too slow or too fast.).

1.3 Buy ARM® DSTREAM-ST

ARM has over 100 trusted distributors around the world offering products, training, and support.

You can [contact them](#) to buy DSTREAM-ST.

For OEM licenses, [contact ARM®](#) directly.

Chapter 2

Setting up ARM® DSTREAM-ST

This chapter contains instructions for connecting your DSTREAM-ST unit to your host computer and target system.

It contains the following sections:

- [2.1 Installing the USB drivers for the DSTREAM-ST unit on page 2-18.](#)
- [2.2 Updating the DSTREAM-ST firmware on page 2-19.](#)
- [2.3 DSTREAM-ST unit boot sequence on page 2-20.](#)
- [2.4 Connecting and powering up the DSTREAM-ST unit on page 2-21.](#)

2.1 Installing the USB drivers for the DSTREAM-ST unit

To use the DSTREAM-ST unit with a USB connection, USB device drivers must be installed for your operating system. The USB drivers for DSTREAM-ST are provided with ARM DS-5.

The drivers for DSTREAM-ST are optionally installed as part of the install process for DS-5. If you have skipped the driver install process in DS-5, follow these steps to install them.

Procedure

- On Windows:
 1. Using administrative privileges, run the `driver_install.bat` batch file available in `DS-5_install_directory\sw\driver_files` directory.
 2. In the **DS-5 Driver Installation Wizard**, click **Next** and follow the steps.

————— **Note** —————
During installation, you might receive warnings such as **Windows can't verify the publisher of this driver software**. You can safely ignore these warnings and continue with the installation.

—————
 3. After the drivers are installed, click **Finish**.
- On Linux:
 1. Using root privileges, run the `run_post_install_for_ARM_DS-5_vx.x.sh` script file available in the DS-5 install directory. The `x.x` in the filename denotes the DS-5 version that is installed on your workstation.
 2. Enter `yes` to confirm the installation.

The USB drivers are now installed on your workstation.

2.2 Updating the DSTREAM-ST firmware

The DSTREAM-ST firmware contains specific sections of code for each ARM processor. These are called templates. Each template defines how to communicate with the device and the settings that you can configure for that particular device.

Firmware updates are supplied with ARM DS-5. You must ensure that you align the firmware updates with the same version used by DS-5.

In DS-5, the latest firmware files are available at: *DS-5_install_directory\sw\debughw\firmware*

To install or update the firmware on DSTREAM-ST, use the *Debug Hardware Firmware Installer* view in DS-5. To view the **Debug Hardware Firmware Installer** in DS-5, from the main menu, select **Window > Show View > Other > Debug Hardware Firmware Installer**.

2.3 DSTREAM-ST unit boot sequence

Your DSTREAM-ST unit goes through a boot sequence when you power it up. Various LEDs identify the progress of the boot sequence.

The DSTREAM-ST unit follows this boot sequence:

1. The DSTREAM logo illuminates blue.
2. The **FLASH** LED flashes as accesses take place.
3. The **STATUS** LED flashes green and then stays illuminated.
4. If the target is connected to the DSTREAM-ST unit and powered, the **TARGET** LED illuminates green.

The DSTREAM-ST unit is now ready for use.

2.4 Connecting and powering up the DSTREAM-ST unit

Connect the DSTREAM-ST unit to your host computer and to the target hardware using the appropriate cables and connector.

Prerequisites

- You must have DS-5 installed to access the software drivers and debug hardware configuration utilities.
- Your target hardware must contain a debug interface supported by DSTREAM-ST.
- You require the following parts to connect the DSTREAM-ST unit between your workstation and the target hardware:
 - The DSTREAM-ST unit.
 - The power adaptor for the DSTREAM-ST unit and the mains cable for the power adaptor that is appropriate for your region.
 - One of the following cables, to connect the DSTREAM-ST unit to the PC or the network:
 - The USB cable, to connect the DSTREAM-ST unit directly to the PC using the USB3.0 port.
 - The RJ-45 Ethernet cable, to connect the DSTREAM-ST unit to the network.
 - [Target-compatible cable on page 1-11](#) to connect the DSTREAM-ST unit to the target hardware.

Note

If the DSTREAM-ST unit or the target hardware are not properly earthed, potential differences can occur between them, causing unwanted pulses in the debug interface during connection. This can cause unwanted resets to occur.

Procedure

1. Connect the host computer to the DSTREAM-ST unit as shown in the following figure, using either the USB port or a TCP/IP network connection as required:

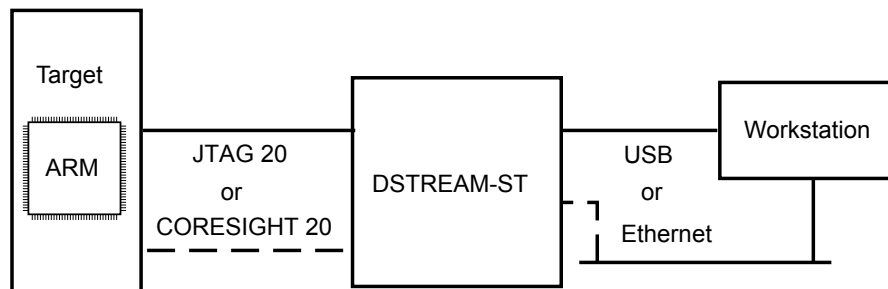


Figure 2-1 Connecting the DSTREAM-ST unit

- If you are connecting using the USB port, connect the DSTREAM-ST unit to the host PC using the supplied USB 3.0 cable.

Note

The USB drivers are provided with DS-5. See [2.1 Installing the USB drivers for the DSTREAM-ST unit on page 2-18](#) for more information.

- If you are connecting across an Ethernet network, connect the DSTREAM-ST unit to the local network using the supplied RJ-45 Ethernet cable.
2. Power up the DSTREAM-ST unit. Your DSTREAM-ST unit goes through a boot sequence when you power it up. Various LEDs identify the progress of the boot sequence. See [2.3 DSTREAM-ST unit boot sequence on page 2-20](#) for more information.

3. **Note**

You do not have to perform this step if you are using a USB connection.

Use the **Debug Hardware Configure IP** view in DS-5 to configure Ethernet and internet protocol settings for your DSTREAM-ST unit. You can also use the **Debug Hardware Configure IP** view to assign a name for the DSTREAM-ST unit. See the DS-5 documentation for *[Debug Hardware Configure IP](#)* view for more details.

4. Connect the DSTREAM-ST unit to the target hardware using the appropriate cables and connector.
5. Power up the target hardware.

Chapter 3

Working with ARM® DSTREAM-ST

ARM DSTREAM-ST is a comprehensive solution for development and debug of complex SoCs. This chapter explains some of the ways you can use DSTREAM-ST to work with your targets.

It contains the following sections:

- [3.1 Debugging with DSTREAM-ST on page 3-24.](#)
- [3.2 Hot-plugging the debug cable on page 3-25.](#)

3.1 Debugging with DSTREAM-ST

The software on your host provides the interface between your debugger and the DSTREAM-ST hardware that controls the target devices. The host software translates debugger commands, such as start, stop, and download, into control sequences for a particular processor.

Depending on your needs, there are several options:

ARM® DS-5 Development Studio

DS-5 Development Studio is a suite of tools for embedded C/C++ software development on any ARM-based SoC, featuring an editor, compilers, debugger, and system profiler. Combined with DSTREAM-ST, you get a comprehensive solution for developing and debugging complex SoCs.

For more information on debugging using DS-5, see the [documentation](#).

You can download the latest version of DS-5 from the [DS-5 downloads page](#).

Remote Device Debug Interface (RDDI)

Third-party debuggers, both for ARM and other processor cores, can connect to DSTREAM-ST using the RDDI interface.

For example, using the RDDI interface:

- You can address each target device individually, without affecting other devices on the board. It uses this ability to create virtual connections for each of the JTAG devices on the board. Your debugger can attach to one of these virtual connections, and perform debugging operations with no knowledge of the other devices on the board.
- You can enable multiple concurrent connections to debug multiprocessor systems. Depending on the system, you can also perform a synchronized start or stop of processors for debugging multiprocessor systems where the processors interact with each other.
- For simple tasks such as production testing, a low-level RDDI connection to DSTREAM-ST can be used to gain access to the JTAG scan-chains inside the target device.

RDDI is freely available from within the DS-5 installation.

CoreSight Access Tool (CSAT)

The CoreSight Access Tool (CSAT) provides a scriptable low-level interface to the CoreSight Debug Access Port (DAP) on a target. CSAT is useful to perform initial bring-up tests before a debugger connection to the target is available.

CSAT enables the configuration of third-party IP connected to the DAP, for example, custom instrumentation hardware. CSAT can be used while a debugger is connected to an ARM processor. This enables the debugging of complex hardware-related problems.

See the [CoreSight Access Tool \(CSAT\) User Guide](#) for more information.

3.2 Hot-plugging the debug cable

At times, you might want to connect or disconnect a debug cable without powering off the target. You can do this provided certain conditions exist.

You can connect and disconnect the DSTREAM-ST unit to the target hardware without affecting operation of the target if:

- The DSTREAM-ST unit is powered by its original, earthed-output power supply.
- The target hardware is earthed either through its power supply or a separate earth connection.

Note

If the DSTREAM-ST unit or the target hardware are not properly earthed, potential differences can occur between them, causing unwanted pulses in the debug interface during connection. This can cause unwanted resets to occur.

In a scenario where the DSTREAM-ST unit is not connected to your target, but the target behavior has to be analyzed without affecting its current state, you must:

- Power up the DSTREAM-ST unit before connecting to the target.
- After the DSTREAM-ST unit is powered up, connect the debug cable to the target.
- As an added precaution to guard against ground-loop noise, it is advisable to ensure that one of the GND pins of the debug connector makes contact first when connecting the debug cable to the target system. See ARM DSTREAM-ST Target Interface Connections chapter in the ARM DSTREAM-ST System and Interface Design Reference Guide for pinout details.

Doing so ensures that the current target state is not affected in any way when you connect DSTREAM-ST unit to the target.

When unplugging the debug connector, you must be aware that:

- If you are using a *Return Test Clock* (RTCK) system, make sure that no communication is taking place between the system and the DSTREAM-ST unit. Otherwise, if the DSTREAM-ST unit is waiting for a return clock, it might lock up.
- If you are not using an RTCK system, the debug software can handle this situation. However, you must arrange to do a *Test Access Port* (TAP) reset using the debugger when you next plug the DSTREAM-ST unit into a target.