Getting Started with the SuperTrace Probe

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Chapter 1

Installing Your Probe

Contents

About This Book

This book explains how to install and configure your SuperTrace Probe by performing the following steps:

- Verifying the receipt of all necessary probe hardware and accessories.
- Adding the Green Hills Probe software to your Green Hills Compiler installation.
- Physically connecting your probe to your debug target.
- Physically connecting your probe to your computer's USB port and/or network port and configuring the probe's settings.

Once you complete these steps, the probe will be ready to debug your board. You can then create, debug, and collect trace from a simple program in MULTI. Before you begin, review the following sections to ensure familiarity with critical terms, troubleshooting procedures, and the proper installation of MULTI.

Note

. For reference information, detailed information about commands and options, and advanced topics, see the *Green Hills Debug Probes User's Guide*.

Requirements

Before installing and configuring your SuperTrace Probe, you must install MULTI and the Green Hills Compiler for each architecture that you plan to use. If you have not installed MULTI yet, do so now. For information about installing MULTI, see the installation document located in the root directory of the installation DVD. The instructions in this guide cover installation with MULTI 6 and 7. If you are using another version, some instructions may differ.

Terms You Should Know

- **Host** — The computer on which you are running MULTI.
- **Target** — The hardware for which you are developing programs.

- **Target Adapter** — An adapter that connects your probe to your target. Target adapters can connect both debug and trace signals to a debug probe, and are used by both Green Hills Probe and SuperTrace Probe v3.
- **Trace Pod** — A target adapter with active logic that collects trace data and connects the port marked `PARALLEL` on the SuperTrace Probe v3 to your target's trace port. A trace pod also connects to the debug signals of a target, and allows the SuperTrace Probe v3 to control and debug a target. There are two kinds of trace pods: the TraceEverywhere (TE) trace pod and an older Legacy trace pod. This manual mostly refers to the TE trace pod.
- **TraceEverywhere (TE)** — The Green Hills interface for trace port adapters that carry trace and debugging signals. TE target adapters adapt a specific target trace port to TE, enabling the probe to trace different targets by swapping TE trace adapters.
- **High-Speed Serial Trace (HSST)** — Trace using a high-speed serial protocol such as Aurora, which requires a SuperTrace Probe v3 with a port in front marked `SERIAL`. Because of HSST's high-speed signaling, it requires a target-specific cable plugged directly into the probe with no TE target adapters. HSST often includes a target's regular debug signals allowing the probe to control and debug a target through a single cable.
- **TE Trace Kit** — A target connection kit that consists of a pre-attached cable and trace pod, and a TE target adapter.
- **HSST Kit** — A cable that connects your probe directly to your target for HSST (no adapters or pods required).
- **Legacy Kit** — A target connection kit that consists of a pre-attached cable and trace pod, and may or may not contain an additional adapter for your target.

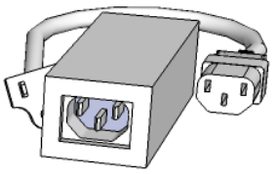
When You Encounter Problems

If at any time you receive an error or are unable to continue, see Appendix A, “Troubleshooting” on page 37. For more information about any of the options or procedures described in this book, see the *Green Hills Debug Probes User's Guide*.

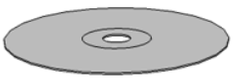
Verifying Components

All SuperTrace Probe boxes contain the following items:

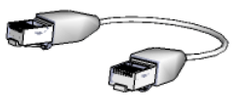
SuperTrace Probe



Power supply

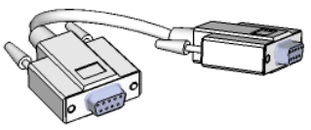


SuperTrace Probe CD



Ethernet cable

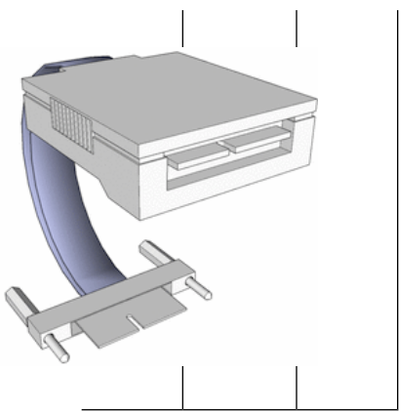
USB cable



Null modem serial cable

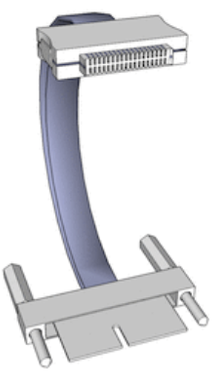
Depending on your target connection, it will also contain one of the following kits:

TraceEverywhere (TE) Kit



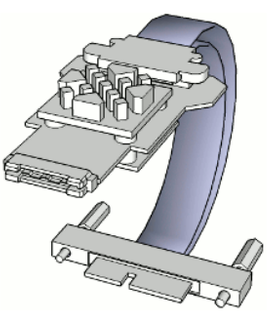
TE trace pod

HSST Kit

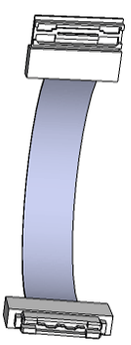


HSST cable

Legacy Kit

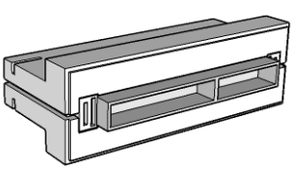


legacy trace pod

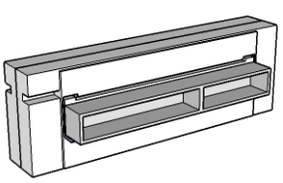


Extension

TE Kits come with a target adapter (varies by target):



Edge mount adapter



Vertical mount adapter

Installing SuperTrace Probe Software

Before using your SuperTrace Probe with MULTI, you must install the software on the SuperTrace Probe CD. The software on the CD includes:

- USB drivers.
- Probe firmware for the release marked on the CD. This firmware is installed in ***install_dir*/ghprobe**.
- Host tools for administering a probe and debugging or tracing a target.
- Project Wizard files that add support for new boards.
- Documentation, as PDF files and in the MULTI help viewer.

To install the software, follow the instructions provided for your operating system:

Windows

1. Log in to Windows using an account with administrative privileges. Close MULTI and any other Green Hills Software applications. Make sure that the probe is not connected to your host machine.
2. Insert the SuperTrace Probe CD for your target into the CD-ROM drive of your host machine. If the installation program does not start automatically, run **ginstall_win32.exe**.
3. The installer will suggest an installation directory. If this is the directory you would like to install to, click the **Easy Install** button; otherwise, click **Advanced Install** to specify an installation directory. The probe should be installed in the directory where the Green Hills Compiler is located (for example, **C:\ghs\comp_201854**).

Linux

1. Close MULTI and any other Green Hills Software applications.
2. Insert the SuperTrace Probe CD for your target into the CD-ROM drive of your host machine. If the installation program does not start automatically, run **ginstall_linux86**.

3. The installer will suggest an installation directory. If this is the directory you would like to install to, click the **Easy Install** button; otherwise, click **Advanced Install** to specify an installation directory. The probe should be installed in the directory where the Green Hills Compiler is located (for example, **/usr/ghs/comp_201854**).

Connecting Your Probe to Your Target

After checking the contents of the box and installing the necessary software, you are ready to set up your SuperTrace Probe. This section explains how to connect the probe to your target using current cabling systems.

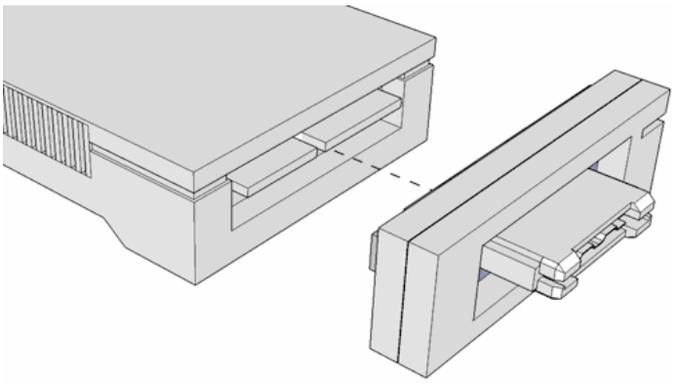
All SuperTrace Probes ship with a **PARALLEL** port. SuperTrace Probes that support high-speed serial trace (HSST) have an additional **SERIAL** port on the front. Refer to the section below that matches your pod for further connection instructions:

- “Connecting with TraceEverywhere” on page 6
- “Connecting with a Legacy Trace Pod” on page 38
- “Connecting with HSST” on page 8 (requires a probe with a **SERIAL** port on the front)

Connecting with TraceEverywhere

1. Make sure that the power switch on the back of the probe is in the off (○) position.

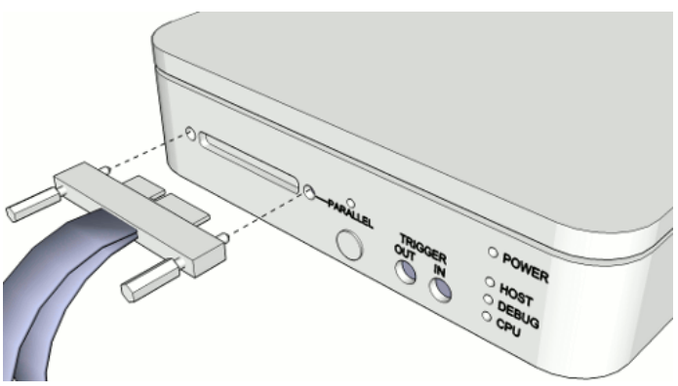
2. Connect the TE trace pod to your TE target adapter:



Warning

Take care when handling the TE trace pod. The heat fins on the sides of the pod can get very warm. Additionally, the probe may detect an error in the link to the TE trace pod due to ESD if the pod is handled by its heat fins. You may see an error message from the probe, debug control may be affected, and any trace data being collected at the time may be lost. If a target/probe debug setup must be handled during an active debugging session, we recommend the use of ESD mitigation measures to minimize the potential for disruption.

3. Connect the probe end of the cable to the **PARALLEL** port on the front of the probe. The connector is keyed and only fits in one way. Do not force the cable.

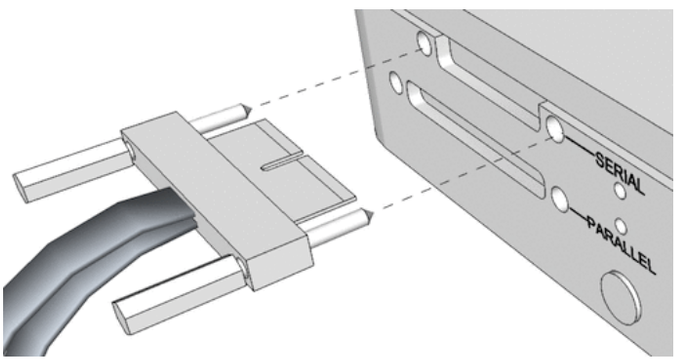


4. Make sure that your target's power is off, and connect the TE trace kit to your target. If your target has a shrouded MICTOR connector, remove the shroud before connecting the pod to your target.

5. If we included a MICTOR extension cable with your shipment, we recommend that you use it for the following reasons:
   - It reduces strain on connections.
   - It is helpful for making connections in tight areas.
   - It may improve trace reliability on some targets.
6. Connect the power supply to the power input connector on the back of the probe and to an AC power outlet.
7. Turn the power switch on the back of the probe to the on (|) position. The **Parallel** light should turn green. If it does not, see Appendix A, “Troubleshooting” on page 37.

Connecting with HSST

1. Make sure that the power switch on the back of the probe is in the off (○) position.
2. Connect the probe end of the cable to the **SERIAL** port on the front of the probe (not the RS-232 port on the back), and secure it by tightening the large screws on the cable housing. Do not force the cable:

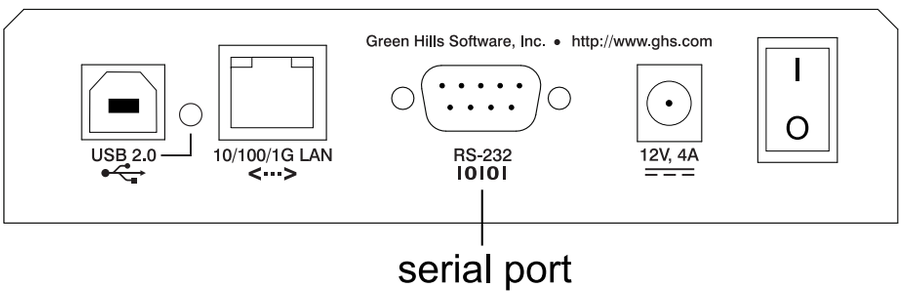


3. Make sure that your target's power is off, and connect the other end of the cable to your target.
4. Connect the power supply to the power input connector on the back of the probe and then to an AC power outlet.
5. Turn the power switch on the back of the probe to the on (|) position. The **Serial** light should turn green. If it does not, see Appendix A, “Troubleshooting” on page 37.

Connecting Your Host to Your Probe Over the Serial Port

Now that you have connected your probe to your target, you can connect to the probe from your host machine over an RS-232 serial connection to confirm that it is operational. To establish a serial connection:

1. Connect a null modem cable to the serial port on the back of your probe and to a serial port on your host PC:



2. On your host machine, open a connection to your serial port with a serial terminal emulator (such as TeraTerm) using the following settings:
   - **Baud Rate** — 9600
   - **Data Bits** — 8
   - **Parity** — none
   - **Stop Bits** — 1
   - **Flow Control** — none
3. Set the probe's power switch to the on position (|).
4. If you see the following banner in the serial terminal, the serial connection was successful (the banner may vary depending on your firmware revision):

```
ghBootloader
Green Hills Probe, Version 3
Unit Serial Number 100840
Booting...

Probe Firmware Release Version 6.4.4

Module core built Sun Aug 15 19:32:36 2021
Serial No: 100840
SuperTrace Probe v3
Part number 520-ST400-01x
```

```
Green Hills Software, Inc
http://www.ghs.com

Serial: 9600
USB: Enabled
Ethernet: Enabled
IP: DHCP
Gateway: DHCP
Netmask: DHCP
MAC Addr: 00:12:5c:01:84:e8

Starting the initialization sequence.
01234567 done.

Type 'info' to list probe information.
Type 'setup' to set the current configuration.
Type 'help' to list the online help.

[x] %
```

The prompt after the banner indicates that booting has finished, and displays both the target setting and state (`ppc5567` is provided as an example).

Note

You may power on your target after it is plugged into the probe and the probe is turned on, but you do not need to do so until you are ready to communicate with it.

Chapter 2

Configuring Your Probe

Contents

Your Green Hills probe is equipped with gigabit Ethernet and USB ports for high-speed connections to your host computer. Although connecting to your probe through the serial port is a good way to confirm that it is operational, you must connect to your probe over Ethernet or USB to use it with MULTI.

- If you want to connect to your probe over Ethernet, see “Connecting to Your Probe Over Ethernet” on page 12
- If you want to connect to your probe over USB, see “Connecting to Your Probe Over USB” on page 18

Connecting to Your Probe Over Ethernet

The probe can detect network settings automatically using DHCP. To connect your probe to a network using this feature, see “Configuring a Dynamic IP Address with DHCP” on page 13.

Warning

The Probe is intended as a debugging device within a trusted network. An additional network authentication and security layer (such as a VPN or corporate firewall) should always be provided to restrict Probe usage to intended users. Green Hills Probes should not be placed directly on the public Internet.

Configuring a Dynamic IP Address with DHCP

In the serial terminal window, type `setup net`. The probe presents the following settings along with default values:

```
[x] % setup net
Green Hills Probe (tm) Interactive Setup

    To accept the current setting press 'Enter'.
    For information on any option type a '?'.
    Use the 'set' command at a terminal to individually set options.

Network configuration (net):

    dhcp: [on]
    hostname: [ghprobe101234]

Saving options to EEPROM...
Consider running "detect" to set the target setting.

[x] %
```

1. `dhcp` — Press Enter to accept the default setting (`on`).
2. `hostname` — Type the hostname for your probe and press Enter. The DHCP server associates this hostname with your probe so that you can connect to your probe by specifying its hostname instead of its IP address. By default, the probe's hostname is `ghprobe`*`serial`*, where *serial* is your probe's serial number (for example, `ghprobe101234`). The probe's serial number is located on a sticker affixed to the bottom of the probe.
3. After the setup command completes, type `reboot` at a probe prompt to reboot your probe so the changes will take effect.

You have now configured your probe to obtain an IP address using DHCP. Skip to “Testing Your Probe's Ethernet Connection” on page 16.

Configuring a Static IP Address

If you want to configure your probe to have a static IP address, you might need to contact your network administrator to obtain the following settings:

- IP address
- Gateway
- Netmask

If you set the IP address incorrectly, you could disrupt other devices on your network.

In the serial terminal window, type `setup net`. The probe presents the following settings with their default values:

Note

To configure your probe using only a USB connection, see "Connecting to Your Probe Over USB" on page 18 and "Connecting the Probe Administrator to Your Probe" on page 19.

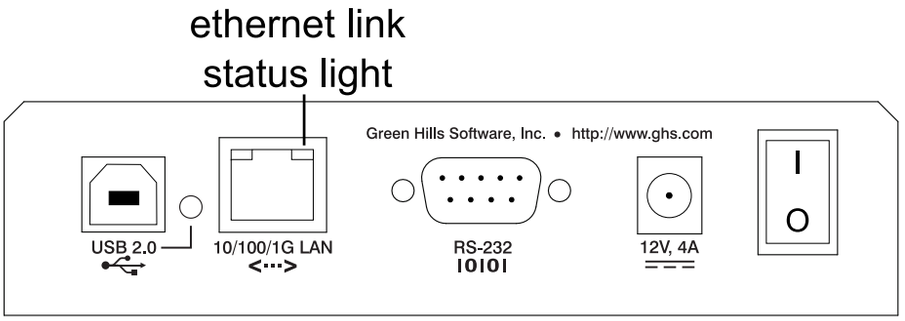
1. `dhcp` — Type `off` and press Enter.
2. `ip` — Type an IP address in dotted quad form and press Enter (for example, `192.168.1.150)`.
3. `netmask` — Type the netmask in dotted quad form and press Enter. The default setting is appropriate for class C networks (most networks are class C). Use a different setting if you are not on a class C network.
4. `gateway` — Type the gateway's IP address in dotted quad form and press Enter.
5. `hostname` — Press enter to accept the default setting. This setting is not used when DHCP is off; it is provided for future protocol support. When transporting your probe between networks with and without DHCP, your probe retains its hostname.
6. When the probe asks if you want to reboot, press Enter to reboot the probe.

You have now configured your probe to use a static IP address.

Testing Your Probe's Ethernet Connection

After configuring your probe for your network, test the Ethernet connection with Telnet. To connect to the probe through Telnet:

1. Plug one end of an Ethernet cable into your probe and the other end into a switch or hub that is attached to your network. If the probe detects that it is connected to a network, the Ethernet link status light turns on:



2. 2. In the serial terminal window, type `reboot` to reboot your probe.
3. If you are using Windows, select **Run** from the **Start** menu, type `telnet`, and click **OK**. If you are using Linux, open a shell and type `telnet`.

4. At the Telnet prompt, type `open` *`ip_address`*, where *`ip_address`* is your probe's IP address. If Telnet can connect to the probe, you should see text approximating the following:

```
Probe Firmware Release Version 6.4.4

Module core built Sun Aug 15 19:32:36 2021
Serial No: 103512
SuperTrace Probe HSST
Part number 520-ST401-01x
Green Hills Software, Inc
http://www.ghs.com

Type 'info' to list probe information.
Type 'setup' to set the current configuration.
Type 'help' to list the online help.

Selected core 1.
cortexr8[1,h] %
```

Note

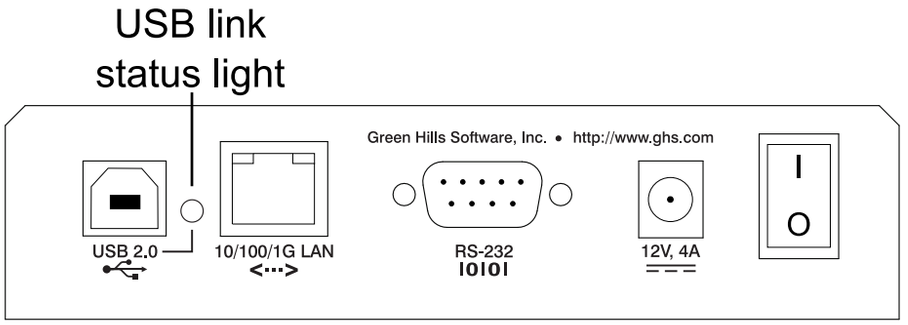
If you are using DHCP and your network supports dynamic hostnames, you can also open a connection with `open` *`hostname`*, where *hostname* is your probe's hostname.

You can now connect to your probe over Ethernet. To configure your probe to debug your target, proceed to “Configuring Probe Options with a Configuration File” on page 21.

Connecting to Your Probe Over USB

This section explains how to connect your probe to your host machine over USB.

1. Connect a USB cable to the USB port on the back of your probe and to a USB port on your host machine (or a USB hub connected to your host machine). The USB link status light should turn on:



2. If you are connecting to a Linux host and the udev rules file is correctly installed, a new device node will be created at **/dev/ghprobe*XXXXXX***, where *XXXXXX* is the probe's serial number. If the rules file is not installed, copy **ghprobe/driver/92-ghprobe.rules** from your compiler installation to **/etc/udev/rules.d** and then unplug your probe's USB cable and plug it in again.
3. If you are connecting to a Windows host and it reports that it has found a new USB device and asks to search for the appropriate drivers, click **Yes**. Windows will locate and use the driver you installed from the SuperTrace Probe CD.

Note

If Windows cannot find the driver and the **Install New Hardware Wizard** appears, run the installer on the SuperTrace Probe CD. For more information, see “Installing SuperTrace Probe Software” on page 5.

Connecting the Probe Administrator to Your Probe

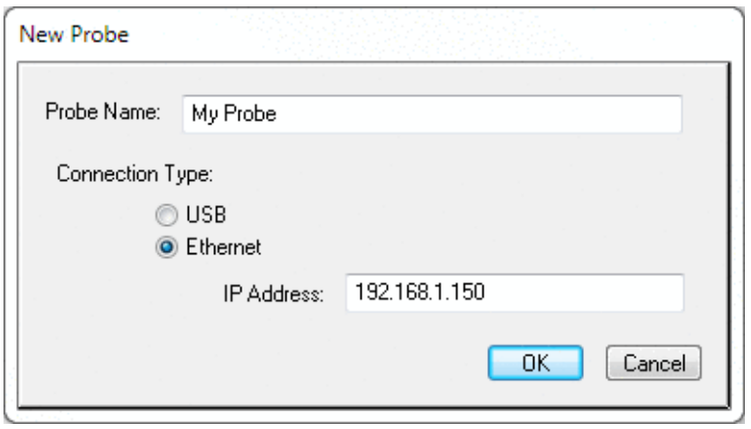
Warning

Currently, the **Probe Administrator** does not support USB connections on Linux, and has other known issues with USB connections on Windows. If you need to configure your probe with a USB connection, we recommend using the serial port console. Host-specific USB issues will be resolved in a future version of MULTI.

Now that the probe can connect to MULTI, you can use MULTI's **Probe Administrator** to configure the probe for your target. The **Probe Administrator** allows you to perform basic tasks such as setting options and updating firmware.

To connect to the **Probe Administrator**:

1. On your host machine, run MULTI.
2. In the MULTI Launcher, select **Utilities → Probe Administrator**.
3. In the **Probe Administrator**, select **File → New Probe** to open the **New Probe** dialog box.



4. In the **Probe Name** box, type a name for your probe that is easy to remember. This name is for your convenience only and is unrelated to the probe's hostname.
5. If you connected to your probe over USB, select the **USB** radio button. If you connected to your probe over Ethernet, select the

Ethernet radio button and type your probe's IP address in the **IP Address** box.

6. Click **OK**.
7. In the **Probe Administrator**, double-click your probe's name to open a **Probe Administration** window. You are now connected to your probe with the **Probe Administrator**.
8. Click the **Prompt** tab to open a probe prompt. Configuration and diagnostics instructions in the next few sections will require a probe prompt.

Configuring Probe Options with a Configuration File

Green Hills provides probe configuration files for many different target boards. These files contain tested settings for all target-related configuration options. When you create a new project using MULTI 6.0 or later, a copy of this file will be added to your project under **Target Resources**. In most cases, this file will be automatically loaded when you connect MULTI to your target; in other cases, a **board_info.txt** file will contain further target-specific configuration instructions. If you have an earlier version of probe or MULTI software, you can find and load this configuration file manually. To determine if one of these files exists for your board, and to use that file to configure your probe:

1. In a terminal window or command prompt, navigate to your MULTI install directory for MULTI 5, or your tools install directory for MULTI 6 or newer. Inside that directory, navigate to **target*architecture***.
2. If there is a directory that is named after your board, navigate to that directory and look for a file that ends in **.cfg** or **.ghpcfg**. When you find the file, run one of the following commands:

   ```
   > tools_install\mpadmin -cfgload hostname config_file
   ```

   ```
   > tools_install\mpadmin -cfgload -usb config_file
   ```

   If there is no directory named after your board, or if the directory exists but it does not contain a configuration file, try detecting your target (see next section).

Detecting Your Target

The probe can automatically detect most targets. To detect your target:

1. Power on your target.
2. Open a probe prompt via one of the previously described connection methods: telnet, USB serial port console, or **Probe Administrator** prompt.
3. At the prompt, type `detect`. This command configures the SuperTrace Probe for the processors on your target board. It is useful even if the prompt indicates that the probe knows what target you are using, because it confirms that the probe is able to see your target and that the target is configured correctly. If the command prints the following message:

   `Target has been detected and set to` *`target_string`*

   where *target_string* is the name of your target, the detection was successful.
4. Type `save` to save the settings changed by **detect**.

If you have problems detecting your processors, see Appendix A, “Troubleshooting” on page 37.

Note

Auto-detection cannot detect every parameter required for a reliable debugging session. If possible, use a supplied configuration file. For more information, see “Configuring Probe Options with a Configuration File” on page 21.

Running Diagnostics

Now that you have detected your target, run the following diagnostics to make sure that you can communicate with it:

1. Type `selftest` to run diagnostic tests on the probe's trace components. If any of the tests fail, ensure that the pod is securely attached to the probe and try again. If **selftest** still fails, contact Green Hills Support.
2. Type `vb` to test the bypass register of all devices on the JTAG scan chain. If your target is configured for SWD mode, use the **vswd** command instead. (Note that **vb** and **vswd** are not supported on PowerPC 5xx, PowerPC 8xx and ColdFire targets. If you are using one of these targets, skip this step.)
3. If your target has multiple cores, type `tl` (as in “target list”) to obtain a list of cores and IDs. Then, type `t` *`core_id`* to select a core. Most subsequent commands, including the following diagnostics, control or configure just that core.
4. Type `tr` to reset your target. This command verifies that you can reset your target, and is necessary for some targets after testing bypass mode.
5. Type `rr` to confirm that the probe can read your target's registers. When successful, this command returns a list of registers, similar to the following output:

```
ppc5200[H] % rr
gpr0=0xac5658ad  gpr9=0x805000a0 gpr18=0x24444889 gpr27=0x04100821
gpr1=0x845008a1 gpr10=0x04400880 gpr19=0x8816102c gpr28=0x0446088c
gpr2=0x08421084 gpr11=0x04000801 gpr20=0x2c5058a0 gpr29=0x08101021
gpr3=0x24004800 gpr12=0x04020804 gpr21=0xa0404080 gpr30=0x2c425885
gpr4=0x8c001800 gpr13=0x08001001 gpr22=0x8c041808 gpr31=0xa0024005
gpr5=0x28005000 gpr14=0x2006400d gpr23=0x24144829    lr=0x00000000
gpr6=0xa0044008 gpr15=0x80120024 gpr24=0x885610ad   iar=0x00003ffc
gpr7=0x88141029 gpr16=0x00440089 gpr25=0x205240a4
gpr8=0x205640ac gpr17=0x08121024 gpr26=0x84440888
ppc5200[H] %
```

6. Type `vr 100` to test the probe's ability to write to registers and read back the values. This command runs the test 100 times.

If you are able to run all of the above commands without errors, your probe is able to communicate with your target and is ready for use with

the MULTI Debugger. If any of the diagnostics fail, see Appendix A, “Troubleshooting” on page 37.

Note

If you have been using the **Probe Administrator** with a USB connection, close the **Probe Administrator** window before proceeding. If you leave the window open, other applications may not be able to connect to your probe over USB.

Chapter 3

Creating and Debugging a Program

Contents

Before beginning your first MULTI debugging session using your SuperTrace Probe, you must ensure that your target board is configured properly. This section explains how to create a Top Project that you can use to configure your target, test your debugging environment, and download and debug a “Hello World” program.

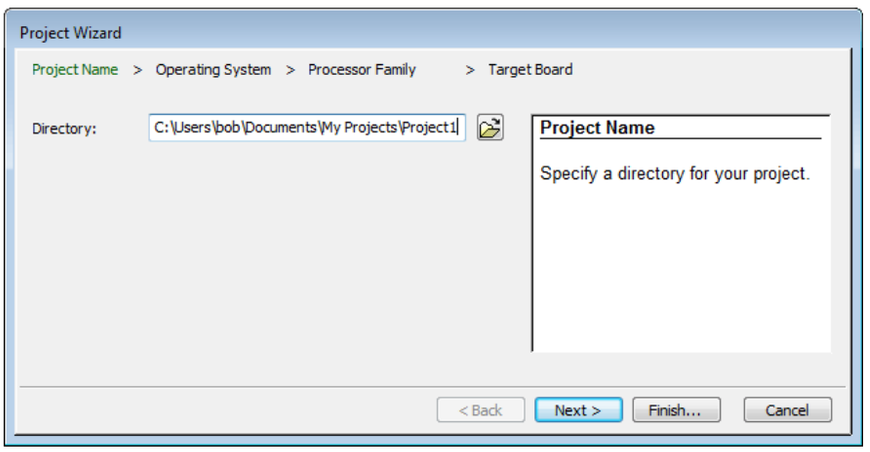
Creating a Top Project for Your Program

The Project Wizard is a tool that prompts you for information about your target board and creates a Top Project that contains:

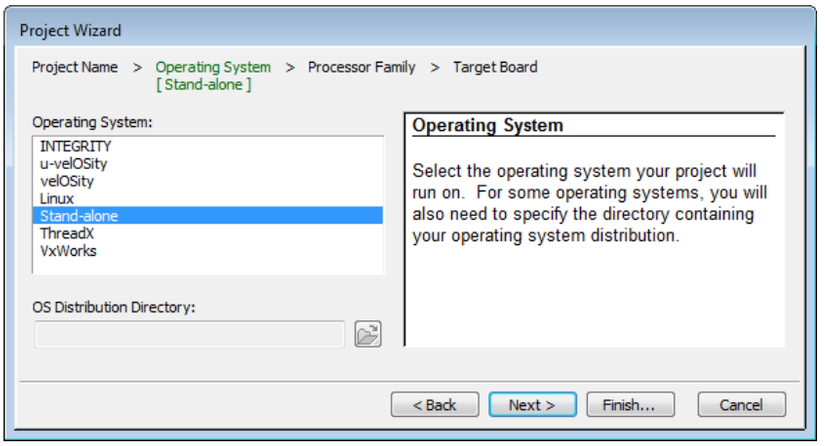
- Connection Methods that you use to connect to your target through your SuperTrace Probe.
- A MULTI board setup (**.mbs**) script that configures your target.
- Linker directives files that define memory maps for your target.

To use the Project Wizard to create a **Top Project**:

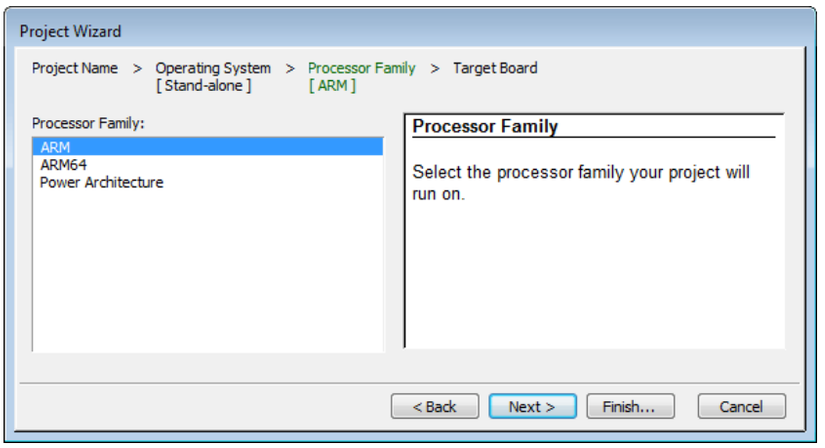
1. On your host machine, open MULTI.
2. From the MULTI Launcher, click  and select **Create Project** to open the Project Wizard.
3. Leave the default value in the **Name** box, and enter a directory for your Top Project in the **Directory** box. Click the **Next** button.



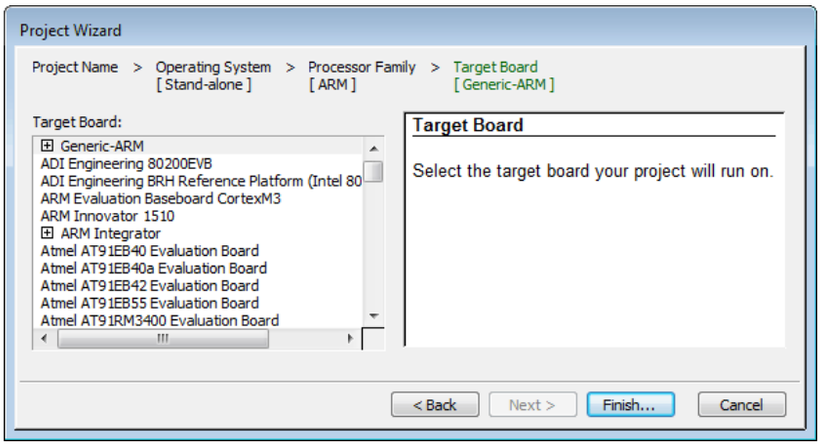
4. In the **Operating System** list, select **Stand-Alone**. Click the **Next** button.



5. In the **Processor Family** list, select the processor family to which your target's processor belongs. If you have only installed one processor family for MULTI, the wizard does not display this screen. Click the **Next** button.



6. In the **Target Board** list, select your target board. If your target board is not listed or you are using custom hardware, click the plus sign to the left of the **Generic** item at the top of the list and select your processor. In this case, you will probably need to customize the board setup script and linker directives files the wizard creates for your target. Click the **Finish** button to create your Top Project.



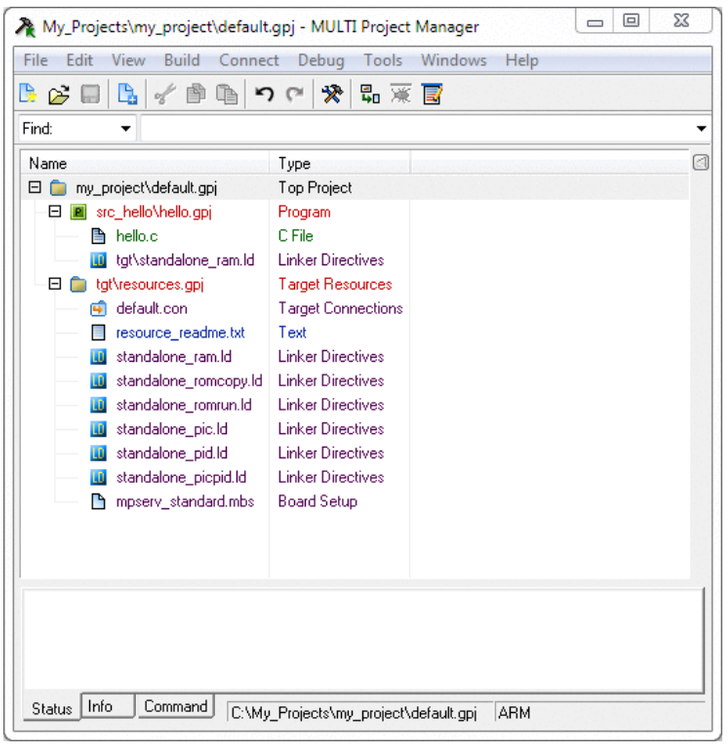
7. When the Project Wizard closes, a dialog box may open to inform you about the newly created Top Project. If so, click the **OK** button to continue.
8. After you create a new Top Project, the **Add Item to Project** dialog box opens. If you are creating a Stand-Alone project, select **Hello World (C)** and click the **Finish** button. This adds an example "Hello World" program to your Top Project.

You have now created a Top Project for your target.

For more information about Project Wizard screens and options, see the documentation about creating a new project in the *MULTI: Building Applications* book for your processor family.

Top Project Structure

After you create a Top Project, the MULTI Project Manager opens. It should look similar to the following window:



There are three projects in the window:

- ***dir*\default.gpj** — The Top Project.
- **src_hello\hello.gpj** — The example “Hello World” program you added with the **Add Item to Project** dialog box.
- **tgt\resources.gpj** — The *Target Resources project*. This project contains files necessary to configure and connect to your target (such as setup scripts and linker directives files).
    - **mpserv_standard.mbs** — The board setup script for your target. This script prepares your target for downloading and running a program. You may need to customize this script if you are using custom hardware.
    - ***name*.ld** — Linker directives files for your target. These files help determine how your program is laid out in memory. You may need to customize these files if you are using custom hardware.

In this example, the **src_hello\hello.gpj** program is linked using **standalone_ram.ld**. The **tgt\standalone_ram.ld** item in the **src_hello\hello.gpj** program represents the same file as the **standalone_ram.ld** item in the Target Resources project.

- ***board_config*.ghpcfg** (not available for all targets) — Probe configuration file containing recommended settings for debugging your target. If present, this file will be automatically queued to be written to your probe on connection. Note that some boards may have multiple configuration files available for different uses (such as trace and non-trace).
- **board_info.txt** (not available for all targets) — Additional notes about your target. If your project contains this file, read its contents before proceeding to the next section.

Building a Program from the Top Project

After you create a Top Project with the Project Wizard, you should test your debugging environment by downloading and running the example "Hello World" program. Before downloading the program, you must build your project.

To build the "Hello World" example project:

1. Select **src_hello\hello.gpj** in the Project Manager.
2. Click  .

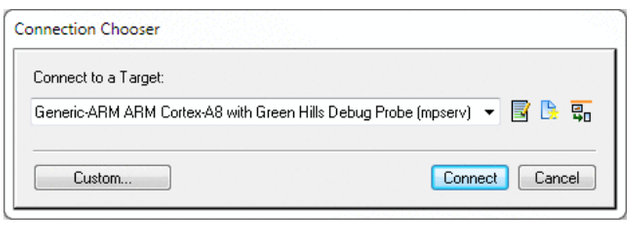
If the build was successful, you should see text similar to the following in the **Status** pane:

```
Building hello
Compiling hello.c because hello.o does not exist
Linking hello because it does not exist
Done
Build successful (Mon Jul 23 12:30:00 2018)
```

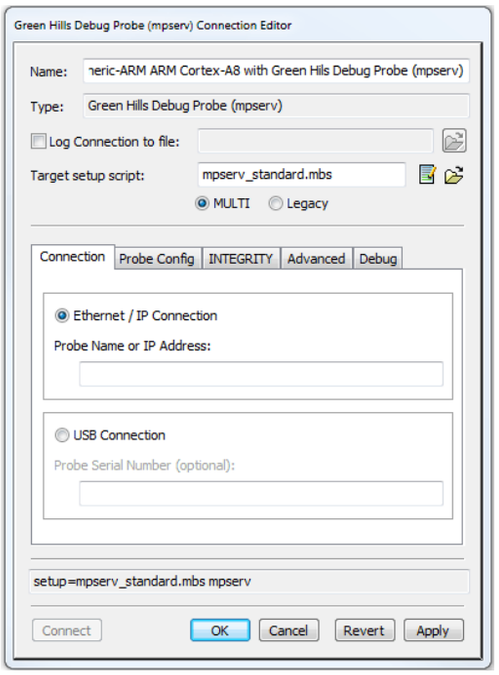
Connecting MULTI to Your Target

To connect MULTI to your target:

1. Verify that all hardware connections are tight and secure, and that both the board and your probe are powered.
2. In the Project Manager, select **src_hello\hello.gpj** and click  to open the MULTI Debugger.
3. If you have a **Probe Administrator** window open and connected to your probe via USB, close that window now. You can only have one USB connection to the probe at a time. Leaving this window open will prevent you from connecting MULTI to your probe in the next few steps.
4. In the Debugger window, click  to open a **Connection Chooser** window.
5. In the **Connect to a Target** list, select the **Green Hills Debug Probe (mpserv)** connection for your target. For example:



6. Click the **Connect** button. When the **Connection Chooser** prompts you to enter a Probe Name for the new connection, click **OK**. The **Connection Editor** window opens.


Green Hills Debug Probe (mpserv) Connection Editor
Name:
neric-ARM ARM Cortex-A8 with Green Hils Debug Probe (mpserv)
Type:
Green Hills Debug Probe (mpserv)
Log Connection to file:
Target setup script:
mpserv_standard.mbs
MULTI
Legacy
Connection
Probe Config
INTEGRITY
Advanced
Debug
Ethernet / IP Connection
Probe Name or IP Address:
USB Connection
Probe Serial Number (optional):
setup=mpserv_standard.mbs mpserv
Connect
OK
Cancel
Revert
Apply

7. In the **Connection Editor** window:
    a. In the **Connection** tab, select the radio button that corresponds to your connection type (Ethernet or USB). If you connect to your probe over Ethernet, type the probe's hostname or IP address in the **Probe Name or IP Address** box. If you connect to multiple probes over USB, type the probe's serial number in the **Probe Serial Number** box to specify which probe you want to connect to, and make sure that there are no active connections to that probe (such as the **Probe Administrator**).
    b. In the **Target Setup script** box, leave the default value (**mpserv_standard.mbs**). This file is the setup script that the Project Wizard generated and placed in your Target Resources project.
    c. In the **Probe Config** tab, you will see the ***board_config*.ghpcfg** file that matches your target (if an appropriate file is available). You can either select a different configuration file, or remove the reference to the file entirely to preserve the probe's current settings.
    d. Click **OK**.

The MULTI Debugger is now connected to your target.

For more information about the **Connection Editor**, see the documentation about the Connection Editor in the *MULTI: Configuring Connections* book.

Warning

Do not unplug the USB cable while MULTI is connected to your target over USB.

Downloading and Debugging a Program

To download and run the “Hello World” program:

1. In the MULTI Debugger, click  . The **Prepare Target** dialog box opens.
2. In the **Prepare Target** dialog box, leave the settings at their default values. The project is configured to download the program to RAM. Click **OK**.
3. The **Initializing Target** dialog box opens. This dialog box shows progress as MULTI runs your setup script and downloads the program. It closes when the progress is complete.

If the download and execution of the program are successful, your debugger should show output similar to the following:

```
I/O: Hello world.
I/O: ---------------------------
```

If the download was not successful, the **Prepare Target** dialog opens and displays any errors that occurred during the setup script or while downloading the program. If you are using custom hardware and have not modified the default setup script and/or linker directives files, you should expect some errors in red text in the **Prepare Target** dialog box.

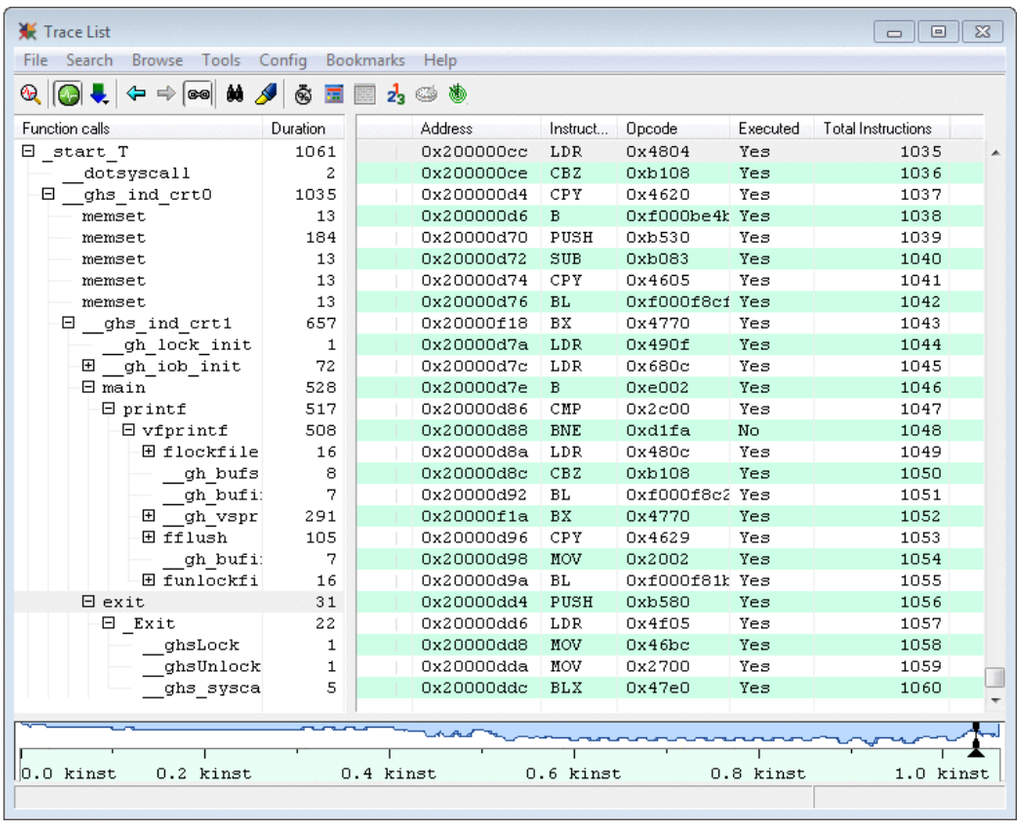
If this happens, you must modify the default setup script and linker directives files in your Target Resources project to configure your target properly. For more information, see Chapter 2, “Configuring Target Resources” in the *Green Hills Debug Probes User's Guide*.

Viewing the 'Hello World' Program's Trace Data

This section only applies if you are debugging a target with supported trace data collection. By default, the SuperTrace Probe collects trace data every time it halts your target. This means that you can view trace data immediately after the 'Hello World' program terminates. To view the trace data in list form:

- In the Debugger, select **TimeMachine → Trace List**

If the **Trace List** opens and looks similar to the following screen, your trace connection is configured properly:



For more information about browsing trace data, see the documentation about analyzing trace data with the TimeMachine tool suite in the *MULTI: Debugging* book.

Appendix A

Troubleshooting

Contents

This section explains how to troubleshoot problems you may encounter when configuring your probe to detect and communicate with your target. Before looking at a specific topic, make sure that:

- Your target is powered on.
- Your probe is powered on.
- All connections are tight and secure.
- The supplied ribbon cable is plugged into your target in the proper orientation, in the correct port. Also, check that it is properly aligned (not shifted over by one pin).

As with all problems you may encounter with your probe, consider using the **help** command to investigate related topics, the **set** command to view or change option settings, and the **support** command to output a log that will be helpful to Green Hills Support. For information about these commands, see Chapter 4, “Probe Option Reference” in *Green Hills Debug Probes User's Guide*.

If you have checked all the items in the previous list and are still having trouble setting up your SuperTrace Probe, consult one of the following sections.

Setting Up Your Hardware

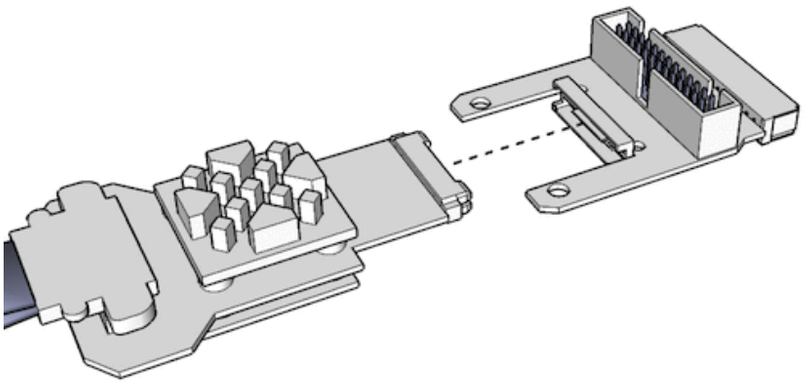
This section provides troubleshooting steps for initial probe setup.

Connecting with a Legacy Trace Pod

The instructions in this guide cover connections over TE and HSST. This section describes how to connect your probe to your target using a legacy trace pod:

1. Make sure that your probe's power is off.
2. Connect the probe end of the cable to the **PARALLEL** port on the front of the probe.

3. Check that the target adapter is appropriate for your target and connect the legacy trace pod to the adapter. For example:



4. Make sure your target's power is off, and connect the other end of the cable to your target. If your target has a shrouded MICTOR connector, remove the shroud before connecting the kit to your target.

Warning

If you have a Nexus target, verify that your target adapter is labeled “Nexus” and make sure to attach it before connecting the trace pod to your target, or you may damage the trace pod.

5. If we included a MICTOR extension cable with your shipment, we recommend that you use it for the following reasons:
   - It reduces strain on connections.
   - It is helpful for making connections in tight areas.
   - It may improve trace reliability on some targets.

The Supplied Ribbon Cable or Pod Does Not Fit in the Target's Debug Header

If the supplied ribbon cable or pod does not fit in one of your target's debug ports:

- Do not attempt to physically modify the cable or pod.

- Some targets have more than one debug header. Look for a different debug header that fits.
- If your SuperTrace Probe shipped with adapters for the ribbon cable or pod, try using one of them.
- If you are using a trace pod adapter, MICTOR pin-swapping adapter, or MICTOR extension cord, and your target has a shrouded MICTOR connector, remove the shroud.

The SuperTrace Probe v3 Power Light Is Solid Red

If the power light on your SuperTrace Probe v3 is solid red, there is an electrical problem. See “SuperTrace Probe v3 Beeps in a Repeating Pattern” on page 41.

The SuperTrace Probe v3 Parallel or Serial Light Is Solid Red

If the **parallel** or **serial** light on your SuperTrace Probe v3 is red:

- Make sure that the trace pod and cable are plugged in all the way.
- Make sure that either a High-Speed Serial Trace or a parallel cable is connected, but not both.
- If the connections are secure but the red light persists, contact Green Hills Support.

Corrupted Data is Printed to the Serial Terminal

If your serial terminal emulator is displaying corrupted data when connected to the probe, your terminal's baud rate is probably incorrect.

The probe's serial port is configured at 9600 baud for a few seconds after it is power cycled, after which it changes to its configured baud rate setting. If the configured setting is not 9600 baud, the probe prints the following message in the terminal before changing the baud rate. For example, if the probe's baud rate is set to 38400, it would print the following message:

```
Switching baud rate to 38400, press the space bar to remain
at 9600.
```

If you need to change the rate back to 9600 baud:

1. Press the space bar when the probe prints this message.
2. After you are connected to the probe, type:

```
set baud 9600
```

If you want to continue using the new baud rate (for example, 38400 baud), change the baud rate setting in your terminal program to 38400.

Cannot Type Commands Into the Serial Terminal

If you cannot type commands into the serial terminal:

- Make sure serial flow control is turned off in your serial terminal.
- Use a different null modem serial cable.

Note

Certain versions of the HyperTerminal application exhibit problems communicating with target systems in general. If you are experiencing problems, restart HyperTerminal. If this does not remedy the problem, try a different host machine, upgrade HyperTerminal, or switch to a different application.

SuperTrace Probe v3 Beeps in a Repeating Pattern

If your SuperTrace Probe v3 beeps in a repeating pattern, it indicates one of the following conditions:

- three short beeps — The probe has a blown fuse. Turn off the probe and contact Green Hills Support.
- three short beeps followed by a long beep — The power supply voltage is inadequate. The probe requires a power supply that provides 12 V and 4 Amps.
- a high beep followed by a low beep — The probe is overheating. If this happens:
    - Turn the probe off immediately.

- Check to see if any of the probe's vents are obstructed. If they are, remove the obstruction before turning the probe on again.
- Check the ambient temperature near the probe and make sure it is below 120 F (50 C).

If none of the vents are obstructed and the ambient temperature is within operating levels, call Green Hills Support.

Configuring Your Probe to Connect to MULTI

This section provides troubleshooting steps for configuring your probe to connect to your host machine.

Cannot Find Telnet On Windows Vista and Later

The Telnet application is not installed by default on Windows Vista and later systems. To install the Telnet application:

1. Click the **Start** button and click **Control Panel**.
   - If your control panel has the normal view:
     a. Click **Programs**.
     b. In the **Programs and Features** group, click Turn **Windows Features On or Off**.
   - If your control panel has the classic view:
     a. Click **Programs and Features**.
     b. Click **Turn Windows Features On or Off**.
2. Select the **Telnet Client** check box and click **OK**.

Cannot Connect to Probe Over Telnet

If you cannot connect to your SuperTrace Probe over Telnet, your Ethernet settings are probably incorrect. The easiest way to determine if your probe Ethernet settings are correct is to ping it from your host machine. To ping your probe, from a command prompt, type:

```
$ ping hostname
```

where *hostname* is your probe's hostname, or

```
$ ping ip_address
```

where *ip_address* is your probe's IP address.

If **ping** is successful, it prints a report similar to the following:

```
$ ping ghprobe11111
```

```
    Pinging ghprobe11111.ghs.com [192.168.100.111] with 32 bytes of data:

    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time=10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29
    Reply from 192.168.100.111: bytes=32 time<10ms TTL=29

    Ping statistics for 192.168.100.111:
        Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
       Minimum = 0ms, Maximum =  10ms, Average =  2ms
```

If **ping** is unsuccessful, it prints a report similar to the following:

```
$ ping ghprobe11111

    Pinging ghprobe11111.ghs.com [192.168.100.111] with 32 bytes of data:

    Request timed out.
    Request timed out.
    Request timed out.
    Request timed out.

    Ping statistics for 192.168.100.111:
        Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum =  0ms, Average =  0ms
```

- If **ping** is unsuccessful, verify that an Ethernet cable is plugged in and that the connection light in the upper-right corner of the probe's Ethernet port is illuminated.
    - If it is illuminated, watch the light in the upper-left corner of the Ethernet port. If the light on the left is not flashing periodically, you may need to reconfigure your IP address, netmask, and/or gateway (see “Connecting to Your Probe Over Ethernet” on page 12 for instructions).
    - If it is not illuminated, try a different cable or connect to a different port on your hub or switch.
- If **ping** is successful but you cannot connect to the probe over Telnet, unplug the Ethernet cable from the probe and ping it again, with the cable unattached.
    - If **ping** is still successful, another device on your network probably has the same hostname or IP address as your probe. Obtain a unique address and hostname from your network

administrator and reconfigure the probe (see “Connecting to Your Probe Over Ethernet” on page 12 for instructions).

- If **ping** is no longer successful, or if you have a unique IP address and still have problems, open a Telnet connection from a different host machine. If the problem still persists, contact Green Hills technical support.

Cannot Connect to Probe Over USB

Only one software program can connect to a probe over USB at a time. If you have connected to the probe over USB before, but now are unable to, check that there are no other active USB connections to the probe, such as **mpadmin**, **mpserv**, or the **Probe Administrator**. If there are, close them.

The USB link LED should illuminate when the host machine and the probe have both been booted. If this does not happen:

1. Check that you have properly installed the USB cable between your host machine and the probe.
2. If the previous steps do not solve the problem, unplug the USB cable from the probe and plug it back in again.
3. If the problem persists, contact Green Hills technical support.

Windows is Unable to Start Probe as a USB Device

On some hosts, Windows may report that it is unable to start your device (with error 10) the first time you plug in a probe to the USB port. If this happens, unplug the USB cable and plug it back in. Windows should now be able to start it as a USB device.

Configuring Your Probe for Your Target

This section provides troubleshooting steps for configuring your probe to connect to your target, detect its processors, and read registers. To follow the instructions in this section, your probe must be connected to your target, and your host must be connected to the probe over the serial port. For instructions that explain how to connect to your probe, see “Connecting Your Host to Your Probe Over the Serial Port” on page 9.

If the troubleshooting steps in this section do not address your problem, your target may require extra configuration. For more information, see “Usage Notes” in Appendix D, “Troubleshooting and Usage Notes” in the *Green Hills Debug Probes User's Guide*.

detect Does Not Display a Processor Table

If the **detect** command does not display a processor table, but returns output similar to the following:

```
ERROR 1 (general error): Unable to detect target. (jtag_ir_length=0; TDO
held low?) Please use the "set target" command to configure manually.
ERROR 1 (general error): Timeout while trying to determine number
of cores.
```

The logic high level of the probe may be set incorrectly for your target. See “Configuring the Probe's Logic High Level” on page 53.

For non-BDM targets, **detect** requires that the **debug_type** configuration option matches your target. Please verify that **debug_type** is set correctly if you have a JTAG, cJTAG, or SWD target.

If the **detect** command continues to fail, there may be a low-level debug connection problem. See “Diagnosing Low-Level Debug Connection Problems” on page 51.

detect Sets the Target Settings and then Issues an Error

If the **detect** command is able to set your target setting but then returns an error, it is likely that the probe cannot reset the target. For more information, see “tr Does Not Reset the Target” on page 49.

detect Sets the Target Setting to other

If the **detect** command sets your target setting to `other`, enter the following command at a probe prompt:

```
set target ?
```

Look for your processor in the resulting list. If your processor is listed:

1. Configure the probe's target setting manually with the following command:

   `set target` *`target_string`*

   where *target_string* is the string listed for your processor.
2. Configure the probe's endianness setting:

   `set endianness` *`mode`*

   where *mode* is either `big` or `little`.

If your processor is not listed, it may not be supported. Contact your Green Hills sales representative for more information.

detect Lists Devices Connected to the Probe, but Sets the Target Setting to other

If the **detect** command lists devices connected to the Probe, but sets the target setting to `other`, it may be accompanied by one of the following messages:

```
* - Indicates a core that requires a Probe feature key to debug.
```

If you receive this message, it indicates that you are connected to a target that is not supported by the default Probe configuration. Access to the debug features of this core may be enabled with a feature key (generally available through an early access agreement or a specific license agreement). If you have received a feature key, install the key, reboot your Probe, and try again. If you are entitled to a key but do not have one, contact Green Hills Support.

```
+ - Indicates a core whose detected jtag idcode is known to be shared
by many cores, and detect failed to distinguish among them.
```

If you receive this message, it indicates that you are connected to a target that shares an `idcode` with several other devices, and the Probe could not determine which one you have. In this case, there are two possibilities:

- Your target is supported, but you need to specify it manually using the **set target** command.
- Your target is not supported, in which case you can contact your sales team to learn when the device will be supported.

detect Sets the Target Setting Incorrectly

Because multiple processors within the same family sometimes have the same `PVR` or `idcode`, **detect** might not set the target to the correct processor. If this happens, set your target setting manually using the instructions in “detect Sets the Target Setting to other” on page 47.

detect Passes but vb or vswd Fails

PowerPC 5xx, PowerPC 8xx, and ColdFire targets do not support **vb** or **vswd**. Do not use these commands if you have one of these targets. If your target supports one or both commands, you may see an error message that approximates the following:

```
ERROR 13 (test failed): Test failed: in=input, out=output,
i=iter
```

If you receive the above error (or a general error when running **vswd**):

1. The debug clock may be set too fast. The probe **detect** command uses a clock setting of 10kHz, while the default clock setting is 10MHz. Set the clock to 1MHz by typing the following command at a probe prompt:

   ```
   set clock 1MHz
   ```

   If **vb** or **vswd** work after increasing the clock speed, you can try increasing it slowly to find higher speeds that still work reliably. If 1MHz does not work, try clock settings that are between 10kHz and 1MHz.

2. You may need to set the probe's logic high level. See “Configuring the Probe's Logic High Level” on page 53.
3. If **vb** or **vswd** continue to fail after you have configured the probe's clock speed and high logic level, your target setting may have been set incorrectly. For information about solving this problem, see “detect Sets the Target Setting Incorrectly” on page 48.

detect is Successful but Target Cannot Be Debugged

The **detect** command may perform operations that change the state of a connected target. In some cases, a target may require a post-**detect** power cycle in order to be debugged.

tr Does Not Reset the Target

If your target does not reset when you enter the **tr** command, the debug clock speed might not be set correctly. To adjust the clock speed:

1. At a probe prompt, type `set clock 1MHz` to set the clock speed to 1MHz.
2. Type `tr` to reset your target.

If **tr** still does not reset your target:

- The nHRESET and nTRST lines may be tied together. For more information, see “Diagnosing JTAG TAP and CPU Reset Line Problems” in Appendix D, “Troubleshooting and Usage Notes” in the *Green Hills Debug Probes User's Guide*.

vr Fails or Issues Error 18

If **vb** or **vswd** passes, but **vr** fails or returns an error such as:

```
ERROR 18: the target is not stopped
```

the debug clock speed may be set too high. To fix this problem:

1. At a probe prompt, type the following command to lower the clock speed:

   ```
   set clock 1MHz
   ```

2. Type `vb` (or `vswd`, if applicable) to confirm that you can communicate with the target. If you are using a BDM target, type `tr` instead of `vb`.
3. Type `vr 100` to perform the register test again.

MULTI Reports a "Traceserv Failed to Respond" Error

If MULTI opens a dialog box with the message `traceserv failed to respond`, and your probe booted less than a minute ago, wait one minute and click the **Continue** button. When the probe boots, it performs a self test that can take up to one minute. This test must complete before the probe can begin collecting trace data.

The Trace List Is Empty, Near Empty, or Reports an Error

If the **Trace List** is empty, near empty, or reports `No Full Address Broadcast Found`, the SuperTrace Probe is probably unable to collect trace data from your target. In this case:

- If you have a trace pod or adapter, make sure that it is securely connected to the cable. Also make sure that the cable is securely connected to the SuperTrace Probe body.
- Make sure the trace pod, adapter, or High-Speed Serial Trace cable is connected securely to the connector on your board, and is in the correct orientation.
- Make sure the trace outputs are enabled on your board (see “Enabling Your Target's Trace Port” on page 53).
- Make sure the SuperTrace Probe's adapter setting is `auto`.

General Configuration Instructions

While the previous sections explained how to fix specific problems that you may encounter while configuring your probe, this section explains how to troubleshoot probe problems that are more general in nature.

Diagnosing Low-Level Debug Connection Problems

Use the **vta** command to troubleshoot low-level debug connection problems. **vta** verifies that the probe can individually control each pin on the target by individually setting each pin HIGH and LOW, checking for shorts, opens, and stuck-at conditions. For example, **vta** can detect if the TCK pin is shorted to GND, or if the TMS pin is not making contact with the probe.

To run this test:

1. Unplug the ribbon cable or pod from your target in case there is a shorted pin or other problem that could cause damage.
2. At a probe prompt, type `vta`.

The results of a successful test look similar to the following output (only a few lines are shown here):

```
>vta
Testing arm-20 adapter pins:
                      VTREF passed. [100%]
                    VSUPPLY passed. [100%]
                      NTRST passed. [100%]
                        GND passed. [100%]
                        TDI passed. [100%]
                        GND passed. [100%]
                        TMS passed. [100%]
```

If a pin has a connection problem, the probe issues an error. For example, if the probe could not bring `TDO` low, it would print:

```
TDO was not initially low.
```

Check that target adapter type shown in the results correctly matches the adapter on the probe's front panel. If this test fails and the adapter type is correct, there may be a problem with the adapter on the probe. In this situation:

- Repeat the test with the ribbon cable unplugged from the adapter.
- Verify that the adapter is plugged in securely, and the screws are snug.
- Remove the adapter, inspect it for damage or contaminants, re-install it, and repeat the test.

If the test still fails, the probe or target adapter may be damaged. In this situation:

- Try a different target adapter
- Try a different cable. If using an active COP pod, try a passive COP cable or a shielded COP cable.
- Contact Green Hills technical support.

Note

Some debug pins controlled by the probe (for example, reset lines) are connected to open-drain connections with more than one driver, meaning that the probe cannot drive them HIGH. When you run **vta** with your target unplugged, it issues the following message for each of these pins, because there is no pull-up resistor on the target adapter to bring the signal HIGH:

```
PIN could not be brought high.
```

If *PIN* is connected to an open-drain connection, this does not necessarily mean that there is a problem with the adapter, but it indicates that there should be a pull-up resistor on the target board for this pin.

Configuring the Probe's Logic High Level

To configure the logic high level for your probe:

- If the target is connected through a Legacy Kit, the SuperTrace Probe does not support detecting the correct logic high level automatically. See below to set the logic high level manually.
- Type `dlh` at a probe prompt to detect the correct logic high level for your target.

To set the logic high level manually:

1. Consult your target's reference manual to confirm its logic high level.
2. Type the following command at a probe prompt:

   `set logic_high` *`level`*

   where *level* is the logic high level for your target. To confirm that the probe has updated this setting, type:

   `set logic_high`

The range of supported **logic_high** values varies depending on the adapter. Type `set logic_high ?` to determine the supported values for your currently connected adapter.

Enabling Your Target's Trace Port

In order to collect trace data, you must enable the trace port on your target. If you selected your target in the Project Wizard, it may have provided you with one of the following ways to enable trace:

- The generated setup script may enable trace ports by default. In this case, you do not need to do anything.
- The generated setup script may require you to set a variable in the script to enable trace. To check if this is the case, in the Project Manager, open the **Target Resources** project and double-click **mpserv_standard.mbs** to edit it.

- There may be two setup scripts, one that enables trace and one that does not. In this case, you must specify the setup script that enables trace (see the documentation about specifying setup scripts in the *MULTI: Debugging* book).
- If you are using High-Speed Serial Trace, you may need to perform additional steps. For more information, see "Additional Considerations for High-Speed Serial Trace" in Chapter 2, "Configuring Target Resources" in *Green Hills Debug Probes User's Guide*.

If you are using custom hardware, refer to your hardware's manual for information about enabling the trace port, and add the necessary commands to your setup script.

Recovering a Probe That Does Not Boot Properly

If your SuperTrace Probe is not booting properly, you can recover it using the serial port with the instructions below:

1. Turn your probe off.
2. On your host machine, run MULTI. In the MULTI Launcher, select **Utilities → Probe Administrator**.
3. In the **Probe Administrator** window, select **Probe → Recover Probe**. A dialog box opens to confirm that you want to update your firmware. Click **OK**.
4. The **Update Probe Firmware** window opens. Enter the full path to a firmware file in the **Firmware File** box, or click the  button and select it in the file chooser. Click the **Flash Probe** button.
5. The **Serial Boot** dialog box opens. If the correct serial port is not already displayed, type the name of the serial port to which your probe is connected. Click **OK**.
6. A dialog box opens. Turn your probe on while holding down the **User** button (as instructed by the dialog). After turning on your probe, click the **OK** button.
7. The **Reloading Probe Firmware** dialog box opens and displays the status of the update. When it is finished, click **Done**.

8. Power cycle your probe. The new firmware is now loaded and running.

Note

For information about updating probe firmware, see “Updating Probe Firmware” in Chapter 1, “Administering Your Probe” in *Green Hills Debug Probes User's Guide*.

Uninstalling Probe Software

To uninstall probe software on Linux, follow the instructions for using **gpatch** located at ***install_dir*/restore/readme.txt**.

To uninstall probe software on Windows, use the **Add/Remove Programs** feature in your version of Windows.

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