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CodeWarrior TAP Probe User Guide

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Introducing the CodeWarrior TAP Probe

The CodeWarrior TAP probe allows your personal computer workstation to communicate with Freescale Power Architecture, StarCore, and ColdFire processors using a privileged debug connection, such as COP, ONCE, or BDM.

This chapter explains:

- [What is the CodeWarrior TAP Probe?](#)
- [Operating Requirements](#)
- [Related Documentation](#)

CAUTION The CodeWarrior TAP probe contains components that are subject to damage from electrostatic discharge. Whenever you are using, handling, or transporting the CodeWarrior TAP probe, or connecting to or disconnecting from a target system, always use proper anti-static protection measures, including static-free bench pads and grounded wrist straps.

What is the CodeWarrior TAP Probe?

The CodeWarrior TAP probe uses advanced emulation technology to provide control of and visibility into your target embedded system. Combined with a host debugger, the CodeWarrior TAP probe speeds the debugging process by letting you interactively control and examine the state of your target system.

The basic CodeWarrior TAP probe system is composed of two parts:

- The CodeWarrior TAP probe as shown in [Figure 1.1](#), which provides visibility into and control of your target system using a JTAG or BDM interface and connects to your host computer through a USB 2.0, 10BaseT, or 100BaseT link.
- JTAG/COP, StarCore or ColdFire/BDM probe tip, which is designed to provide a physical and electrical interface to the target system processor that you want to gain visibility into.

Introducing the CodeWarrior TAP Probe

What is the CodeWarrior TAP Probe?

Figure 1.1 CodeWarrior TAP Probe



Product Highlights

The CodeWarrior TAP probe has these features:

- Supports the following systems: Power Architecture processors, StarCore processors, and ColdFire™ processors. Go to the <http://freescal.com/CWTAP> for the latest supported Freescale processors
- Supports all CPU core speeds
- Lets you control and debug software running in-target, with minimal intrusion into target system operation
- Lets you debug code in cache, ROM, RAM, and flash memory
- Supports 10/100 Ethernet network connection
- Supports telnet access to your target systems serial port, allowing you to interact with your target system's serial port over the network
- Supports USB 2.0 High-speed connection
- USB Powered
- Supports both big and little endian byte-order
- Software debug capabilities, usually part of host software like CodeWarrior, include:
 - Control instruction execution
 - Display and modify target system memory
 - Examine and modify any processor registers

- Run to breakpoints in ROM, RAM, or flash memory
- Single-step through source and assembly language code views
- Step into, over, or out of functions
- Collect and analyze real-time data
- With the correct host level software, the CW TAP can perform boundary scan testing
- With the correct host level software, the CW TAP can be used to program all onboard memories

The Debugging Environment

The CodeWarrior TAP probe works with the CodeWarrior debugger to give you control over the emulation functions and your target system.

CodeWarrior TAP Probe Benefits

The CodeWarrior TAP probe provides these key benefits:

- *Visibility:* The CodeWarrior TAP probe makes it possible for you to observe registers and the current state of target system memory. You can halt program execution at predefined states and examine the data for a particular program state.
- *Control:* You can conveniently control the state of the target system by downloading code, manually modifying processor registers and memory, single-stepping through the code, or setting breakpoints.

Target Connections

The TAP probe connects to your target through the standard debug port for the processor family and supports a single target connection, based on the connected probe tip. For details on processor list, go to <http://freescale.com/CWTAP>.

The TAP probes are available in the following Freescale versions:

- JTAG/COP for Power Architecture™, QorIQ, PQII, PQIII, AMP, Qonverge, but not PQI
- BDM for ColdFire® targets (not ColdFire v1)
- OnCE for StarCore

For information on connecting to a target, refer to the [Connecting to the Target System](#) chapter.

Operating Requirements

Before setting up the system, you should make sure that the operating environment is prepared.

Standard Electrostatic Precautions

This instrument contains static-sensitive components that are subject to damage from electrostatic discharge. Use standard ESD precautions when transporting, handling, or using the instrument and the target, when connecting/disconnecting the instrument and the target, and when removing the cover of the instrument.

We recommend that you use the following precautions:

- Use wrist straps or heel bands with a 1 M Ω resistor connected to ground.
- On the work surface and floor, use static conductive mats with a 1 M Ω resistor connected to ground.
- Keep high static-producing items, such as non-ESD-approved plastics, tape and packaging foam, away from the instrument and the target.

The above precautions should be considered as minimum requirements for a static-controlled environment.

Operating Temperature

For operating temperature of TAP probe, refer to the [Physical Considerations](#) topic.

Electrical Requirements

The TAP probe can be powered through a USB cable and does not require an external power supply. It is designed to be plugged directly into a host computer, but also can work with self-powered hubs. For details on Bus-powered hubs, refer to the [Electrical Characteristics](#) topic. If your hub is not able to provide sufficient power, connect the TAP probe directly to your host PC, or purchase a self-powered USB hub.

If you only plan to use Ethernet communications, the CodeWarrior TAP probe can be powered from the external power supply provided with your unit. It can use line voltages of 100-240 VAC (50/60 Hz).

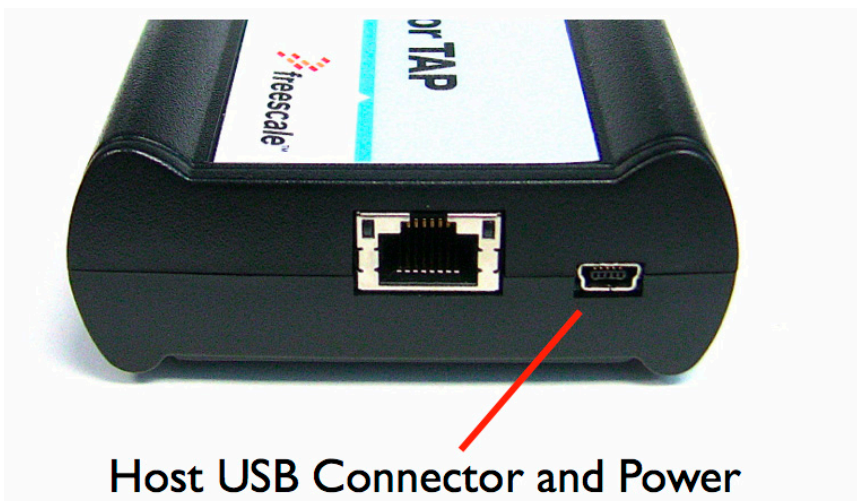
We recommend that you use a surge protector between the power supply and AC power.

Connecting the Power Supply Cable

Connect the power supply USB cable connector to the USB connector on the CodeWarrior TAP probe as shown below.

CAUTION Connect only the provided power supply to the CodeWarrior TAP probe. Other power supplies may look similar, but can damage the probe if the supply specifications differ from the required specifications.

Figure 1.2 CodeWarrior TAP Probe with USB Connector



Cycling Power to the System

When you need to apply or cycle power to the CodeWarrior TAP probe, connect or disconnect the power cable from the power source or from the probe. After you have connected the probe to your target system, use the following sequence for applying or removing the power:

To turn the power on

1. Turn on CodeWarrior TAP probe power.
2. Turn on target system power.

Introducing the CodeWarrior TAP Probe

Related Documentation

To turn the power off

1. Turn off target system power.
2. Turn off CodeWarrior TAP probe power.

NOTE In the case of PowerPC targets with a \overline{QACK} signal, for the CodeWarrior TAP probe to properly stop and restart the target, the \overline{QACK} signal must be pulled low. The CodeWarrior TAP probe pulls this signal low through the probe tip.

Related Documentation

The CodeWarrior documentation explains how to install and configure the CodeWarrior IDE and debugger and use the CodeWarrior TAP.

Connecting to a Network

This chapter explains how to connect the CodeWarrior TAP probe to an existing TCP/IP network.

The CodeWarrior TAP probe is an Ethernet device that may be configured for TCP/IP using DHCP to acquire its IP configuration (the default method) or through a static IP configuration.

This chapter explains:

- [Connecting the CodeWarrior TAP Probe to the Network](#)
- [Customizing the CodeWarrior TAP Probe](#)
- [Testing Network Communication](#)

Connecting the CodeWarrior TAP Probe to the Network

The CodeWarrior TAP probe's default operation is to acquire its network configuration automatically using DHCP, and attempt to register its hostname with a name server. The factory assigned host name is FSLXXYYZZ where XYYZZ is the last three octets of the Ethernet MAC address, provided on a label on the bottom side of the probe. For example, if the probe's Ethernet MAC address is 00:04:9f:00:77:31, the host name will be FSL007731. For TAP probe serial number, see [Figure 4.1](#).

The CodeWarrior TAP probe can connect directly to a network using Ethernet (10/100BaseT) cables.

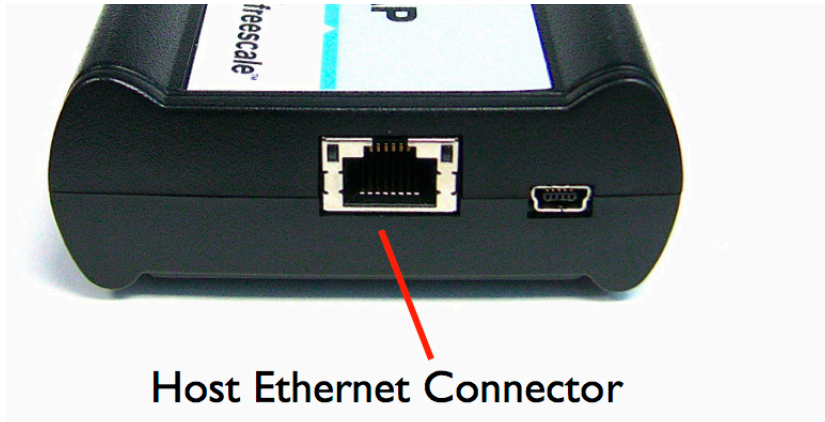
Connecting to a Network

Connecting the CodeWarrior TAP Probe to the Network

To connect to the Ethernet interface

1. Plug one end of the supplied RJ-45 cable (p/n 600-75499) into the RJ-45 connector of the CodeWarrior TAP probe.

Figure 2.1 CodeWarrior TAP Probe with Ethernet Connector



2. Connect the other end of the RJ-45 cable into the RJ-45 connector of your Ethernet network or host computer.

Figure 2.2 CodeWarrior TAP Probe with an RJ-45 Cable Attached



NOTE When you configure the debugger for the hardware connection, you will need to specify the CodeWarrior TAP probe IP address or hostname. The CCS

`findcc` utility is used to search any probe on the local subnet. For more information, refer to the [Using CCS to Search For CodeWarrior TAP Probes](#) topic.

NOTE Depending on the type and complexity of your network, your network administrator may need to update network server tables so that the network accesses the CodeWarrior TAP probe correctly. Updating network server tables requires both a detailed knowledge of Ethernet address resolution and network routing with write access permission to the server tables. For more information on network administration, refer to the [Network Administration](#) topic.

Customizing the CodeWarrior TAP Probe

As shipped, the CodeWarrior TAP probe acquires its network configuration automatically using DHCP. If you cannot use DHCP, you must configure the probe for your network using static IP address resolution.

To manually configure the network settings of the CodeWarrior TAP probe for your network, access the probe configuration console as described below and use the probe on-board setup utility `netparam` to change the probe network settings. The probe `netparam` utility lets you select and modify network parameters that are saved in probe memory. Use `netparam` to configure the probe to match your network address resolution and routing protocols.

If the probe needs to communicate with hosts on other subnets, you will need to configure the probe for one of the following routing options:

- Default gateways
- Static routing tables

To Access the CodeWarrior TAP Configuration Console

1. Connect the other end of the USB cable to the USB connector of the CodeWarrior TAP probe as shown in [Figure 2.3](#).

Figure 2.3 CodeWarrior TAP Probe with USB Cable Attached



2. Wait for the TX/RX led to start flashing green.
3. Identify the serial port device assigned to the CodeWarrior TAP. On Windows, click **Start > Control Panel > Administrative Tools > Computer Management > Device Manager > Ports** and then select **USB serial port** from the ports list. On Linux, the device file is located at: `/dev/ttyACM0`.
4. When prompted, press **Enter**. The login banner should be displayed and the `core>` command-line prompt appears.

To customize the CodeWarrior TAP probe network settings

1. Change the CodeWarrior TAP probe network settings.
 - a. At the `core>` prompt, enter the `netparam` command to view the current settings.
 - b. For network setup, see [netparam](#) section for syntax and options. For more information on installing the CodeWarrior TAP probe on a network, see [Network Administration](#) section.
 - c. At the `core>` prompt, enter the `netparam` commands and required parameters.
2. At the `core>` prompt, enter `reset` to reboot the CodeWarrior TAP probe to activate the new network settings.

Example: Assign a static IP address and hostname to the CodeWarrior TAP probe

If the CodeWarrior TAP probe has a static IP address of 195.121.1.2 and a hostname of lab01, enter the following commands:

```
core> netparam bootconfig static:lab01
core> netparam static_ip_address 195.121.1.2
core> reset
```

The `netparam` utility copies its settings into non-volatile memory on the probe. Follow these rules while using `netparam` utility:

- Each time you enter a `netparam` command, wait for the `core>` prompt to re-appear before entering the next command. The prompt indicates that the parameter change has been logged.
- When you have finished entering all settings, type `reset` at the `core>` prompt. When the probe restarts, it will use the new `netparam` parameters.

Testing Network Communication

You can use the `ping` command to ensure that the CodeWarrior TAP probe can communicate with the host.

To verify communication

At a host command prompt, type the following:

```
ping hostname | ip_address
```

where *hostname* is the name and *ip_address* is the IP address assigned to the CodeWarrior TAP probe.

If no output is displayed on the screen, check the following:

Connecting to a Network

Testing Network Communication

- The physical connections are tight.
- The CodeWarrior TAP probe address and netmask in the `hosts` file match those in CodeWarrior TAP probe flash.
- The netmask used for the CodeWarrior TAP probe and for the Ethernet Network Interface Card (NIC) are appropriate to the class of the IP address.

Connecting to the Target System

To use your CodeWarrior TAP probe, you must have a prototype hardware or an evaluation board.

This chapter explains how to connect a CodeWarrior TAP probe to the target system.

This chapter explains:

- [Debug Port Connector Information](#)
- [Connecting to the Target System](#)
- [Connecting to the Target System Serial Port](#)

Debug Port Connector Information

The CodeWarrior TAP probe offers debugging capabilities without modifying any target system code or any special I/O port in the target system for communication with a monitor program running on the target system. Target system connections can be made using the debug ports (JTAG/COP, StarCore, or ColdFire BDM).

The CodeWarrior TAP probe connects to the target system's JTAG header using a probe tip adapter and ribbon cable. The TAP probe is a powerful development tool for use with a wide variety of processors that use either JTAG/COP, ColdFire BDM, or StarCore debug interfaces.

The following appendices describe the debug port connector specifications:

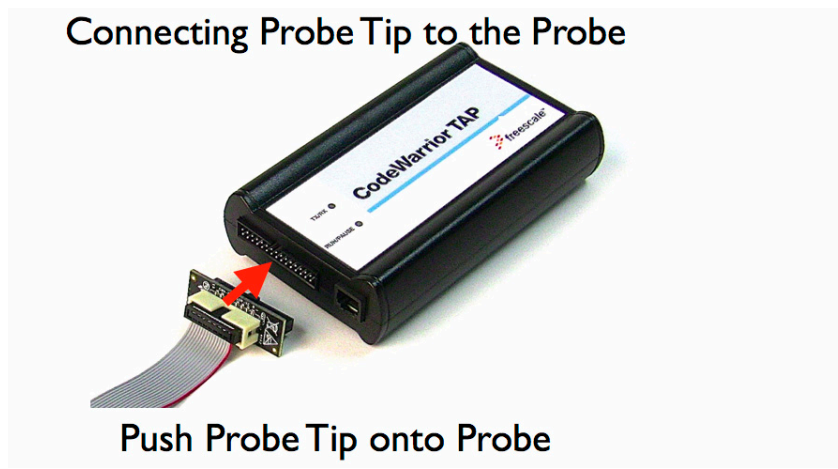
- [“JTAG/COP Connector Information” on page 57](#)
- [“ColdFire BDM Connector Information” on page 67](#)

Connecting to the Target System

CAUTION Failure to properly connect the TAP probe to the target may damage the probe or target. Verify all connections before applying power.

The target system must have a debug port header that you can connect to the CW TAP probe. Make sure that you properly align the TAP multi-pin socket connector with the multi-pin header on your target system.

Figure 3.1 CW TAP Probe — Connecting Probe Tip to the Probe



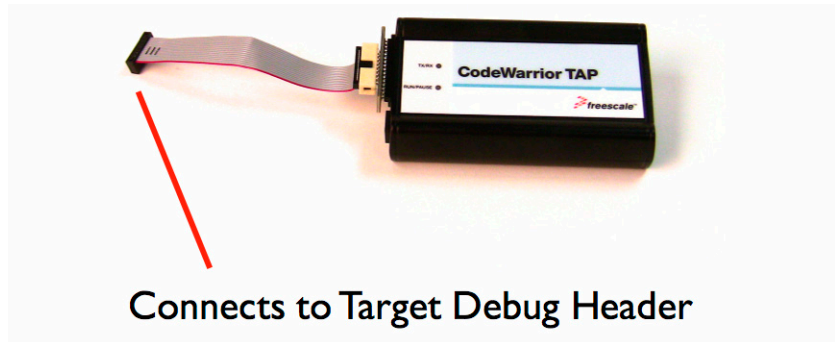
NOTE Pin 1 is clearly marked on the gray ribbon cable by a red line down one side of the cable and a small triangle in the plastic socket.

Connecting Probe Tip to the Target

To connect the CW TAP cable to the target debug port header:

1. Turn off the power to the target system.
2. Make sure that the USB cable from the TAP probe is not connected to the host computer.
3. Connect the probe tip to the CodeWarrior TAP probe.
4. Make sure that pin 1 of the gray ribbon cable connector aligns with pin 1 on the target's debug port header.

Figure 3.2 CW TAP Probe — Connecting to the Target



5. Gently (but firmly) press the connector onto the target system debug port header.

Connecting to the Target System Serial Port

Many target system boards have a built-in serial port. A console interface connection to the serial port of the target system lets you query and configure the state of your target system.

Figure 3.3 CW TAP Probe — Target Serial Connector



The CodeWarrior TAP probe provides a serial port which can be configured to access the serial port of the target system. This is useful if you need to access the serial port of a remotely located target system over Ethernet from the host system.

Connecting to the Target System

Connecting to the Target System Serial Port

The following sections explain how to access the serial port of the target system:

- [Connecting the CodeWarrior TAP Probe to the Target System](#)
- [Configuring the Target Serial Port](#)
- [Accessing the Target Serial Port](#)

Connecting the CodeWarrior TAP Probe to the Target System

An RJ-25 cable (P/N 600-76822) is provided with the CodeWarrior TAP probe to connect to the serial port of your target system.

To connect the serial cable between the CodeWarrior TAP probe and the serial port of the target system

1. Connect one end of the RJ-25 cable, and the appropriate adapter, to the serial port on your target system board.
2. Connect the other end of the RJ-25 cable to the CodeWarrior TAP probe RJ-25 serial connector.

Configuring the Target Serial Port

[Table 3.1](#) shows the default settings of the CodeWarrior TAP Target Serial port.

Table 3.1 CodeWarrior TAP Probe Target Serial Port Default Settings

For this option...	Select...
Baud rate	9600
Data bits	data8
Stop bits	stop1
Parity	noparity
Hardware flow control	nortscts
XON/XOFF flow control	noxon
Target echo feature	echo

If the CodeWarrior TAP probe Target Serial port settings do not match the serial port settings of your target system, use the following steps:

To configure the CodeWarrior TAP probe serial port

1. Make sure network communications have already been configured correctly. For more information, refer to the [Connecting to a Network](#) chapter or [Setting Up a Standalone PC Ethernet](#) appendix.
2. Connect to the CodeWarrior TAP probe internal setup utility. For more information, refer to the [Connecting to the CodeWarrior TAP Probe Setup Utility](#) topic.
3. When the `core>` prompt appears on the terminal, enter the `tgTTY` command to configure the CodeWarrior TAP probe Target Serial port. The syntax is:

```
tgTTY
[9600|19200|38400|57600|115200]
[data8|data5|data6|data7]
[stop1|stop2]
[noparity|oddparity|evenparity|lowparity|highparity]
[rtcts|nortcts]
[xon|noxon]
[echo|noecho]
```

For example:

```
tgTTY 19200 data8 stop2 noparity nortcts noxon echo
```

4. Verify the Target Serial port configuration at the `core>` prompt by entering the `tgTTY` command by itself:

```
tgTTY
```

To restore the target serial port to the default settings

1. Make sure network communications has already been configured correctly. For more information, refer to the [Connecting to a Network](#) chapter or [Setting Up a Standalone PC Ethernet](#) appendix.
2. Connect to the Ethernet TAP probe internal setup utility. For more information, refer to the [Connecting to the CodeWarrior TAP Probe Setup Utility](#) topic.
3. When the `core>` prompt appears on the terminal, use the `tgTTY` command to reset the Target Serial port to the default settings:

```
tgTTY default
```

Accessing the Target Serial Port

You can use telnet to connect to the CodeWarrior TAP probe Target Serial port and access the serial port of your target system remotely over Ethernet.

To telnet to the Target Serial port

1. Make sure that you have physically connected the Ethernet TAP probe RJ-25 cable to your target system (for more information, refer to the [Connecting the CodeWarrior TAP Probe to the Target System](#) topic).
2. Verify the serial port settings (refer to the [Configuring the Target Serial Port](#) topic).
3. Start a telnet session and connect to the Ethernet TAP probe Target Serial port:

```
telnet {hostname | ip_address} 1082
```

Use the host name or IP address of the probe. For static IP, the host name must be the same one you entered into the `hosts` database file; refer to the [Connecting to a Network](#) chapter or [Setting Up a Standalone PC Ethernet](#) appendix. To identify the IP address of any probe on the subnet, refer to the [Using CCS to Search For CodeWarrior TAP Probes](#) topic. The Target Serial port number of the CodeWarrior TAP probe is 1082.

4. You should now have access to the serial port of your target system. You can use this connection in the same manner as if your host computer were connected directly to the serial port of your target system.

Using the CodeWarrior TAP Probe

This chapter provides system startup procedures and explains how the CodeWarrior TAP probe is accessed remotely.

This chapter contains the following sections:

- [Debugging with the CodeWarrior TAP System](#)
- [Accessing a CodeWarrior TAP Probe Remotely](#)

Debugging with the CodeWarrior TAP System

This section explains how to start debugging with the CodeWarrior TAP probe.

Before starting debug with the CodeWarrior TAP probe, make sure you have:

- Connected the CodeWarrior TAP probe to your network or computer.
- Connected the CodeWarrior TAP probe to the target system.
- Installed the debugger software such as CodeWarrior Development Studio and properly configure it to communicate with the CodeWarrior TAP probe.

To start the CodeWarrior TAP probe

1. Apply power to the CodeWarrior TAP probe.
2. Apply power to the target system.
3. Start the CW debugger.
4. Configure the debugger for the CodeWarrior TAP connection.

LEDs are provided to indicate the status of the CodeWarrior TAP probe. For details on the LED indicators, refer to the [CodeWarrior TAP Probe Specifications](#) topic.

You are now ready to begin your debug session. For information on using the debugger, refer to the *Targeting User Guide*.