Curiosity PIC64GX1000 Kit ES Quickstart Guide

Table of Contents

1. Introduction (Ask a Question)

This Quick Start Guide outlines the steps to download drivers and software, connect, power up and communicate with the Curiosity Kit board.

The following table lists the items included in the Curiosity PIC64GX1000 Kit ES.

Table 1-1. Kit Contents—CURIOSITY-PIC64GX1000-KIT-ES

Quantity	Description
1	Curiosity PIC64GX1000 Kit ES Board with PIC64GX1000-V/FCS
1	USB type C Male to C Male 3.28' (1.00m) shielded cable
1	SanDisk® Ultra microSD UHS-I Card 32 GB, 120 MB/s R
1	Quickstart card

2. Board components (Ask a Question)

The following figures show the top and the bottom view of the board and the components.

Figure 2-1. Top View of Curiosity Kit Board

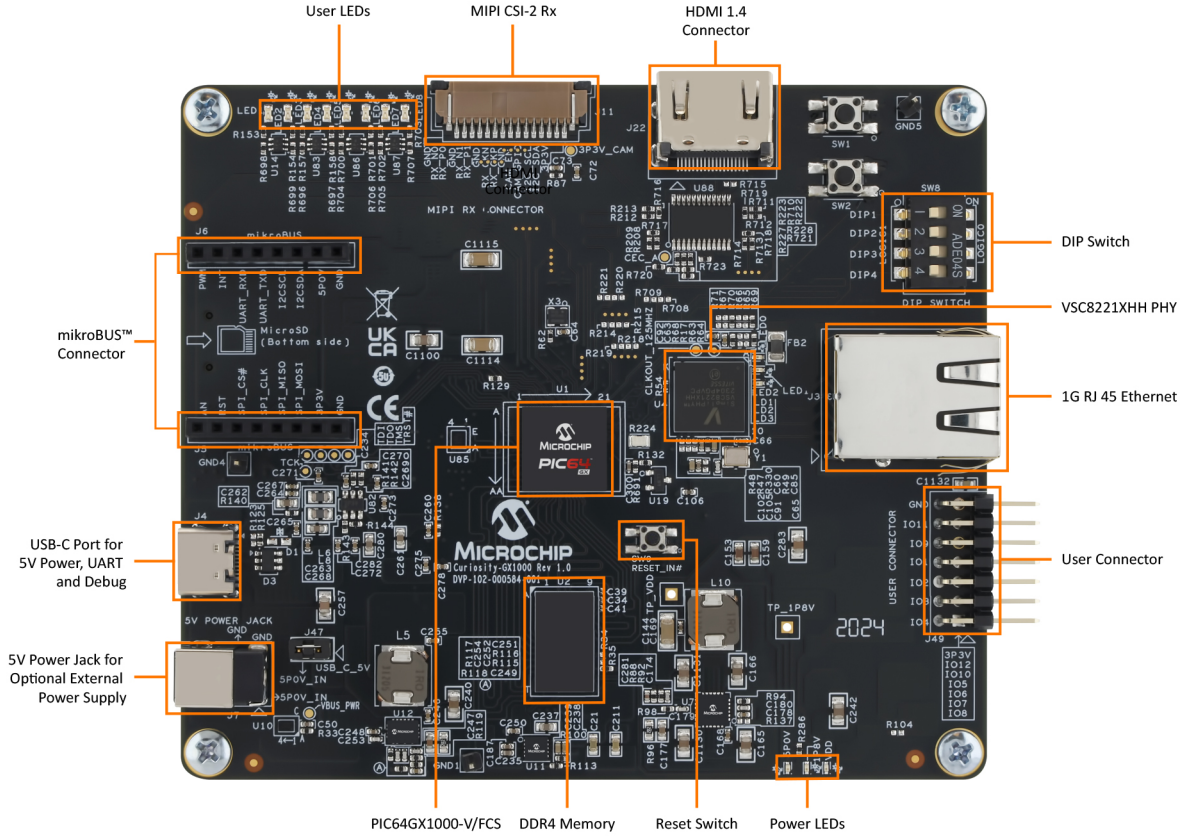
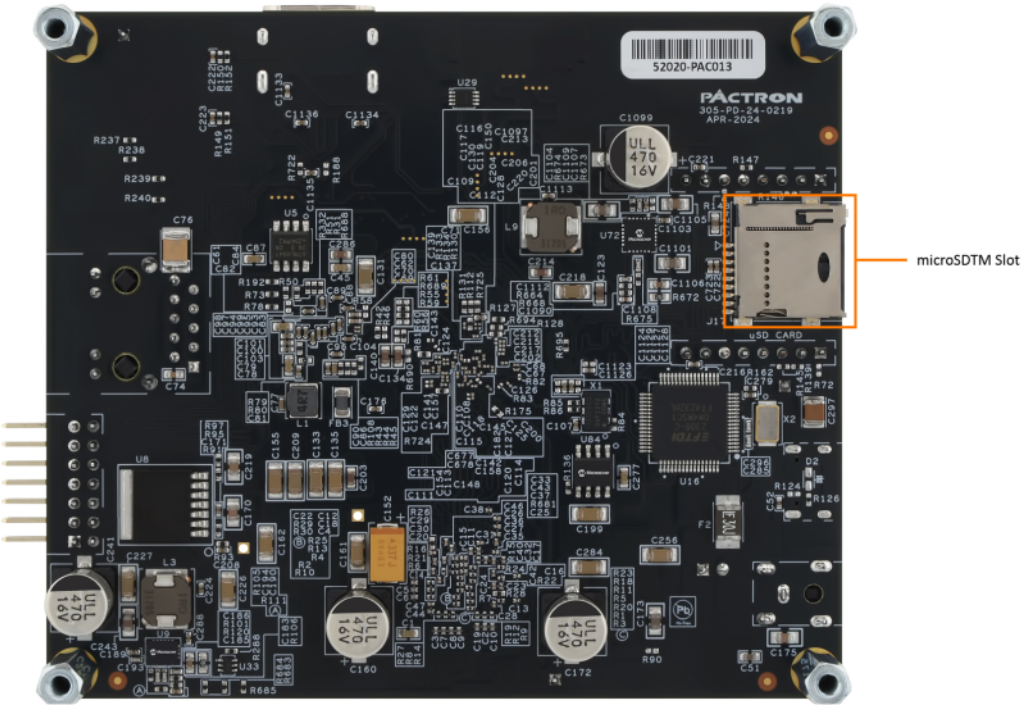


Figure 2-2. Bottom View of Curiosity Kit Board



3. Getting Started with Curiosity Kit (Ask a Question)

Windows® and Linux® host operating systems require different drivers. This section describes the driver installation processes for both the Windows and Linux systems.

Note: For optimal performance and to avoid compatibility issues, power the board directly from a laptop or the USB port of the PC. The kit has not been tested with USB ports from the docking stations, so using a USB port on a laptop or PC is the most reliable option.

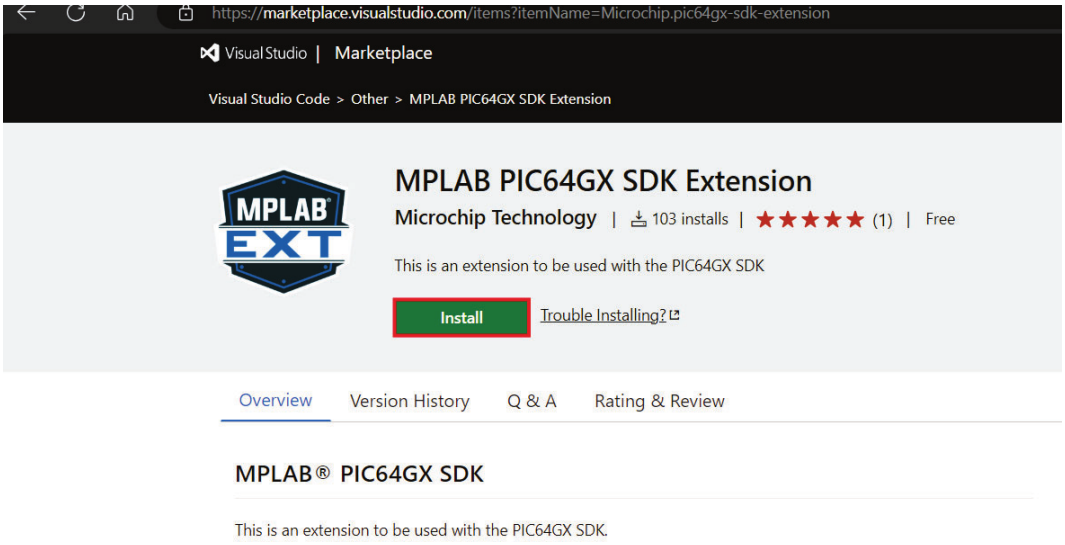
3.1 Connecting to UART Interfaces from Windows Hosts (Ask a Question)

To manage communication between the board and the host PC, you need FTDI and libusb drivers.

To download and install these drivers, follow these steps:

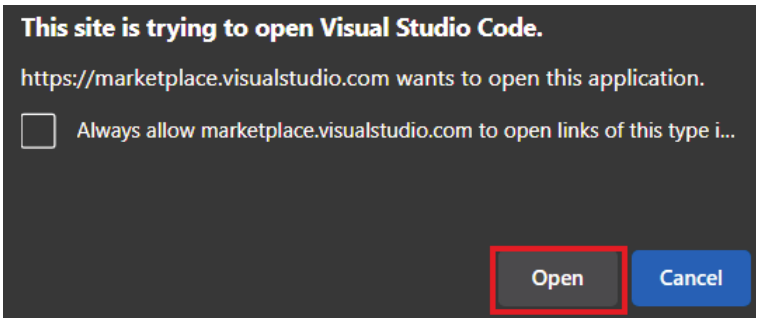
1. Install Visual Studio Code.
2. Download and install the MPLAB PIC64GX SDK Visual Studio Code extension:
   a. On the **VS Code Marketplace** page, click **Install**.

Figure 3-1. Open VS Code Marketplace



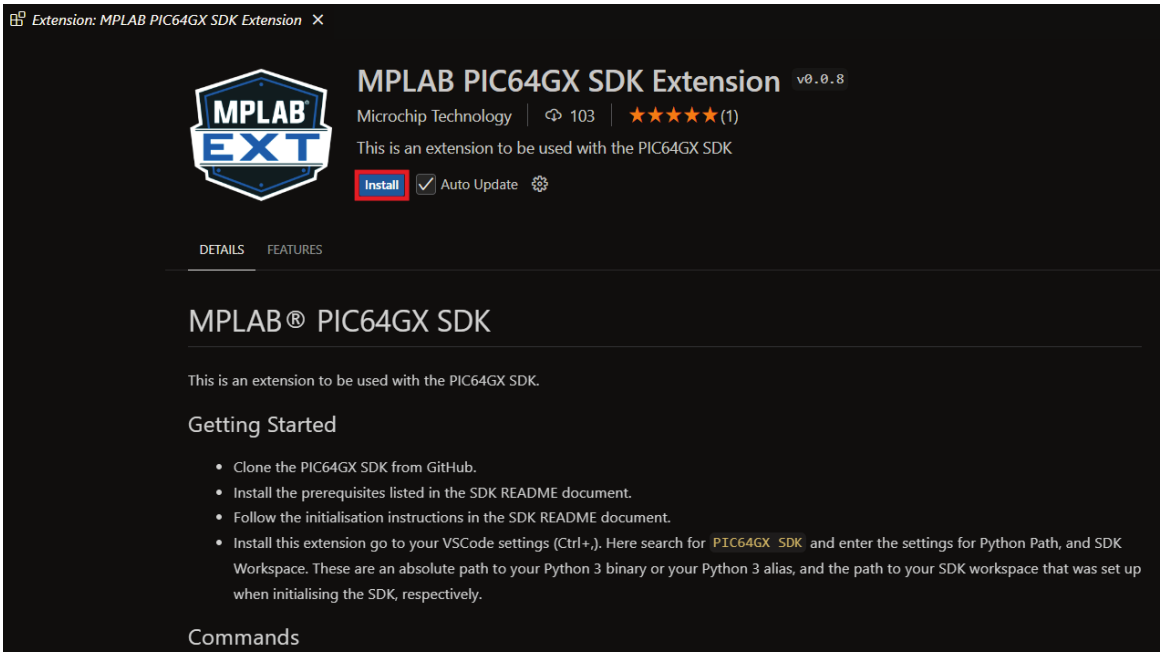
   b. If a warning appears saying VS Code will launch, click **Open**.

Figure 3-2. Allow VS Code to Launch



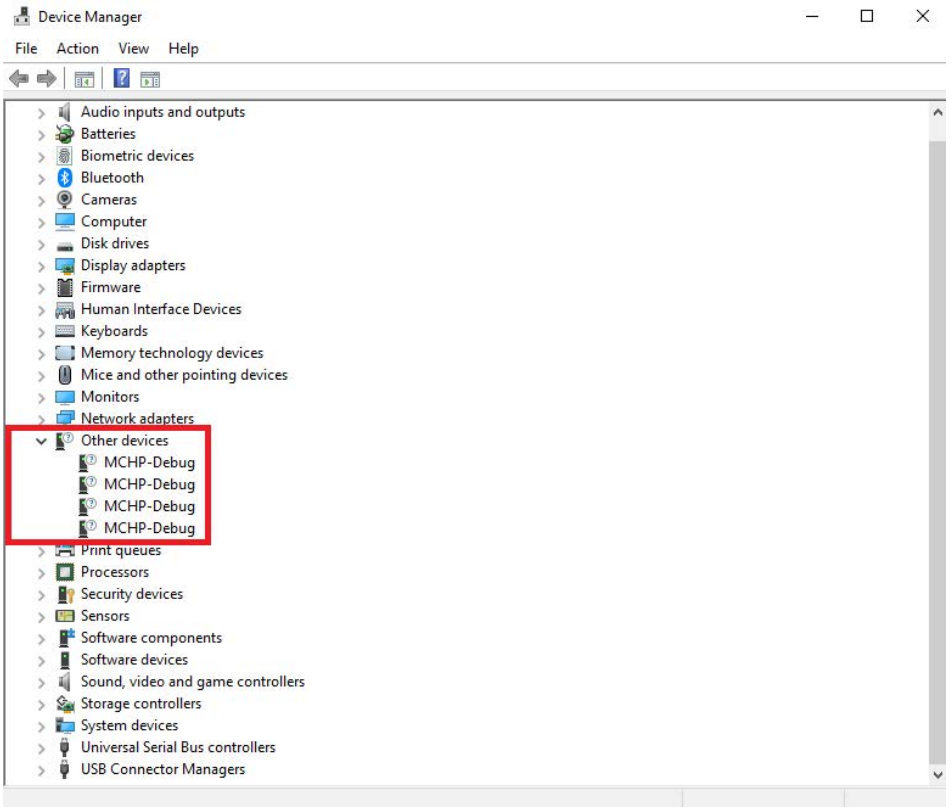
   c. In VS Code, click **Install**.

Figure 3-3. Launch VS Code and Install the Extension



3. Connect the USB-C cable to the USB-C port on the kit and a USB-C port on the host PC. The three power LEDs on the kit must illuminate.
   Note: If the three power LEDs fail to illuminate, then power the kit using an external power supply and the 5V barrel jack.
4. To install the PIC64GX drivers follow these steps:
   a. To open the Windows **Device Manager**, right-click the **Start** button (press **Windows key + X**), and then click **Device Manager**.
   b. In the **Device Manager** window, click **Other devices** to expand the section.

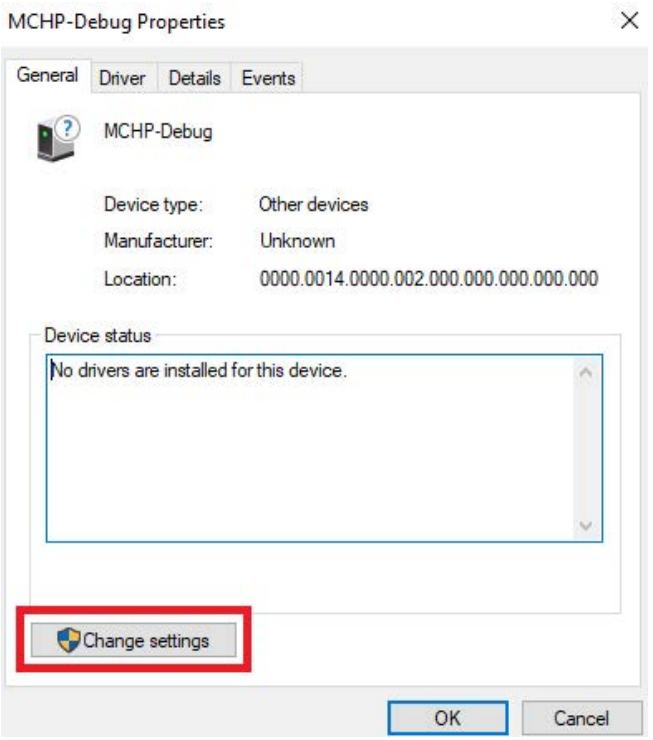
Figure 3-4. Other Devices



c. Double-click one of the devices named, **MCHP-Debug**. The **MCHP-Debug Properties** page opens.

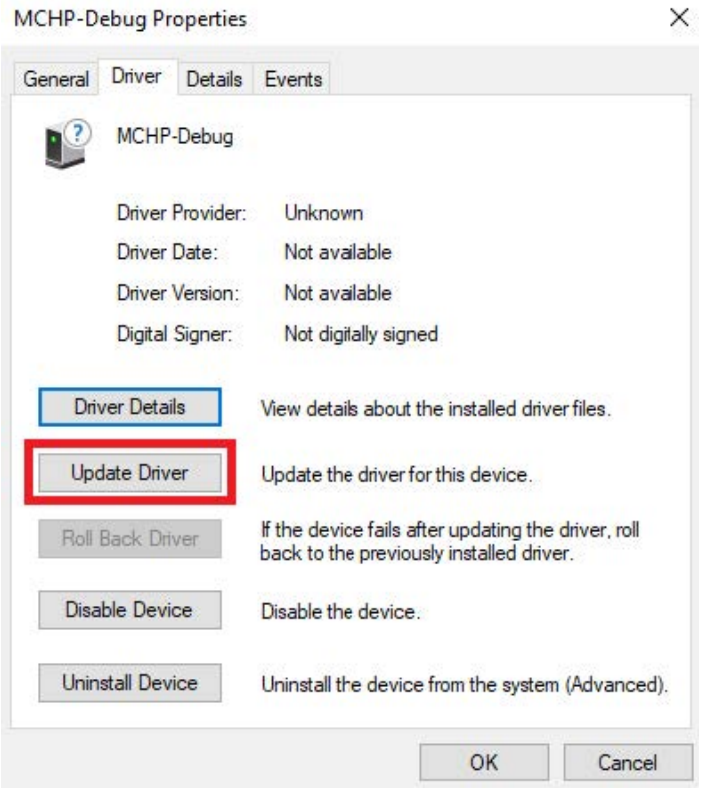
d. Click **Change settings**.
Note: You require administrator privileges.

Figure 3-5. Change Settings



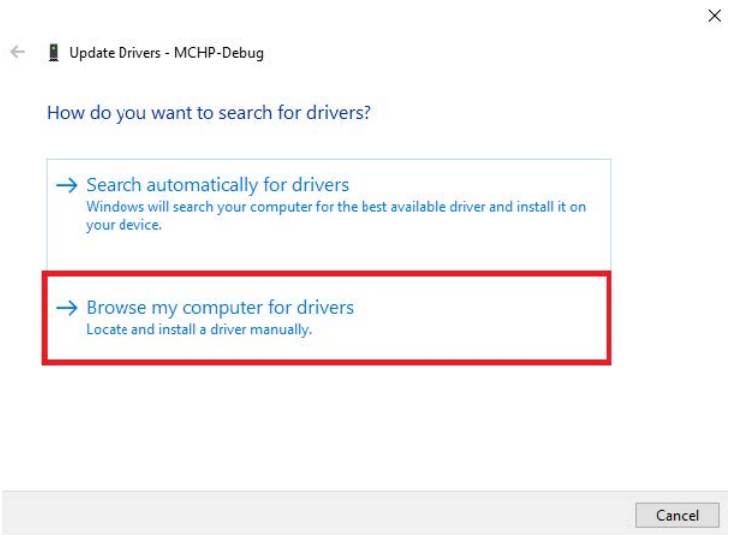
e. On the **Driver** tab, click **Update Driver**. The **Update Drivers - MCHP-Debug** window opens.

Figure 3-6. Update Driver



f. Click **Browse my computer for drivers.**

Figure 3-7. Browse for Driver



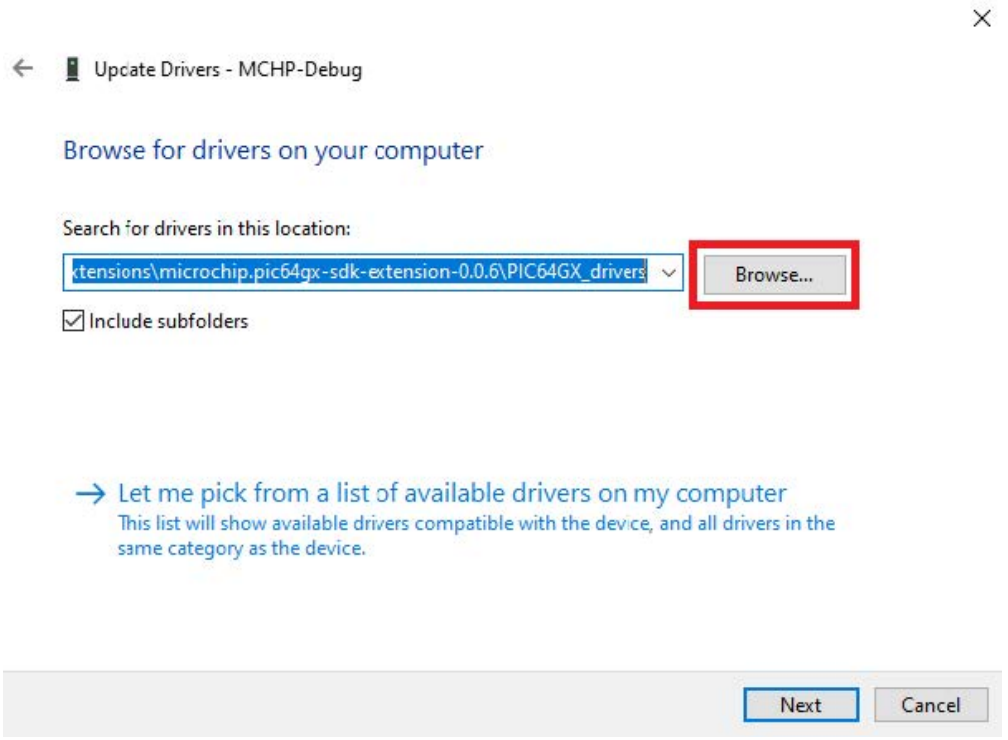
g. Click **Browse** and use the file navigation window to select the driver folder. The driver is in the MPLAB PIC64GX SDK Extension.
Example: `C:/Users/<USER>/.vscode/exenstions/microchip.pic64gx-sdk-extension-<VERSION>/PIC64GX_drivers`

Notes:

i. `<USER>` must be replaced with your user name

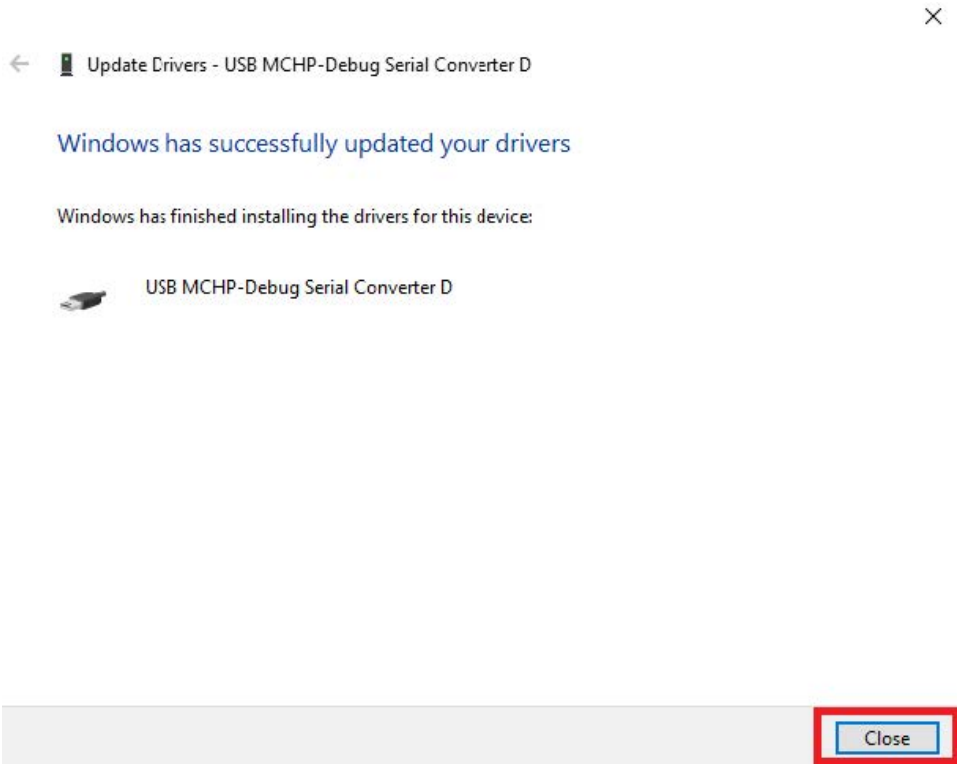
ii. `<VERSION>` must be replaced with the version of the extension that was installed

Figure 3-8. Select the Driver



h. Click **Next**. You must be prompted with a message saying, "**Windows has successfully updated your drivers**"; you can close this window.

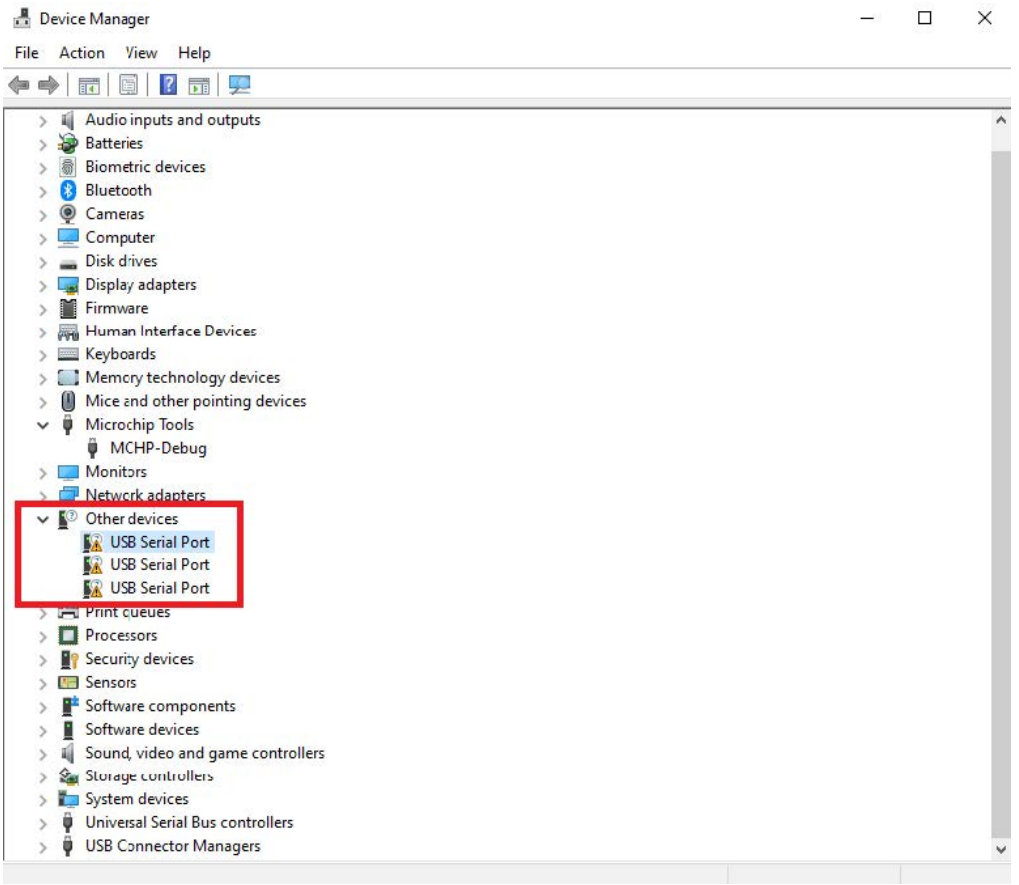
Figure 3-9. Confirm the Driver Update



i. Repeat steps 5c to 5h for each **MCHP-Debug** device in the **Other devices** section.

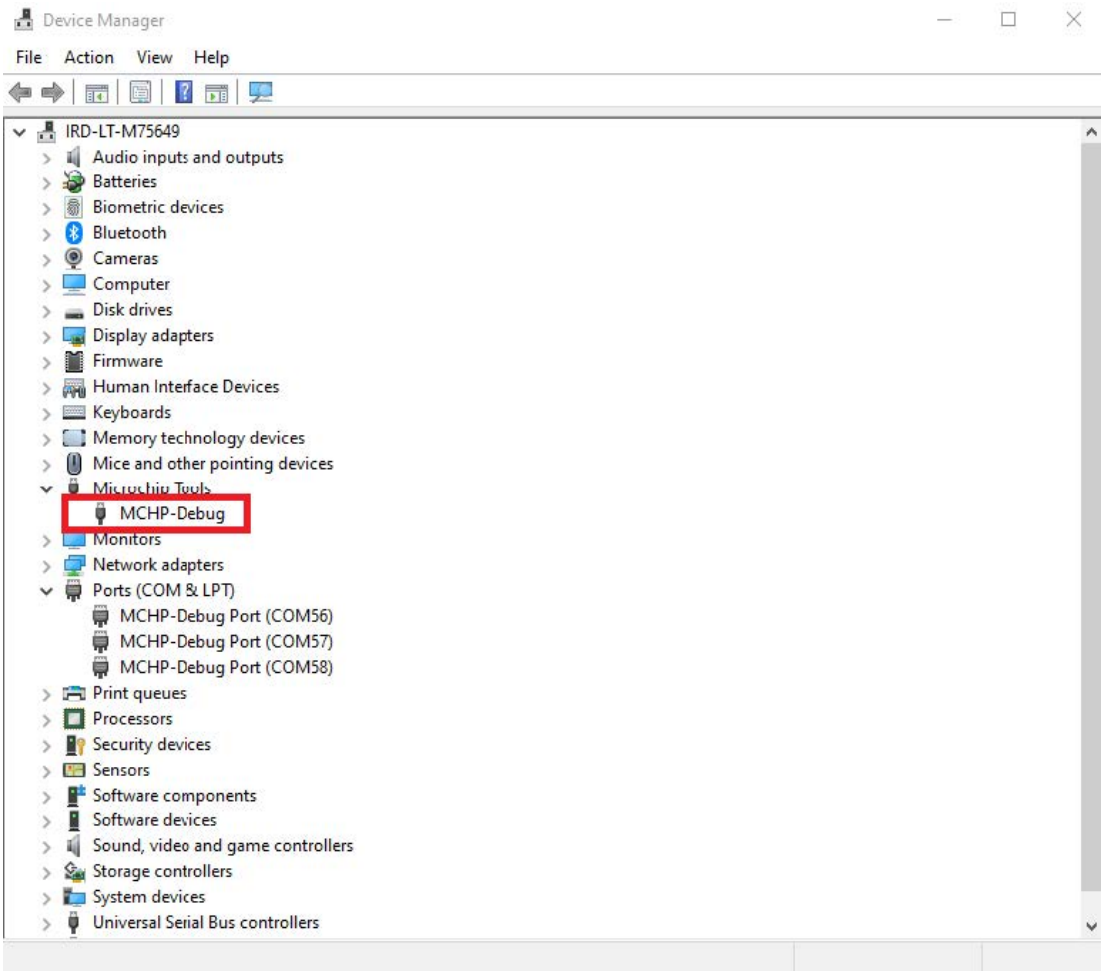
j. The **Other devices** section must now contain three **USB Serial Port** devices. Repeat steps 5c to 5h for each **USB Serial Port** device.

Figure 3-10. Verify the USB Serial Port Devices



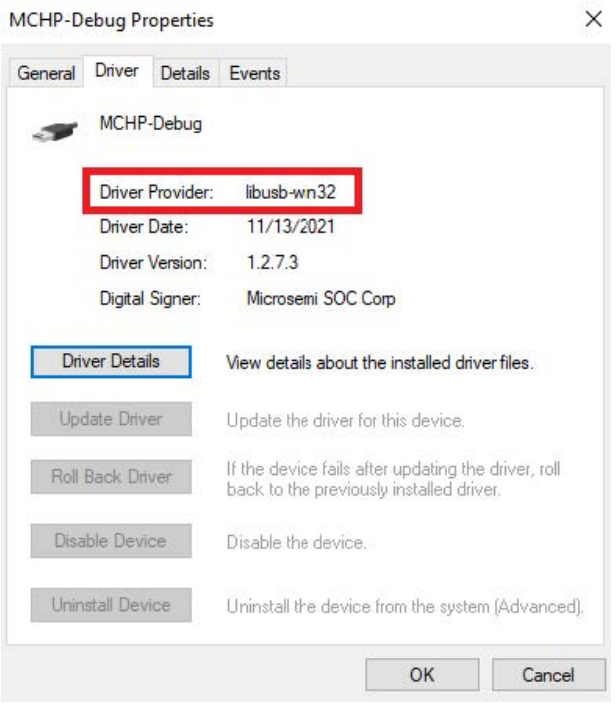
5. To verify that the drivers have been installed correctly, follow these steps:
   a. In the **Device Manager**, under the **Microchip Tools** section, double-click the **MCHP-Debug**, and then click the **Driver** tab.

Figure 3-11. Open MCHP-Debug



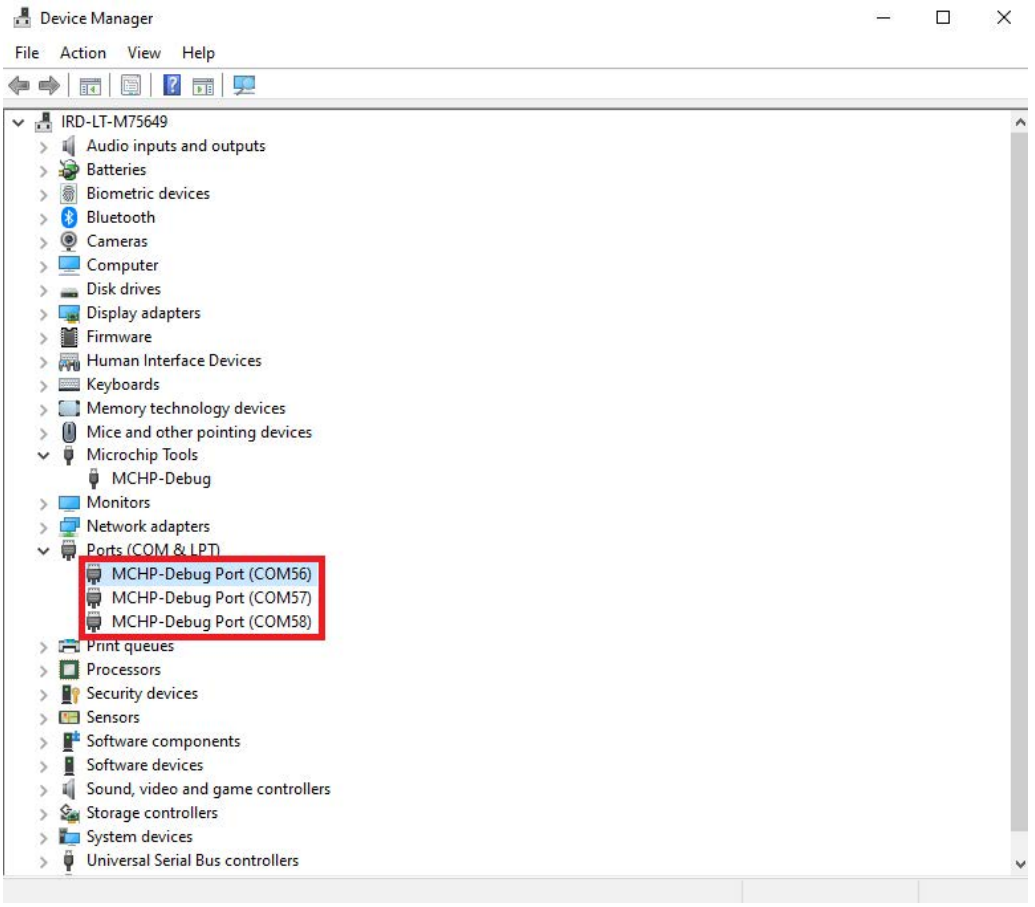
b. In the **MCHP-Debug** window, the **Driver Provider** must show **libusb-win32**.

Figure 3-12. Confirm the Driver provider



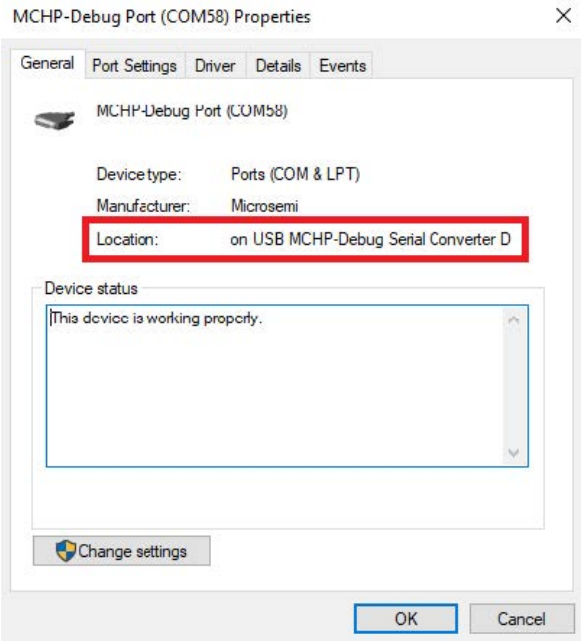
c. In the **Device Manager**, double-click **Ports (COM & LPT)** to expand it, and then double-click each of the **MCHP-Debug Port** devices.

Figure 3-13. Open the MCHP-Debug Port Devices



d. If one of the ports properties shows: **Location: on USB MCHP-Debug Serial Converter D**, and the step 5c was true, then it is verified that the drivers are installed.

Figure 3-14. Verify the Driver

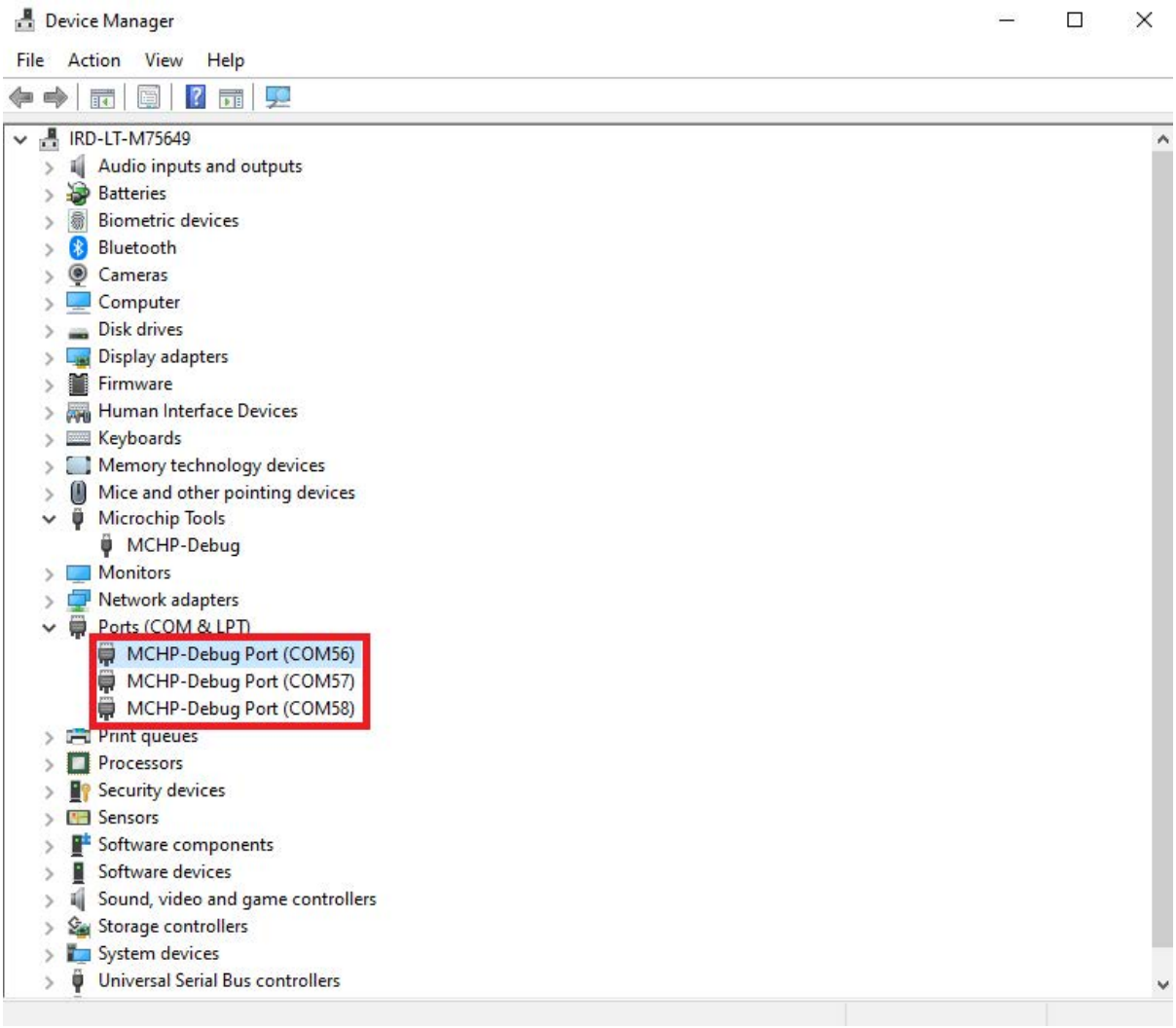


Additional step:

To identify the COM ports used for UART communication, perform the following steps:

1. Open device manager (if not already open).
2. Expand the **Ports (COM & LPT)** drop down.
3. There must be three instances of **MCHP-Debug Port (COMxx)**.
4. xx represents the COM port number that can be used for each UART interface.

Figure 3-15. Available COM Ports for UART Interface



3.2 Connecting to UART Interfaces from Linux Hosts (Ask a Question)

If the Curiosity Kit is being used with a Linux host PC, udev rules must be added to allow Linux to detect the FTDI USB to UART bridge. Without these settings, the COM ports may not appear on the Linux host. No additional driver is required to be installed.

1. Open the file at `/etc/udev/rules.d/70-microchip.rules`.
2. Add the following text (using a text editor, such as, VIM or nano) running as sudo.

```
# Bind ftdi_sio driver to all input
ACTION=="add", ATTRS{idVendor}=="1514", ATTRS{idProduct}=="200a", \
ATTRS{product}=="MCHP-Debug", ATTR{bInterfaceNumber}!="00", \
RUN+="/sbin/modprobe ftdi_sio", RUN+="/bin/sh -c 'echo 1514 200a > /sys/bus/usb-serial/
drivers/ftdi_sio/new_id'"
```

```
# Unbind ftdi_sio driver for channel A which should be the JTAG
SUBSYSTEM=="usb", DRIVER=="ftdi_sio", ATTR{bInterfaceNumber}=="00", \
RUN+="/bin/sh -c 'echo $kernel > /sys/bus/usb/drivers/ftdi_sio/unbind'"

# Helper (optional)
KERNEL=="ttyUSB[0-9]*", SUBSYSTEM=="tty", SUBSYSTEMS=="usb", \
ATTRS{interface}=="MCHP-Debug", ATTRS{bInterfaceNumber}=="01", \
SYMLINK+="ttyUSB-MCHPDebugSerialB" GROUP="dialout" MODE="0666"

KERNEL=="ttyUSB[0-9]*", SUBSYSTEM=="tty", SUBSYSTEMS=="usb", \
ATTRS{interface}=="MCHP-Debug", ATTRS{bInterfaceNumber}=="02", \
SYMLINK+="ttyUSB-MCHPDebugSerialC" GROUP="dialout" MODE="0666"

KERNEL=="ttyUSB[0-9]*", SUBSYSTEM=="tty", SUBSYSTEMS=="usb", \
ATTRS{interface}=="MCHP-Debug", ATTRS{bInterfaceNumber}=="03", \
SYMLINK+="ttyUSB-MCHPDebugSerialD" GROUP="dialout" MODE="0666"
```

3. After adding the new udev rules, run the following command to apply the changes: `sudo udevadm --control reload`.

To identify the COM port numbers used in Linux, execute the following command.

```
ls /dev/tty*
```

Note: This command must be run without the kit connected to see the serial terminals available when there is no kit connected, and then re-run with the kit connected to see the additional serial terminals that are available once the kit is connected. The new ports that appear once the kit has been connected are the COM ports for the kit.

4. Using the Kit (Ask a Question)

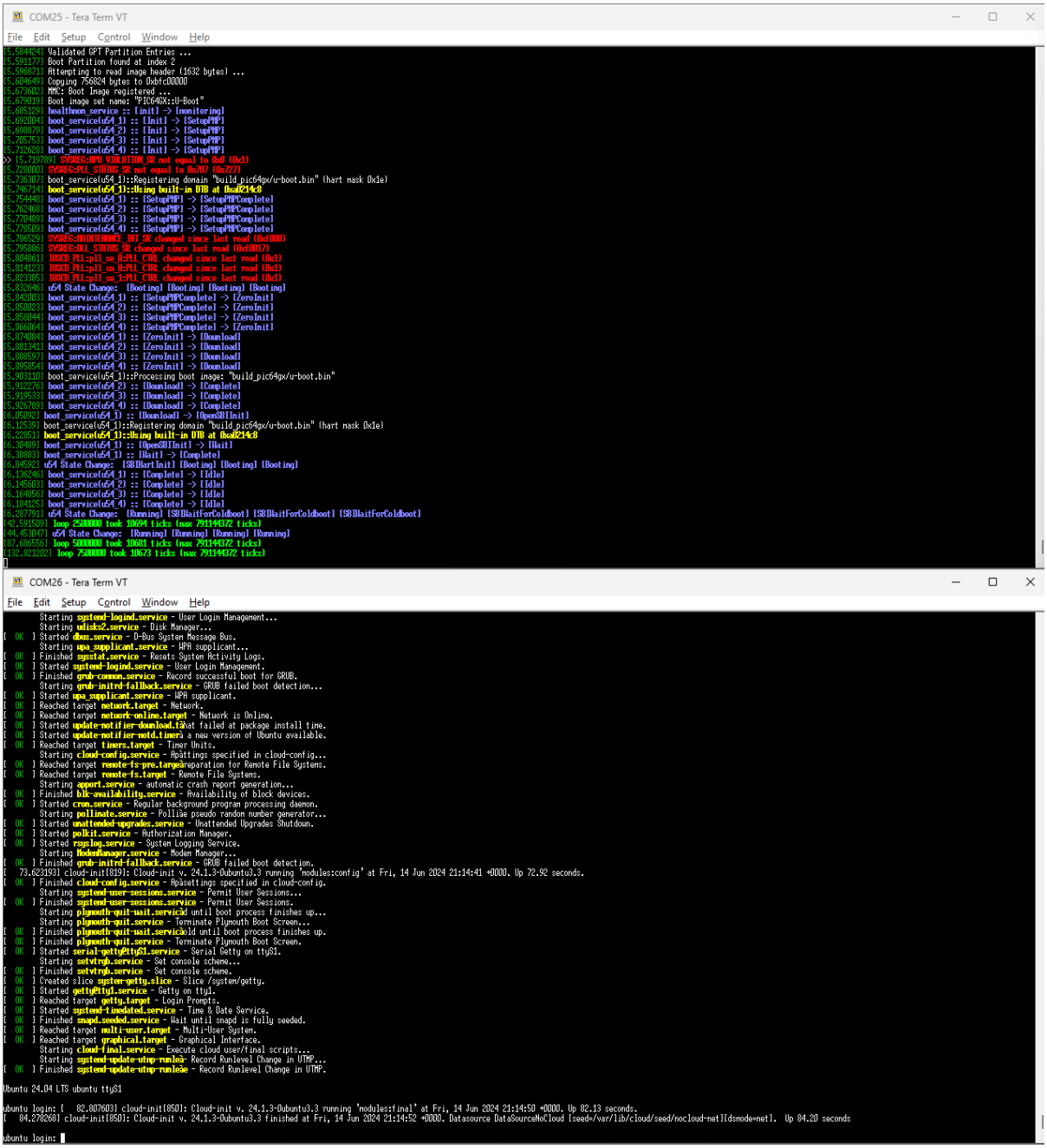
You can use any terminal emulator software of your choice to connect to the board. The examples below use TeraTerm on Windows. The same approach can be used with other serial console software and on other host operating systems.

4.1 Connecting the Board using the USB-C Serial Interface (Ask a Question)

To connect the board using the USB-C serial interface and then verifying the connection, perform the following steps:

1. Insert the provided microSD card into the microSD card slot on the kit, if it is not already inserted.
2. Connect the USB-C cable to the USB-C port on the kit and a USB-C port on the host PC. The three power LEDs on the kit must illuminate.
   Note: If the three power LEDs fail to illuminate, then it may be required to power the kit using an external power supply and the 5V barrel jack.
3. After identifying the COM port numbers of the PIC64GX Curiosity board (see Connecting to UART Interfaces from Windows Hosts or Connecting to UART Interfaces from Linux Hosts depending on your host operating system), start three instances of the serial emulator of your choice (for example, PUTTY, TeraTerm and Screen); one for each COM port of the device. The default baud rate is 115200, no flow control and no parity.
   a. On Windows®, you can use terminal emulator, such as: PUTTY and TeraTerm.
   b. On Linux®, you can use terminal emulator, such as: Screen.
4. On the board, press **Reset** (the **RESET_IN#** push button located beside the PIC64 part).
   a. The first terminal displays the Hart Software Services (HSS) bootloader messages.
   b. The second terminal displays the Ubuntu boot messages and an Ubuntu boot prompt.
   c. The third terminal is unused in this example – it can be used to display messages from a second context if one is running on the kit in the AMP mode.

Figure 4-1. Login Prompt



Note: Some warnings may be displayed by the bootloader on boot, and they can be ignored.

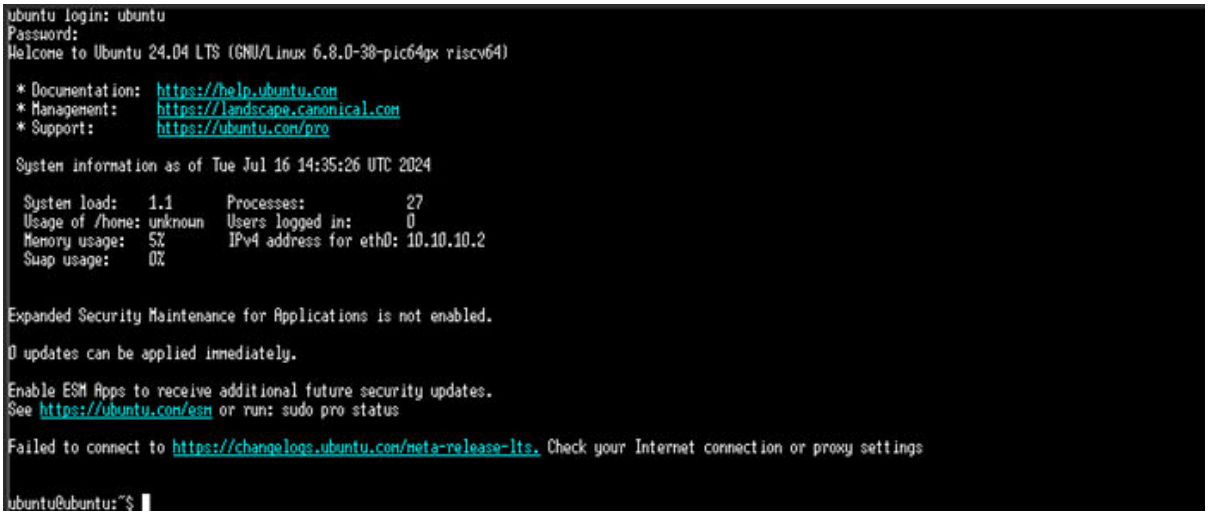
Note: The initial boot can take several minutes as the system is configured.

5. To login, use the following credentials on the serial terminal used by Ubuntu:
   Username: **ubuntu**
   Password: **ubuntu**

   Note: You are required to set a new password on the initial login, subsequent logins must use the updated password.

   A welcome page and Ubuntu prompt is shown (note the welcome message may differ depending on the Ubuntu version used and if a network cable is connected):

Figure 4-2. Welcome Screen

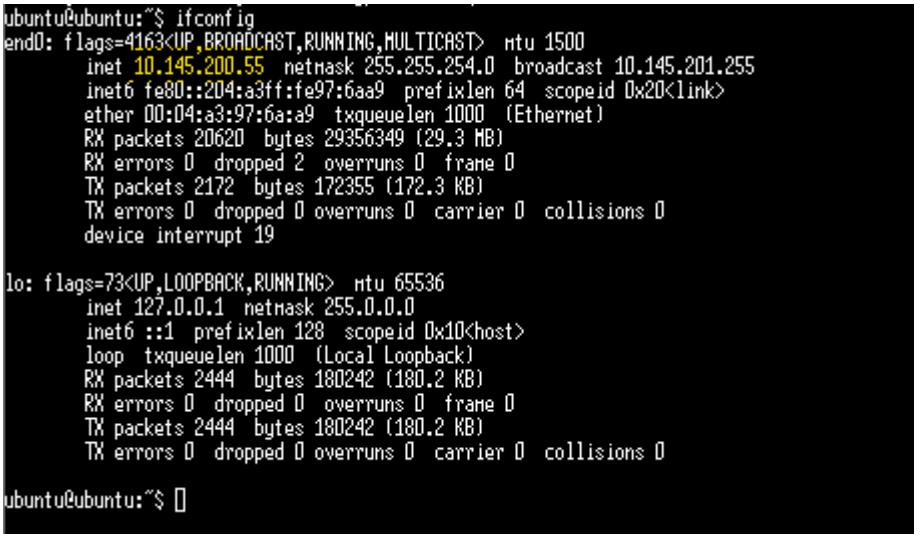


4.2 Setting the System Time, Installing Packages, and Connecting through SSH (Ask a Question)

To set the system time, install packages and connect it through SSH, perform the following steps:

1. To provide internet access to the kit, connect an Ethernet cable to the Ethernet port of the kit and connect it directly to a router on the same network as your host PC. A direct connection to a laptop is possible with a static IP/bridged connection, but this is not documented in this guide.
2. Before installing any packages or successfully using networking, time must be set correctly on the OS. Ensure the following timing related configurations:
   Note: If the time is not set correctly, some networking functionality may not work correctly.
   a. To check the current date and time of the OS, run the following command.
   ```
   timedatectl
   ```
   b. To correct the system time in the OS, disable the network time synchronization, set the time manually, and re-enable the network time synchronization. To perform these, run the following commands:
   ```
   sudo timedatectl set-ntp false
   sudo timedatectl set-time "2019-06-22 13:41:00"
   sudo timedatectl set-ntp true
   ```
   Note: Use an approximate local date and time in the format YYYY-MM-DD HH:MM:SS.
   Now, the system time synchronizes automatically.
3. To install the net-tools package, run the following commands.
   ```
   sudo apt update
   sudo apt-get install net-tools
   ```
   Note: As an alternative to installing the net-tools package and using the `ifconfig` command, Ubuntu supports running the `ip address` command out of the box without requiring any additional packages.
4. To determine the IP address of the kit, run the `ifconfig` command.
   Note: "`end0`" corresponds to the Ethernet connection to the kit and the "`inet`" entry corresponds to the IP address.

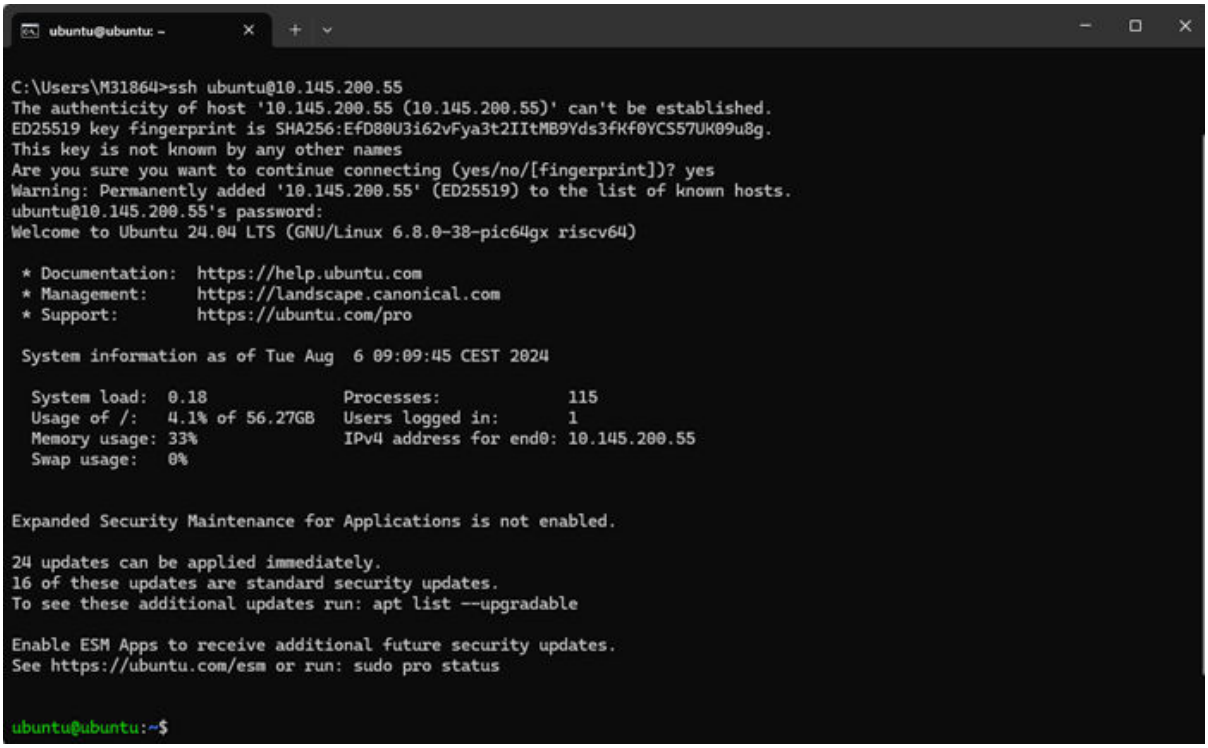
Figure 4-3. IP Address of the Kit



Note: As an alternative to installing the net-tools package and using the `ifconfig` command, Ubuntu supports running the `ip address` command out of the box without requiring any additional packages.

5. Open a terminal or command prompt on your host PC. Ensure the host PC is connected to the same network as the kit.
6. To access the kit using SSH, un the following command on the terminal that was opened in the previous step on the host PC: `ssh ubuntu@<IP ADDRESS>`.
   Notes:
   a. You might be prompted to add the kit to a list of known hosts through a warning which says "The authenticity of this host 'xxxxxxx' can't be established.' 'Are you sure you want to continue connecting' - this is normal, ensure you have used the correct IP address of the kit to avoid attempting to connect to an unknown host! As seen in the following figure.
   b. You are prompted to enter the password that was configured for the kit.

Figure 4-4. Accessing Kit Using SSH



4.3 Transferring Files to the Kit (Ask a Question)

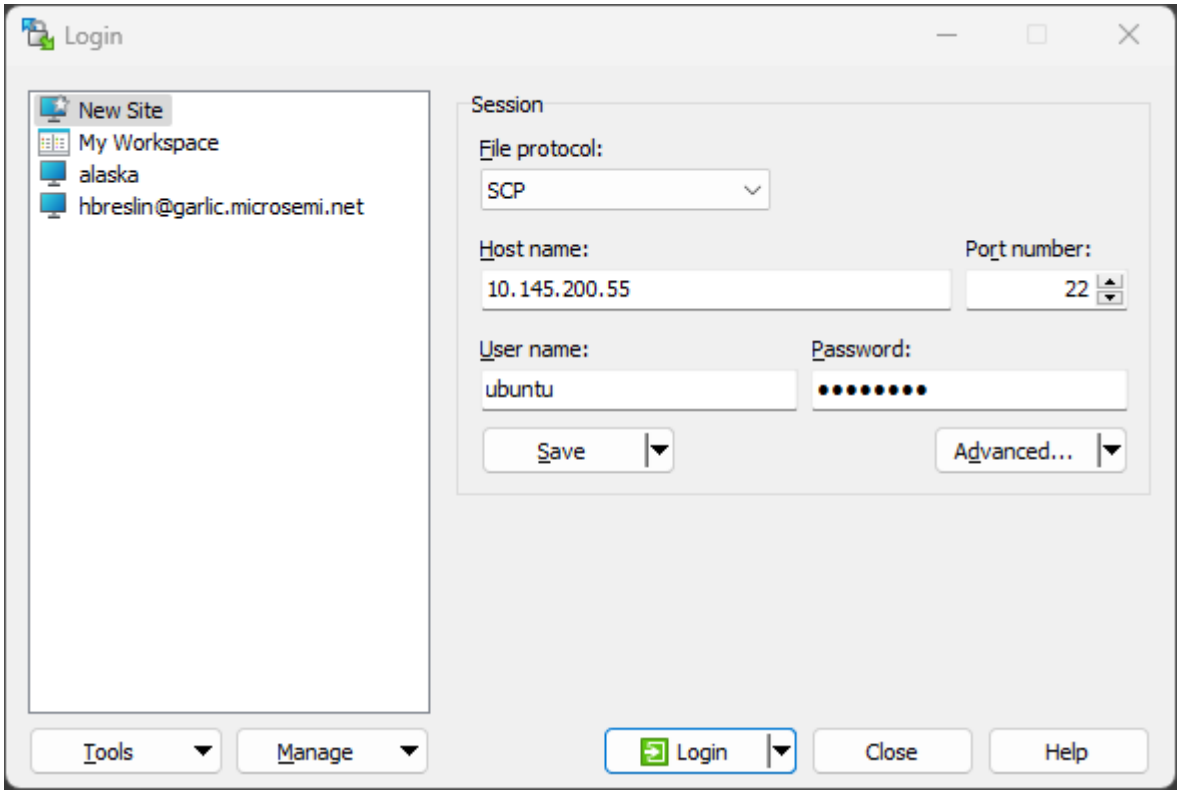
Tools such as WinSCP or FileZilla are used to transfer files to and from the kit. Tools such as wget running on the kit can be used to download files from a network also.

4.3.1 Using a Graphical SCP Utility (Ask a Question)

To transfer files to the kit, perform the following steps:

1. Launch the transfer manager of your choice (in this case, WinSCP is used) and connect to the kit. In this case, the SCP protocol is used.

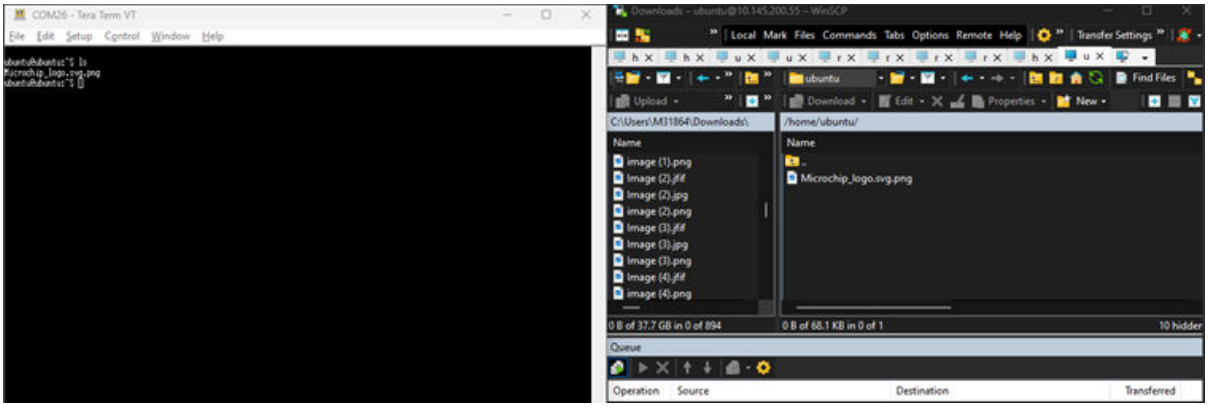
Figure 4-5. Launch Transfer Manager



Once connected, you have the access to the home folder of the ubuntu user (that is, `/home/ubuntu`) – files can be transferred to any directory.

2. Drag the file to the desired directory—verify the transfer using the `ls` command.

Figure 4-6. Transfer File



3. SCP commands can also be run from terminal/command line, for example:

```
scp .\Microchip_logo.svg.png ubuntu@10.145.200.55:/home/ubuntu/test
```

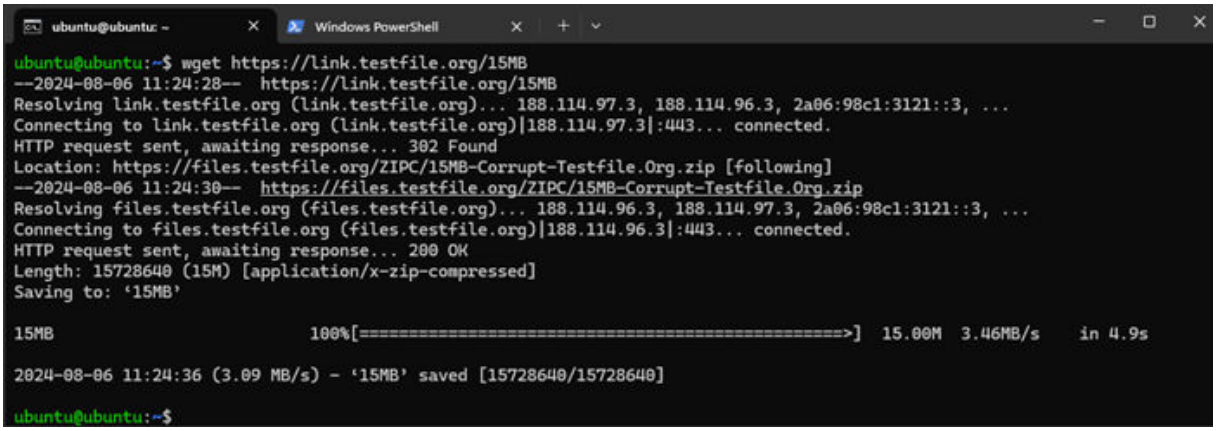
4.3.2 Using wget (Ask a Question)

To download files from a network, perform the following step:

- The wget package is available on Linux running on the kit, for example, for example:

```
wget https://link.testfile.org/15MB
```

Figure 4-7. Download File Using wget



4.4 Running a Webserver with Python (Ask a Question)

A simple webserver is launched using Python with a single line of code. This server returns a plain HTML page with a directory listing from the kit.

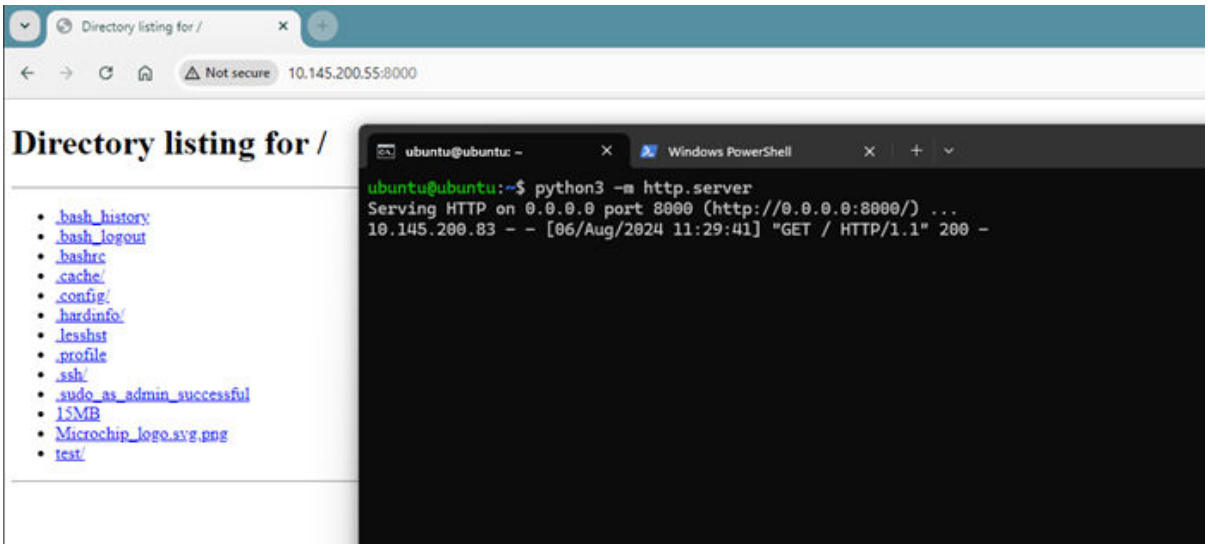
To launch a webserver, perform the following steps:

1. Run the following command on the kit (either through SSH or UART).

```
python3 -m http.server
```

2. Open a browser on your PC and point to the IP address of the kit and port 8000, for example, 10.145.200.55:8000. The webserver opens.
Note: To obtain the IP address of your kit refer back to step 4 of the Setting the System Time, Installing Packages, and Connecting through SSH section.

Figure 4-8. Running the Webserver



4.5 Additional Examples (Ask a Question)

Any packages supported by Ubuntu can be installed. For example, a selection of command line games is available (these display better over "SSH vs UART").

To install and launch Space Invaders, perform the following steps:

1. To install Space Invaders, run the following command.

```
sudo apt install ninvaders
```

2. To launch the game, run the following command.

```
ninvaders
```

Figure 4-9. Install Space Invaders

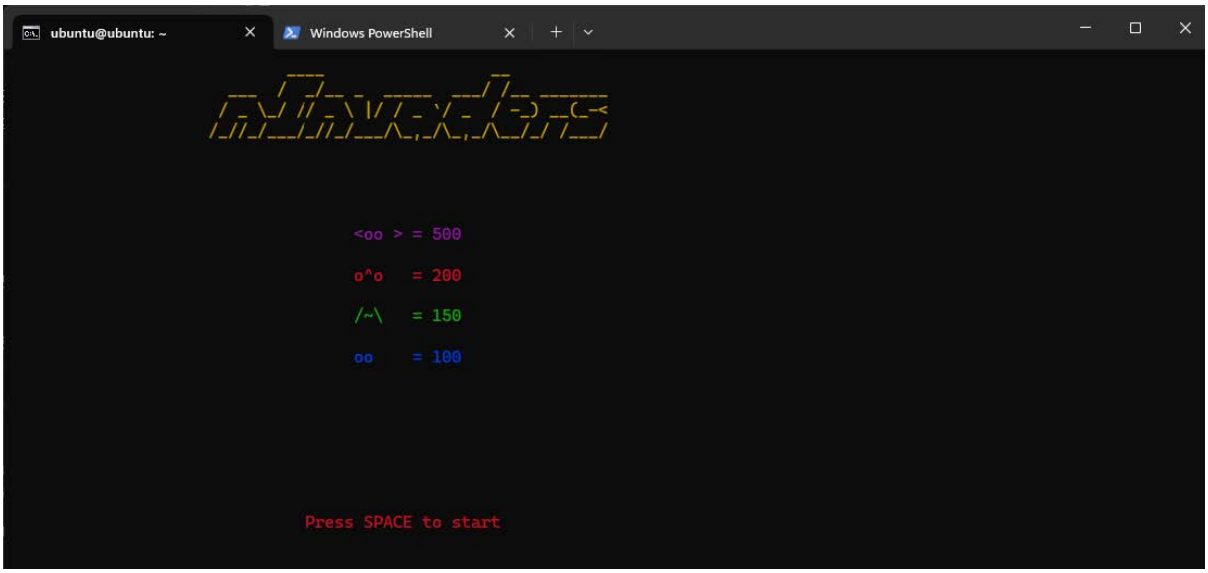
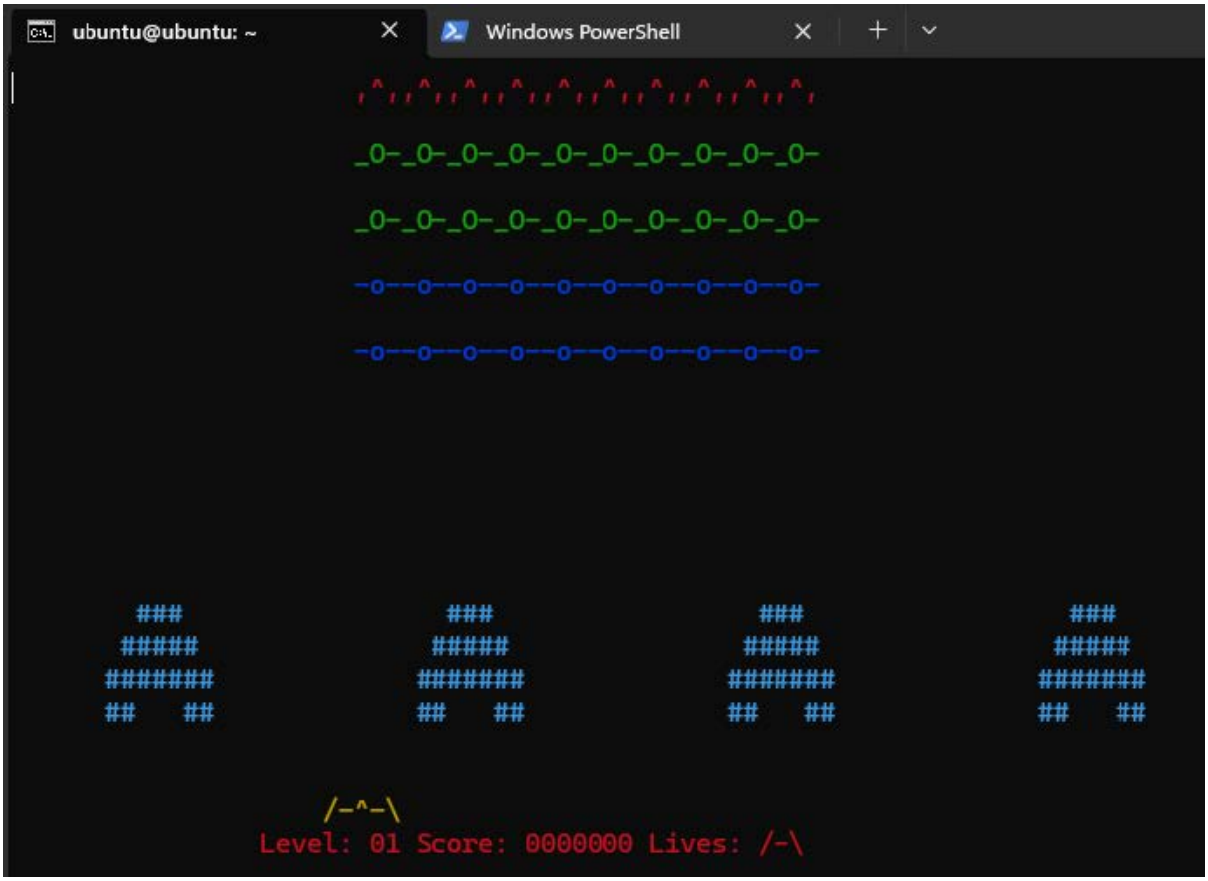


Figure 4-10. Launch Space Invaders



4.6 Restoring to Clean Ubuntu Image (Ask a Question)

If you need to restore the kit to the factory image for any reason, an image file for SD cards can be found on the Ubuntu for RISC-V page.

To restore your Ubuntu image to a clean state, see the instructions in this guide.

5. Additional References (Ask a Question)

The following is a list of documents you can refer for further information:

Table 5-1. Documentation Resources

Title	Link
PIC64GX product page	For more information on PIC64GX, see **microchip.com/pic64gx**
Curiosity Kit Product Page	For the Curiosity Kit product page, see **www.microchip.com/PIC64GX1000-kit-ES**
Hardware Design & Specifications	For a hardware user guide for the Curiosity Kit , see **PIC64GX1000 Curiosity Kit User Guide**
	For Curiosity Kit schematics, see **PIC64GX1000 Curiosity Kit Schematics**
Boot Loaders	For information on Boot and System monitoring for PIC64GX **Hart Software Services (HSS)**
PIC64GXYocto BSP	For a Yocto Linux build system supporting the Curiosity Kit, see: **PIC64GX Yocto BSP**

6. Software and Licensing (Ask a Question)

The development tools, which you need to work with the PIC64 Curiosity board are free. The following table lists the tools, which you need to work with the PIC64 Curiosity board for all platforms.

Table 6-1. Development Tools

Tool	Description
Visual Studio Code (VSCode)	Additionally the following extensions will be needed: • C/C++ VSCode extension. Search for `ms-vscode.cpptools` in the VSCode extension marketplace. • Embedded Tools VSCode extension. Search for `ms-vscode.vscode-embeddedtools` in the VSCode extension marketplace. • CMake VSCode extension. Search for `twxs.cmake` in the VSCode extension marketplace. • Link: code.visualstudio.com/
Git	• Version 2.32.0.windows.1 or later if using Windows. • Version 2.34.1 or later if using Linux. • Link: – Windows: gitforwindows.org/ – Linux: git-scm.com/book/en/v2/Getting-Started-Installing-Git
Python	3.8 or later Link: www.python.org/downloads/
CMake	3.27.1 or later Link: cmake.org/download/
Linux® specific tools	• `libusb-1.0`: To install `libusb-1.0`, execute the following command: `sudo apt install libusb-1.0-0-dev`. • `libftdi`: To install `libftdi`, execute the following command: `sudo apt install libftdi*`. • `libhidapi`: To install `libhidapi`, execute the following command: `sudo apt install libhidapi-*`. • `unzip`: To install `unzip`, execute the following command: `sudo apt install unzip`.

The following table lists the various Microchip Technology supports available for the user.

Table 6-2. Microchip Technology Support

Support	URL/Contact	Description
Technical Support	Microchip.com/Support	Support, forums, wiki, training, code examples and more
Technical Support Line	(888) 624-7435	Press **'2'** for technical support
Microchip FPGAs & SOCs	Microchip.com/64-bit-mpus	FPGAs, SoCs, design software, development hardware and IP
My Microchip	Microchip.com/MyMicrochip	Your personal Microchip portal
Microchip Direct	MicrochipDirect.com	Buy direct from Microchip
Product Alerts	Microchip.com/PCN	Product change notification service
Microchip University	Microchip.com/MU	Comprehensive training courses

Get Support for PIC64

Microchip PIC64 products group backs its products with various support services, including Customer Service, Customer Technical Support Center, a website, and worldwide sales offices. Customers are suggested to visit Microchip online resources before contacting support, as their queries are likely already answered.

Contact Technical Support Center through the website at www.microchip.com/support. Mention the PIC64 Device Part number, select appropriate case category, and upload design files while creating a technical support case.

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

- From North America, call **800.262.1060**
- From the rest of the world, call **650.318.4460**
- Fax, from anywhere in the world, **650.318.8044**

Microchip Information

The Microchip Website

Microchip provides online support via our website at www.microchip.com/. This website is used to make files and information easily available to customers. Some of the content available includes:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip design partner program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

Product Change Notification Service

Microchip's product change notification service helps keep customers current on Microchip products. Subscribers will receive email notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, go to www.microchip.com/pcn and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Embedded Solutions Engineer (ESE)
- Technical Support

Customers should contact their distributor, representative or ESE for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in this document.

Technical support is available through the website at: www.microchip.com/support

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
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