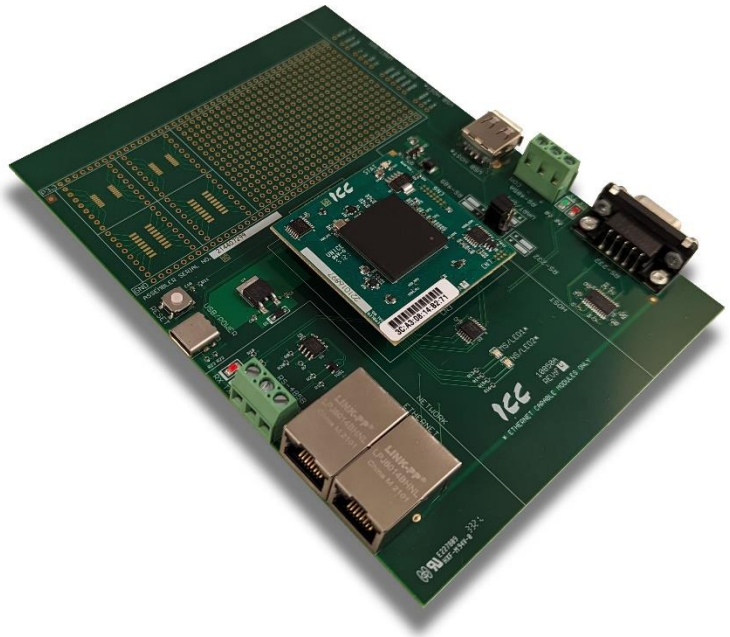
INDUSTRIAL CONTROL COMMUNICATIONS, INC.

User's Manual

PicoPort Development Kit



March 20, 2024

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User's Manual

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No complex software or hardware system is perfect. Bugs may always be present in a system of any size. In order to prevent danger to life or property, it is the responsibility of the system designer to incorporate redundant protective mechanisms appropriate to the risk involved.

This user's manual may not cover all of the variations of interface applications, nor may it provide information on every possible contingency concerning installation, programming, operation, or maintenance.

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Usage Precautions

Operating Environment

- Please use the development board only when the ambient temperature is within the following specified temperature limits:

  Operation: -10 ~ +50°C (+14 ~ +122°F)

  Storage: -40 ~ +85°C (-40 ~ +185°F)
- Avoid installation locations that may be subjected to large shocks or vibrations.
- Avoid installation locations that may be subjected to rapid changes in temperature or humidity.

Installation and Wiring

- Route all communication cables separate from high-voltage or noise-emitting cabling (such as ASD input/output power wiring).
- Proper ground connections are vital for both safety and signal reliability reasons. Ensure that all electrical equipment is properly grounded.
- The development board has a common internal ground plane that is accessible at a variety of interface locations (refer to the development board schematic). This ground plane serves as the ground reference for all power, GPIO and communication signals.
- Make all ground connections such that no ground current flows through the case or heatsink of a connected electrical device.
- Do not make connections to unstable or noise-producing grounds.

This device is lead-free / RoHS-compliant.

TABLE OF CONTENTS

1. Introduction

Congratulations on your purchase of the PicoPort Development Kit. This development kit allows product engineers to get a jump-start on using the PicoPort and PicoPort-E communication modules to integrate their equipment with automation networks. The development kit offers a variety of selectable communication interfaces, physical I/O interfaces, and a breadboard area for convenient hardware prototyping. Using the development kit provides the quickest path to begin working with the PicoPort and PicoPort-E, creating configurations, and testing them out in a simulated or actual environment.

Prior to using the development kit, please familiarize yourself with the product and be sure to thoroughly read the instructions and precautions contained in this manual. For the latest information, support software and firmware releases, please visit http://www.iccdesigns.com.

Before continuing, please take a moment to ensure that you have received all materials shipped with your kit. These items are:

- PicoPort development kit
- PicoPort and/or PicoPort-E communication module(s)
- USB standard-A to Type-C cable
- USB standard-A power adapter (specific type depends on global region)

This manual will primarily be concerned with the development kit's configuration, jumper selection, wiring and operational characteristics. For specific information pertaining to the PicoPort, PicoPort-E, or the *ICC Configuration Studio* software, please refer to the PicoPort or PicoPort-E datasheet.

2. Overview

The PicoPort development board is divided into separate sections, each of which will be addressed in later sections of this document. Refer to Figure 1.

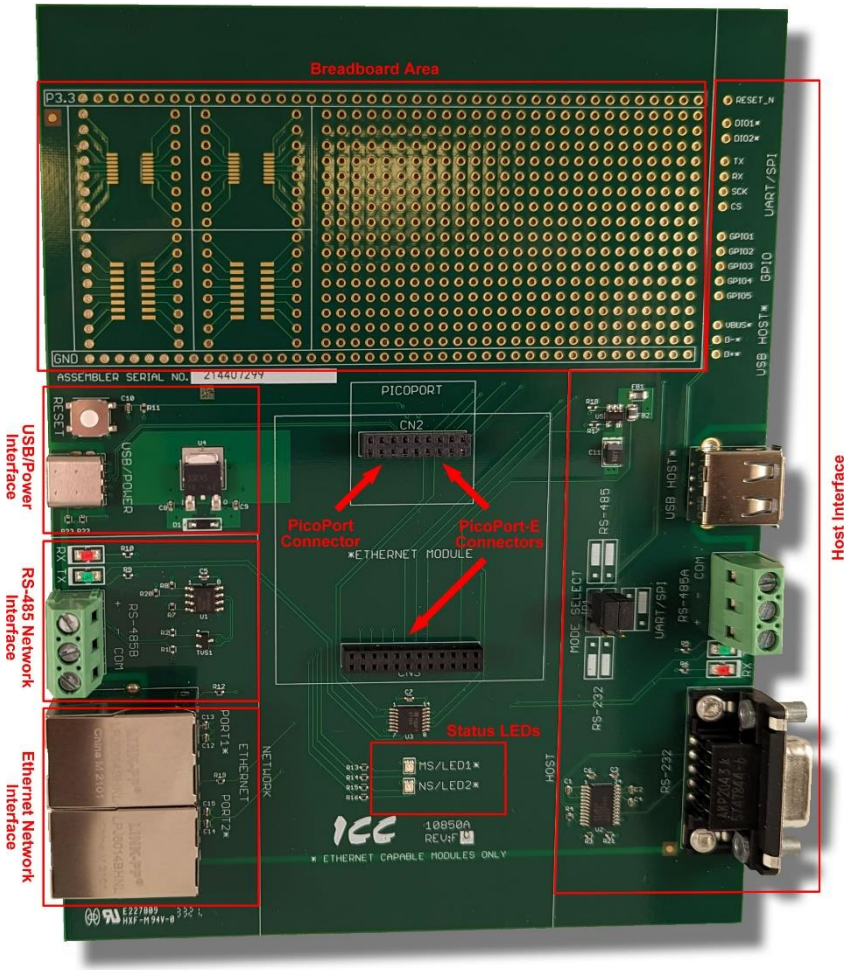


Figure 1: PicoPort Development Board Overview

3. Setup

Step 1: Unpack the development board, PicoPort and/or PicoPort-E communication module(s), USB cable, and power adapter. Do not connect any cables to the development board at this time. To prevent inadvertent electrical damage, please observe all appropriate precautions for handling ESD-sensitive components.

Step 2:
PicoPort - Install the PicoPort module into connector CN2 on the development board. Pay particular attention to the module's orientation in the connector, as there is no keying on CN2 to prevent incorrect insertion. When installed properly, the "STAT" LED will be in the upper-right hand corner and the orientation of the ICC logo on the module will match the orientation of the ICC logo on the development board (refer to Figure 2).

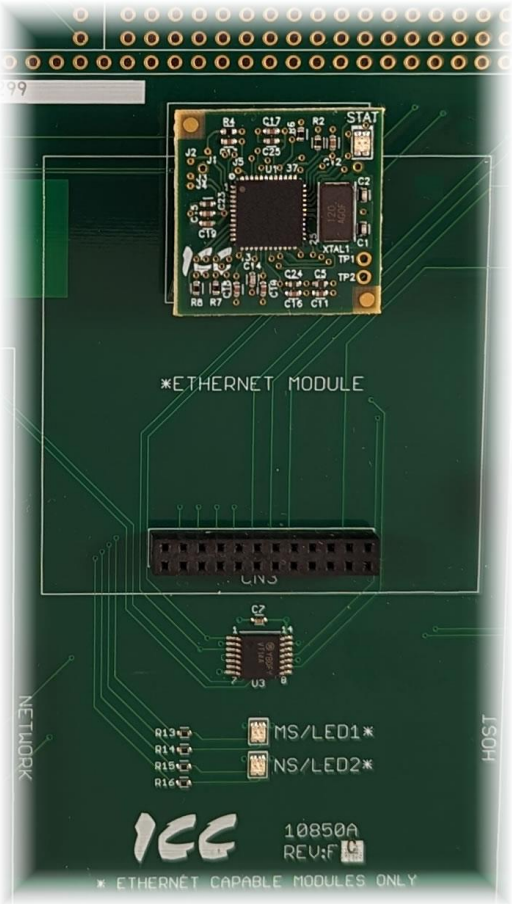


Figure 2: PicoPort Module Correctly Installed

PicoPort-E - Install the PicoPort-E module into connectors CN2 and CN3 on the development board. Pay particular attention to the module's orientation in the connectors, as CN2 and CN3 differ in width and number of pins. When installed properly, the "STAT" LED will be in the upper-right hand corner and the orientation of the ICC logo on the module will match the orientation of the ICC logo on the development board (refer to Figure 3).

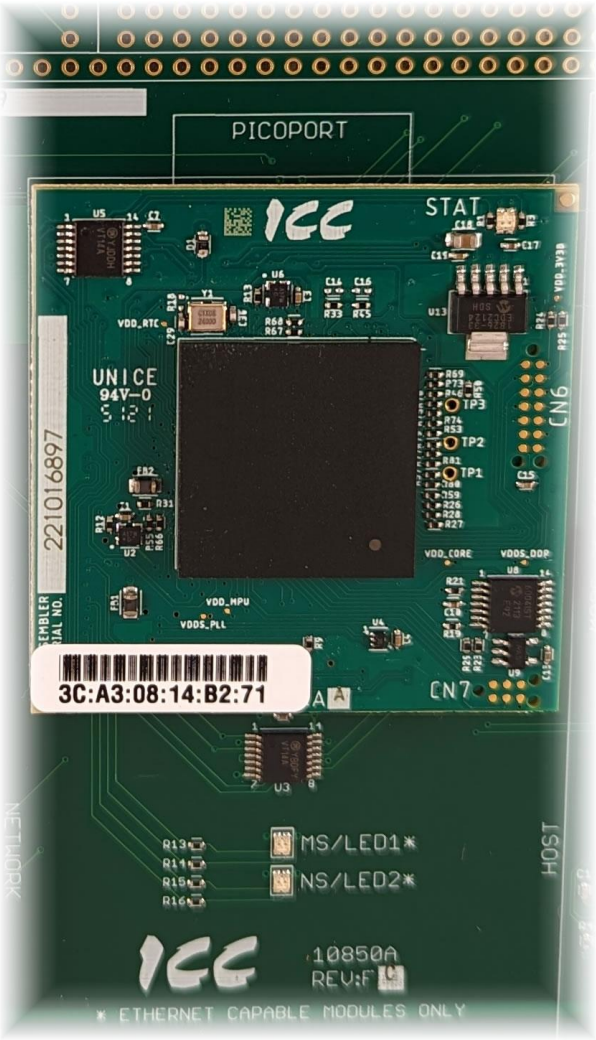


Figure 3: PicoPort-E Module Correctly Installed

After insertion, double-check that the module is oriented correctly, fully seated, and that it is centered in the appropriate square, white silkscreen printed on the development board.

Step 3: Download the latest version of the *ICC Configuration Studio* software from http://www.iccdesigns.com and install the software onto your computer. The *ICC Configuration Studio* contains product-specific USB drivers necessary for communication with the PicoPort and PicoPort-E modules.

Step 4: Configure the development board's jumpers as necessary, and install the external network wiring/cables for the type of communication to be performed.

Step 5:
PicoPort – Connect the development board's USB/POWER jack to an available USB port on your computer with the provided USB cable. This connection serves the dual purpose of providing power to the development board as well as allowing the *ICC Configuration Studio* to communicate with the on-board PicoPort module. Upon startup, the PicoPort's STAT LED will flash a red/green sequence and then continuously flash green (indicating that the USB driver on the computer has successfully enumerated the PicoPort module). If the STAT LED is lit green but does not flash, then this indicates a problem with the USB driver installation: confirm that the *ICC Configuration Studio* has completed installation successfully, and reinstall if necessary.

PicoPort-E – Connect an Ethernet cable between your computer (or Ethernet switch) and PORT1 (or PORT2) on the development board. Next, connect the development board's USB/POWER jack to the USB power adapter with the provided USB cable. Upon startup, the Ethernet module's STAT LED will flash a red/green sequence and then remain solid green. This is the recommended connection method.

Optionally, the development board's USB/POWER jack may be connected to an available USB port on your computer with the provided USB cable. An Ethernet cable connection is not required. The USB connection will both power the development board and allow the *ICC Configuration Studio* to communicate with the on-board PicoPort-E module. Upon startup, the PicoPort-E's STAT LED will flash a red/green sequence and then continuously flash green (indicating that the USB driver on the computer has successfully enumerated the PicoPort-E module). If the STAT LED is lit green but does not flash, then this indicates a problem with the USB driver installation: confirm that the *ICC Configuration Studio* has completed installation successfully, and reinstall if necessary.

Step 6: At this point, it is possible to use the *ICC Configuration Studio* to configure and otherwise interact with the on-board PicoPort or PicoPort-E communication module. Refer to the *ICC Configuration Studio* section in the PicoPort or PicoPort-E datasheet for further assistance.

4. Development Board Interfaces

4.1 PicoPort Connector

The connector CN2 accommodates a PicoPort module (refer to Figure 4). When installing the module, pay particular attention to the module's orientation in the connector, as there is no keying on CN2 to prevent incorrect insertion. When installed properly, the "STAT" LED will be in the upper-right hand corner and the orientation of the ICC logo on the module will match the orientation of the ICC logo on the development board (refer to Figure 2 on page 6).

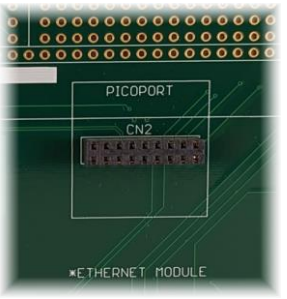


Figure 4: PicoPort Module Connector

After insertion, double-check that the module is oriented correctly, fully seated, and that it is centered in the square, white "PICOPORT" silkscreen printed on the development board.

Do not insert or remove the PicoPort module while power is applied to the development board.

4.2 Ethernet Module Connectors

The connectors CN2 and CN3 accommodate a PicoPort-E module (refer to Figure 5). When installing the module, pay particular attention to the module's orientation and install the 18-pin connector into CN2 and the 24-pin connector into CN3. When installed properly, the "STAT" LED will be in the upper-right hand corner and the orientation of the ICC logo on the module will match the orientation of the ICC logo on the development board (refer to Figure 3 on page 7).

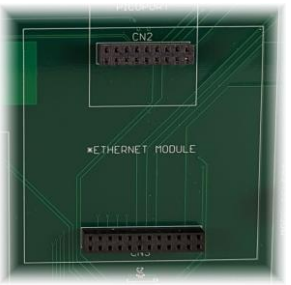


Figure 5: Ethernet Module Connectors

After insertion, double-check that the module is oriented correctly, fully seated, and that it is centered in the square, white "*ETHERNET MODULE" silkscreen printed on the development board.

Do not insert or remove the PicoPort-E module while power is applied to the development board.

4.3 USB/POWER Interface

The development board is powered via 5VDC provided to the USB/POWER jack (refer to Figure 6). This 5VDC is supplied either directly from a computer's USB port or from the USB power adapter and is then provided to the PicoPort-E module and on-board IC's. An on-board voltage regulator steps the voltage down to 3.3VDC, which is then provided to the PicoPort module, on-board ICs, and the "P3.3" rail in the breadboard area.

Figure 6: USB/POWER Interface

When connected to a computer, the USB port also serves as the communication mechanism by which the *ICC Configuration Studio* interacts with the module for configuration, monitoring, etc.

A RESET button is also provided which provides a reset signal to the module when pushed.

4.4 Status LED Indicators

The bicolor status LEDs are connected to the module's external LED signals (if supported) through 330 ohm current limiting resistors. Please refer to the communication module's datasheet for details on whether these signals are supported and the behavior and meaning of these signals.

Figure 7: Status LEDs

MS/LED1 LED ..... Module status or general-purpose LED1, depending on the module used. This signal is not supported by the PicoPort. For the PicoPort-E, this is the Module Status indicator.

NS/LED2 LED ..... Network status or general-purpose LED2, depending on the module used. This signal is not supported by the PicoPort. For the PicoPort-E, this is the Network Status indicator.

4.5 Breadboard Area

A breadboard area is located at the top of the development board (refer to Figure 8.) The breadboard area can be useful for prototyping product-specific SMT or thru-hole hardware, such as signal conditioning circuitry for sensor applications.

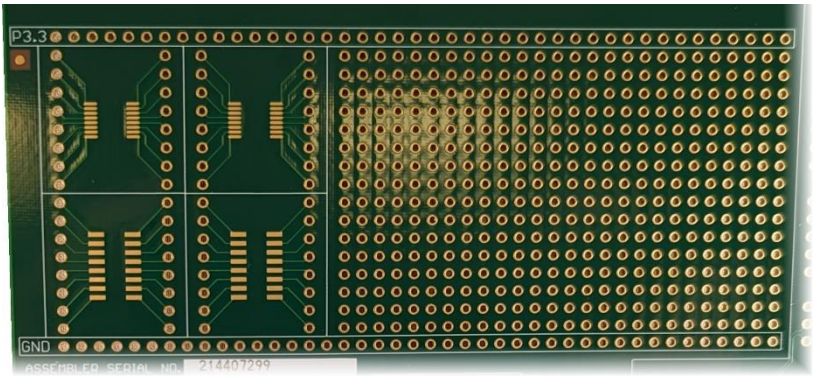


Figure 8: Breadboard Area

Some items to note regarding the breadboard area include:

- All thru-hole vias are 0.035” in diameter and 0.1” center-to-center.
- Two each TSOP-16 and SO-16 SMT package patterns are provided, each pinned out to a series of thru-hole vias.
- With the exception of the “P3.3” and “GND” rails (located at the top and bottom of the breadboard area, respectively), no electrical connections exist to any of the thru-hole vias.
- The vias located in the “P3.3” and “GND” rails are connected to the internal P3.3 and GND PCB planes, respectively.

4.6 Network Interface

4.6.1 RS-485

The serial network interface is located in the left-hand portion of the development board, and is physically exposed as an RS-485 port on terminal block RS-485B (refer to Figure 9.).

Figure 9: Network RS-485 Interface

Table 1: Network RS-485B Interface Pinout

Terminal	Notes
+	RS-485 Positive (Non-Inverting) Data Signal
-	RS-485 Negative (Inverting) Data Signal
COM	RS-485 Common-Mode (0V) Reference

4.6.2 RS485 LED Indicators

The serial network interface has one green “TX” and one red “RX” LED to indicate the status of the network:

Green (TX) LED ..... Lights when the module is transmitting data on the network port.

Red (RX) LED ..... Lights when the module is receiving data on the network port. Note that this does not indicate the validity of the data with respect to a particular protocol: only that data exists and is being detected.

4.6.3 Ethernet

The Ethernet network interface is located in the lower left-hand portion of the development board and is exposed as RJ45 jacks PORT1 and PORT2 (refer to Figure 10). Each RJ45 jack includes built-in status LED indicators for each port. The Ethernet interface is not supported by all communication modules. Refer to the module's datasheet for details on supported features.

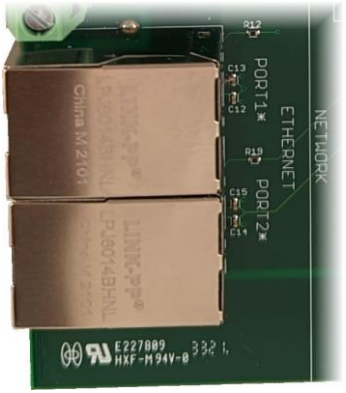


Figure 10: Network Ethernet Interface

Table 2: Ethernet LED Indicators

LED Activity	Status	Definition
Green On	Link	A valid Ethernet link exists: communication is possible on this port
Green Off	No Link	A valid Ethernet link does not exist: communication is not possible on this port
Green Blinking	Activity	Indicates when a packet is transmitted or received on this port
Yellow Off	N/A	Not connected

4.7 Host Interface

The host interface portion of the development board allows a variety of jumper-selectable communication interfaces (refer to Figure 11). These interfaces provide the ability to interact with RS-485, RS-232, or UART/SPI logic-level communications as well as general-purpose I/O and USB host.

Figure 11: Host Interface

4.7.1 RS-485

The module's host-side serial communications port may be exposed as an RS-485 physical layer on the RS-485A terminal block. Note that selection of the RS-485 physical layer is mutually exclusive with the RS-232 physical layer (refer to section 4.7.2.) Additionally, to avoid signal level mismatch and contention issues, remove all wiring from the UART/SPI prototyping vias and RS-232 port when using the RS-485 port.

To enable the RS-485 port, the "MODE SELECT" jumpers must be in the "RS-485" position.

Table 3: Host RS-485A Interface Pinout

Terminal	Notes
+	RS-485 Positive (Non-Inverting) Data Signal
-	RS-485 Negative (Inverting) Data Signal
COM	RS-485 Common-Mode (0V) Reference

4.7.2 RS-232

The module's host-side serial communications port may be exposed as an RS-232 physical layer on the RS-232 DB9 connector. Note that selection of the RS-232 physical layer is mutually exclusive with the RS-485 physical layer (refer to section 4.7.1.) Additionally, to avoid signal level mismatch and contention issues, remove all wiring from the UART/SPI prototyping vias and RS-485A port when using the RS-232 port.

The RS-232 port is specifically designed to allow easy interfacing to a standard computer RS-232 port. When connecting to a computer's RS-232 port, use a straight-through serial cable (aka serial extension cable): do not use a null modem or crossover cable.

To enable the RS-232 port, the "MODE SELECT" jumpers must be in the "RS-232" position.

Table 4: Host RS-232 DB9 Interface Pinout

Pin Number	Notes
2	TX output
3	RX input
5	GND
7	Internally shorted to pin 8
8	Internally shorted to pin 7

4.7.3 UART/SPI

The module's host-side serial communications port may be accessed as logic-level signals exposed as thru-hole vias located on the upper right-hand side of the development board. These vias can subsequently be connected to signal conditioning circuitry located in the breadboard area (when prototyping a physical layer not already provided on the host interface), or to an actual serial port located on an external device. This allows the module to directly interact with an intelligent target device during development, even in scenarios that require a custom physical layer or direct connection to a host CPU. Note that the selection of the UART/SPI interface precludes the ability to use the RS-485 and RS-232 physical layers.

As these vias are directly connected to the corresponding pins on the module, use caution to ensure that all applicable voltage and current limitations detailed in the module's technical specifications are adhered to when making connections to circuitry or external devices. To avoid module damage, also ensure that appropriate grounding/reference voltage connections are included in all connection schemes.

To enable the UART/SPI interface, the "MODE SELECT" jumpers must be in the "UART/SPI" position.

Table 5: Host UART/SPI Interface Pinout

Signal	Notes
TX	Module HOST_TX/SPI_MISO output
RX	Module HOST_RX/SPI_MOSI input
SCK	Module SPI_SCK input/output
CS	Module HOST_TXEN/SPI_CS input/output

4.7.4 LED Indicators

The host interface has one green "TX" and one red "RX" LED to indicate the status of the network connected to the interface:

Green (TX) LED ..... Lights when the module is transmitting data on the host port.

Red (RX) LED ..... Lights when the module is receiving data on the host port. Note that this does not indicate the validity of the data with respect to a particular protocol: only that data exists and is being detected.

4.7.5 GPIO

The host interface exposes the module's GPIO1...GPIO5 pins, and DIO1...DIO2 pins (if supported), as thru-hole vias located on the right-hand side of the development board. These vias can subsequently be connected to signal conditioning circuitry located in the breadboard area, or to actual I/O signals terminating on external devices. For applications that wish to asynchronously reset the module, the active-low RESET_N signal is also available in this same area.

As these vias are directly connected to the corresponding pins on the module, use caution to ensure that all applicable voltage and current limitations detailed in the module's technical specifications are adhered to when making connections to circuitry or external devices. To avoid damaging the module, also ensure that appropriate grounding/reference voltage connections are included in all connection schemes.

Table 6: Host GPIO Interface Configuration

To Use	Jumper Positions	Notes
GPIO1...GPIO5	N/A	Direct connection to module
DIO1...DIO2	N/A	Direct connection to module (PicoPort-E only)
RESET_N	N/A	Direct connection to module. As "RESET" switch shorts this signal to GND when depressed, suggested interface is open-collector type drive.

4.7.6 USB Host

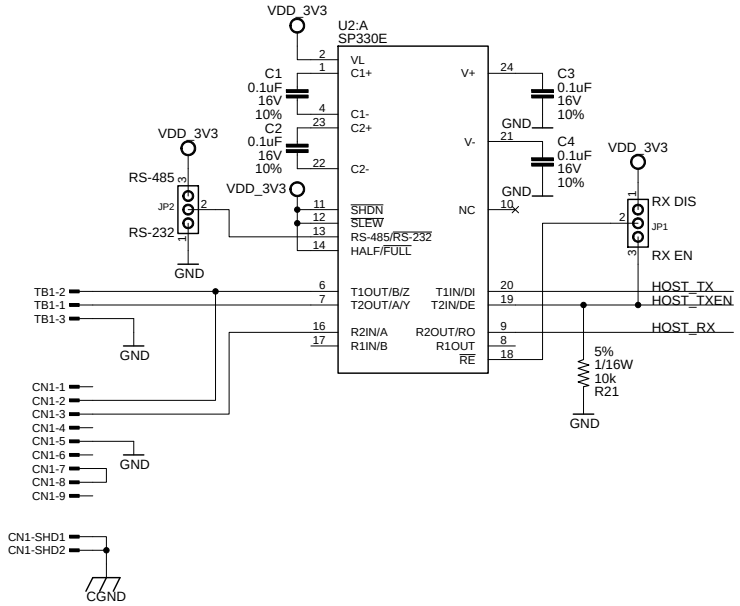
USB host is only supported on specific modules and is currently reserved for future use.

The module's USB host communications port is exposed on both the USB HOST Type-A port and the thru-hole vias on the right-hand side of the development board. Note that there are two separate connections for the single USB host port. Therefore, a USB device should never be connected to the USB HOST Type-A port when a USB device IC, or similar, is connected to the USB HOST signal vias.

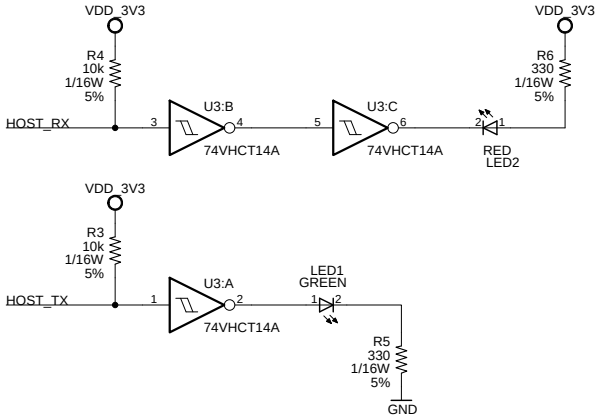
5. Schematic

Serial Communications

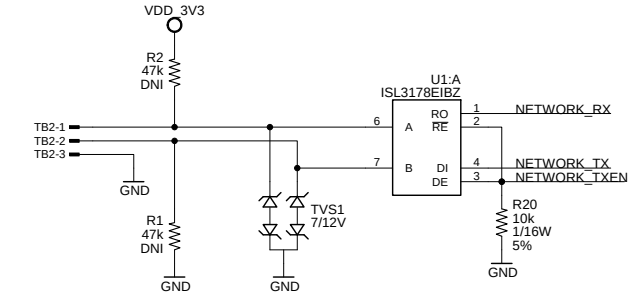
Host RS-232/485

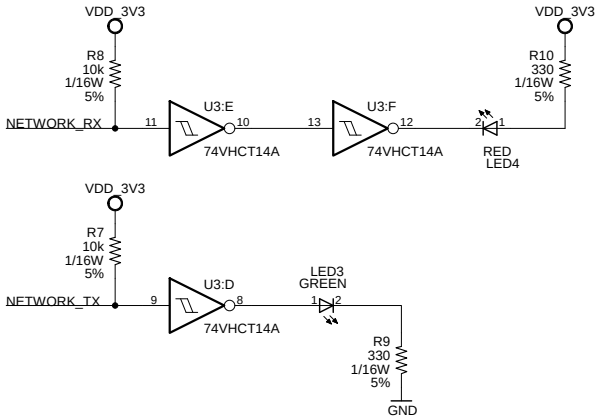


TX/RX LEDs



Network RS-485





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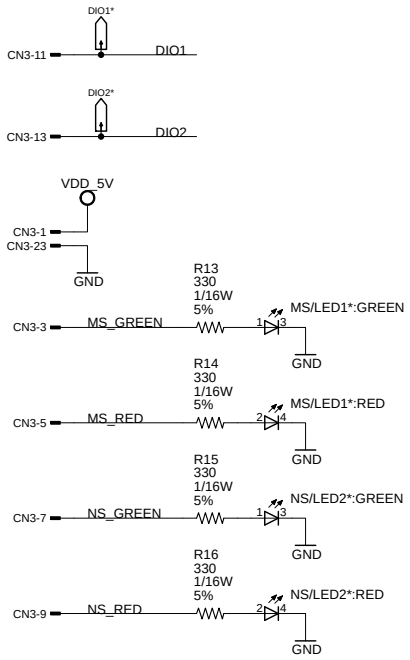
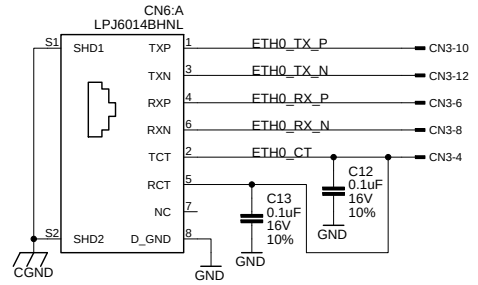
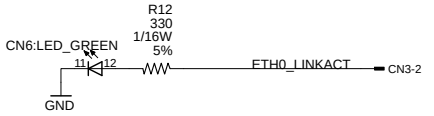
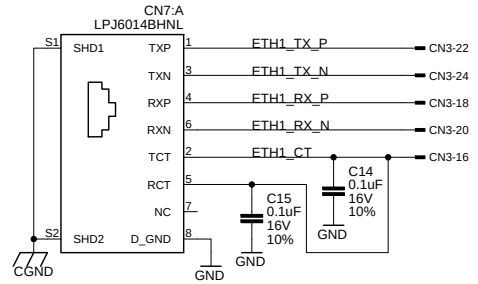
PicoPort-E

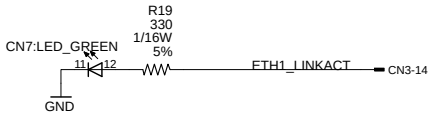


Ethernet Communications

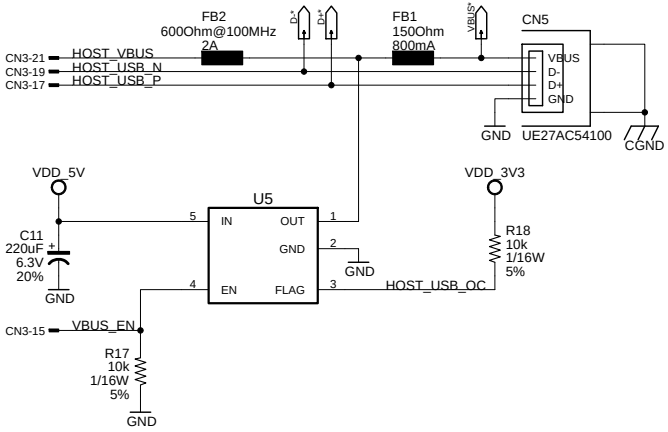








USB Host



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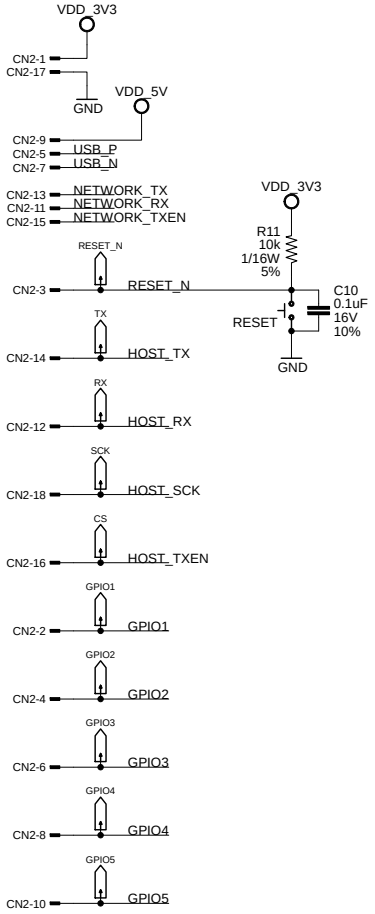
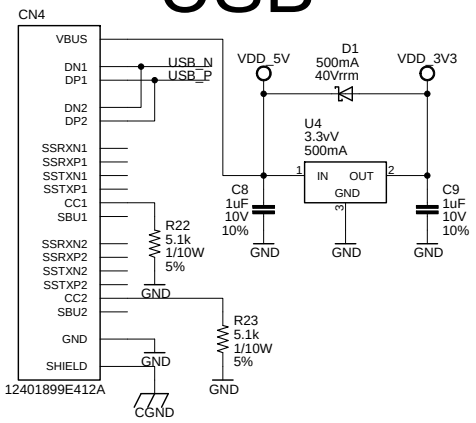
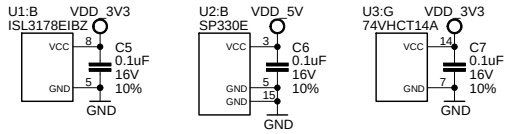
PicoPort



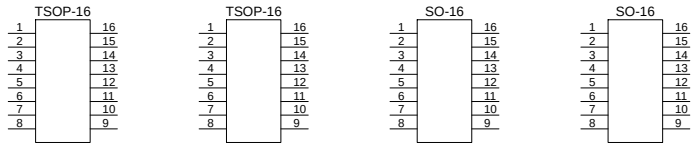
USB



Power



Prototyping Footprints



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