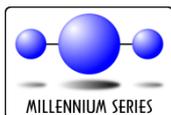
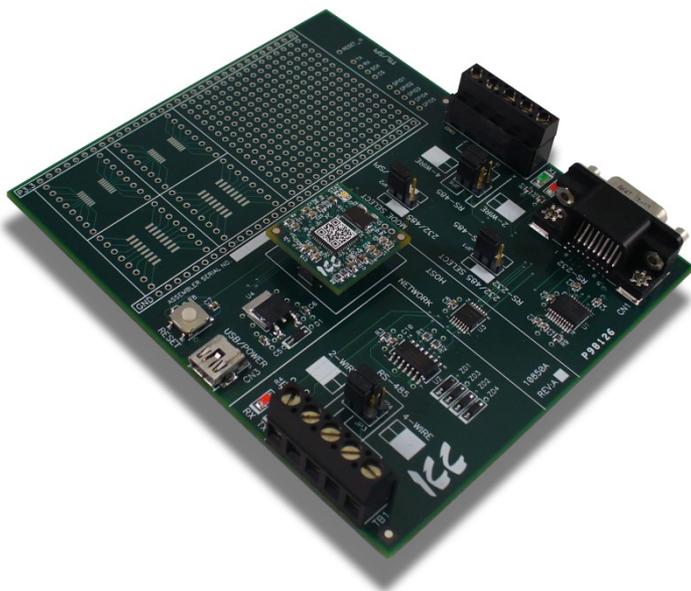




INDUSTRIAL CONTROL COMMUNICATIONS, INC.

User's Manual

PicoPort Development Kit





PicoPort Development Kit User's Manual

Printed in U.S.A.
©2013 Industrial Control Communications, Inc.
All rights reserved

NOTICE TO USERS

Industrial Control Communications, Inc. reserves the right to make changes and improvements to its products without providing notice.

Industrial Control Communications, Inc. shall not be liable for technical or editorial omissions or mistakes in this manual, nor shall it be liable for incidental or consequential damages resulting from the use of information contained in this manual.

INDUSTRIAL CONTROL COMMUNICATIONS, INC.'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE-SUPPORT DEVICES OR SYSTEMS. Life-support devices or systems are devices or systems intended to sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling and user's manual, can be reasonably expected to result in significant injury.

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.

The contents of this user's manual shall not become a part of or modify any prior agreement, commitment, or relationship between the customer and Industrial Control Communications, Inc. The sales contract contains the entire obligation of Industrial Control Communications, Inc. The warranty contained in the contract between the parties is the sole warranty of Industrial Control Communications, Inc., and any statements contained herein do not create new warranties or modify the existing warranty.

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	4
2. Overview	5
3. Setup	6
4. Development Board Interfaces	8
4.1 PicoPort Connector	8
4.2 USB/POWER Interface	8
4.3 Breadboard Area	9
4.4 Network Interface	10
4.4.1 RS-485	10
4.4.2 LED Indicators	10
4.5 Host Interface	11
4.5.1 GPIO	11
4.5.2 RS-485	12
4.5.3 RS-232	12
4.5.4 TTL/SPI	13
4.5.5 LED Indicators	14
5. Schematic	15

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 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, 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 communication module
- USB standard-A to mini-B 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 communication module and the *ICC Configuration Studio* software, please refer to the separate references addressing those topics.

2. Overview

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

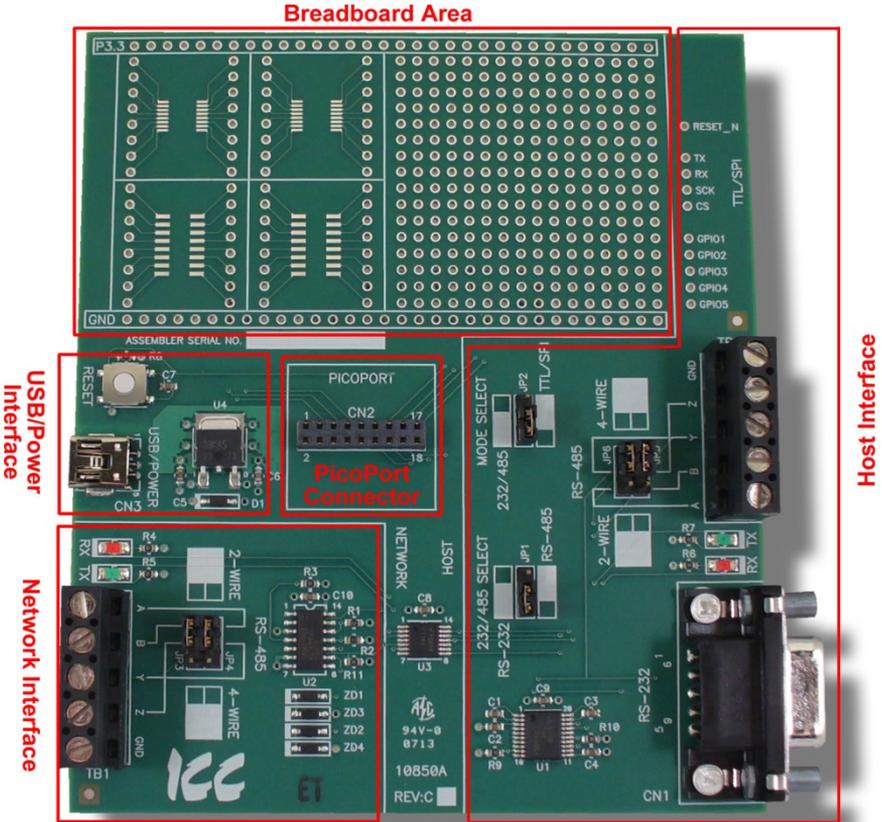


Figure 1: PicoPort Development Board Overview

3. Setup

Step 1: Unpack the development board, PicoPort module, and USB cable. 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: 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 (refer to Figure 2).

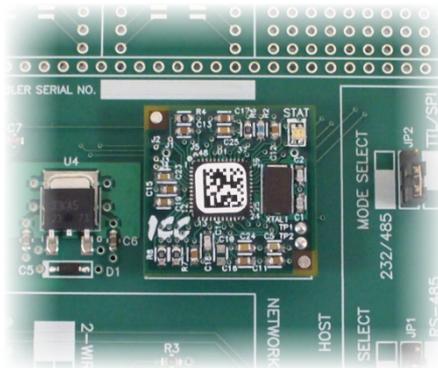


Figure 2: PicoPort Module Correctly Installed

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

Step 3: Install the *ICC Configuration Studio* software onto your computer from the CD-ROM included with the development kit or by downloading the latest version from <http://www.iccdesigns.com>. The *ICC Configuration Studio* contains product-specific USB drivers necessary for communication with the PicoPort module.

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

Step 5: Connect the development board's USB/POWER jack (CN3) 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.

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

4. Development Board Interfaces

4.1 PicoPort Connector

The PicoPort connector (CN2) accommodates a PicoPort module (refer to Figure 3). 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 (refer to Figure 2 on page 6).

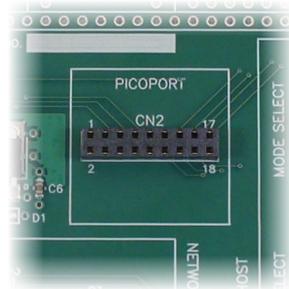


Figure 3: PicoPort Connector

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

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

4.2 USB/POWER Interface

The development board is powered via 5VDC provided to the USB jack (CN3). Refer to Figure 4. This 5VDC is supplied either directly from a computer's USB port or from the USB power adapter. An on-board voltage regulator steps the voltage down to 3.3VDC, which is then provided to the PicoPort module, all other on-board ICs, and the "P3.3" rail in the breadboard area.

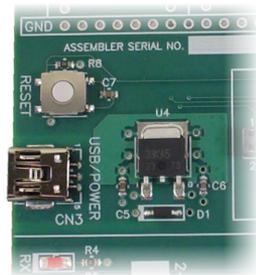


Figure 4: USB/POWER Interface

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

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

4.3 Breadboard Area

A breadboard area is located at the top of the development board (refer to Figure 5.) The breadboard area can be useful for prototyping product-specific SMT or thru-hole hardware, such as signal conditioning circuitry for sensor applications.

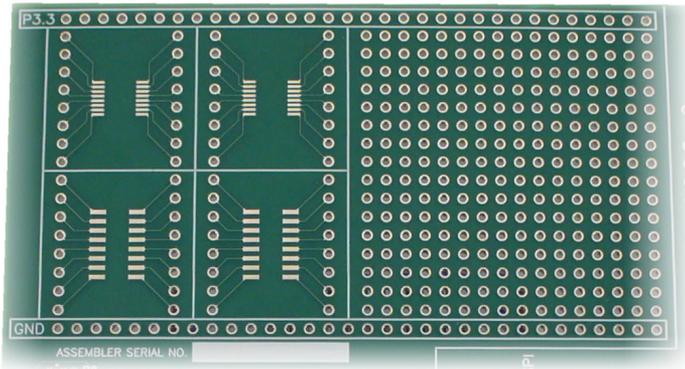


Figure 5: Breadboard Area

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.

4.4 Network Interface

4.4.1 RS-485

The PicoPort’s “network” interface is located in the lower left-hand portion of the development board, and is physically exposed as an RS-485 port on terminal block TB1 (refer to Figure 6.) Two jumpers (JP3 and JP4) are provided which allow the on-board selection of a 2-wire (jumpers on the top) or 4-wire (jumpers on the bottom) RS-485 interface. When switching between 2-wire and 4-wire interfaces, always ensure that both jumpers are placed in the same position.

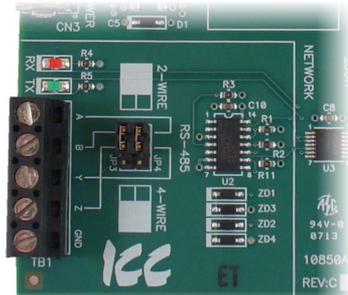


Figure 6: Network Interface

Table 1: Network Interface Configuration

To Use	Jumper Positions	Notes
4-wire RS-485	JP3 and JP4 in “4-WIRE” positions	A = non-inverting RX input B = inverting RX input Y = non-inverting TX output Z = inverting TX output
2-wire RS-485	JP3 and JP4 in “2-WIRE” positions	A/Y = non-inverting RX in / TX out B/Z = inverting RX in / TX out

4.4.2 LED Indicators

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

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

Red (RX) LED Lights when the PicoPort 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. Also note that if a 2-wire RS-485 network is in use, that the corresponding RX LED will light in conjunction with the TX LED (as transmitting devices on 2-wire RS-485 networks also receive their own transmissions).

4.5 Host Interface

The host interface portion of the development board allows a variety of physical interfaces to the PicoPort module. Refer to Figure 7. These interfaces provide the ability to interact with actual physical I/O as well as an RS-232, RS-485, or logic-level physical layer.

4.5.1 GPIO

The host interface exposes the PicoPort’s GPIO1...GPIO5 pins 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 terminating on external devices. For applications that wish to asynchronously reset the PicoPort, 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 PicoPort module, use caution to ensure that all applicable voltage and current limitations detailed in the PicoPort technical specifications are adhered to when making connections to circuitry or external devices. To avoid PicoPort module damage, also ensure that appropriate grounding/reference voltage connections are included in all connection schemes.

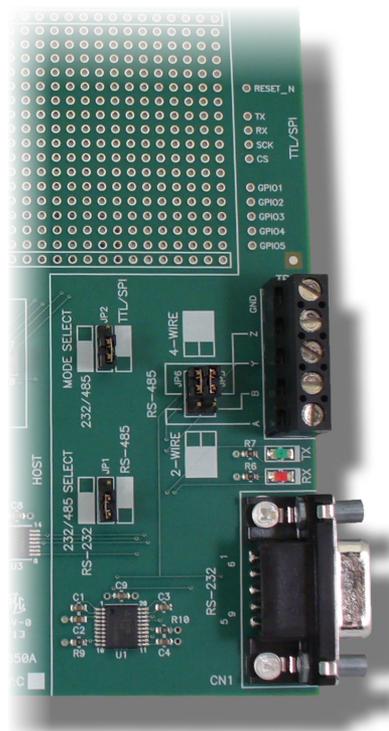


Figure 7: Host Interface

Table 2: Host GPIO Interface Configuration

To Use	Jumper Positions	Notes
GPIO1...GPIO5	N/A	Direct connection to PicoPort module
RESET_N	N/A	Direct connection to PicoPort module. As “RESET” switch shorts this signal to GND when depressed, suggested interface is open-collector type drive.

4.5.2 RS-485

The host interface allows the PicoPort module’s host-side serial communications port to be exposed as an RS-485 physical layer on terminal block TB2. Note that selection of the RS-485 physical layer is mutually exclusive with the RS-232 physical layer (refer to section 4.5.3.) Additionally, to avoid signal level mismatch and contention issues, remove all wiring from the TTL/SPI prototyping vias and CN1 when using the RS-485 port.

To enable the RS-485 port, the following jumpers must be properly selected:

- “MODE SELECT” jumper (JP2) must be in the “232/485” position
- “232/485 SELECT” jumper (JP1) must be in the “RS-485” position

Two jumpers (JP5 and JP6) are provided which allow the on-board selection of a 4-wire (jumpers on the top) or 2-wire (jumpers on the bottom) RS-485 interface. When switching between 2-wire and 4-wire interfaces, always ensure that both jumpers are placed in the same position.

Table 3: Host RS-485 Interface Configuration

To Use	Jumper Positions	Notes
4-wire RS-485	<ul style="list-style-type: none"> • JP1 in “RS-485” position • JP2 in “232/485” position • JP5 and JP6 in “4-WIRE” positions 	A = non-inverting RX input B = inverting RX input Y = non-inverting TX output Z = inverting TX output
2-wire RS-485	<ul style="list-style-type: none"> • JP1 in “RS-485” position • JP2 in “232/485” position • JP5 and JP6 in “2-WIRE” positions 	A/Y = non-inverting RX in / TX out B/Z = inverting RX in / TX out

4.5.3 RS-232

The host interface allows the PicoPort module’s host-side serial communications port to be exposed as an RS-232 physical layer on DB9 connector CN1. Note that selection of the RS-232 physical layer is mutually exclusive with the RS-485 physical layer (refer to section 4.5.2.) Additionally, to avoid signal level mismatch and contention issues, remove all wiring from the TTL/SPI prototyping vias and TB2 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 CN1 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 following jumpers must be properly selected:

- “MODE SELECT” jumper (JP2) must be in the “232/485” position
- “232/485 SELECT” jumper (JP1) must be in the “RS-232” position
- “RS-485” jumpers (JP5 and JP6) must both be in the “4-WIRE” position

Table 4: Host RS-232 Interface Configuration

To Use	Jumper Positions	Notes
RS-232	<ul style="list-style-type: none"> • JP1 in “RS-232” position • JP2 in “232/485” position • JP5 and JP6 in “4-WIRE” positions 	CN1:2 = TX output CN1:3 = RX input CN1:5 = GND CN1:7 internally shorted to CN1:8

4.5.4 TTL/SPI

The host interface allows the PicoPort module’s host-side serial communications port to be accessible as logic-level signals exposed 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 (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 PicoPort 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 selection of the TTL/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 PicoPort module, use caution to ensure that all applicable voltage and current limitations detailed in the PicoPort technical specifications are adhered to when making connections to circuitry or external devices. To avoid PicoPort module damage, also ensure that appropriate grounding/reference voltage connections are included in all connection schemes.

To enable the TTL/SPI interface, the following jumper must be properly selected:

- “MODE SELECT” jumper (JP2) must be in the “TTL/SPI” position

Table 5: Host TTL/SPI Interface Configuration

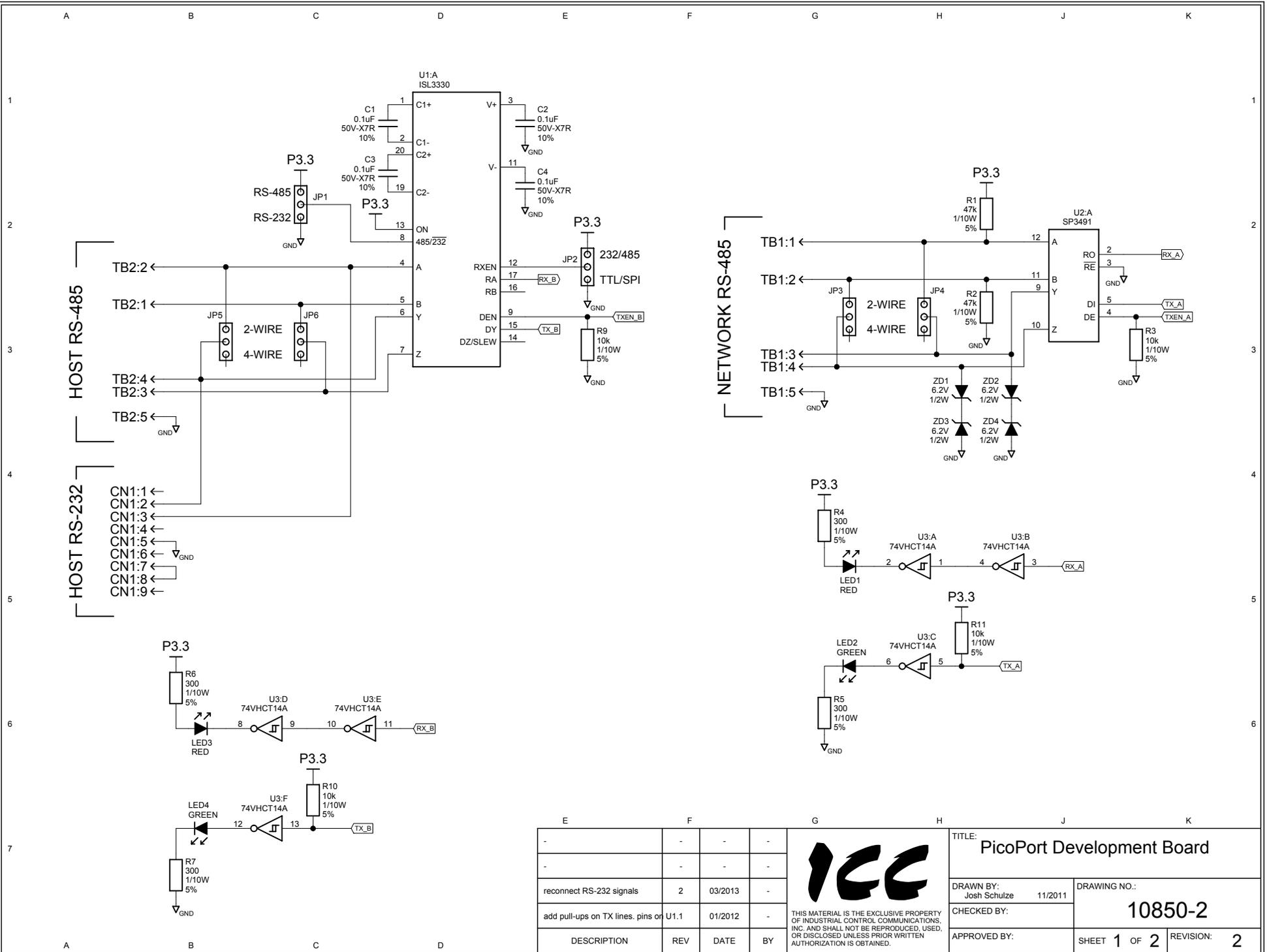
To Use	Jumper Positions	Notes
TTL/SPI	JP2 in “TTL/SPI” position	TX = PicoPort TX_B output RX = PicoPort RX_B input CS = PicoPort TXEN_B output / CS input/output SCK = PicoPort SCK input/output

4.5.5 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 PicoPort is transmitting data on the host port.

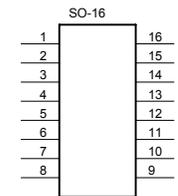
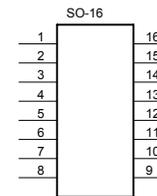
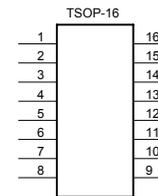
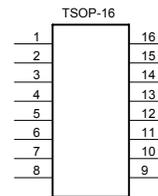
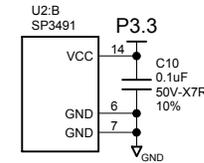
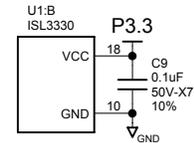
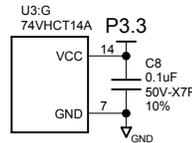
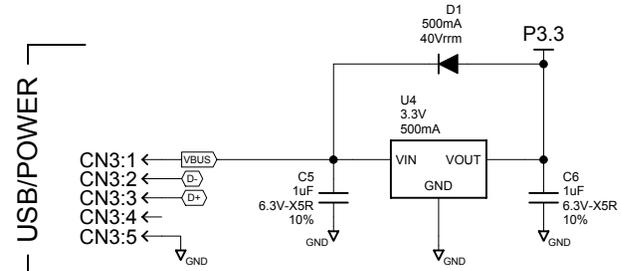
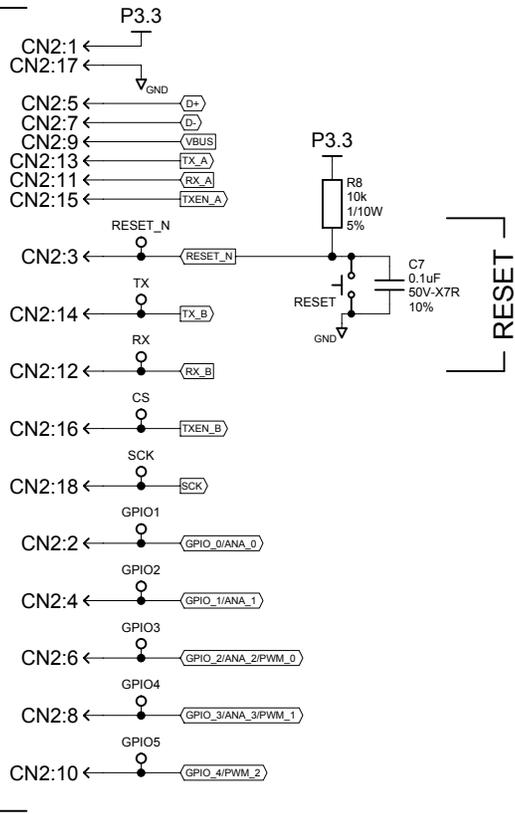
Red (RX) LED Lights when the PicoPort is receiving data on the host port. Note that this does not indicate the validity of the data with respect to a particular protocol: only that data exists and is being detected. Also note that if a 2-wire RS-485 network is in use, that the corresponding RX LED will light in conjunction with the TX LED (as transmitting devices on 2-wire RS-485 networks also receive their own transmissions).



DESCRIPTION	REV	DATE	BY	TITLE:	DRAWN BY:	DRAWING NO.:
-	-	-	-	 TITLE: PicoPort Development Board	DRAWN BY: Josh Schulze 11/2011	DRAWING NO.: 10850-2
reconnect RS-232 signals	2	03/2013	-			
add pull-ups on TX lines. pins on	U1.1	01/2012	-		CHECKED BY:	APPROVED BY:

THIS MATERIAL IS THE EXCLUSIVE PROPERTY OF INDUSTRIAL CONTROL COMMUNICATIONS, INC. AND SHALL NOT BE REPRODUCED, USED, OR DISCLOSED UNLESS PRIOR WRITTEN AUTHORIZATION IS OBTAINED.

PICOPORT



DESCRIPTION	REV	DATE	BY	TITLE:
-	-	-	-	PicoPort Development Board
reconnect RS-232 signals	2	03/2013	-	DRAWN BY: Josh Schulze 11/2011
add pull-ups on TX lines. pins on U1.1	01/2012	-	-	CHECKED BY:
				10850-2
				APPROVED BY:
				SHEET 2 OF 2
				REVISION: 2



THIS MATERIAL IS THE EXCLUSIVE PROPERTY OF INDUSTRIAL CONTROL COMMUNICATIONS, INC. AND SHALL NOT BE REPRODUCED, USED, OR DISCLOSED UNLESS PRIOR WRITTEN AUTHORIZATION IS OBTAINED.



INDUSTRIAL CONTROL COMMUNICATIONS, INC.

1600 Aspen Commons, Suite 210
Middleton, WI USA 53562-4720
Tel: [608] 831-1255 Fax: [608] 831-2045

<http://www.iccdesigns.com>

Printed in U.S.A