

Introduction

The XR22804IL56-0A-EB is an evaluation board for the XR22804IL56-F. The XR22804IL56-F is a Hi-Speed USB 2.0 compound device with an embedded hub and 7 downstream USB functions: 10/100 Ethernet controller, 4 UARTs, multi-master capable I²C controller and an Enhanced Dedicated GPIO Entity (EDGE) controller. This manual is intended to guide users to operate these different functions of XR22804IL56-F on a windows 7 platform. The XR22804IL56-F shares common evaluation board with XR22802IL56-F. The only difference between the XR22804IL56-F and the XR22802IL56-F is that the XR22802IL56-F has two UART channel whereas XR22804IL56-F has four UART channels.

Table 1: Ordering Information

Device Ordering Part Number	Evaluation Board Ordering Part Number	Device Package	Device Location
XR22804IL56-F	XR22804IL56-0A-EB	56-pin QFN	U7
XR22802IL56-F	XR22802IL56-0A-EB	56-pin QFN	U7

Board Layout and Outline

Evaluation Board outline

Figure 1 provides shows the topography of the board. For XR22802IL56-F serial port connectors for UART channel-C and channel-D are not installed.

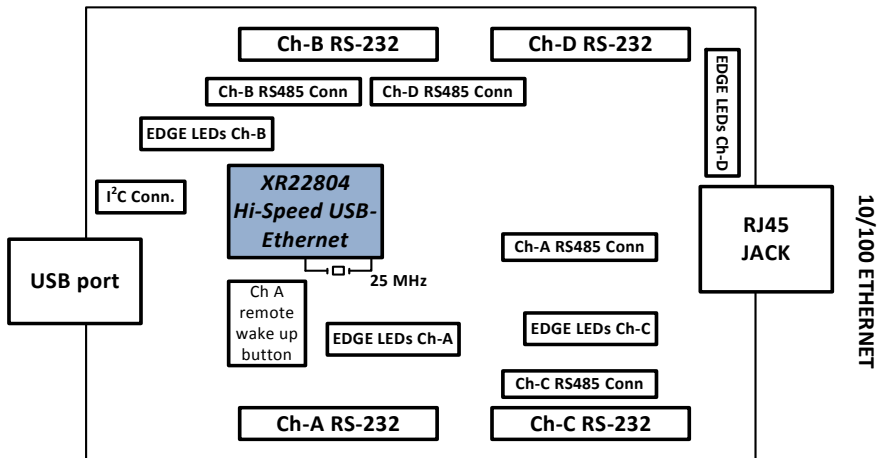


Figure 1: Outline XR22804 Evaluation Board (Top View)

Evaluation Board Layout

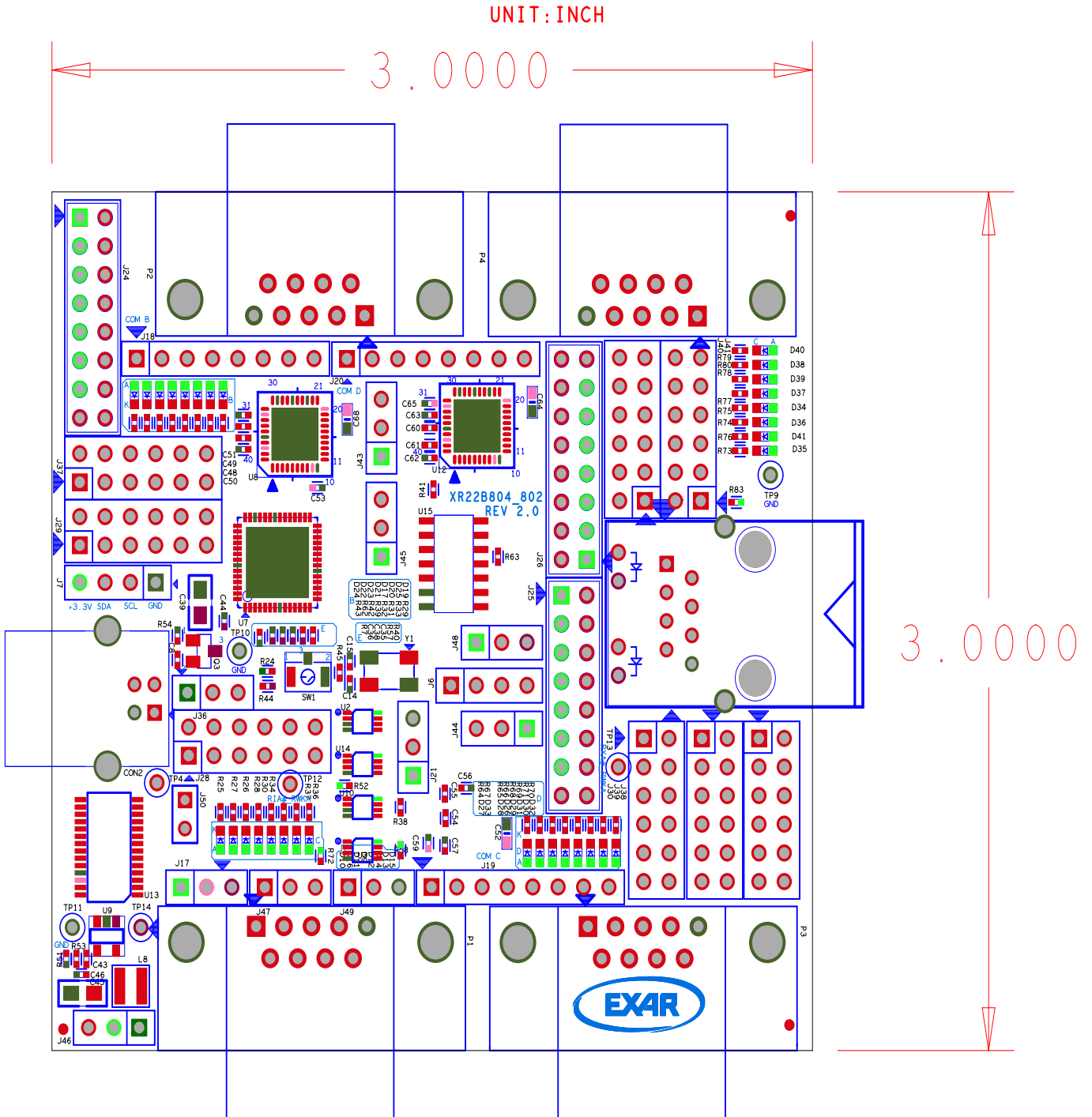


Figure 2: XR22804 Evaluation board Top View

Software Drivers

This section provides assistance regarding installation of the drivers for the embedded hub and the downstream USB functions of the XR22804/2. The hub and the HID functions (I²C and EDGE) are supported by Windows in-box generic drivers. Therefore no custom driver need to be installed. The Windows system should automatically load drivers for these functions. The Ethernet and UART functions are CDC compliant functions. The XR22804/2IL56-0A-EB is shipped with an installation CD that contains the latest Windows Xp/7 custom drivers for Ethernet and UART devices. This drivers can also be downloaded from the XR22804/2's product web page.

Device Enumeration

When the device is first plugged into the system the embedded hub is enumerated first. It appears in the Device Manager under the "Other devices" tab as shown in the Figure 3. In order to access the Device Manger, go to start and in the search box enter "devmgmt.msc" and hit carriage return key on the keyboard.

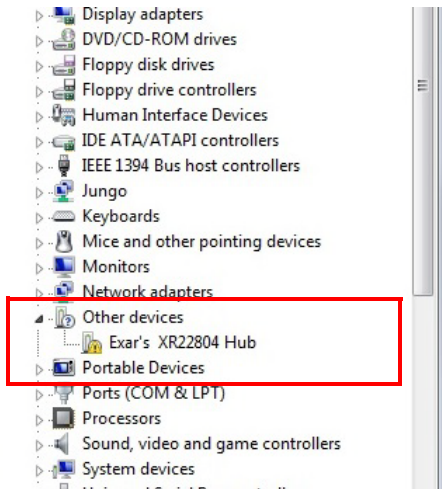


Figure 3: XR22804 hub enumeration

The downstream USB functions are initially enumerated as shown in Figure 4 in Device Manager under the "Other devices" tab before their drivers are installed.

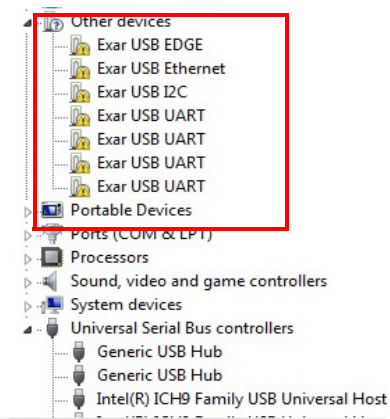


Figure 4: Enumeration of USB downstream ports

Driver Installation

As mentioned previously the drivers for the embedded hub and HID functions should be installed automatically. This section provides assistance in installing custom driver for UART and Ethernet function. The example in this manual uses XR22804IL56-F but the steps are the same for XR22802IL56-F.

Driver Installation for Embedded HUB

Once the driver for the embedded hub is installed it will appear under “Universal Serial Bus Controller” tab as “Generic USB Hub” as shown in Figure 5. The users may confirm the Hardware IDs of the “Generic USB Hub” devices to differentiate between other generic hubs attached to the system.

In order to access Hardware IDs right click on “Generic USB Hub” and select “Properties”

In Properties page go to “Details” tab, in the Property drop-down menu select “Hardware Ids”

The Hardware ID of that device is showed under “Value” window.

For XR22804IL56-F, the value shown in this window: USB\VID_04E2&PID_0804

For XR22802IL56-F, the value shown in this window: USB\VID_04E2&PID_0802

Where 0x04E2 is the Vendor ID(VID) of Exar and 0x0804/2 is the Product ID(PID).

The downstream functions are enumerated only after the hub driver has been successfully installed.

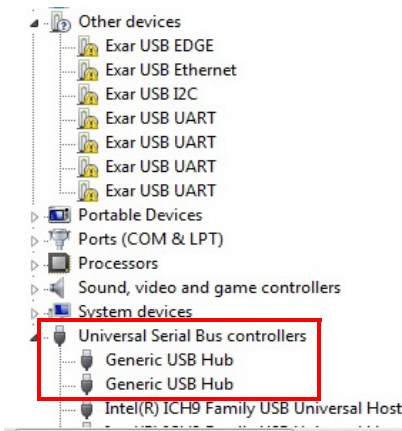


Figure 5: XR22804IL56-F embedded hub in Device manager

Driver Installation for HID (I²C and EDGE) devices

Drivers for the HID devices will be installed automatically after the Hub drivers are installed and they will appear under “Human Interface devices” tab in Device Manager. To differentiate between HID devices read the Hardware IDs. The product ID for HID-I²C is 0x1100 and for HID-EDGE is 0x1200.

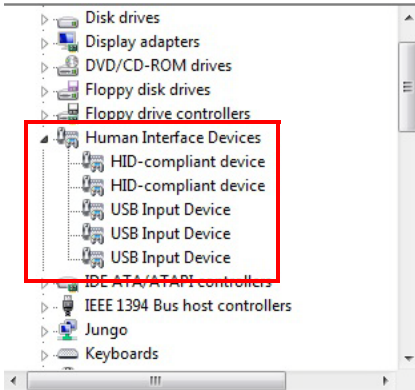
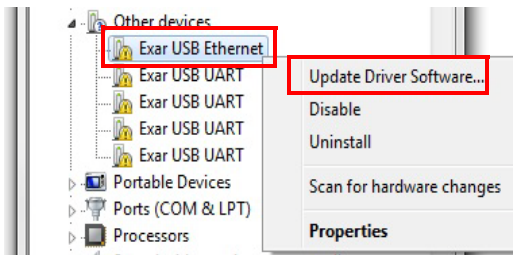


Figure 6: HID devices in Device Manager

Installing Custom Driver for Ethernet Function

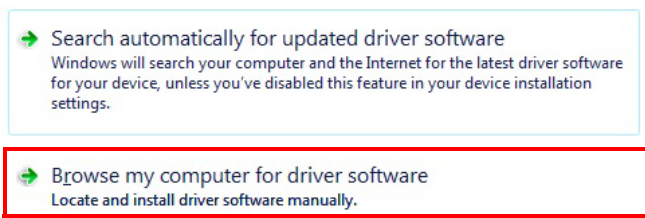
In the installation disc goto folder “Driver/Ethernet” and copy its contents on the hard drive. Extract all contents of the “.zip” folder.

Go to device Manger and right click on “Exar USB Ethernet” under the “Other devices” tab and select “Update Driver”.

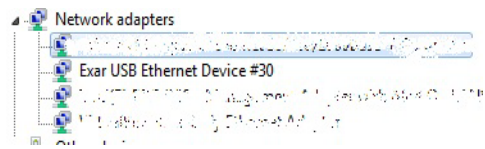


On the next wizard page select option “Browse my computer for driver software”

How do you want to search for driver software?



On the next wizard page select the option “Let me pick from a list of device drivers on my Computer” then click button “Have Disk...” and browse to the folder where all the driver files were extracted and select the “xrusbnet.inf” file. On successful installation of driver the device will be listed under “Network Adapters.”



Driver Installation for UART

The steps for installing driver for UARTs is same as steps mentioned for Ethernet drivers except the inf file for UART is “xrusber.inf”. The user will have to perform this task for one of the four UARTs and then re-enumerate (unplug & plug) the device. After the drivers are installed successfully the UARTs will be listed under “Ports (COM & LPT)” in the Device Manager.

Software Application and Utilities

After successful installation of drivers, the next step in the process is to operate XR22804/2IL-0A-EB. The installation disc contains various test applications for testing the various USB functions. It contains test application for UARTs, I²C and EDGE functions. The user may use a web browser for evaluating the Ethernet function.

The following screen-shots and information are provided to operate the 4 different types of embedded functions for all tests including Suspend/Resume testing. Each type of function is described separately but can/will be run simultaneously.

Ethernet 10/100 - PID 0x1300

After successful installation of Ethernet driver plug in cat-5 ethernet cable into the RJ45 ethernet jack. The device properties related to ethernet port can be modified from Device Manager. Right Click on “Exar USB Ethernet Device” instance under “Network Adapter” and select Properties. In Properties select Advanced tab as shown below in Figure 7

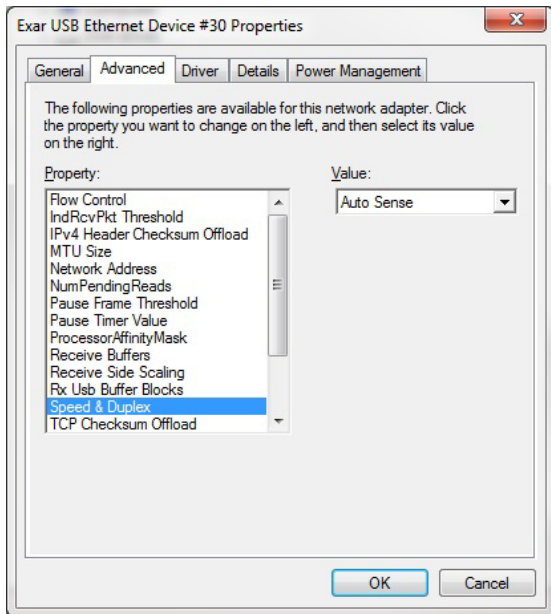


Figure 7: Ethernet device Properties

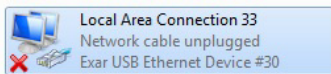
In this tab the user can modify various properties related to Ethernet e.g. Flow control, Remote Wake-up modes, Speed and Duplex modes etc. In Speed & Duplex property the users can select among different link speed configurations supported by XR22804IL56-F in “Speed & Duplex” property. The different speed configurations are Auto Sense, 100M Full- Auto, 100M Full- Fixed, 100M Half- Auto, 100M Half- Fixed, 10M Full- Auto, 10M Full- Fixed, 10M Half- Auto and 10M Half- Fixed. All of this mode are explained in brief below:

Table 2: Speed and Duplex Settings

Property Name	Description
Auto Sense (Default)	XR22804IL56-F automatically determines the link speed through the process of Auto-Negotiation, where XR22804IL56-F advertises itself to be 10M & 100M Full & Half capable to the link partner.
100M Full/Half -Auto	During this mode XR22804IL56-F will always advertise itself to be 100M Full/Half capable only to the link partner.
10M Full/Half -Auto	During this mode XR22804IL56-F will always advertise itself to be 10M Full/Half capable only to the link partner.
100M Full/Half -Fixed	During this mode XR22804IL56-F is forced to 100M Full/Half mode. There is no link negotiation with the link partner.
10M Full/Half -Fixed	During this mode XR22804IL56-F is forced to 10M Full/Half mode. There is no link negotiation with the link partner.

The XR22804IL56-F supports static and dynamic IPs. Follow the steps below to configure the static IP (if the static IP is assigned):

1. Go to the Start menu
2. In the Search box, search for “View network connections” and hit carriage return
3. Right click on Local Area Connection # icon of Exar USB Ethernet shown in figure below and select properties



4. On the properties page select “Internet Protocol Version 4” and click on Properties button as shown in Figure 8

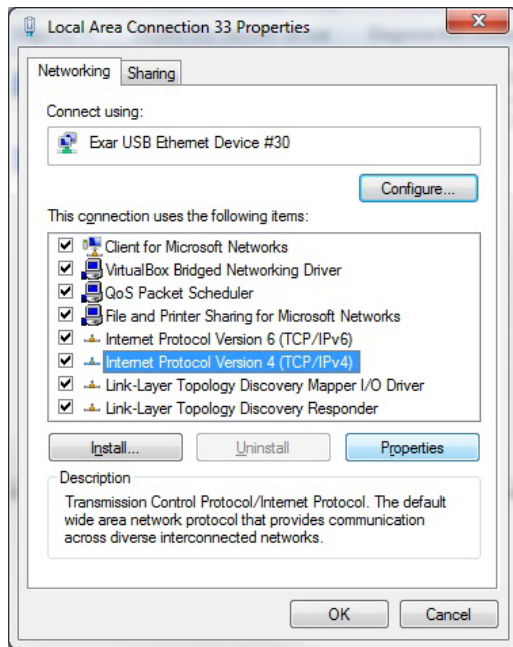


Figure 8: Local Area Connection Properties window

5. Configure their static IP as shown in the figure. For DHCP select the option “Obtain the IP address automatically”.

Obtain an IP address automatically

Use the following IP address:

IP address:

Subnet mask:

Default gateway:

Obtain DNS server address automatically

Use the following DNS server addresses:

Preferred DNS server:

Alternate DNS server:

Confirm the IP settings by following the below mentioned step:

1. Go to Start menu and search for “cmd” and hit carriage return
2. In the command prompt enter “ipconfig /all”
3. It will display information for all the network adapters connected to the system. The user should look for Ethernet adapter whose description says “Exar USB Ethernet Device # ” as shown in figure below

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Administrator: Command Prompt

Ethernet adapter Local Area Connection 33:

    Connection-specific DNS Suffix . . . : 
    Description . . . . . : Exar USB Ethernet Device #30
    Physical Address. . . . . : 00-BD-27-00-09-2D
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::f4a8:45af:a5fd:d2b3%90(Preferred)
    IPv4 Address. . . . . : 192.168.1.2(Preferred)
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.1.1
    DHCPv6 IAID . . . . . : 1509997863
    DHCPv6 Client DUID. . . . . : 00-01-00-01-19-A7-7F-8A-00-1D-60-EA-73-FE

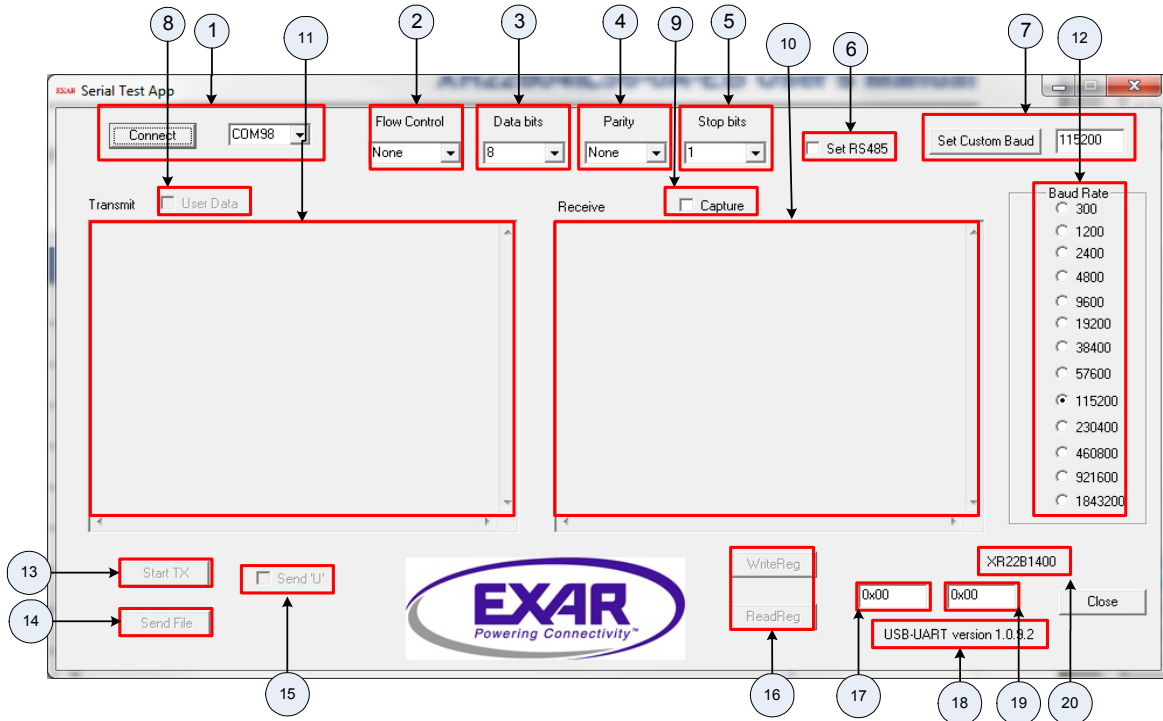
    DNS Servers . . . . . : fec0:0:0:ffff::1%1
                           fec0:0:0:ffff::2%1
                           fec0:0:0:ffff::3%1
    NetBIOS over Tcpip. . . . . : Enabled
  
```

Figure 9: Local Area Connection adapter information

After configuring the ethernet port based on the network requirement, it will be ready to be used. Use a web browser to verify the functionality of the Ethernet port.

UARTs - PIDs: 0x1400 (Channel A), 0x1401 (Channel B), 0x1402 (Channel C) and 0x1403 (Channel D)

The installation disc contains the Serial_test_App.exe utility for evaluating the UARTs functions. The snapshot below shows the UART “Serial Test App”:



Using this utility user can send and receive continuous data through UARTs. Each portion of the utility is described in Table below:

Table 3: GUI Description

GUI Item	Name	Description
1	Connect	After selecting the appropriate UART in the list. Click “Connect’ button to open the port. Upon successful connection the button changes to “Disconnect”. Clicking on “Disconnect” will close the port
2	Flow Control	Selects the flow control setting: Hardware, Software or No flow control
3	Data bits	Selects the number of data bits - 5, 6, 7, 8 & 9 per character. 5 and 6 bits are not supported by XR2280x devices
4	Parity	Selects among the parity types - odd, even, mark or space
5	Stop bits	Selects the length of stop bit - 1 or 2 bit time
6	Set RS485	Configures RTS pin to control a half-duplex RS485 transceiver
7	Set Custom Baud	Sets custom baud rate. Baud rate value should be between 300bps - 15Mbps
8	User Data	User can enter the data to be transmitted in Transmit Window
9	Capture	Click this option to save the received data in to a text file
10	Receive window	Displays data received
11	Transmit window	Displays data to be transmitted

Table 3: GUI Description

GUI Item	Name	Description
12	Baud Rate	Selection among the standard baud rates
13	Start Tx	Click this button to start data transmission, the application will send a fixed pattern continuously. Eg: "L00 - 0123456789abcdefghijklmnopqrstuvwxy L01 - 0123456789abcdefghijklmnopqrstuvwxy L02 - 0123456789abcdefghijklmnopqrstuvwxy..." Once data transmission initiates successfully this button becomes "Stop" button. Click "Stop" to stop data transmission
14	Send File	Select this option to send a text file
15	Send U	Sends 'U' (0x55) continuously
16	Read & Write	Read button executes read command for reading register. write button executes write button to write to the register
17	Address field	Enter register address on which read/write operation is performed
18	Application Version	Displays version of the application
19	Data field	For Read operation: Display the read data For Write operation: Enter data to be written
20	Device PID	Displays Product ID(PID) of the UART

HID-I²C - PID 0x1100

The XR22804IL56-0A-EB evaluation board provides an interface (header J7) to connect I²C slave to its I²C master interface. The installation disc contains HID-I²C utility to control this HID-I²C master function. The figure shows the snapshot of HID-I²C utility.

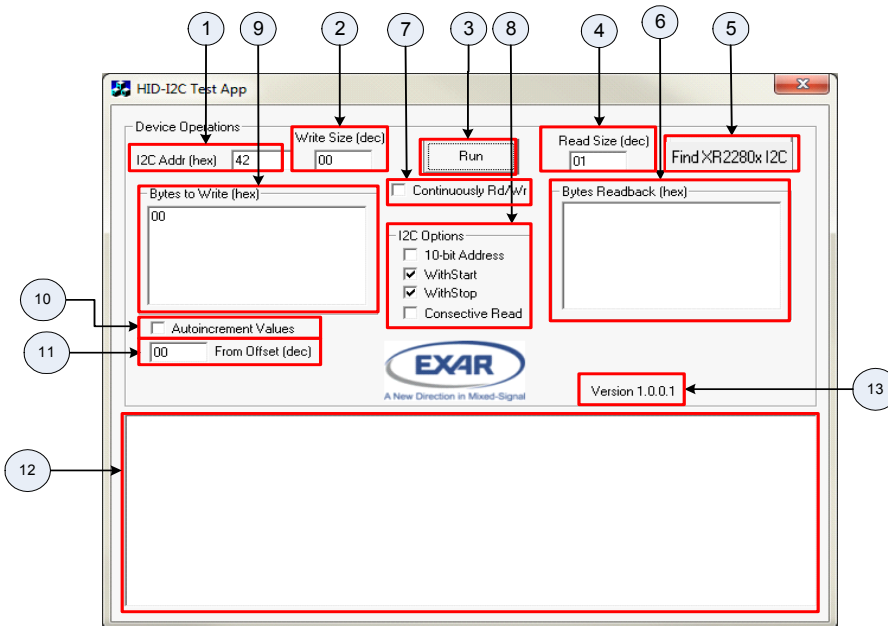


Figure 10: HID-I²C utility

Connect I²C slave device to the XR22804IL56-0A-EB evaluation board via 4-pin header J7. The evaluation board has 47K pull-up installed on SDA and SCL pin refer to the schematic for more details. Run the HID-I²C test app. Push “Find XR2280x I2C” button. Each portion of HID-I²C utility is described in table below:

Table 4: HID I²C GUI Description

GUI Item	Name	Description
1	I2C Addr	Enter the address of the Slave i ² c device. The value entered should be in hexadecimal system and right shifted by one bit. e.g.- If Slave address= “60” the value entered in this box will be “30”
2	Write Size	Enter in decimal the number of bytes, without including the slave address, to be sent to slave device
3	Run	Push this button to execute Read/Write command
4	Read Size	Enter in decimal the number of bytes expected to be read from the slave device
5	Find XR2280x I2C	Push this button to force the utility to look for XR2280x device
6	Bytes Readback	This window display the bytes read from the slave device. The number of bytes read is defined by GUI item #4. This window will also display status of any operation in terms of whether it “succeeded” or “failed”
7	Continuously Rd/Wr	Enable this box in order to perform read/write operation continuously. De-selecting the check box will stop the operation.
8	I2C options	These settings controls the I ² C protocol
	a. 10-bit Address	Check this box to enable 10-bit slave addressing mode
	b. WithStart	Check this box to initiate I ² C transaction with start bit. The master sends a start bit followed by the address byte to select a slave and initiate a transfer.
	c. WithStop	Check this box to initiate I ² C transaction with stop bit. The master sends a stop bit, this relinquishes the bus, and another master may then claim it.
	d. Consecutive Read	Check this box to perform consecutive read operation
9	Bytes to Write	Enter the data string that needs to be send to slave device. If there is more than one data byte they should be separated by space. For eg: For write operation- In order to send data string 0x22, 0x3C, 0x4A, 0x55, 0x56 and 0x8F to slave device enter these values in box as below: “22 3C 4A 55 56 8F” In most slave devices the first byte is the address in slave device where the following data should be written. For this example 0x22 is that address. For Read Operation- Enter the Address in the slave device that needs to be accessed. For e.g: if the address of location in slave device is 0x22 enter “22” in the box. The value read will be shown in Bytes Readback (GUI item #6)
10	Autoincrement Values	Enable the check box to auto-increment, by 1, the data byte, specified by the offset (GUI item #11), in Byte to Write (GUI item #9). for e.g: if data string in “Byte to Write”= “22 3C 4A 55 56 8F” offset= 1, after every transaction data byte, in this case 0x3C, will be incremented by 1 and the remaining string remains the same.
11	From Offset	Enter the offset location, in decimal system, of the byte in the data string in “Bytes to Write” box
12	Message window	All the messages related to HID-I ² C is displayed in this box
13	Version	It describes the version number for the existing application

HID-EDGE- PID 0x1200

The XR22804IL56-0A-EVB evaluation board has LEDs installed for testing EDGE pins. The LEDs are active LOW hence they lite up when output LOW. The installation disc contains an application to control configure the EDGE pins. The user needs to confirm the jumper settings before proceeding with this test. The figure below shows the snapshot of HID-EDGE utility.

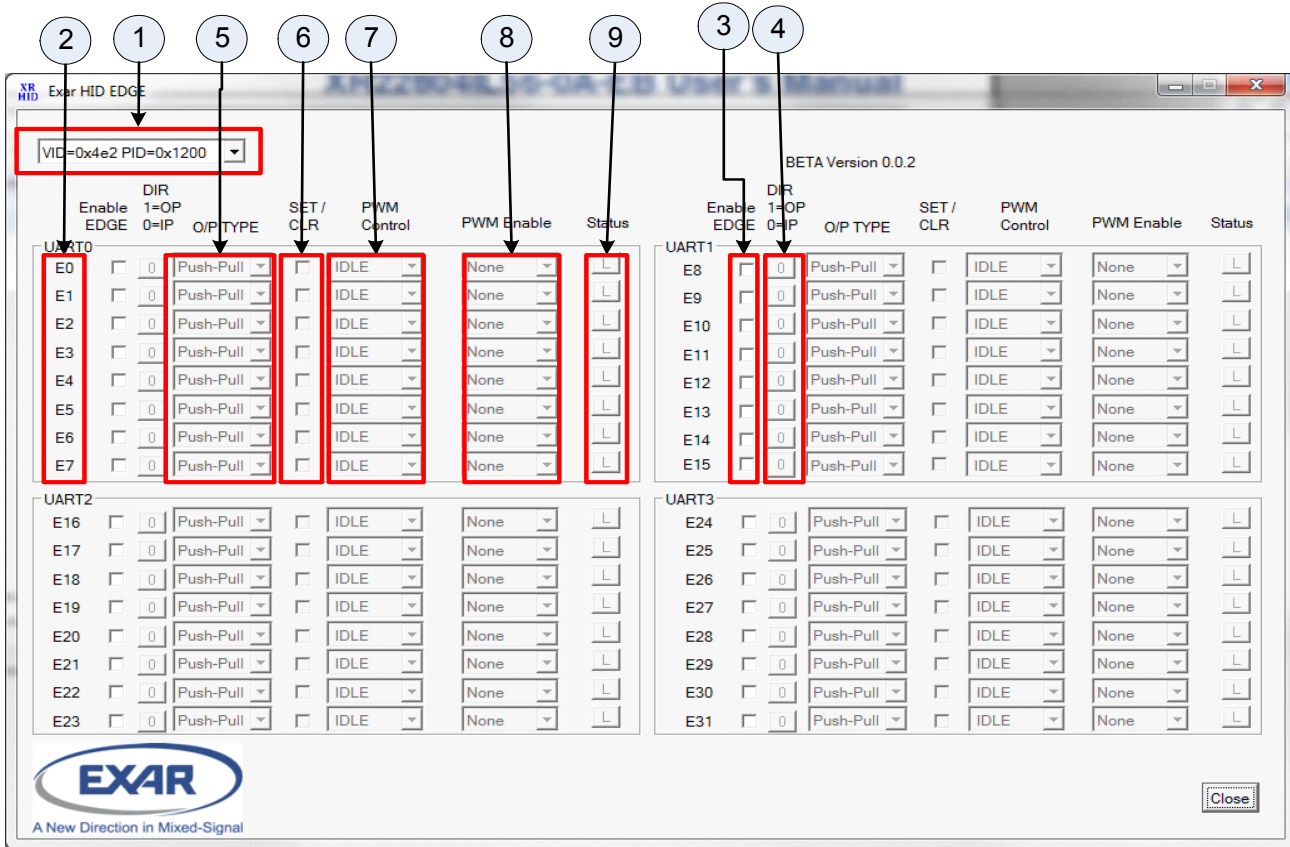


Figure 11: HID-EDGE Application

Table 5: HID I²C GUI Description

GUI Item	Name	Description
1	Device Info	This box displays device information: Vendor ID(VID), Product ID(PID)
2	EDGE pin number	Element in this column references to the EDGE pin number. E.g: E0= Edge Pin 0, E1= Edge Pin 1 etc
3	Enable EDGE	Check this box to configure this pin to EDGE. Uncheck this box to configure this pin to UART
4	DIR	1= This pin is configures as output pin 0= This pin is configured as input pin
5	O/P TYPE	A drop-down menu provides three options: 1. Push-Pull: select this option to set output pin to be PUSH-PULL 2. Open-Drain: select this option to set output pin to be an open drain pin 3. Tri-State: select this option to set output pin to be a Tri-state pin

Table 5: HID I²C GUI Description

GUI Item	Name	Description
6	SET/CLR	Check this box to set the output HIGH. Uncheck this box to set the output LOW
7	PWM Control	A drop-down menu provides three options: 1. IDLE: select this option to leave PWM output idle 2. Stp_LOW: select this option driver output LOW when PWM is idle. 3. One Shot: If output is high, run one low cycle and stop high. If output is low, run one high cycle and stop low. Cleared to IDLE when completed. 4. RUN: select this option for PWM output to toggle HIGH-LOW. 5. Stp_HIGH: select this option driver output HIGH when PWM is idle.
8	PWM Enable	A drop-down menu provides an option to select among two PWMs. Select None to disable PWM mode
9	Status	If not configured as UART or PWM this box display state of the pin. 1= pin state is HIGH 0= pin state is LOW

For further details on any of the above functions refer to the datasheet.

Hardware Configuration

This section describes the default board settings, when shipped from the factory, and jumper setting that are required when changing modes.

Power Configurations

When shipped from the factory, the XR22804/2 is configured for bus-powered mode and uses the 5V supplied by the USB host. Table 6 shows the default jumper settings for power:

Table 6: Default Jumper Settings for Power

Jumper Settings	Description
J46- 1 & 2	Connects +3V3A node to +3.3V node that sources transceivers on the board.
J36- 2 & 3	Connects VBUS to the VBUS_SENSE pin through a voltage divider. VBUS_SENSE pin is ignored during bus powered mode.
J17- 1 & 2	Connect VCC_TRANS node to +3.3V node. This provides 3.3V to SP3245EEY and SP339EER transceivers. The XR22804IL56-0A-EB evaluation board uses the 3V3_out pin (+3.3VA node) to power the transceivers on the board.
J48-2 & 3	Connect VCC of SP3036EEN,RS485 transceiver to +3.3V node.

Pin Configurations

XR2280x IO pins supports multiple functions. They can be programmed to be UART pins or GPIO pins or EDGE pins. When shipped from factory, IO pins of the XR22804IL56-0A-EB are programmed to be UART pins and are connected to transceiver via jumpers. They can be connected to LED for GPIO or EDGE function testing. This selection is also made through jumpers mentioned in tables below. LED is turned ON when pin is driven LOW.

Table 7: Default Jumper Settings for UART Channel A

Pin Name	SP3245EEY(Default)	LED	Notes
E0/RIA#/RWKA#/GA0	J28-7 & 9	J28-9 & 11	LED is not installed. This pin connected to a pull-up resistor

Table 7: Default Jumper Settings for UART Channel A

Pin Name	SP3245EEY(Default)	LED	Notes
E1/CDA#/GA1	J28-8 & 10	J28-10 & 12	
E2/DSRA#/GA2	J28-1 & 3	J28-3 & 5	
E3/DTRA#/GA3	J28-2 & 4	J28-4 & 6	
E4/CTSA#/GA4	J30-7 & 9	J30-9 & 11	
E5/RTSA#/RS485A/GA5	J30-8 & 10	J30-10 & 12	
E6/RxA/RWKA#	J30-1 & 3	J30-3 & 5	
E7/TxA	J30-2 & 4	J30-4 & 6	

Table 8: Default Jumper Settings for UART Channel B

Pin Name	SP339EER1 (Default)	LED	Notes
E8/RIB#/RWKB#/GB0	J29-7 & 9	J29-9 & 11	LED is not installed. This pin connected to a pull-up resistor
E9/CDB#/GB1	J29-8 & 10	J29-10 & 12	
E10/DSRB#/GB2	J29-1 & 3	J29-3 & 5	
E11/DTRB#/GB3	J29-2 & 4	J29-4 & 6	
E12/CTSB#/GB4	J37-7 & 9	J37-9 & 11	
E13/RTSB#/RS485B/GB5	J37-8 & 10	J37-10 & 12	
E14/RxB/RWKB#	J37-1 & 3	J37-3 & 5	
E15/TxB	J37-2 & 4	J37-4 & 6	

Table 9: Default Jumper Settings for UART Channel C¹

Pin Name	SP339EER1 (Default)	LED	Notes
E16/RIC#/RWKC#/GC0	J38-7 & 9	J38-9 & 11	LED is not installed. This pin connected to a pull-up resistor
E17/CDC#/GC1	J38-8 & 10	J38-10 & 12	
E18/DSRC#/GC2	J38-1 & 3	J38-3 & 5	
E19/DTRC#/GC3	J38-2 & 4	J38-4 & 6	
E20/CTSC#/GC4	J39-7 & 9	J39-9 & 11	
E21/RTSC#/RS485C/GC5	J39-8 & 10	J39-10 & 12	
E22/RxC/RWKC#	J39-1 & 3	J39-3 & 5	
E23/TxC	J39-2 & 4	J39-4 & 6	

¹Note: Not installed for XR22802

Table 10: Default Jumper Settings for UART Channel D¹

Pin Name	SP339EER1 (Default)	LED	Notes
E24/RID#/RWKD#/GD0	J40-7 & 9	J40-9 & 11	LED is not installed. This pin connected to a pull-up resistor
E25/CDD#/GD1	J40-8 & 10	J40-10 & 12	
E26/DSRD#/GD2	J40-1 & 3	J40-3 & 5	
E27/DTRD#/GD3	J40-2 & 4	J40-4 & 6	
E28/CTSD#/GD4	J41-7 & 9	J41-9 & 11	
E29/RTSD#/RS485D/GD5	J41-8 & 10	J41-10 & 12	
E30/RxD/RWKD#	J41-1 & 3	J41-3 & 5	
E31/TxD	J41-2 & 4	J41-4 & 6	

¹Note: Not installed for XR22802

Table 11: Remote Wake up Jumper settings

Jumper Settings	Description
J28-9 and TP12	(Not installed) This jumper connects a button switch to RI pin. This switch is used to wake up the device from sleep

Transceiver Configurations

On XR22804/2IL56-0A-EB board there's an SP3245EEY for RS232 communication and SP3086EEN for RS485 communication for UART channel A. It also has multi protocol transceiver, SP339EER1, for RS232/485 communication for UART channel B, C¹ and D¹. When shipped from the factory the SP339EER1 transceiver are configured for RS232 communication. The jumper setting for this mode is shown in table below.

Table 12: SP339EER1 Settings

UART Channel	Jumper number	RS-232 Mode (default)	Half-Duplex RS-485 Mode	Full-Duplex RS-485 Mode
B	J24	Jumper installed between 5&6	Jumper installed between 7&8	Jumper installed between 5&6 and 7&8
C ¹	J25	Jumper installed between 5&6	Jumper installed between 7&8	Jumper installed between 5&6 and 7&8
D ¹	J26	Jumper installed between 5&6	Jumper installed between 7&8	Jumper installed between 5&6 and 7&8

¹Note: Not installed for XR22802

Half-Duplex RS-485/422 mode

In the RS-485 half-duplex mode, the DIR1 pin of the SP339EER1 enables or disables the RS-485/422 line drivers. The DIR1 pin can be controlled by the XR22804/2 using the RTS# output pins. The connection between RTS# and the DIR1 pin can be made by installing a jumper between 1 & 2 of J43, J44 and J45 for UART channel B, C¹ & D¹ respectively. Refer to the XR22804/2 datasheet for details for selecting and enabling the Automatic Transceiver Enable feature for the RTS# pin.

¹Note: Not installed for XR22802

Revision History

Revision	Date	Description
1A	June 2014	Initial release

For Further Assistance:

Email: UARTtechsupport@exar.com

Exar Technical Documentation: <http://www.exar.com/techdoc/>

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