# Modbus TCP

Included files: Lantronix DeviceInstaller (folder): Program to configure E-485 Bridge (Ethernet)

# **Overview**

This application note will show how to setup a SilverDust QCI-D2-IG8-EM servo controller for Modbus TCP communications. Typically Modbus is used to share registers between the controller and some Modbus host (i.e. HMI, PLC, ...).

The Modbus TCP E-485 Bridge firmware in these units converts Modbus TCP to single or multi-drop Modbus RTU across the servo controller's RS-485 bus. Therefore, a single Modbus TCP E-485 Bridge can be used as a gateway to an entire network of Modbus RTU servo controllers via the RS-485 bus.

The controllers first must be initialized to use the Modbus RTU protocol over RS-485 and then the Modbus TCP protocol needs to be configured on the E-485 Bridge.

This document assumes the reader is familiar with Quicksilver's Modbus Protocol as described in QCI-AN038 Modbus Protocol.

### **Servo Controller Configuration**

#### 1) SilverDust QCI-D2-IG8-EM Jumpers

If your PC has an RS-485 port, QCI suggests using it to program the controller.

If you are using your PC's RS-485 port install only two the "485 TERM". If you are using the PC's RS-232 port (i.e. COM1), remove all jumpers.

### 2) Set QuickControl's Comm Port to Modbus

Protocol

Setup->Comm Port

Comm Properties 🔀		check
OK Cancel	Press	Comm COM1
COM E-485 Bridge (Ethernet)	Modify	
COM port COM1 Enter COMnnn Default=COM1 (i.e. COM200) or select from list		
Baud Rate 57.6K  Default=57600		
Protocol 8-Bit ASCII 2 Stop Bits, No Parity	Press the proto	ocol bu
Default=8-Bit ASCII, No Parity, 2 Stop Bits		



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Select Modbus protocol, 2 Stop Bits, No Parity

Press OK,OK,OK

	×		
Select Protocol, Stop Bits and Parity. NOTE: 9-Bit Binary requires 2 Stop Bits, No Parity	OK Cancel		
Protocol (Default: 8-Bit ASCII)	-		
Modbus			
Parity and Stop Bits (Default: 2 Stop Bits, No Parity)			
2 Stop Bits, No Parity	•		

#### 3) Run Initialization Wizard

Tools->Initialization Wizard

Select Protocol from the Communications branch.

Edit PRO:Protocol	×
Select Protocol, Stop Bits and Parity. NOTE: 9-Bit Binary requires 2 Stop Bits, No Parity	OK Cancel
	Description
Protocol (Default: 8-Bit ASCII)	
Modbus	▼
Parity and Stop Bits (Default: 2 Stop Bits	s, No Parity)
2 Stop Bits, No Parity	•

Initialization Wizard	×
Press "Download" to initialize servo or change the factory default parameters using the "Initialize Parameter Browser " or "Interview". Device <u>"Dev #1"</u> Motor <u>A171</u> Adr = 16 SilverDust D2 IG8	Serialize     Exit w/ Save       Download File     Dptions       To Device     Interview       Motor Cable     Interview       Length (it)     4
File 1 Init MB.qcp   _	Initialize Parameter Browser Communications Identity Protocol Serial Interface Baud Rate ACK Delay

Select the Modbus protocol, 2 Stop Bits, No Parity. Press OK.

Press "Download File..."

Follow the prompts.

#### 4) RS-485 Serial Interface (only for PCs with RS-232 interface)

If your are programming the controller using RS-232, you will need to switch to RS-485 in your application program prior to using Modbus TCP. Simply download a program (.qcp file) with the SIF command set to RS-485.

#### 5) SilverDust QCI-D2-IG8-EM Jumpers

Disconnect the serial connection and install the 4 485 jumpers:

485 TERM ETHERNET A ETHERNET B 485 TERM



## **Xport TCP Configuration**

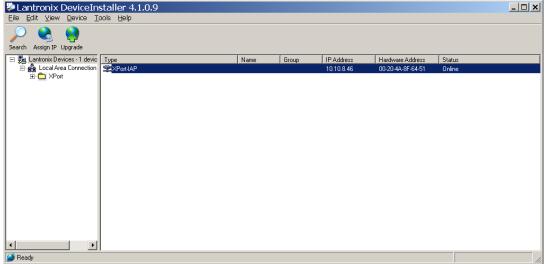
Contact your network person for an available fixed IP address for the unit, as well as your local subnet mask and default gateway. This address should NOT be in the range of any DHCP serving range to avoid conflicts. For this example, we will set the IP to 10.10.8.245, with a mask of 255.255.255.0, and a gateway address of 10.10.8.1

Install the Lantronix DeviceInstaller included with this application note by running the setup program in the Lantronix DeviceInstaller folder.

The E-485 Bridges will initially use DHCP (dynamic host configuration protocol) to get an initial IP address if your router or server has DHCP configured. In the example, the served address as 10.10.8.46. We do not want to use such a dynamic address, as it may likely change after a period of time. Normally we want to assign a static address to each Modbus TCP device. Run the DeviceInstaller from the Start menu.

Start => Programs => Lantronix => DeviceInstaller

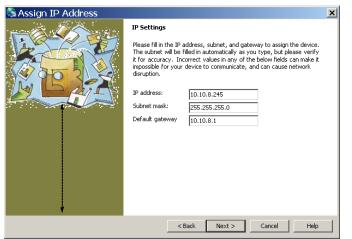
Pushing the "Search" button, we locate all Lantronix adapters on the local LAN.



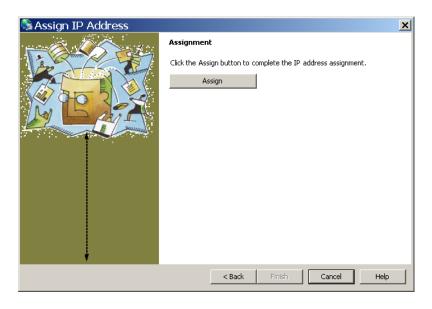
Select the wanted unit from the list. In this case, only a single unit is present. Click on the unit and then select "Assign IP". Select "Assign Specific IP address", NEXT



Enter the IP address, subnet, and default gateway, NEXT



Select "ASSIGN" to make it active, then FINISH. This will take several seconds.



Next double click on the wanted device (note the new IP address!)

### Select the Telnet Configuration Tab.

Lantronix DeviceInstaller 4.1.0.9		<u> </u>
<u>Eile E</u> dit <u>V</u> iew <u>D</u> evice <u>T</u> ools <u>H</u> elp		
Search Assign IP Upgrade		
티 목 Lantronix Devices - 1 device(s)	Device Details Web Configuration	
Content Connection (10.10.8.3) □ □ XPort □ □ XPort-IAP - firmware v2.30	IP Address 10.10.8.245 Pot 9999 Connect Clear	
10.10.8.245		-
		-
🥩 Ready		1

#### Select "Connect", and then <ENTER> to connect

Lantronix DeviceInstaller 4.1.0.9		
File Edit View Device Tools Help		
Search Assign IP Upgrade		
E 📇 Lantronix Devices - 1 device(s)	Device Details Web Configuration Telnet Configuration	
Local Area Connection (10.10.8.3)	IP Address 10.10.8.245 Port 9999 Disconnect Clear	
2 10.10.8.245	Nodbus/TCP to RTU Bridge NAC address 00204A8F6451	<u>^</u>
	Software version 02.3 (050420) XPTEX	
	Press Enter to go into Setup Mode	
	Model: Device Server Plus+! (Firmware Code:XA)	
	Modbus/TCP to RTU Bridge Setup 1) Network/IP Settings:	
	IP Address	
	Netmask 255.255.255.000	
	<ol> <li>Serial &amp; Mode Settings: Protocol Modbus/RTU,Slave(s) attached</li> </ol>	
	Serial Interface	
	CP1 Not Used CP2 Not Used	
	CP3 Not Used	
	4) Advanced Modbus Protocol settings:	
	Slave Addr/Unit Id Source Modbus/TCP header Modbus Serial Broadcasts Disabled (Id=0 auto-mapped to 1)	
	MB/TCP Exception Codes Yes (return OOAH and OOBH)	
	Char, Message Timeout 00050msec, 05000msec	
	D)efault settings, S)ave, Q)uit without save	
	Select Command or parameter set (14) to change:	
Ready		
m ricauy		11.

Type 2 to select protocol and serial interface, then keep RTU, Slaves attached - <CR> Set Interface type to RS485+2wire (3) Set serial Interface to 57600,8,N,2

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File Edit View Device Tools Help		
Search Assign IP Upgrade		
	Device Details Web Configuration Telnet Configuration	
Second Area Connection (10.10.8.3)     C XPort     XPort	IP Address 10.10.8.245 Port 9999 Disconnect Clear	
	))efault settings, S)ave, Q)uit without save	
8	Select Command or parameter set (14) to change:	
l.	Attached Device (1=Slave 2=Master) (1)	
	Serial Protocol (1=Modbus/RTU 2=Modbus/ASCII) (1)	
	Interface Type (1=RS232 2=RS422/RS485+4-wire 3=RS485+2-wire) (1) 3	
E	Enter serial parameters (9600,8,N,1) 57600,8,N,2	
2	Modbus/TCP to RTU Bridge Setup	
1	1) Network/IP Settings:	
	IP Address 10.10.8.245	
	Default Gateway 010.010.008.001	
	Netmask	
2	Protocol Modbus/RTU,Slave(s) attached	
	Serial Interface	
3	) Modem/Configurable Pin Settings:	
	CP1 Not Used	
	CP2 Not Used	
	CP3 Not Used	
4	Advanced Modbus Protocol settings:	
	Slave Addr/Unit Id Source Modbus/TCP header	
	Modbus Serial Broadcasts Disabled (Id=O auto-mapped to 1) MB/TCP Exception Codes Yes (return OOAH and OOBH)	
	NB/ICP Exception Codes Hes (return COMH and COBH) Char, Message Timeout 00050msec, 05000msec	
I	))efault settings, S)ave, Q)uit without save	
2	Select Command or parameter set (14) to change:	-
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Select Modem/Configurable pin settings (3) CP1 function: Select RS485 Enable (4) Invert RS485 Output Enable: (N) CP2 function: Unused (1) CP3 function: Unused (1)

Lantronix DeviceInstaller 4.1.0.	9	_ 🗆 ×
File Edit View Device Tools Help		
Search Assign IP Upgrade □  □  □  □  □  □  □  □  □  □  □  □  □	Device Details         Web Configuration         Telnet Configuration           IPAddress <b>10.10.8.245</b> Port <b>9999</b> Disconnect         Clear	
10.10.8.245	D)efault settings, S)ave, Q)uit without save Select Command or parameter set (14) to change:	<u> </u>
	CP1 Function (1=Unused, 2=Status LED Output, 3=RTS Output, 4=RS485 Enable) (1) 4 Invert RS485 Output Enable (active low) (N) N	
	CP2 Function (1=Unused, 2=DTR Output, 3=RS485 Output Enable) (1) CP3 Function (1=Unused, 2=Diagnostic LED Output) (1) Modbus/TCP to RTU Bridge Setup	
	1) Network/IP Settings: IP Address	
	Netmask	
	<ol> <li>Modem/Configurable Pin Settings: CP1 R5485 Output Enable CP2 Not Used     </li> </ol>	
	CP3 Not Used 4) Advanced Modbus Protocol settings: Slave Addr/Unit Id Source Modbus/TCP header Modbus Serial Broadcasts Disabled (Id=0 auto-mapped to 1) MB/TCP Exception Codes Yes (return OAH and 00BH)	
	Char, Message Timeout 00050msec, 05000msec D)efault settings, S)ave, Q)uit without save Select Command or parameter set (14) to change:	
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Select Advanced Modbus Protocol Settings (4)

Other choices are up to system choices, but set Serial TX delay after RX to 1 ms Auto slave address uses the address set in each controller as set the by the Initialization Wizard in QuickControl, and allows multiple units to be controlled via RS-485 from a single E-485 Bridge.

Slave address (0 for auto, or 1..255 fixed otherwise) (0) Allow Modbus Broadcasts (1=Yes 2=No) (1) Use MB/TCP 00BH/00AH Exception Responses (1=No 2=Yes) (2) Disable Modbus TCP pipeline (1=No 2=Yes) (1) Character Timeout (0 for auto, or 10-6950 msec) (0) Message Timeout (200-65000 msec) (200) Serial TX delay after RX (0-1275 msec) (1) Swap 4x/0H to get 3x/1x (N) N

antronix DeviceInstaller 4.1.0	.9	_ [ ] :
Edit View Device Tools Help		
Ch Assign IP Upgrade		
Lantronix Devices - 1 device(s)	Device Details Web Configuration Telnet Configuration	
Local Area Connection (10.10.8.3)     Area Connection (10.10.8.3)     Area Connection (10.10.8.3)     Area Connection (10.10.8.3)     Area Connection (10.10.8.3)	IP Address 10.10.8.245 Port 9999 Connect Clear	
20.10.8.245		-
	D)efault settings, S)ave, Q)uit without save	
	Select Command or parameter set (14) to change:	
	Slave address (0 for auto, or 1255 fixed otherwise) (0)	
	Allow Modbus Broadcasts (1=Yes 2=No) (1)	
	Use MB/TCP 00BH/00AH Exception Responses (1=No 2=Yes) (2)	
	Disable Modbus/TCP pipeline (1=No 2=Yes) (1) Character Timeout (0 for auto, or 10-6950 msec) (50) 0	
	Message Timeout (200-65000 msec) (5000) 20	
	Serial TX delay after RX (0-1275 msec) (0) 1	
	Swap $4x/0H$ to get $3x/1x$ (N) N	
	Modbus/TCP to RTU Bridge Setup	
	1) Network/IP Settings:	
	IP Address 10.10.8.245	
	Default Gateway 010.010.008.001	
	Netmask 255.255.255.000	
	<ol> <li>Serial &amp; Mode Settings:</li> </ol>	
	Protocol Modbus/RTU,Slave(s) attached	
	Serial Interface 57600,8,N,2,RS485	
	3) Modem/Configurable Pin Settings:	
	CP1 R5485 Output Enable	
	CP2 Not Used	
	CP3 Not Used	
	<ol> <li>Advanced Modbus Protocol settings: Slave Addr/Unit Id Source Modbus/TCP header</li> </ol>	
	Modbus Serial Broadcasts Enabled (Id=0 used as broadcast)	
	MB/TCP Exception Codes Yes (return OOAH and OOBH)	
	Char, Message Timeout 00000msec, 00200msec	
	,	
	D)efault settings, S)ave, Q)uit without save	
	Select Command or parameter set (14) to change:	
	Parameters saved, Restarting	

Finally select Save (S) to keep these parameters Exit the Lantronix configuration.

Unit is now accessible via Modbus TCP.

# **Register Watch Monitor**

A good way to troubleshoot your programs while using Modbus TCP is to connect a PC to the controller's RS-485 bus and use QuickControl's Register Watch Monitor tool to monitor the controller's registers. Register Watch Monitor will passively monitor the RS-485 bus and extract any commands containing register data. The results are displayed in Register Watch's Data column.

Register Watch			. 🗆 ×
<u>A</u> dd Register	<u>D</u> elete Register	Device 16 Dev #1	
Monitor)			
Register	Register		Units
Target Position[0]		11769	

Register Watch Monitor is enabled by checking "Monitor" in the Register Watch tool.