

## **PLC COMMUNICATIONS**

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### Introduction

This chapter explains the communications ability of the CLICK PLUS PLC system for exchanging data between the PLC unit and other connected serial devices. It covers:

- Electrical connections used for communications
- Networking routing between the PLC and other devices,
- Setting the port communication parameters,
- Selecting the protocols and the available data addressing types to use, and
- Ladder logic program instructions that make it all work together.

All CLICK PLUS PLCs have a built-in microB USB port for programming.

The C2-01CPU and C2-03CPU have an RS-232 port, designated Port 2. The port uses a 6-pin RJ12 phone type jack. It is a general purpose port, user configurable, with its communication parameters within CLICK Programming Software, C0-PGMSW. Port 2 can be used as a Modbus RTU master or slave protocol device, or handle ASCII data In or Out (ASCII stands for American Standard Code for Information Interchange and defines a character encoding method for text that is used in computers and other communication devices. Details can be found by doing a search for ASCII on the internet).

The C2-03CPU also has a 3-pin RS-485 port, designated Port 3. Like Port 2, Port 3 is a general purpose port with its communication parameters being user configurable from the programming software. Port 3 can be used as a Modbus RTU master or slave protocol device, or handle ASCII data In or Out.

The C2-01CPU and C2-03CPU have a built-in Ethernet communications port.

The C2-02CPU and C2-03CPU have an antenna port capable of both Bluetooth and WLAN communications.

The CLICK PLUS PLCs can be networked to other CLICK PLCs, data input devices (barcode readers, weight scales, etc.), and/or data output devices (serial printers, serial text displays, etc.). It is also possible to network the CLICK PLUS PLC to other 3rd party PLCs and devices that have the ability to communicate using the Modbus RTU and TCP protocols.

The final part of the PLC Communications chapter contains explanations and examples of the various ways the Send and Receive programming instructions can be used to perform Modbus RTU protocol and ASCII data communications between devices.

There are three different data addressing types that can be selected when using the Modbus RTU protocol from the Send and Receive instructions. They are, CLICK addressing, Modbus 984 addressing, or Modbus HEX addressing. The CLICK addressing makes it convenient to exchange data between CLICK PLCs. The other addressing choices are selected based on the Modbus protocol addressing the networked devices are using. For details on the Modbus protocol, visit www.modbus.org.



**NOTE:** The Modbus RTU Master is identified as the device that controls the exchange of data between itself and any connected slave device. There can only be one master on the network. When the CLICK PLC is the master, it is easily identified. It will be the PLC in the network with the Send and/or Receive instructions using the Modbus protocol in its ladder logic program.

### **PLC Communication Ports Specifications**

The CLICK PLUS PLC units have several built-in communications ports, as shown below.



C2-02CPU Bluetooth & WLAN microB USB



Port 1 Pin Descriptions			
1	TX+	Transmit Data (+)	
2	TX-	Transmit Data (-)	
3	RX+	Receive Data (+)	
4	NC	Not connected	
5	NC	Not connected	
6	RX-	Receive Data (-)	
7	NC	Not connected	
8	NC	Not connected	

**Com Port 2 Specifications** Default Use: Serial Communication Physical: 6 pin, RJ12, RS-232 Communication speed (baud): 2400, 4800, 9600, 19200, 38400, 57600, 115200 38400 Odd Parity: odd, even, none Station Address: 1 to 247 1 Data length: 8 bits (Modbus RTU) or 7, 8 bits 8 bits (ASCII) Stop bit: 1.2 1 Protocol: Modbus RTU Modbus (master/slave) or ASCII in/out RTU

**Com Port 1 Specifications** 

Protocol: Modbus TCP (client/server), EtherNet/IP Implicit and Explicit (adapter server), DNS, DHCP, NTP, MQTT

Use: Programming and Ethernet Communication

Physical: 8 pin, RJ45, Ethernet Communication Speed (Mbps): 10/100





Port 1

8 pin RJ45 Phone Type Jack



	Port 2 Pin Descriptions				
1	0V	Power (-) connection (GND)			
2	5V	Power (+) connection			
3	RXD	Receive data (RS-232)			
4	TXD	Transmit data (RS-232)			
5	RTS	Request to send			
6	0V	Power (-) connection (GND)			

Port 3

3 Pin Terminal Block



	Port 3 Pin Descriptions		
1	+ (plus)	Signal A (RS-485)	
2	– (minus)	Signal B (RS-485)	
3	LG	Logic Ground(0 V)	

See Chapter 2: Specifications for the microB USB port and antenna port specifications.

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### **LED Status Indicators**







### DirectLogic Devices That Do Not Work With CLICK PLCs

The CLICK PLUS PLC does not support K-sequence protocol, so the following DirectLogic devices do not work with the CLICK PLUS PLC:



### **Remote PLC App Configuration and Use**

The following CLICK PLCs support the iOS and Android Remote PLC App:

- C0-10xxx-x
- C0-11xxx-x
- C0-12xxx-x
- C2-01CPU(-2)
- C2-02CPU(-2)
- C2-03CPU(-2)



The CLICK Remote PLC capability is new in Version 3.60 of the CLICK software and firmware. It enables a user to access data registers and PLC status information using a mobile phone or tablet running either iOS or Android. This enables the user to perform machine troubleshooting and setup operations when access to the programming PC can be awkward or inconvenient.

CLICK Remote PLC app is not intended to replace an operator interface for standard machine operations; instead it provides an additional tool to simplify troubleshooting and configuration of your system.

- 1. To use Remote PLC, you must either:
  - a. Connect your PLC to a network with a Wi-Fi access point.

-OR-

- b. Enable Bluetooth on your C2-02CPU or C2-03CPU.
- 2. Configure a Data Monitor with the Addresses you wish to monitor and user security.

FIL C	lown		g	inport 🖬 Exp	ort	Account Setup
96. 1	Address	Nothame	Read-only	Address Comment		Account Admin
2	061	Flash Cycle Time	E .	Conveyor Speed (30-80H	(2)	Manager
3	Ba	Brable Flash	D	Ensure the gate status is	1	Worker1
4	055	on debounce delay	E			Worker2
5	056	off debounce delay				Maintenance
6	BC10	Input Signal	10			
7	BC20	Output Signal	12			
8	101	Flash On Timer	C			
9	062	Mold Temp Setting	C	Plastic Mold Temperature		
10	B 731		0			

- 3. Set up users with access to up to 32 data monitors.
- 4. Download the Remote PLC App for your mobile device:

**Apple App Store** 

**Google Play (Android)** 





### **C2-DCM Intelligent Module Communication Ports Specifications**

The C2-DCM Option Slot module has two serial communications ports, as shown below.





Ports 1 and 2

I	Port Pin Descriptions			
1	TERM	120Ω resistor		
2	+	Signal A (RS-485)		
3	-	Signal B (RS-485)		
4	LG	Logic Ground		
5	ТΧ	RS-232 Transmit		
6	RX	RS-232 Receive		

Port Specifications		
Number of Ports	2	
Port Types	RS-232, RS-485 (2-wire)	
Supported Protocols	Modbus RTU, ASCII (user-defined)	
	• Baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115.2k bps	
Communications	Data bit: 7 bits, 8 bits	
Parameters	<ul> <li>Parity: None, Odd, Even</li> </ul>	
	Stop bit: 1 bit, 2 bits	
	Flow Control: None	
RS-485 Terminating Resistor	120Ω, Internal	
Status Indicator LEDs	OK, ERR, TX (per port), RX (per port)	

Terminal Block Specifications		
Connector Type	Pluggable Terminal Block	
Number of Pins	6 (x2 terminal blocks)	
Pitch	3.50 mm	
Wire Size Range	16-28 AWG	
Stripping Length	7.0 mm	
Wire Specification	Lead-free, heat resistant, polyvinyl chloride insulated copper wire, rated over 80°C	
Screw Thread	M2.0	
<b>Tightening Torque</b>	2.0 - 2.2 lb-inch [0.22 - 0.25 N·m]	
Recommended Cable	Shielded cable (AutomationDirect Q8105-1 or Q8302-1 recommended)	

### **3 Steps to Using the CLICK PLC Communications**

We offer an easy 3-step method for using the communication features of the CLICK PLC.



The following pages show the devices that you may connect to the CLICK PLC Com ports. Use the table below to locate information on communications for your particular application. As you can see in the table, each step has subcategories. For each step, find the subcategory description that best describes your application. Use the subcategory references (W-x, C-x, and P-x.) to find more information on these topics in this chapter. See the example below.

CLICK PLC Communications			
Step	Subcategory Reference	Subcategory Description	Page
	W-1	USB	4-12
	W-2	Com port 2 (RS-232)	4-13
Step 1	W-3	Com port 1 (Ethernet)	4-17
Wiring	W-4	Com port 3 (RS-485)	4-19
	W-5	C2-DCM Port 1 or 2 (RS-232)	4-20
	W-6	C2-DCM Port 1 or 2 (RS-485)	4-21
	C-1	USB setup	4-22
	C-2	Com port 1 (Ethernet) setup	4-23
	C-3	WLAN setup	4-24
	C-4	Bluetooth setup	4-25
Step 2	C-5	Com port 2 setup (Modbus RTU)	4-26
Com Port Setup	C-6	Com port 2 setup (ASCII)	4-27
	C-7	Com port 3 setup (Modbus RTU)	4-28
	C-8	Com port 3 setup (ASCII)	4-29
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Programming	P-3	Modbus Client programming (Modbus TCP)	4-41
i i ogi allilling	P-4	ASCII Receive programming	4-47
	P-5	ASCII Send programming	4-50

### **Example:**

To connect a barcode reader that sends ASCII data to Com Port 2:



### **Typical Communication Applications**

The diagrams on the following four pages illustrate the typical uses for the CLICK PLUS PLC's communication ports. Typical serial communication applications are continued on the next three pages.



Port 2 (RS-232) – Modbus RTU Slave Mode Only



RS-232 Port

**NOTE:** CLICK's RS-232 port can provide 5VDC to power one monochrome Micro-Graphic panel. If two C-more Micro-Graphic panels are connected to both ports, then at least one of the panels must be powered by a C-more Micro DC power adapter, EA-MG-P1 or EA-MG-SP1, or another 24VDC power source. Color C-more Micro-Graphic panels must also be powered from a separate 24VDC source.









### Port 3 (RS-485 - Modbus RTU or ASCII)



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## W-1 W

### W-1: USB Port Wiring

USB Port wiring pinout is shown below.

	USB Port Pin Descriptions			
1	VBUS	5V Power supply in		
2	D-	Differential signal -		
3	D+	Differential signal +		
4	NC	Not connected (ID not used)		
5	GND	Ground		



Not Available:

### Wiring Strategy

Connect any CLICK PLUS CPU to a USB A port on a Windows PC, using cable USB-CBL-AMICB6 or equivalent.

**NOTE:** The CLICK PLUS CPU can be supplied 5VDC power from a PC over the USB port when no 24VDC power is applied, with the following capabilities and restrictions

- Available:
  - Programming over Port 1, Port 2, and Port 3
- Firmware update
- CLICK Factory Default and CLICK Project Loader Tools
   Modbus Server/Slave over Port 1, Port 2, and Port 3

Option Slot module can be identified in software

 WLAN and Bluetooth are disabled
 Access to the microSD Card from software is disabled

• RUN mode is disabled



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nin P 112 Phone	Port 2 Pin Descriptions			
Type Jack	1	0V	Power (-) connection (GND)	
	2	5V	Power (+) connection	
┍┎╧╧══╤┥	3	RXD	Receive data (RS-232)	
	4	TXD	Transmit data (RS-232)	
	5	RTS	Request to send	
	6	0V	Power (-) connection (GND)	

	-			-
/				
/	1	_	_	=
1	-			-1
_		_		_

**NOTE:** Com port 2 can provide 5VDC; however, the 5VDC power can be used only for the C-more Micro-Graphic panel. AutomationDirect does not guarantee that the CLICK PLUS PLC will work correctly when any other device uses 5VDC from these Com ports. Please also remember these Com ports can provide enough power only for one C-more Micro-Graphic panel.

### Wiring Strategy

The following pages cover five case scenarios for connecting com port 2:

Case 1: Connect Com Port 2 to a PC.

Case 2: Connect Com Port 2 to another CLICK PLC.

Case 3: Connect Com Port 2 to a C-more or C-more Micro-Graphic panel.

Case 4: Connect Com Port 2 to an RS-422 or RS485 port on another device(s).

Case 5: Connect Com Port 2 to an RS-232 port on another device.

### Case 1: Connect Com Port 2 to a PC.

You can connect Com Port 2 to a serial com port or USB port on the PC.

#### 1. Connect to a serial port



Case 2: Connect Com Port 2 to another CLICK PLC



You can use cable D0-CBL.

In this configuration, one of the CLICK/CLICK PLUS PLC units needs to be the network master and the other is the network slave. Connect the D0-CBL on Com Port 2 on the master PLC unit side.



WARNING: The ZL-RJ12-CBL-2 cable cannot be used for this purpose.

### Case 3: Connect Com Port 2 to a C-more or C-more Micro-Graphic panel

Please use the following cables to make your connections.

C-more Graphic Panel Cable Part Number	
C-more Touch panels EA-2CBL (3m) or OP-2CBL (2m)	
C-more Micro-Graphic Panels	DV-1000CBL if the panel receives 5VDC power from the CLICK PLC com port. (Monochrome panels only; color panels must be powered from a separate 24VDC power source. Please refer to the note on page 4-6 for details.)
	EA-2CBL (3m) or OP-2CBL (2m) if the panel receives 24VDC power from other source.



### Case 4: Connect Com Port 2 to an RS-422 or RS485 port on another device(s).

You need a RS-232 to RS-422/485 converter in this case. We recommend our FA-ISOCON as the converter.



The recommended cables to connect the FA-ISOCON to other devices:

- Belden 8103 for the RS-422
- Belden 9842 for 2-wire RS-485
- Belden 9843 for 4-wire RS-485

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### Case 5: Connect Com Port 2 to an RS-232 port on another device

You need to cross the RTD and TXD signal lines and connect 0V on both com ports.



You can make your own cable. However, we offer two products that make your wiring much easier:

1. ZIPLink feed-through module and cable





Com Port 1 (Ethernet) supports 10/100 Base-T Ethernet with an RJ-45 style connector.



Port 1 Pin Descriptions				
1	TX+	Transmit Data (+)		
2	TX-	Transmit Data (-)		
3	RX+	Receive data (+)		
4	NC	Not connected		
5	NC	Not connected		
6	RX-	Receive Data (-)		
7	NC	No connection		
8	NC	No connection		

You can use both straight and cross over cables with Com Port 1.

### Wiring Strategy

- There are two wiring methods to connect to devices which support Modbus TCP protocol.
- Case 1: Connect Com Port 1 to a device that supports Modbus TCP protocol directly such as a PC.
- Case 2: Connect Com Port 1 to other devices that support the Modbus TCP protocol via a switch or hub.

## Case 1: Connect Com Port 1 to a device that supports the Modbus TCP protocol directly such as a PC.

In this illustration a PLC unit is connected directly to a PC.



Case 2: Connect Com Port 1 to other devices that support the Modbus TCP (client/server) protocol via a switch or hub.



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**NOTE:** Com Port 1 can communicate with any number of servers (slaves) using the Receive and/or Send instructions. However, Com Port 1 can communicate with up to 4 servers at the same time. If the ladder program has sent a message to 4 different servers and tries to send a message to another server, the CLICK PLUS PLC unit disconnects the first server and establishes a connection with the new server, maintaining a total of 4 servers.



NOTE: Com Port 1 can communicate with up to 3 clients (masters). If a client attempts to establish communication with Com Port 1 while it is communicating with 3 clients, the CLICK PLUS PLC unit replies with an error to the fourth client.



Com Port 3 supports 2-wire RS-485.



### Wiring Strategy

You need to connect all + signal terminals in the network together. You will also need to connect all – signal terminals together. It is optional to connect the logic ground.





NOTE: The resistance of the termination resistors needs to match the impedance of the communication cable.



NOTE: Use a repeater if connecting more than 32 slaves to Port 3.

## W-5 W-5: C2-DCM Com Port RS-232 Wiring

C2-DCM Com Port wiring pinout is shown below.



	<b>C2-DCM Port Pin Descriptions</b>			
1	TERM	not used for RS-232		
2	+ (Plus)	not used for RS-232		
3	- (Minus)	not used for RS-232		
4	LG	Logic Ground (0 V)		
5	ТΧ	RS-232 Transmit		
6	RX	RS-232 Receive		

#### . . . . . . . . . .

### Wiring Strategy

You need to cross the RX and TX signal lines and connect 0V on both com ports.

You can make your own cable. However, we offer pigtail cables with prewired connectors for many AutomationDirect products. Please check <u>www.automationdirect.com</u> for compatible cables.



LG TX RX

## W-6 W-6: C2-DCM Com Port RS-485 Wiring

The C2-DCM com ports support 2-wire RS-485.

6 Pin Terminal Block

	C2-DCM F	Port Pin Descriptions
1	TERM	120Ω resistor
2	+ (Plus)	Signal A (RS-485)
3	- (Minus)	Signal B (RS-485)
4	LG	Logic Ground (0 V)
5	TX	not used for RS-485
6	RX	not used for RS-485

Ports 1 and 2

### Wiring Strategy

You need to connect all + signal terminals in the network together. You will also need to connect all – signal terminals together. It is optional to connect the logic ground.



1.000 × 10000 × 10000 × 10000 × 10000 × 1000 × 1000 × 1000 × 1000 × 1000 × 1000

**NOTE:** The C2-DCM ports include an internal  $120\Omega$  internal resistor between TERM and - (Minus). When the C2-DCM is at the end of an RS-485 run, connect TERM and + (Plus) to terminate the line.



NOTE: The resistance of the termination resistors needs to match the impedance of the communication cable.



**NOTE:** Use a repeater if connecting more than 32 slaves.

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### C-1 C-1: USB Port Setup

The CLICK PLUS USB port is only used to connect to the CLICK programming software. When a CLICK PLUS device is first connected to a USB port on a Windows PC, a driver is loaded to allow the CLICK PLUS device to emulate a standard serial port. The CLICK PLUS will show up as a USB Serial Device in under Ports in Windows Device Manager.

To connect via USB port, click Connect in the PLC menu, then select USB as the port type. Select the COM port assigned to the USB Serial Device. All other parameters can be left at their default settings.

Connect to CLICK PLC				×
		Note: Use astandard USB data cable like the USB-CBL-AMICB6 (USB-A to USB-micro B) cable. JSB-A USB-mil		
Port Type: USB	~	Recommended Cable		
COM Port No: COM COM Port Sett COM Protocol: 1 Baud Rate: CI IOK Address:	4(CLICK PLUS) V Detail 4(CLICK PLUS) MODBUS 38400 V 1	ADC Part No: USB-CBL-AMICB6		
Parity Bit:	V bb0			
Stop Bit:	1 ~			
Auto Detect	Advanced			
Default Setting	Connection Test	Blink RUN & ERR LEDs	Connect Cancel Help	

### C-2 C-2: Com Port 1 (Ethernet) Setup

Select the **Function** tab located in the Navigation window of the CLICK Programming Software and double click "Com Port 1 Setup" as shown below.

The Com Port Setup Details dialog box will come into view as shown below.





## C-3 C-3: Wireless LAN (WLAN) Setup

Select the Function tab located in the Navigation window of the CLICK Programming Software and double click "Com Port 1 Setup" as shown below.

The Com Port Setup Details dialog box for the WLAN will come into view as shown below.





### C-4 C-4: Bluetooth Setup

The Bluetooth connection available on certain CLICK PLUS CPUs is used for initial setup and provisioning of a wireless network connection and for connecting to the Remote PLC App. It provides a method to get a CLICK PLUS CPU connected to a wireless network so that the CLICK programming software on a PC can find the device, finish the setup and load a project.

The process for Bluetooth connection and WLAN provisioning is discussed in Chapter 1, Getting Started. For further information, please see the Bluetooth help topic in the CLICK programming software.

### C-5 C-5: Com Port 2 Setup (Modbus RTU)

Select the Function tab located in the Navigation window and double click **Com Port2 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration.



You may need to make adjustments to these parameters to overcome communication errors which may occur.



### C-6 C-6: Com Port 2 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port2 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match the



device connected to Port 2. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.







The Com Port Setup Details dialog box will come into view as shown below.

	Com Port Setup Details				
	Port: Port3 👽 Protocol: N	1odbus	<b>~ v</b>		
	Basic Configuration			Wiring Details	<ul> <li>Select Modbus.</li> </ul>
Set up the parameter	Node Address (1-247):	1	-		
to match other devices	Baud Rate (bps):	38400	~	Port3 R5-465 (Non Isolation)	
in the same network.	Parity:	Odd	~	3 pin Removable Terminal Block	
	Stop Bit:	1	*		
	Communication Data (bit):	8	~	+	
	Advanced Configuration				
	Time-out Setting:	500 ms	4		
Make any adjustments here	Character Time-out (2-1000ms):	2	A V		
to eliminate com	RTS ON Delay (0-5000ms):	0	<b>*</b>		for Com Port Setup
errors.	RTS OFF Delay (0-5000ms):	0	A.V		Details online help.
	Response Delay Time (0-5000ms):	0	A V		
		_			
			OK	Cancel Help	

Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.



C-8: Com Port 3 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port3 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match the



device connected to Port 3.



### C-9 C-9: C2-DCM Com Port 1 or 2 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port1 Setup** or Com Port2 Setup under the Slot0 or Slot1 Data Communication Module, as shown below.



The Com Port Setup Details dialog box will come into view as shown below.



Select your Port type and Protocol. Find the Basic Configuration section in the dialog box and set up the parameters to match the device connected to the port. The dialog box also has a section named Advanced Configuration, but no advanced configuration parameters are available in ASCII mode.



C-10 C-10: C2-DCM Com Port 1 or 2 Setup (Modbus RTU)

Select the Function tab located in the Navigation window and double click **Com Port1 Setup** or Com Port2 Setup under the Slot0 or Slot1 Data Communication Module, as shown below.



The Com Port Setup Details dialog box will come into view as shown below.



Select your Port type and Protocol. Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.



## P-1 P-1: Modbus Slave (Server) Programming

Ladder Program

To use a CLICK PLUS PLC as a Serial Modbus slave, you don't need any special ladder program. Set up the communication port properly and you just need an End instruction in the ladder program to put the PLC in Run mode.



To use CLICK PLUS PLC as a Modbus Ethernet Client, the Modbus TCP Server must be enabled.

To enable the Modbus TCP Server, select the **Function** tab located in the Navigation window and expand "Com Port 1 Setup" and double click on Modbus TCP as shown below.

Navigation	A A
Program Function PLC	
Program       Function       PLC         Program       CPU Configuration         System Configuration         System Configuration         Modbus TCP         Modbus TCP         Modbus TCP         MOTT Client         Com Port2 Setup         Com Port2 Setup         Com Port3 Setup         Wireless Port         Bluetooth Port Setup         SD Slot         Scan Time         Watch Dog Timer         User Account Setup         Battery Backup Setup         Wireless Port         Hinb Sneed Input	Modbus TCP Setup × Port: Type Port1 Configuration as Client (Master) Timeout(0-30000ms): 1000 Retries(0-10): 2 Server Inactivity Timeout(0-3600sec): 60 Server Inactivity Timeout(0-3600sec): 60 Server Configuration as Server (Slave) TCP Port Number(0-65535): 502 Maximum Concurrent Sessions: 3 Clarbt Leadin the Taxies (0 2020ma) 60 Maximum Concurrent Sessions: 3
ia - o Software Setup a - ↓ Manual	OK Cancel Help

You can add any additional ladder program to let the slave CLICK PLUS PLC control something by itself. For instance, you may want to shut down the outputs on the slave (server) CLICK PLUS PLC should it lose communication with the Modbus master (client).



**NOTE:** The Modbus master can communicate with the Modbus slave CLICK PLUS PLC without any ladder program. However, output points on the Modbus slave CLICK PLUS PLC cannot be turned on if the PLC is not in the Run mode. Because of this, we recommend having at least one End instruction and to put the PLC in Run mode.

#### Lost Communication Situation

You may want to detect if there is something happening at the Modbus master side that stops communication with the Modbus slaves. Or, the communication cable might have been disconnected. In this situation, you may want the Modbus slaves to take an action. For instance, you may want to shut down the outputs on the slave CLICK PLUS PLC when the communication with the Modbus master is lost. We offer an easy method to accomplish this.

The CLICK keeps counting how long it has been since each com port received a message from the Modbus master, and enters the time duration in the following system data registers.

System Data Registers				
System Data Register	Nickname	Range		
SD41	_Port1_No_Comm_Time	0 - 32767 (sec)		
SD51	_Port2_No_Comm_Time	0 - 32767 (sec)		
SD61	_Port3_No_Comm_Time	0 - 32767 (sec)		
SD214	_WLAN_No_Comm_Time	0 - 32767 (sec)		

Each register is reset to zero automatically when the com port receives a message from the Modbus master. Then its value increments by 1 per second until the com port receives another message from the Modbus master. If one of these registers has 60 as its value, it means the com port has not received any message from the Modbus master for 60 seconds. You can use this info to shut down the outputs on the slave CLICK PLUS PLC. Here is an example program.



### **Modbus Addressing**

Each of the memory addresses in the CLICK (X1, DS1, etc.) has a unique Modbus address. This means the network master in the Modbus network can access any memory address in the slave CLICK PLUS PLC. The best way to check which Modbus address is assigned to a particular CLICK memory address is to use the CLICK programming software.

Click the Program tab located in the Navigation window and double click Address Picker as shown below.

After the Address Picker window opens, check the option Display MODBUS Address on the right bottom.



🕫 Address Picker : Edit Mode 🛛 🔀							
	Fill Down	(Nickname) Find	e 🗸 🗸	Find			
All	Address	🛃 Data Type	MODBUS Address (Function code)	Nickname	These are the	Modbus a	ddresses.
	DS1	RW I INT	400001 (03,06,16)			s in the na	ranthasis
x	D52	RW 🚺 INT	400002 (03,06,16)				i circii colo
v	D53	RW 🚺 INT	400003 (03,06,16)		Indicate wh	ICH TUNCTI	on codes
-	DS4	RW 🚺 INT	400004 (03,06,16)		can be used	l for each	memory
C	DS5	RW 🚺 INT	400005 (03,06,16)			ddress	-
Т	DS6	RW 🚺 INT	400006 (03,06,16)			1441 0551	
T	DS7	RW 🚺 INT	400007 (03,06,16)		No	Disable	
SC	DS8		400008 (03,06,16)		No	Disable	
	D59		400009 (03,06,16)		No	Disable	
DS	DS10		400010 (03,06,16)		No	Disable	
DD	DS11		400011 (03,06,16)		No	Disable	
DH	DS12		400012 (03,06,16)		No	Disable	
DF	DS13		400013 (03,06,16)		No	Disable	
_	DS14		400014 (03,06,16)		No	Disable	
XD	DS15		400015 (03,06,16)		No	Disab (	Check the opti
YD	DS16		400016 (03,06,16)		No	Disab	Dienlay Modh
TD	DS17		400017 (03,06,16)		No	Disat	
TD	DS18		400018 (03,06,16)		No	Disat	Address.
SD	DS19		400019 (03,06,16)		No	Disat	
	DS20		400020 (03,06,16)		No	Disable 🗸	
A I	<		10			>	
Data Type Filter       Used/Unused Address       ✓ Display MODBUS Address         ✓ Display All Data Types       ③ Display both used and unused       ④ MODBUS 994 Addressing         ✓ Integer       Image: Comparison of the second							
				ок	Cancel	Help	

### **Exception Response (Exception Code)**

When the slave CLICK PLUS PLC receives a request from the Modbus master that it cannot respond to, the slave CLICK PLUS PLC sends an exception response to the Modbus master. The CLICK PLUS PLC supports the following Exception Responses.

	Exception Response (Exception Code)				
Code	Name	Details of Exception Response			
01	Illegal Function	The CLICK PLUS PLC does not support the function code received from the MODBUS master.			
02	Illegal Data Address	The MODBUS master tried to access to an invalid address.			
		The data length is zero or exceeds the maximum size.			
03	Illegal Data Value	The data for Write Single Coil is not FF00h (ON) or 0000h (OFF).			
		The PLC mode change request from the MODBUS master is not valid.			
		Password is locked.			
04	Slave Device Failure	When the PLC mode switch is in STOP position, the MODBUS master requested to switch to RUN mode.			
		When the PLC mode switch is in RUN position, the MODBUS master requested to switch to the Firmware Update mode.			

### P-2: Modbus Master Programming (Modbus RTU)

### Instructions

The CLICK PLUS PLC has two instructions to exchange data with external Modbus devices through the com ports; the Receive and Send instructions.

- Receive instruction: Read data from an external Modbus device.
- Send instruction: Write data to external Modbus device(s).

To use these instructions, double click Receive or Send in the Instruction List window as shown below.

	Theme 🔹 🖬 🗗	×	Instruction List
<ul> <li>Offline</li> <li>PLC Mode</li> <li>PLC Error</li> <li>Status</li> </ul>	Status Data View -		Double click Receive or Send in the Instruction List to use it in the ladder program. /
Instruction List	ņ	×	END End
Instruction			Communication
Contact		^	Receive
H Contact (N	10)		Send
🗶 Contact (N	IC)		

Select the Com Port that you are going to use and confirm the Protocol is MODBUS.

Select the Com Port to use.	Receive					
Port to use.	Com Port:	Port2 🗸				
Protocol needs to	Protocol:	MODBUS	COM Port Setup			
be MODBUS.	-Receiving Da	ata Setup				

If the Protocol is not MODBUS, click the Com Port Setup button to open the Com Port Setup Details window and change the Protocol to MODBUS. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction in the ladder program. You cannot change the Protocol setup until you delete those instructions.

Com Port Setup Details					Grayed out	X	
Port:	Port2	~	Protocol:	ASCII	× v		
Basic	Configura	ation				Wiring Details	

#### **Chapter 4: PLC Communications**

When you open the Receive or Send instruction in the Modbus mode, their windows should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.

Protocol: MODBUS	COM Port Setup		Com Port: Port2 * Protocol: MODBUS Sending Data Setup	COM Port Setup
Slave ID (1-247): Modbus Function Code: Addressing Type:	1 01 - Read Col Status Modbus 984 Addressing	~	Slave ID (0-247): Modbus Function Code: Addressing Type:	0 () 05 - Write Single Coll () Modbus 984 Addressing ()
Starting Slave Address:  Starting Master Address:  Number of Bits: Word Swap: Charcter Order:	1 0FF Cher 1, Cher 2	00001 to 065535)	Starting Slave Address: Starting Master Address: Number of Ess: Word S Click the He	(00001 to 065535)
Status Flags Receiving Success Error	*		to get de information setup win	tailed n on this ndow.
Exception Response (Error Code) First Character Time-out (First Err Character Interval Time-out (Inter	(er)		Status Flags Inding Success Error	

### **Com Port Status Indicators**

The CLICK PLC has the following System Control Relays to indicate the status of the Com Ports. If monitoring these bits in ladder, they should be monitored at a ladder location prior to the Receive or Send instructions for the port.

System Control Relays						
Address Nickname Description						
SC100	_Port_2_Ready_Flag	On when Port 2 is ready.				
SC101*	_Port_2_Error_Flag	On when Port 2 has a communication error.				
SC102	_Port_3_Ready_Flag	On when Port 3 is ready.				
SC103*	_Port_3_Error_Flag	On when Port 3 has a communication error.				

\* Errors that will cause SC101 or SC103 error flag to turn on:

Parity Error

Frame Error

Time Out
 CRC Error

Modbus Exception Response

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### **Example Program**

The ladder program to use these Receive and Send instructions are easy. You just need one NO (Normally Open) contact instruction to check if the com port is ready to receive or send data.



### Interlocking

If you are going to use more than one Receive and/or Send instruction with a serial communication port, you need to be sure only one of the instructions is enabled at any point during the operation. The technique to execute more than one Receive and/or Send instructions in order is called 'Interlocking'. When the Interlocking sample program below is executed, the two Receive instructions and two Send instructions are executed one by one.

#### **Example Program: Interlocking with Two Slaves**

In this example, Port 3 on the CLICK PLC unit communicates with two MODBUS slaves. The slave IDs (node numbers) are 1 and 2. The CLICK PLC unit executes one Receive instruction and one Send instruction with each MODBUS slave.



#### Example Program: Interlocking with Two Slaves (Continued)





#### Example Program: Interlocking with Two Slaves (Continued)

### P-3 P-3: Modbus Client (Modbus TCP) Programming

#### Instructions

The CLICK PLC has two instructions to exchange data with Modbus servers through the Com Port 1; the Receive and Send instructions.

- Receive instruction: Read data from external Modbus server.
- Send instruction: Write data to external Modbus server(s).

To use these instructions, double click Receive or Send in the Instruction List window as shown below.



Select Com Port 1 that you are going to use.

	Receive	x
Select Com Port 1	Com Port: Port1  Protocol: MODBIIS COM Port Solution	
	Receiving Data Setup	_

When you open the Receive or Send instruction in the Modbus mode, their windows should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.



### **Com Port Status Indicators**

The CLICK PLUS PLC has the following System Control Relays to indicate the status of Com Port 1 and the WLAN port.

	System Control Relays					
Address	Nickname	Description				
SC80	_WLAN_Ready_Flag	ON when WLAN is Ready, does not indicate Busy Status				
SC81	_WLAN_Error_Flag	ON when there is a WLAN error. SD213 will contain the error information.				
SC82	_WLAN_Connection_Limit	ON when all of WLAN server connections are busy.				
SC83	_WLAN_IP_Resolved	ON when WLAN IP Address is assigned				
SC84	_WLAN_Connected	ON when WLAN is connected to the access point.				
SC86	_WLAN_DHCP_Enabled	ON when WLAN is configured for DHCP.				
SC87	_WLAN_DNS_Success	ON when WLAN DNS Lookup was successful.				
SC88	_WLAN_DNS_Error	ON when WLAN DNS Lookup was an error.				
SC90	_Port_1_Ready_Flag	ON when Port 1 is ready.				
SC91	_Port_1_Error_Flag	ON when Port 1 has a communication error.				
SC92	_Port_1_Clients_Limit	ON when Port 1 is communicating with 3 clients.				
SC93	_Port_1_IP_Resolved	ON when Port 1 obtains an IP address.				
SC94	_Port_1_Link_Flag	ON when Port 1 is connected to an Ethernet network.				
SC95	_Port_1_100MBIT_Flag	ON when Port 1 is communicating at 100Mbps.				

#### **Example Program**

The ladder program to use these Receive and Send instructions are easy. You just need one NO (Normally Open) contact instruction to check if the com port is ready to receive or send data.



### Interlocking

If you are going to use more than one Receive and/or Send instruction with the same server(slave), you need to be sure only one of the instructions is enabled at any point during the operation. The technique to execute more than one Receive and/or Send instructions in order is called 'Interlocking'. When the Interlocking sample program below is executed, one Receive instruction and one Send instruction is executed one-by-one for each server.

#### **Example Program: Interlocking with Two Servers**



#### Example Program: Interlocking with a Server (Continued)



#### Example Program: Interlocking with a Server (Continued)



## P-4 P-4: ASCII Receive Programming

#### Instruction

The Receive instruction allows the CLICK PLC to read ASCII message from an external device. To use this instruction, double click Receive in the Instruction List window as shown below.

	Theme 🔹 🕳 🗗	×	Instruction List
<b>PLC Mode</b>	Status		Double click Receive or Send in the Instruction List to use it in the
) PLC Error Status	Monitor	×	
Instruction List	: <b>-</b>	×	END End
Instruction			Communication
Contact		^	Receive
H Contact (N	VO)		Send
📕 Contact (N	NC)		
			1

Select the Com Port that you are going to use and confirm the Protocol is ASCII.

Select the Com	Receive			
Port to use. 🖯				
	Com Port:	Port2 🗸		
Protocol needs to	Protocol:	ASCII	COM Port Setup	
be ASCII.	-Receiving Da	ita Setup		

If the Protocol is not ASCII, click the Com Port Setup button to open the Com Port Setup Details window and change the Protocol to ASCII. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction in the ladder program. You cannot change the Protocol setup until you delete those instructions.

Com P	Com Port Setup Details					Grayed out			
Port:	Port2	v	Protocol:	Modbus		v		J	
Basic	Configura	ation					Wiring Deta	ails	

Receive		3
Com Port: Port2 Y Protocol: ASCII	COM Port Setup	1
Receiving Data Setup Data Length Type: 📀 Fixed	() variable	
Data Length:	-	
Data Destination:	✓	
Byte Swap  All Timeout Each Charactery	All but null	
First Character: Character Interval:	None V	Click the Help button
Status Flags		to get the detailed
Success	✓	setup window.
Exception Response (Error Code)		
First Character Time-out (First Err) Character Interval Time-out (Inter Err)		
Overflow Recived Data Length	SD 50	
OK	Cancel Help	

When you open the Receive instruction in the ASCII mode, the window should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right

### Example 1: Read ASCII message from a barcode reader.

With the following example program, when C1 is ON, the Receive instruction is activated and Com Port 2 waits for an ASCII message from the barcode reader. When Com Port 2 receives an ASCII message and it includes the termination character (CR = Carriage Return in this example), C2 is turned on and the received ASCII message is copied to TXT1 address.





Example 2: Retrieve numerical data from the received ASCII message.

When numerical data is included in the received ASCII message, you may want to retrieve the numerical data and copy into a data register. The Copy instruction can be used for this purpose.

In this example, received ASCII message is stored in TXT1 to TXT6. This ASCII message includes numerical data '1.23' as ASCII characters from TXT3 to TXT6. The Copy instruction converts those ASCII characters into the equivalent numerical data and copies into data register DF1.



# P-5 P-5: ASCII Send Programming

The Send instruction allows the CLICK PLC to send ASCII messages to an external device. To use this instruction, double click Send in the Instruction List window as shown below.



Select the Com Port that you are going to use and confirm the Protocol is ASCII.

If the Protocol is not ASCII, click the Com Port Setup button to open the Com Port Setup

Select the Com Port to use.	Send			×
	Com Port:	Port2		
Protocol needs to be ASCII.		ASCII	COM Port Setup	

Details window and change the Protocol to ASCII. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction the ladder program. You cannot change the Protocol setup until you delete those instructions.

Com Port Setup Details					Grayed out	×	
Port:	Port2	~	Protocol:	Modbus			
Basic	Configura	tion				-Wiring Detai	is

When you open the Send instruction in the ASCII mode, the window should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.

<ul> <li>Static Text Messa</li> </ul>	ge (MAX: 128 characters)	
	Possible Message Length = 0	-
Embed ASCII Code	Embed Memory Address Embed Discrete Message Simulate	•
O Dynamic Text Me	sage (MAX: 128 characters)	
Start Address: Number of Byte	· · · · · · · · · · · · · · · · · · ·	Click the Help
		to get detai
Termination Code (ASCII HEX code)	1 Character     2 Characters     1: \$00     2: ASCII Table	setup wind
Byte Swap	All O All but null	
Byte Swap	All O All but null	

#### Example: Send ASCII message to a serial printer.

With the following example program, when status of C1 changes from OFF to ON, the Send instruction sends ASCII message 'ABC' and the termination character (CR = Carriage Return in this example). C2 is turned on when sending the ASCII message is completed.

