Ethernet/Serial DataLink Tutorial – Sending and Receiving Data over Ethernet or a Serial Port

This exercise will walk you through using the Ethernet/Serial DataLink to send and receive data. The Ethernet/Serial DataLink allows I/Gear to read and write information to generic Serial or Ethernet (TCP, UDP, and ICMP) devices. It allows for interactive sessions that exchange information with host systems such as an ERP system or a serial-based industrial control device. Even though this tutorial demonstrates TCP/IP, the same steps would be followed if using the serial port.

Requirements

In order to complete this exercise you must have the following:

- PC with Windows 2000 Professional or Windows 2000 Server
- I/Gear v5.2 or greater Installed
- Sample Weigh Scale application

Goals

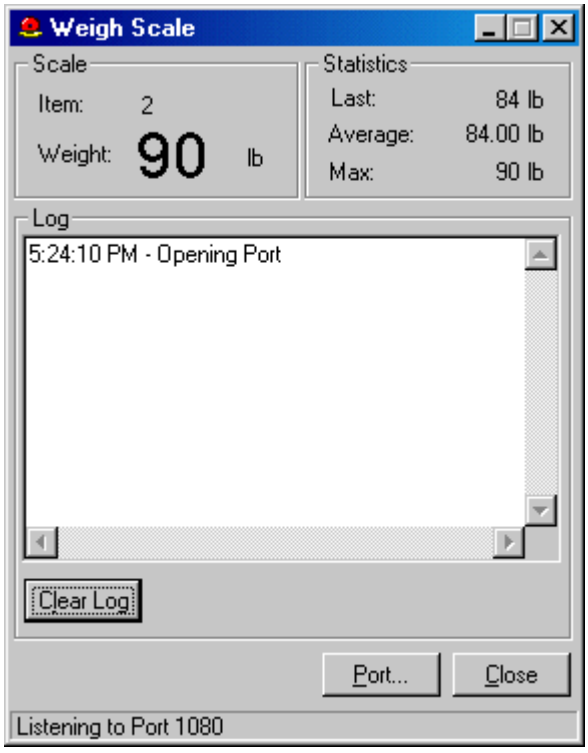
By the end of this exercise, you will know how to:

- Create a New Ethernet/Serial DataLink
- Send Data to an Ethernet device
- Receive Data from an Ethernet device

Step 1 - Creating the Ethernet/Serial DataLink

The first step in sending and receiving data is to configure the Ethernet/Serial DataLink.

For this tutorial, you will use the Weigh Scale application installed with the tutorial. The Weigh Scale application is a TCP/IP Emulator simulating an industrial weighing device. From this device, you can request certain weight values and statistics using the protocol outlined below. The DataLink will be configured to send and receive data on Port 1080. The Weigh Scale application, shown below, will indicate when data has been received and sent through the port. The application is located in the Start menu at **Programs->I-Gear->Tutorial->Weigh Scale**.



How the Weigh Scale Works

Upon opening the Weigh Scale application, the scale will immediately begin "weighing" items. The current item is shown in the top left corner in the **Scale** section. The current weight being read by the scale is shown in large digits in the top left corner as well. Once this weight stays steady for a solid 5 seconds, the scale will reset and the next item will be placed on the scale. The right-hand corner shows current statistics for all items measured. This includes the weight of the last item, the average weight of all the items, and the maximum weight reached.

The **Log** window shows the recent events for the TCP/IP Port of the scale. On startup of the application, the port is opened and the application listens for incoming connection requests, which in this case, will come from I/Gear's Ethernet/Serial DataLink. The port is defaulted to 1080, but may be changed by using the Port… button. Once a connection is established, the scale reads in the command request, one of the protocol commands shown below, and then returns the requested data. The connection to I/Gear is closed and the scale begins listening for another connection request.

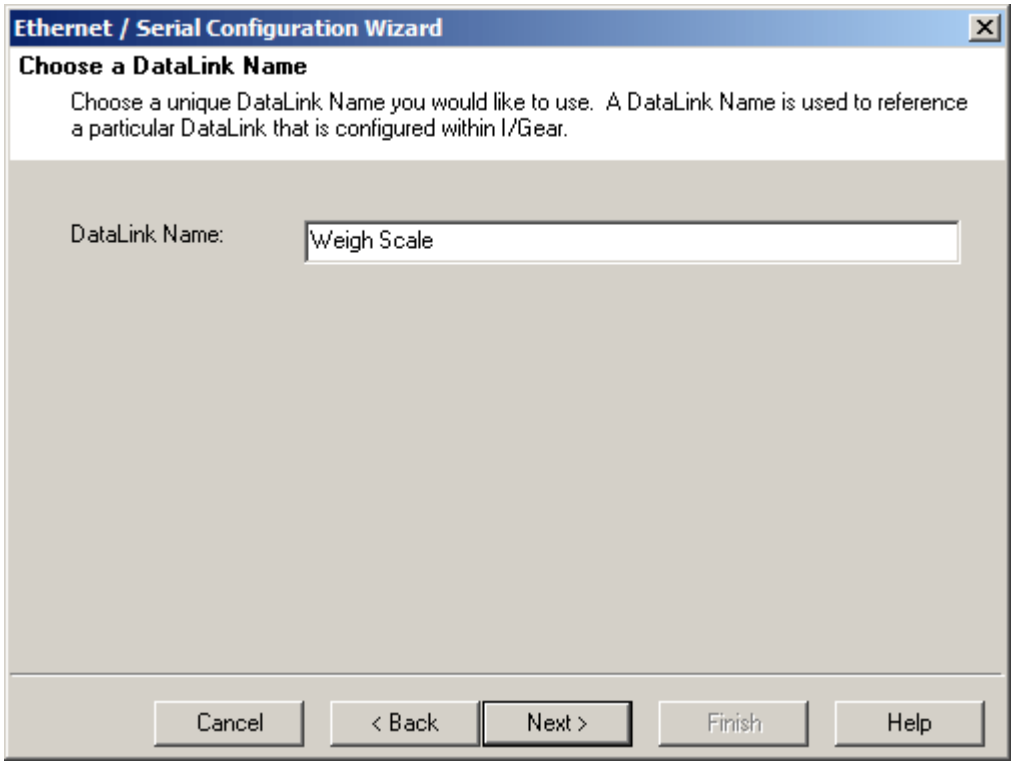
Weigh Scale Communication Protocol

The protocol for the Weigh Scale is used to retrieve statistics and weight values from the device. All commands must be sent with a carriage-return line feed as a data packet terminator. To do this in I/Gear, you specify a control character for Carriage-return and Line Feed as outlined later in this tutorial. Here are the commands utilized by the Weigh Scale.

Command	Description
/M	Returns the maximum weight
/A	Returns the average weight
/C	Returns the current weight
/L	Returns the weight of the last item.

You will now create the Ethernet/Serial DataLink for TCP/IP Communication.

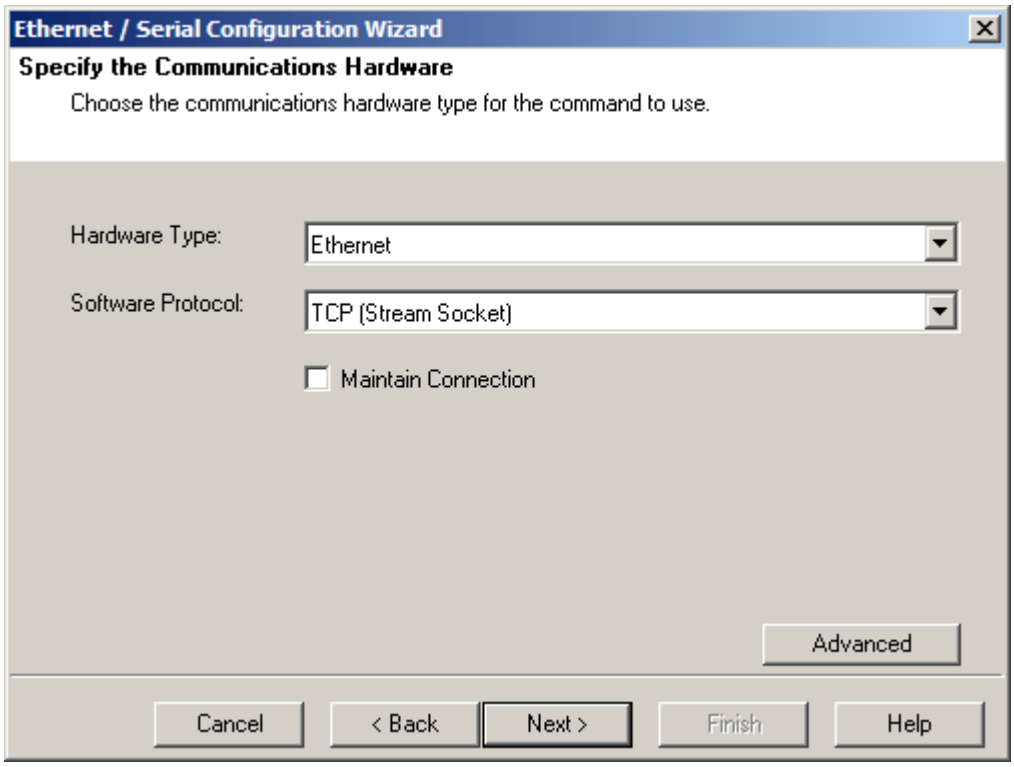
1. Right-click the **DataLinks** node in the tree.
2. On the pop-up menu, select **New DataLink...**
3. Select **Ethernet/Serial** from the list of DataLinks.
4. When the Configuration Wizard opens, click Next.
5. On the **Choose a DataLink Name** screen, type **Weigh Scale** and click Next.



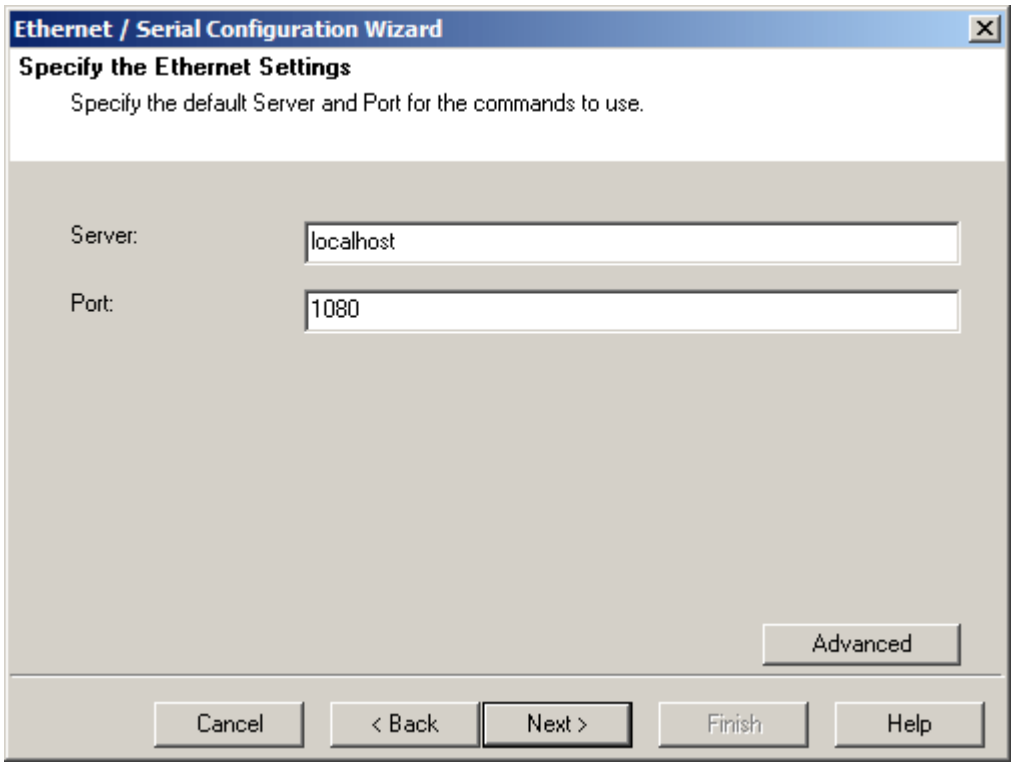
6. On the **Specify the Communications Hardware** screen, select the hardware for communication. There are two available communication hardware types:

   - **Ethernet** – communication over Ethernet.
     This option has four related Software Protocol options: TCP (Stream Socket), UDP (Datagram), ICMP (Ping), and Telnet.
   - **Serial Port** – communication over a Serial connection.

   You will be using Ethernet to communicate with the TCP Server. Select **Ethernet**, **TCP (Stream Socket)**, leave **Maintain Connection** unchecked, and click Next.



7. On the **Specify the TCP Server** screen, enter **localhost** as the Server and **1080** as the Port and click Next. This will establish a connection on Port 1080 to the local computer. In most cases, you will be connecting to a remote server or device using a name or IP Address.



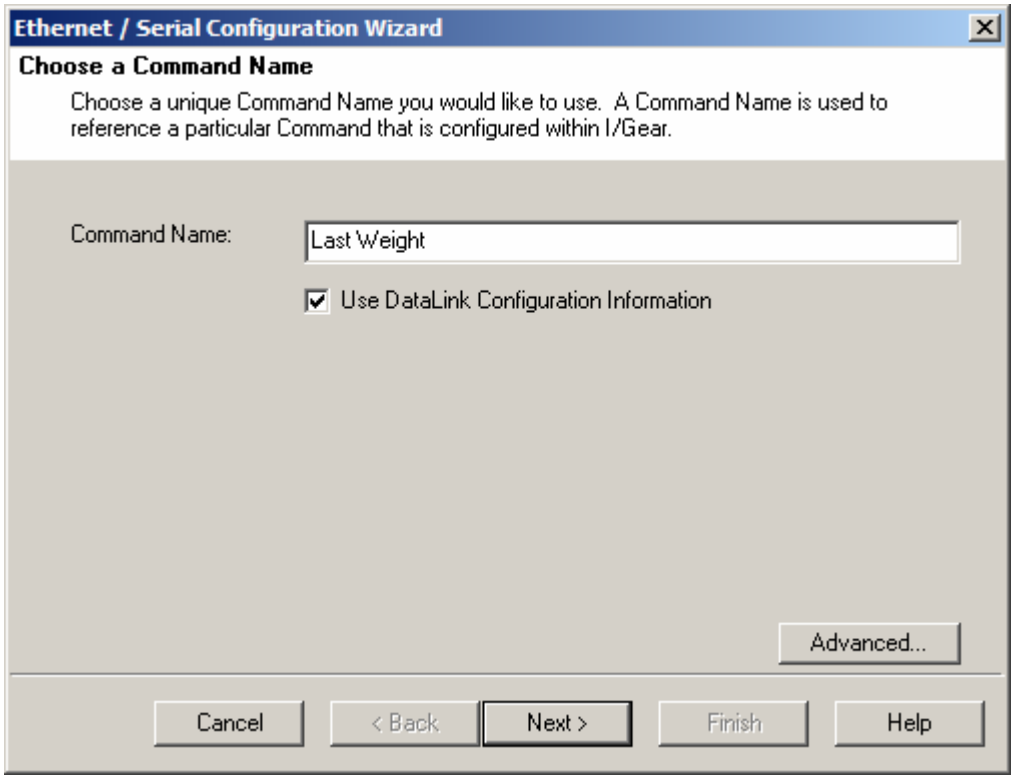
8. Click Next on the **Specify any Protocol Modules** screen, and Click Finish on the **Completing the Ethernet/Serial DataLink Configuration Wizard** screen.

You have now configured the Ethernet/Serial DataLink for connecting to an Ethernet device. The next step is to create an Input Command to receive data.

Step 2 - Receiving Part Information using the TCP Input Command

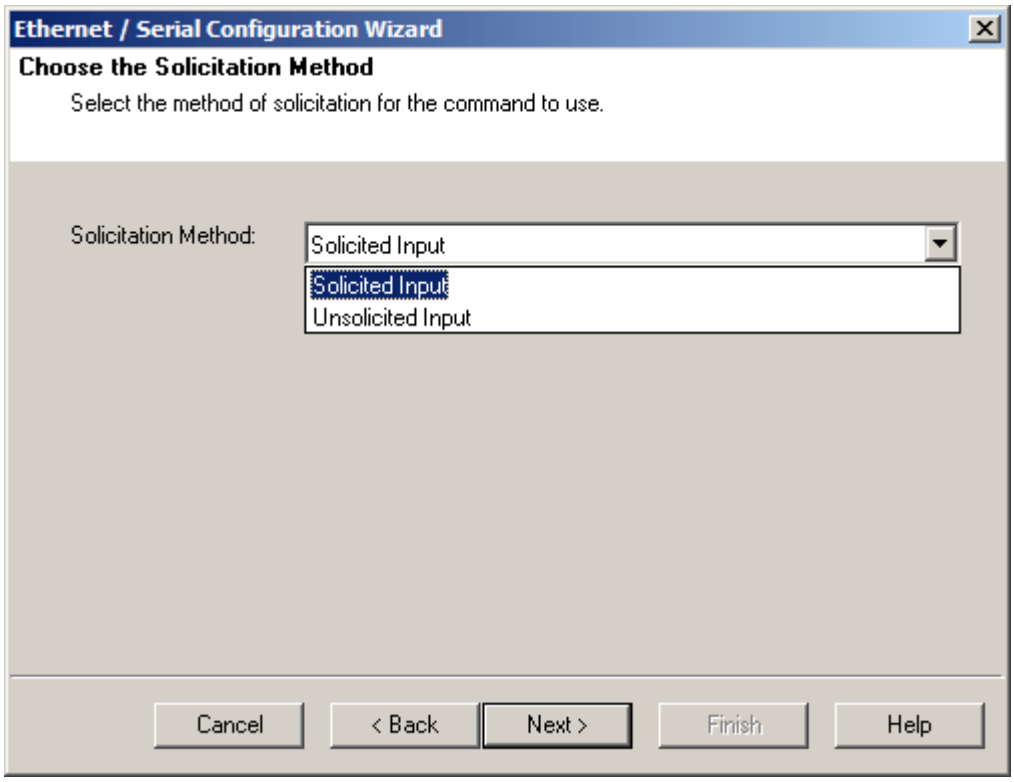
The TCP Input Command retrieves data from the Ethernet device through the specified port of the DataLink. In this step, you will be connecting to the Weigh Scale application and retrieving the maximum weight for the scale. Before starting, open the **Weigh Scale** application from the Start Menu in **Program Files->I-Gear->Tutorial->Weigh Scale**.

1. Expand the **Weigh Scale** DataLink tree
2. Right-click the **Input Commands** node in the tree.
3. On the pop-up menu, select **New Command...**
4. When the Configuration Wizard opens, click Next.
5. On the **Choose a Command Name** screen, type **Last Weight** and click Next.



6. On the **Choose the Solicitation Method** screen, you will choose how to execute the Command. Unsolicited Commands are executed when data is received. Solicited Commands are executed when they are triggered.

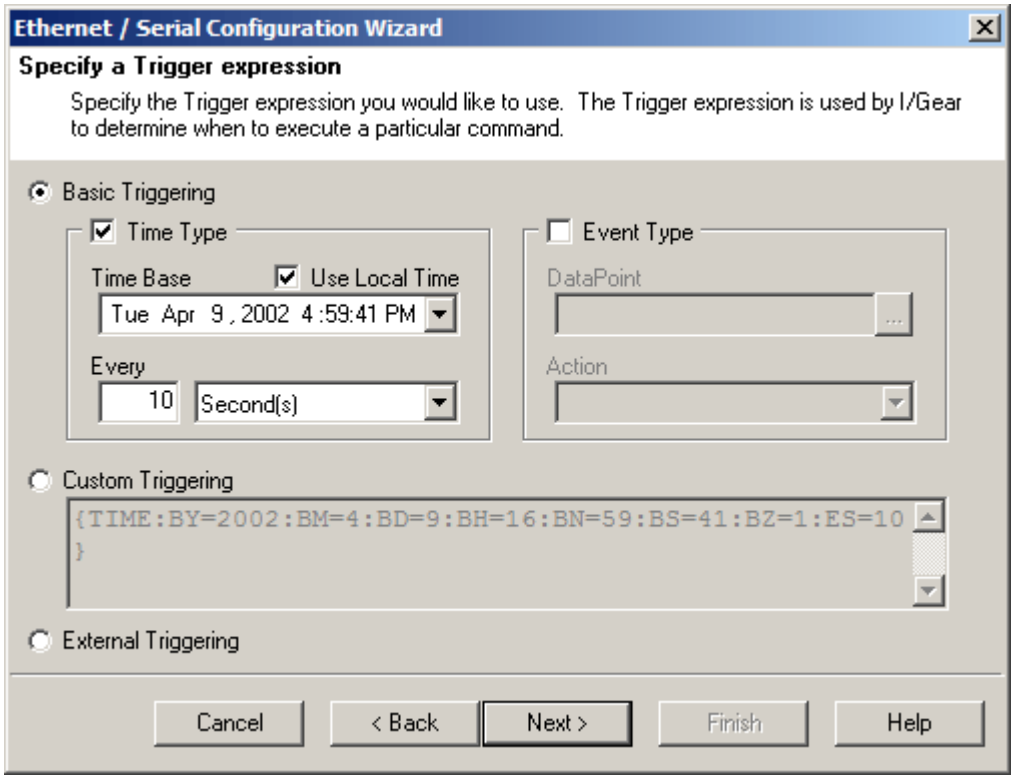
   Since you are setting this Command up to trigger every 10 seconds, choose Solicited Input as shown below and click Next.



7. On the **Specify a Trigger Expression** screen, you will configure a Trigger for the Command. A Command Trigger is an expression determining when the Command will execute. There are several types of Triggering available:

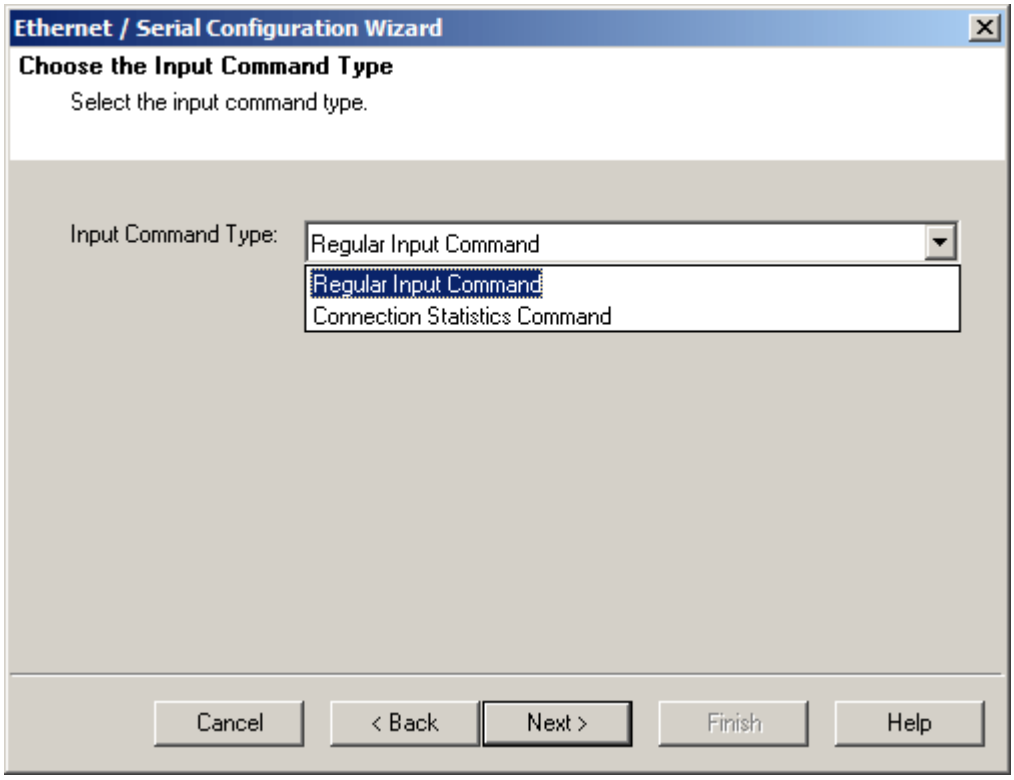
   - **Time Type** – Trigger occurs on a specified time interval from a specific base time such as every one second.
   - **Event Type** – Trigger occurs on certain events of an existing Command or DataPoint, such as on success of the Command or on increase of the DataPoint.
   - **Custom** – Specified by the user using specific syntax and Boolean rules.
   - **External** - The Command can only be executed from the I/Gear Object Model or through the Management Console.

   You want the Command to execute every 10 seconds from the base time. Set the trigger for every 10 seconds as shown below and click Next.



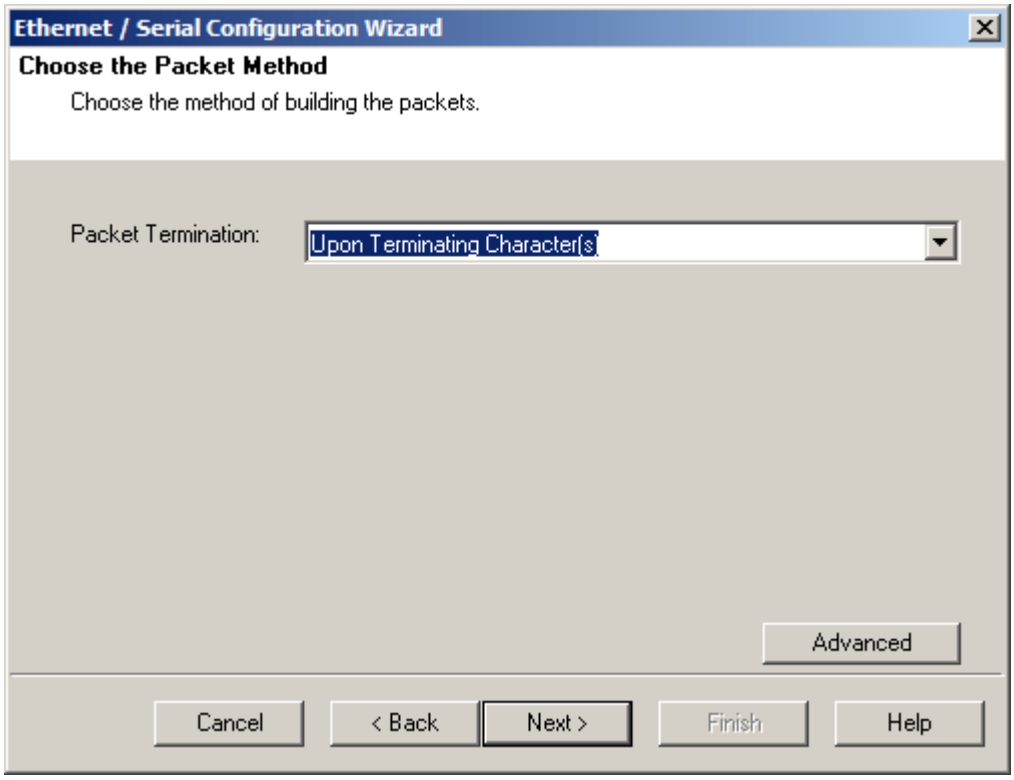
8. On the **Choose the Input Command Type** screen, you can choose the type of Input Command. The available types are as follows:
    - **Regular Input Command** allows the Command to receive and send data through the device.
    - **Connection Statistics Command** gives diagnostic information about the device.

    Since you are creating this Command to receive data, select **Regular Input Command** and click Next.

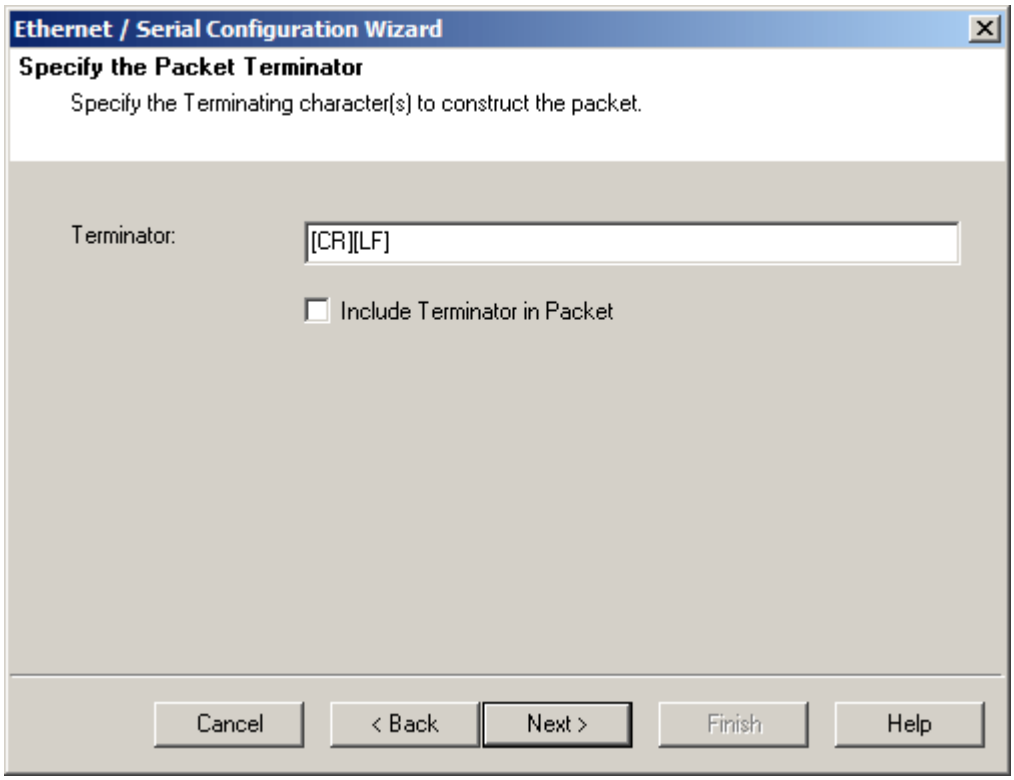


9. On the **Choose the Packet Method** screen, select a method to determine when a data packet has been received. The available methods are as follows:
    - **Upon Terminating Characters** will end the packet after the specified character(s) is received.
    - **Fixed Packet Length** will end the packet after a specified number of characters.
    - **Transmission Deadband** will end the packet after a specified amount of time passes with no data.

    The Weigh Scale sends data with special characters on the end to signify the end of a packet. Therefore, select **Upon Terminating Character(s)** and click Next.



10. On the **Specify the Packet Terminator** screen, verify **[CR][LF]** is entered as shown and that the **Include Terminator in Packet** option is unchecked. This will indicate that the incoming part information is complete once a carriage-return line feed is reached. This will be specific to the device that is sending data back. The Weigh Scale application sends the data with a carriage-return line feed to indicate the packet has ended.



By default, brackets ([]) indicate a control character, telling I/Gear that these are special characters that need to be interpreted as control characters instead of as part of the data. The start and end control characters can be changed in the Advanced Properties of the Ethernet/Serial DataLink. The chart below outlines the characters that can be used. These characters can also be used in transmitted and incoming data packets as well.

DEC	HEX	ASCII
0	00	NUL
1	01	SOH
2	02	STX
3	03	ETX
4	04	EOT
5	05	ENQ
6	06	ACK
7	07	BEL
8	08	BS
9	09	HT
10	0A	LF
11	0B	VT
12	0C	FF
13	0D	CR
14	0E	SO
15	0F	SI

DEC	HEX	ASCII
16	10	DLE
17	11	DC1
18	12	DC2
19	13	DC3
20	14	DC4
21	15	NAK
22	16	SYN
23	17	ETB
24	18	CAN
25	19	EM
26	1A	SUB
27	1B	ESC
28	1C	FS
29	1D	GS
30	1E	RS
31	1F	US

For another example, if you wanted the packet to end on ETX, you could specify [ETX] in character notation or [x03] in hexadecimal notation.

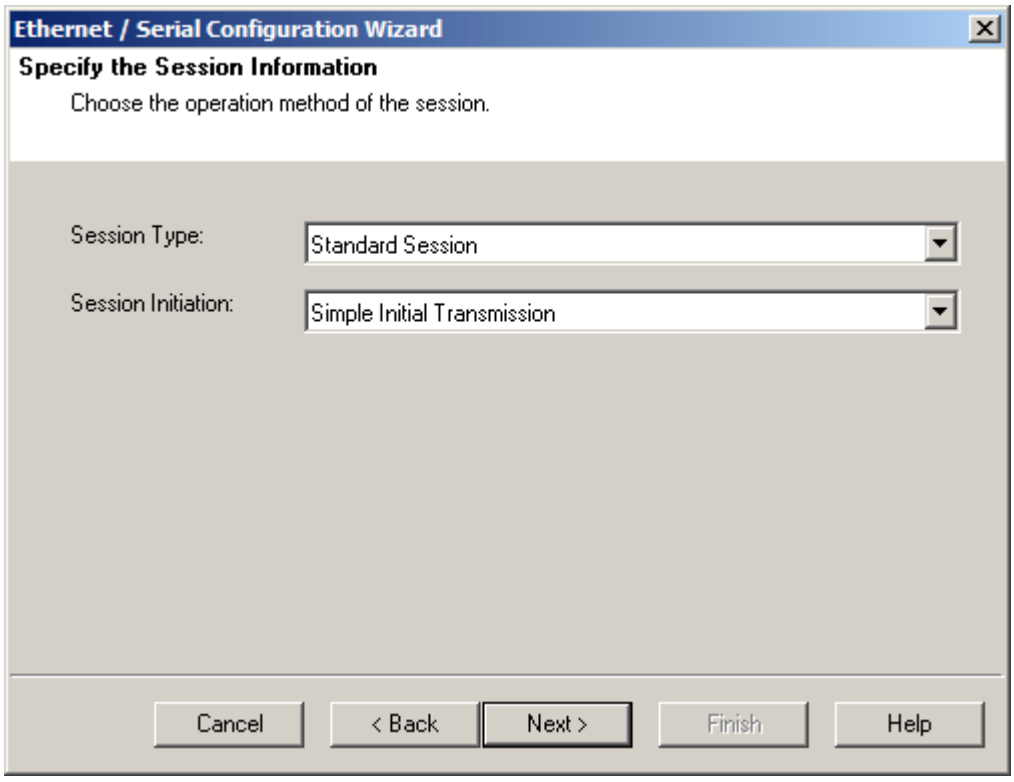
11. On the **Specify the Session Information** screen, you can select a session type and session initiation. There are two available session types:

    - **Standard Session** is a basic session type that doesn't need any scripting.
    - **Script Controlled Session** adds scripting to the session.

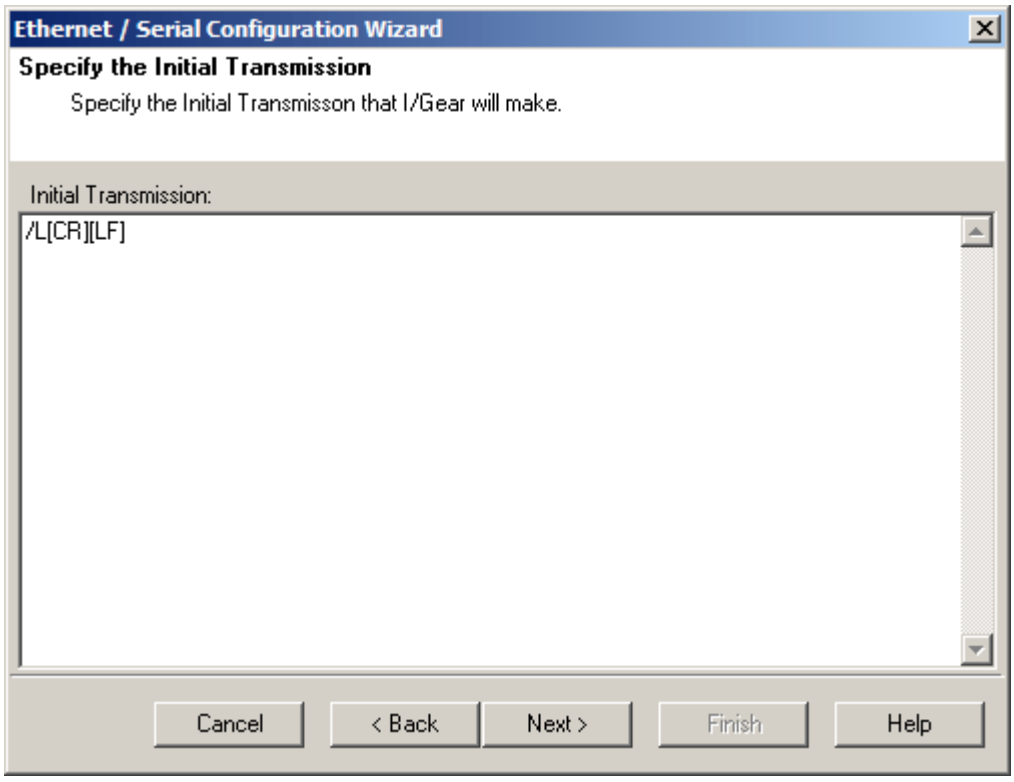
    The Session Initiation also has two options:

    - **No Initial Transmission** is used when the data is returned right after the connection.
    - **Simple Initial Transmission** is used when the data is returned only after a request message is sent.
    - **Script Controlled Initial TX** (only available with **Script Controlled Session**) allows the initial transmission to be set up in a script.

    Accept the defaults of **Standard Session** and **Simple Initial Transmission** as shown below and click Next.



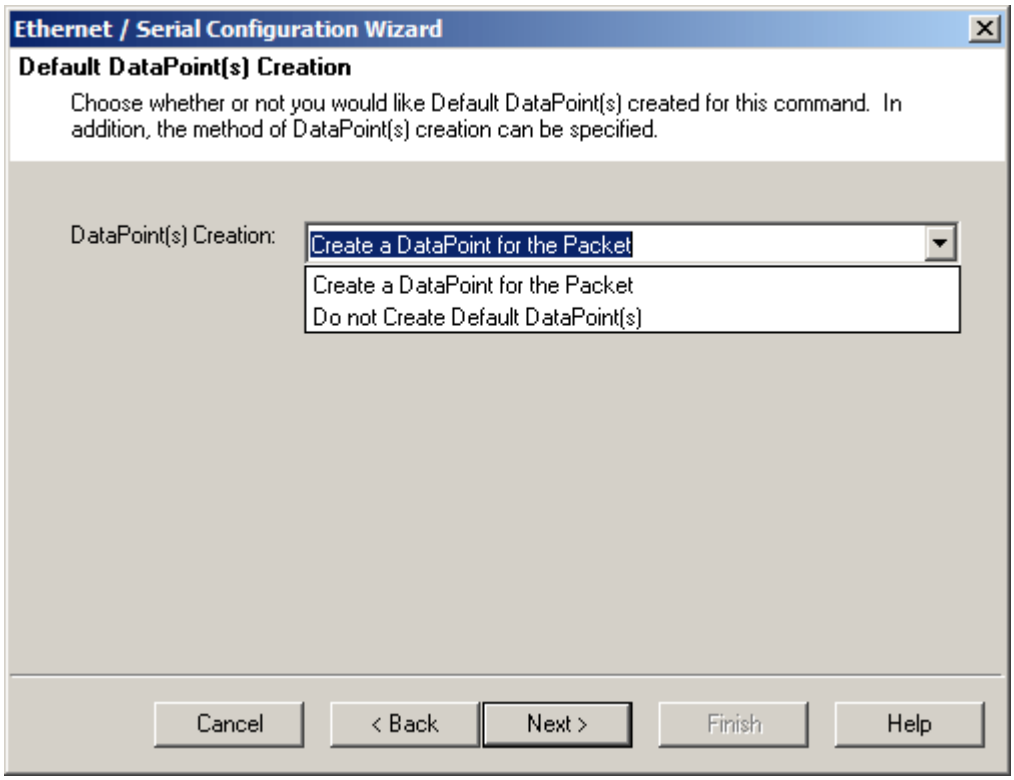
12. On the **Specify the Initial Transmission** screen, enter **/L[CR][LF]**. Some devices or servers require a command or request upon connection indicating what data or operation you are requesting from them. This is part of their communication protocol and is required before you can exchange data with them. In this case, **/L** tells the TCP Server that you wish to obtain the last weight of the scale during this session as noted by the protocol described at the beginning of this exercise. The Weigh Scale also terminates incoming data packets with carriage-return line feeds, hence the ending **[CR][LF]**. When finished, click Next.



13. On the **Default DataPoint(s) Creation** screen, select a method for creating DataPoints. There are two available options:

    - **Create a DataPoint for the Packet** – creates the **Input Packet** DataPoint to hold any incoming data packets.
    - **Do Not Create Default DataPoint(s)** – no DataPoints are created automatically.

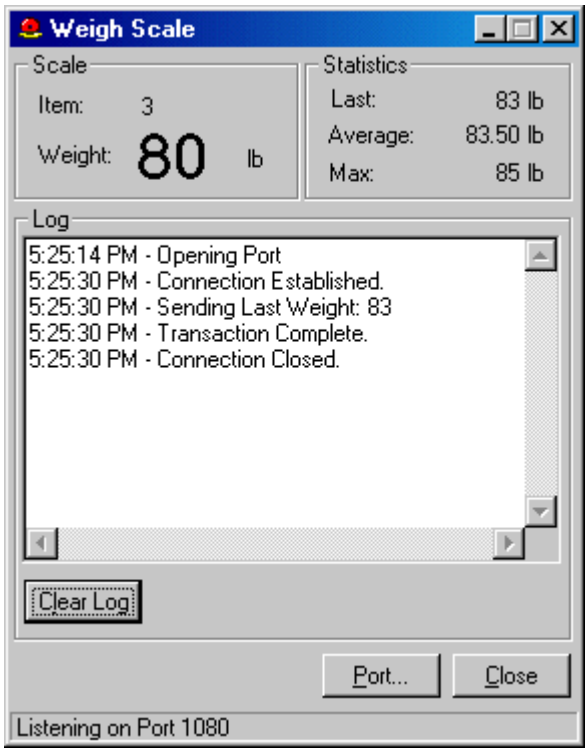
    You want to create a DataPoint to hold the incoming packet. Therefore, select **Create a DataPoint for the Packet** and click Next.



14. Click Finish on the **Completing the Ethernet/Serial Command Configuration Wizard** screen.

This Command will execute every 10 seconds and retrieve data from the Ethernet device or Weigh Scale application. Un-pause the **Last Weight** Command and observe the data coming into the **Input Packet** DataPoint of the Command.

Watch the Weigh Scale application for a minute or two. Notice that every time the **Last Weight** Command executes, a connection is established between I/Gear and the Weigh Scale application. The data requested, in this case the maximum is sent, and then the connection is closed. The application then waits for another connection to be made. After execution, the Weigh Scale application should look similar to the following:



Congratulations! You have now completed the Ethernet/Serial DataLink Tutorial.