POINT SIX WIRELESS

LINK MANAGER™

Manual

Version 1.5 – 12/5/2014

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Contents

Introduction

Overview

The Link Manager is a data server designed to bridge 900 Mhz Point Sensors and a host application listening on a TCP/IP network using the Extended Point Sensor Protocol using UDP. The Link Manager collects data from the 900 Mhz Point Sensors, both the beacon, configuration and the logged data, and maintains an image of the beacon, configuration and logged data. The Link Manager then makes contact with a host application using the same UDP protocol as used for the Wifi Point Sensors and responds to host commands. The Link Manager at this point looks like a Wifi Point Sensor. The Link Manager can support up to sixty (60) 900 Mhz Point Sensors.

Over the Air Sensor Data Collection

The Link Manager communicates with the Point Sensor when the sensor sends a beacon packet. The Link Manager then responds with additional commands depending on if data log records need to be collected or setup information from the sensor needs to be gathered. The Link Manager only collects new log records from the sensor per conversation. The Link Manager collects the setup information when the sensor indicates its setup has been changed locally (through the Point Sensor Utility). The Link Manager conversation frequency is dictated by how often the sensor sends the beacon packet (transmit period). If the Link Manager is holding setup information sent from the host, the Link Manager will send the setup information when the next packet is received from the sensor.

Link Manager Sensor Virtualization

The Link Manager will hold the log data and setup information for up to 60 sensors. When communicating to a host, the Link Manager emulates a Wifi Point Sensor. The Link Manager will send a sensor beacon packet to the host that starts the conversation with the host. The Link Manager then responds to requests from the host. To the host the Link Manager virtualized sensor appears like a Wifi Point Sensor. The host can send setup information to the Link Manager which will be later be forwarded to the 900 Mhz sensor.

The Link Manager will send a beacon packet to the host when the conversation with the sensor has been completed. The Link Manager will continue to send a beacon packet at a regular interval to the host until an acknowledgement response is received from the host.

Link Manager Notes

- Collects data log records and setup information from 900 Mhz Point Sensors.
- Holds data log records and setup information for up to 60 sensors.
- Emulates sensors to the host application. Appears to the host application like up to 60 Wifi Point Sensors.
- The sensor needs to be registered with the Link Manager. (Like how sensors are registered with Point Managers).
- New setup information can be obtained from the sensor (when the setup has been changed through the Point Sensor Utility).
- The host can send setup information to the Link Manager. The Link Manager will forward the setup information to the sensor when the next beacon packet is sent from the sensor.
- Conversations with the host are initiated when the Link Manager's conversation with the sensor is finished.
- The Link Manager is fully configurable through a web browser. Use the Discover tool to locate the Link Manager and then use your web browser to configure the Link Manager and register sensors.
- Each sensor has its own radio address based on the serial number. The Point Sensor Utility is used to set this radio address.
- Programmers can use the Link Manager's command interface to change the setup and check status.
- Link Manager has additional functions link sensor packet PassThru and radio repeater function.

Quick Start Setup

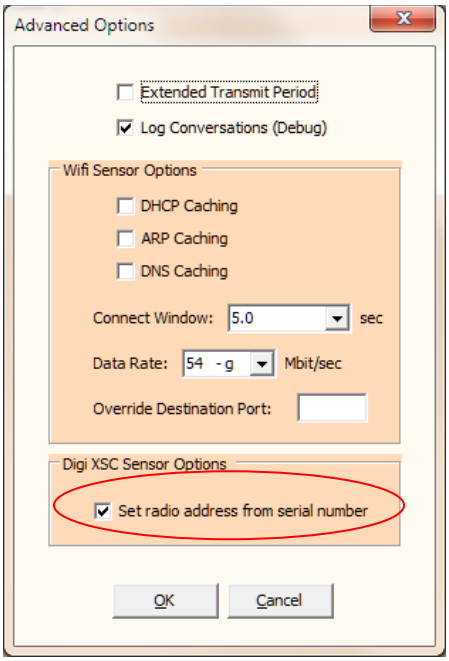
Steps

Set Up Your Sensor Using the Point Sensor Utility.

1. Point Sensor Utility Setup:

   a. Make sure the following line is set in the PointSensorUtility.INI file in the section called [Settings]: *"XSCSerializeAddressEnable=1"*.

   b. In the Advanced Options (from the main menu select the Options / Advanced Options), make sure the "Set radio address from serial number" is checked.



c. Set Up the Sensor:

i. Connect the USB Programmer interface to the sensor and then click the Retrieve button in the Setup tab.

ii. From the Setup tab, set the Transmit Time (ex. 5 minutes), Tries (ex 4) and Log Period (ex 2 minutes).

iii. Click the Update button in the Setup tab to transfer the settings to the sensor. Remove the USB Programmer interface from the sensor when finished.

Connecting the Link Manager

1. *Connect Antenna.* Depending on your specific unit, thread the supplied antenna(s) to the antenna connector(s) to the Link Manager
2. *Connect Ethernet Cable.* Connect an RJ-45 cable to the Link Manager and to your network. Your network must have a DHCP Server that will assign an IP address to the Link Manager. See the section "Ethernet – TCP/IP", if your network does not have a DHCP Server. The green light will light if there is an active Ethernet connection.
3. *Connect the Power Supply.* Connect the provided power supply to the Link Manager. When power is applied, the Link Manager will turn on the red power light. The red light indicates that the Link Manager is functioning. It may take a few seconds before the power light is turned on. The Link Manager also uses the red power light to indicate reception of a packet from a Point sensor. The Link Manager will blink the red light momentarily indicating a packet has been received and processed.
4. *Run the Discover program to find the Link Manager on your network.* Run the Discover program from a computer that is on the same subnet as the Link Manager.
5. *From the Discover program, double click the Link Manager entry to bring up the Link Manager web page.*

Set Up Your Link Manager.

1. At the Link Manager's web page, select the Setup menu option and then select the Manager Setup menu option.
2. Enter a name for a Link Manager.
3. In the Add Sensors field, select "Service Mode for 20 minutes".
4. Enter a Destination Address. This is the address of the computer running the host application. The address can be an IP address or a hostname.
5. Click the Submit button to save and apply the settings.

Register the Sensors With the Link Manager.

1. Navigate to the Link Manager I/O Status page.
2. Press the service button (or use magnet) on the Sensor.
3. Wait up to 15 seconds or press Refresh on you browser. The Sensor will be listed in the I/O Status page. If you click on the default name of the sensor,

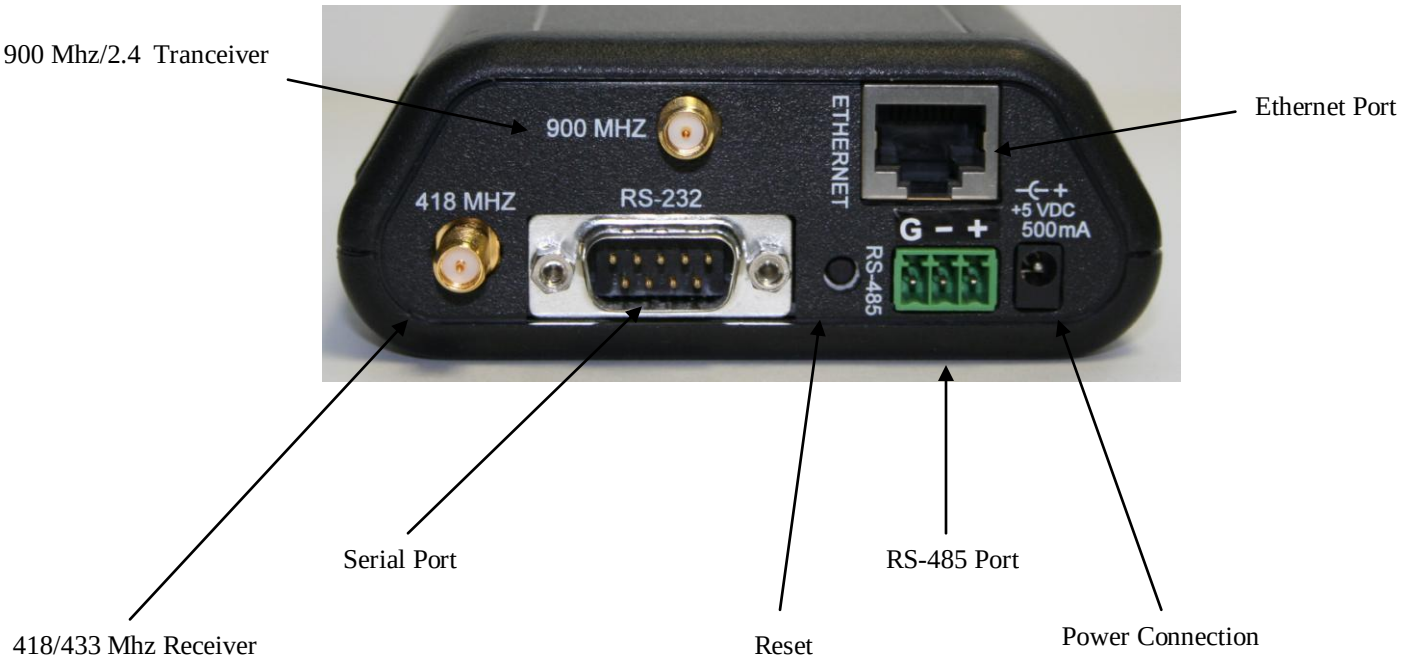
the Link Manager will present you a screen to change the sensor name. The Link Manager will start collecting the sensor's log data. This may take up to 2 minutes to complete. Additional sensors can be registered after the sensor's log data is collected.

4. Press the service button on the sensor and examine the host application to determine the Link Manager is sending sensor data to the host application. If the sensor's log buffer is full, it will take a few minutes for the Link Manager to collect all the sensor data before sending to the host application. You view the progress of the collection from the I/O Status page.

Connecting the Link Manager

Overview: Connecting

The Link Manager has four communication ports: Ethernet-TCP/IP, built-in 900/2.4 Mhz/Ghz Radio an RS232 serial port and an RS485 port. The Link Manager will respond to commands or receive sensor packets on all ports Before using the Link Manager, you should carefully evaluate the communication resources available at the site where the Link Manager will be installed. Typically just the Ethernet and 900 Mhz ports are used.



Ethernet – TCP/IP

LAN Connection

Check with your network administer before connecting the Link Manager to a LAN.

Dynamic IP Address

By default the Link Manager is capable of being assigned an IP address automatically by the network if the network has a DHCP Server. Connect the Link Manager using a straight through Ethernet cable to the LAN. Connect power to the Link Manager. If the 'Ethernet Link' light is on, then the Link Manager is connected physically and electrically to the LAN.

The next task is to obtain the IP address assigned to the Link Manager. Run the Discover utility that came with your Link Manager (or obtain the utility from your dealer). Using the Discover utility, note the IP address for this Link Manager. To view the Link Manager's web page using the Discover tool, right click over the Link Manager entry and then select "Browse" from the pop menu. The Discover utility will start the browser and point it to the Link Manager's web page.

Another method to finding the IP address is to connect via the serial port with your PC. Follow the instructions as described in the section that follows called "Serial Ports" and issue the "IP" command.

Static IP Address

In order for the Link Manager to communicate TCP/IP, it needs an IP address, network mask, and possibly a gateway address. You may need to consult with your network administrator to determine these parameters. Chances are you will have to change the Link Manager's default IP address: IP address 192.168.1.55, network mask 255.255.255.0, no gateway address and port 1000 and turn off dynamic IP address mode. You can change these settings using the "CIDS" and "CIS" commands through any of the communications ports. If you need to use the Ethernet port to change these settings see the next section "Direct to PC".

Example

```
Command:   <^B>CIDSF,F<CR>
Response:  <^B>CIDSF<CR>
Remarks: turn off dynamic IP mode.
Command:   <^B>CIS192.168.1.46,255.255.255.0,192.168.1.200<CR>
Response:  <^B>CIS192.168.1.46<CR>
Remarks: set IP address to "192.168.1.46", subnet mask
to"255.255.255.0" and gateway to "192.168.1.200".
<^B> is STX (02H). Press Ctrl and B using a terminal emulation program.
<CR> is 0DH.  Press Enter using a terminal emulation program.
```

Connect your Link Manager through its Ethernet port to the LAN with a standard (non-crossover) Ethernet cable. The 'Ethernet Link' light will turn on indicating a valid Ethernet physical connection. To test if the connection is valid and the Link Manager is set up properly, use the Ping utility on your computer and ping the Link Manager's IP address. Use your Internet browser to view the Link Manager web page. You can also use the Discover tool to locate the Link Manager if you do not know its IP address.

Direct to PC

The Link Manager can be connected directly to a computer through the Ethernet port by a network cable. You may need to change the TCP/IP settings on your PC and/or the settings in the Link Manager. If the Link Manager's address cannot be automatically assigned, the Link Manager will default to address 192.168.1.55, subnet mask of 255.255.255.0 and port 1000. You will need to set the computer's address to an address on the Link Manager's subnet or change the Link Manager's address to match the computer's subnet mask. To change the IP settings on a computer running the Windows operating system, follow these steps: select the following 'Control Panel -> Network -> TCP/IP'; select the TCP/IP service for your network card; choose 'Properties->IP Address'; choose 'Specify an IP Address' (example: 192.168.1.40 255.255.255.0); and fill in the initial values for subnet mask and IP address. View the LAN connection status or run IPCONFIG to verify changes. When finished changing the IP address and connecting the computer to the Link Manager, use the Ping utility on your computer and ping the Link Manager to verify your settings and connection. Use your Internet browser to view the Link Manager web page.

Note: If your Link Manager has been assigned a dynamic IP address on a previous network and then is moved to a network that does not have a DHCP server, it will remain at the last assigned IP address, **not** revert back to 192.168.1.55.

Browser

Once you have your Link Manager connected and configured for TCP/IP communications, start the browser on your computer and enter the Link Manager's IP address where you would normally enter an URL (Ex. Address: 192.168.1.55). If

you have successfully made the connection, your browser should show the title "Link Manager" and a header row for the sensor table with no sensors.

Serial Port

The Link Manager has an external serial port so it can be connected to receiver or a PC. The serial port can receive packet information from a receiver or receive commands and send responses. The serial port is an RS232 DTE device and requires a NULL modem cable to connect to a computer. Link Manager uses RS232 communication parameters of **19200 baud**, **8 data bits**, **1 stop bit** and **no parity**. The Link Manager does not use RS232 handshaking lines. If connecting to a PC through a NULL modem, it is best to turn off handshaking mode in your communication program.

RS-485 Port

The RS-485 Port is used to connect RS-485 wired sensors (2 wire). These sensors can be multi-dropped (more than one sensor connected to the RS485 port). Link Manager provides optional power through the RS485 connector. The communication parameters for the port are **19200 baud**, **8 data bits**, **1 stop bit** and **no parity**. The following shows the connector pin out:

Pin	Description
RX+	+ communication signal
RX-	- communication signal
Gnd	Ground
PWR	Optional output power to power sensors. 9 Volts DC, 100 milliamps maximum

Commands can be sent and response received through the RS-485 port using the CRC16 protocol.

Point Sensor Utility

Overview

The sensor must be configured in order to be used with the Link Manager. The Point Sensor Utility is used to configure the sensor.

Set Up Point Sensor Utility

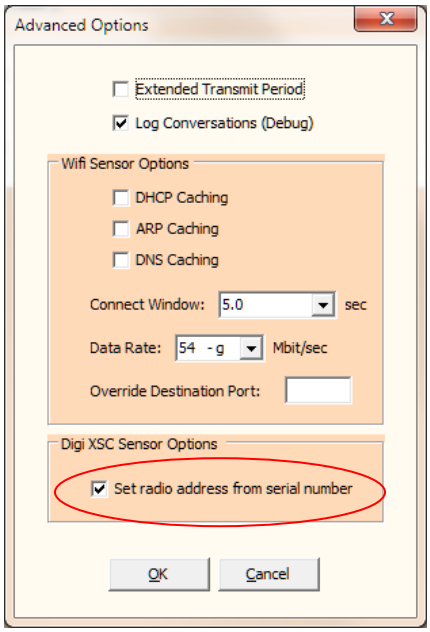
Point Sensors must use a special addressing mode for use with the Link Manager. The Point Sensor Utility must be set up to configure the sensor to use the addressing mode.

In the Point Sensor Utility's setup file, add the following settings paramter to enable the special addressing mode. In the Point Sensor Utility , go to the Help menu and then select "Utility Folder Paths" and then "Explore Setup". The utility will open a text editor showing the Point Sensor Utility settings. Add the line "XSCSerializeAddressEnable=1" to the [Settings] section. Here is an example:

```
[Settings]
QuickHelp=0
DebugLog=1
XmitPeriodOverride=0
DHCPCache=0
ARPCache=0
DNSCache=0
ConnectWindow=5.0
WLanRate=15
DestPortOverride=0
XSCSerializeAddressEnable=1
```

Save the changes and then restart the Point Sensor Utility.

Go to the Advanced Options Window (from the main menu select "Options" and then "Advanced Options") and check the box "Set radio address from serial number" and click OK



Set the utility to use the Digi XBee 900 radio. From the main menu, select Options and Radio Type. Select "Digi Xbee 900/2.4".

Point Sensor Utility Usage

Connect the USB Programming interface into the sensor and then from the Setup tab click on the Retrieve button to retrieve the sensor's settings.

From the Setup tab, set the Transmit Period, Tries, Logging Period, Alarms and the ID Info.

Click the Update button (in the Setup tab) to update the sensor with the latest settings and also set the special addressing mode for the sensor radio.

Disconnect the USB Programming interface. The sensor is now ready to be used with a Link Manager.

Advanced Setup

You may need to set the Point Sensor to use another radio Hop Table under the following circumstances:

1. Having interference issues using the default Hop Table (3).
2. Have more than one Link Manager within radio range and want to isolate the radio networks between Link Managers.

To change the Hop Table number, in the Point Sensor Utility , go to the Help menu and then select "Utility Folder Paths" and then "Explore Setup". The utility will open a text editor showing the Point Sensor Utility settings. Add the line "XSCSNHopTable=*n*" to the [Settings] section where "n" is a number from 0 to 6. Here is an example:

```
[Settings]
QuickHelp=0
DebugLog=1
XmitPeriodOverride=0
DHCPCache=0
ARPCache=0
DNSCache=0
ConnectWindow=5.0
WLanRate=15
DestPortOverride=0
XSCSerializeAddress=1
XSCSerializeAddressEnable=1
XSCSNHopTable=6
```

Save the changes and then restart the Point Sensor Utility.

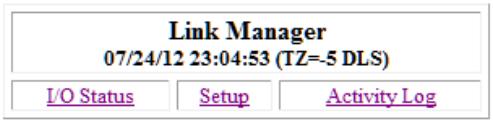
The Link Manager must be set to the same Hop Table.

User Interface

Overview

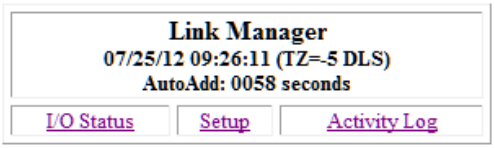
From the Link Manager web pages, the Link Manager can be configured to manage sensors and send data to the host application.

Main Menu

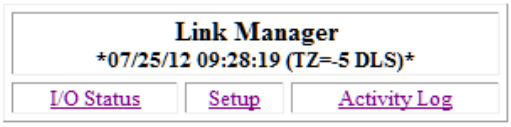


The main menu allows access to the I/O Status, Setup and Activity Log web pages. The Link Manager also shows the name given to the Link Manager, the current time of date set in the Link Manager's clock along with the time zone offset. The Link Manager also shows various states and conditions.

The Link Manager shows the current sensor and the number of log records being collected.

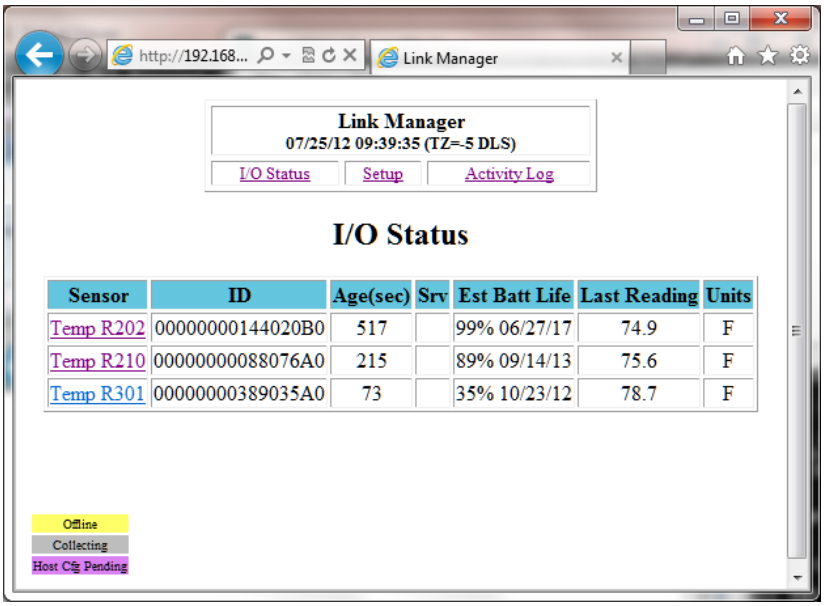


The Link Manager shows how many seconds remain for adding sensors to the Link Manager through the AutoAdd mechanism.



The Link Manager will frame the time and date and timezone with "*" to indicate that the Automatic Time Update could not update the real time clock. Just because the automatic time update failed does not necessarily mean the clock is wrong but that the clock has not been synchronized.

I/O Status



The Link Manager shows the current state of the sensor in the I/O Status page. The following information is presented:

Name – Name of the sensor. Click on the name to show the "Sensor Setup" page. The name is only used within the Link Manager and is not given to the host application.

ID – Serial number of the sensor. The serial number is used to identify the sensor to the host application.

Age – Number of seconds since the last communications with the sensor.

Est Batt Life – Estimated battery life remaining shown as the percentage of the battery remaining and also the estimated date at which the battery will be exhausted.

Last Reading – the last I/O reading from the sensor.

Units – Engineering units of the Last Reading.

The Link Manager will highlight the row color of a sensor to indicate a sensor condition:

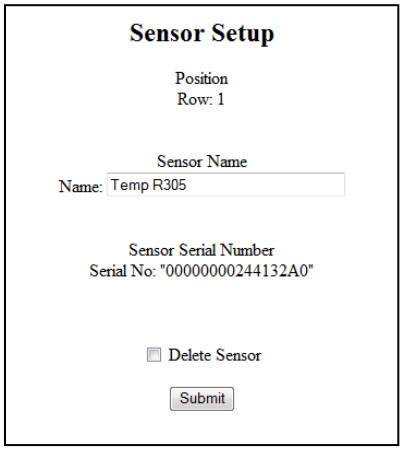
Offline – yellow – sensor is determined to be offline (as set in the Manager Setup page)

Collecting – gray – the Link Manager is currently collecting or is expecting to collect logged data from the sensor.

Host Cfg Pending – amber – the Link Manager has received a sensor configuration change from the host application is waiting to send that it on the next contact from the sensor.

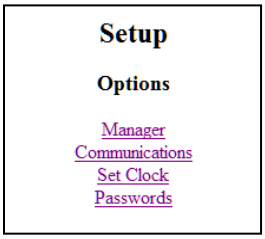
The I/O Status page is refreshed every 15 seconds. Hit the Refresh button on your browser to refresh the page on demand.

Sensor Setup



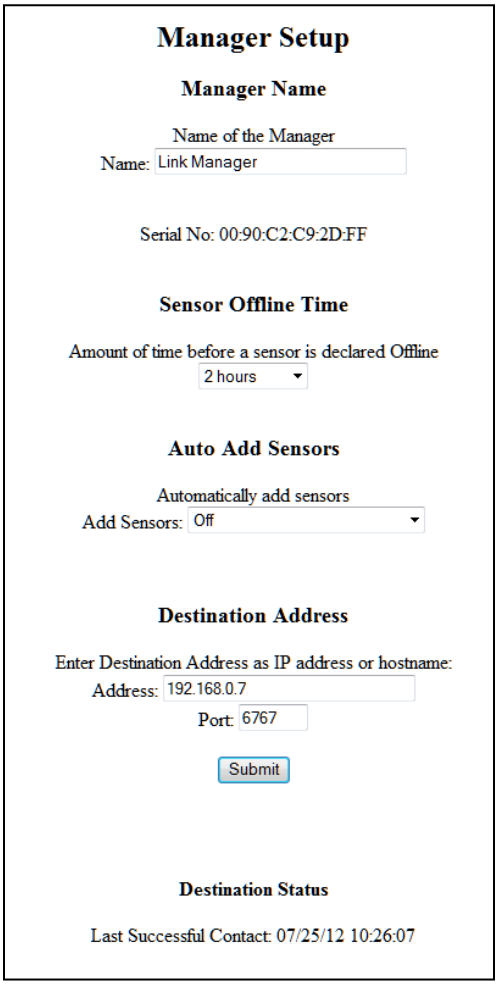
From the Sensor Setup page, you can change the name of the sensor or delete the sensor from the Link Manager. The name field is used only by the Link Manager and not sent to the host application.

Setup Menu



The Setup Page gives a list of the setup options.

Manager Setup



The Manager Setup page allows you to configure the following:

Name – name of the Link Manager (shown in the main menu).

Serial No: MAC address of the Link Manager

Sensor Offline Time: the amount of time given before the Link Manager identifies the sensor as being offline. Used by the Link Manager only; not provided to the host application.

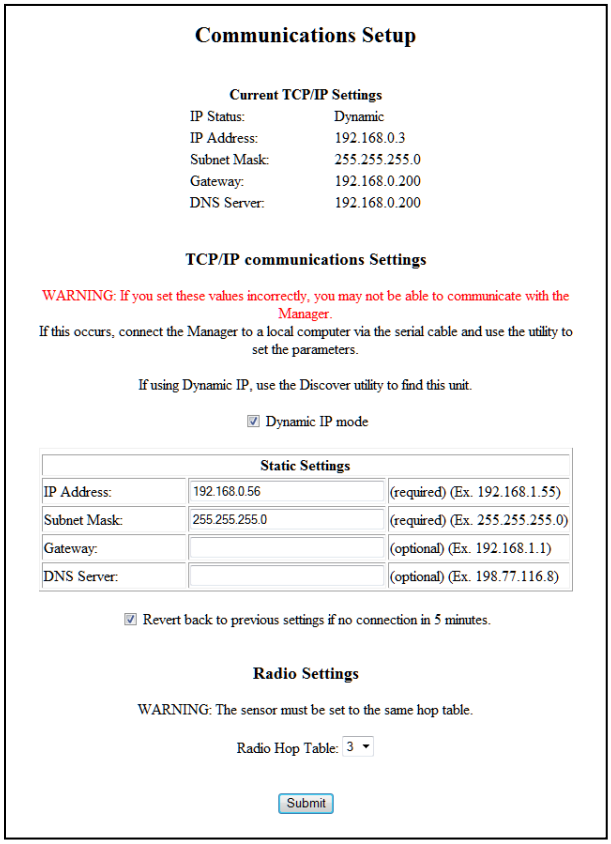
Auto Add Sensor: The amount of time the Link Manger gives to allow sensors to be added via radio using the sensor's service button.

Destination Address: The IP address or hostname of the host application where the Link Manager will send the sensor data.

Destination Port: The port number that the host application is listening for data that the Link Manager will send. Default is 6767.

In the Destination Status, the Link Manager indicates the condition of the last attempt to make contact with the host application. The Link Manager shows the time and date of the last successful contact. If the last contact attempted failed, the Link Manager will show an error message.

Communications Setup



The communication page shows that current settings of the Link Manager and allows the user to change the communication parameters:

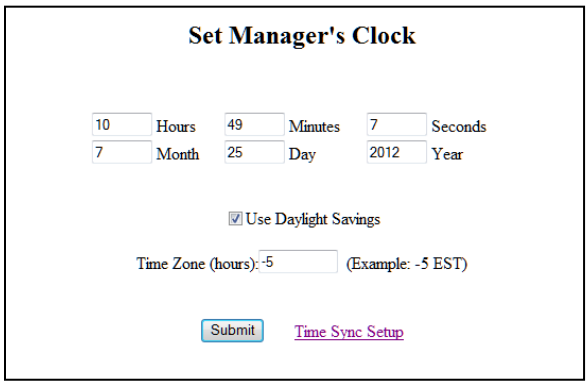
Current TCP/IP Settings – The Link Manager shows the current IP address, Subnet mask, Gateway address and the DNS Server. These parameters may be set statically or dynamically.

Dynamic IP mode – when checked the Link Manager will have the IP parameters assigned dynamically from a DHCP Server; unchecked, the Link Manager will the IP parameters entered and set statically.

Revert back to previous settings if no connection in 5 minutes – if checked the Link Manager will revert back to previous settings if no contact is made with the Link Manager in 5 minutes. If you cannot make contact with the Link Manager after making changes, wait 5 minutes and the Link Manager will revert back to the previous settings.

Radio Hop Table: default is 3. Select the desired radio channel hop table.
The sensor's radio must be set to this same value using the Point Sensor Utility.

Set Manager's Clock



Set the Link Manager's time of day clock, daylight savings mode and time zone.

Time: Hours, Minutes, Seconds: set the current time of day.

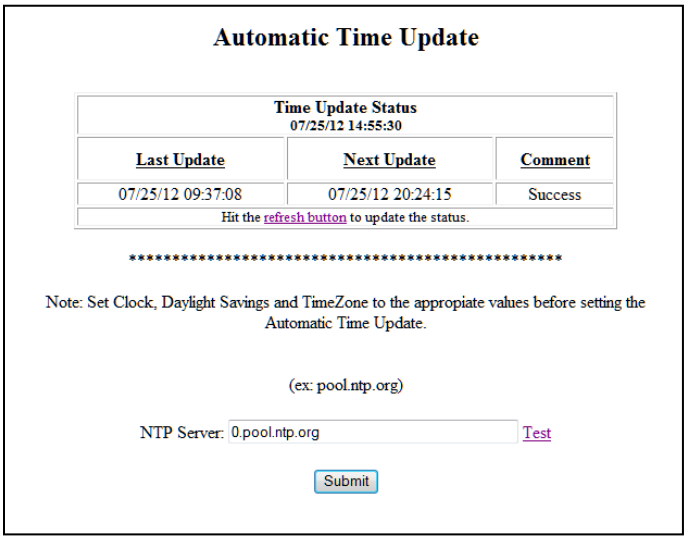
Date: Month, Day, Year: set the current date.

Use Daylight Savings: check if using Daylight Saving mode.

Time Zone: set the time zone offset in hours.

Time Sync Setup: click link to show the "Automatic Time Update" page.

Automatic Time Update



The Link Manager can update its clock from an external time server. The top portion of the page shows the current status of the last update with the time server:

Last Update: timestamp of the last update with the time server.

Next Update: timestamp of the next scheduled update with the time server.

Comment: current status with the last update of the time server. The Link Manger will show an error message if the last update failed or “Success” if the manager successfully updated its time.

The NTP Server field specifies the address of the time server (hostname or IP address). To stop the Link Manager from obtaining time from a time server, just blank the NTP Server field.

The “Test” link starts the update process now instead of waiting for the next scheduled update.

Click the browsers refresh button to update the Time Update Status section.

Passwords Setup

Link Manager can control access to the different resources of the Link Manager through passwords. There are two levels of login access for the Link Manager: Data and Setup. Through the Data Login, the Link Manager allows access to the data portions of the Link Manager like the I/O Status page. Through the Setup Login, the user can make changes to the Link Manager setup. With the Setup Login, the user has all the rights of the Data Login as well.

If you set up a password to restrict viewing ("Data Password") you must also configure a Setup Password. If you configure a password for Setup ("Setup Password") without setting the “Data Password” then viewing of data is not

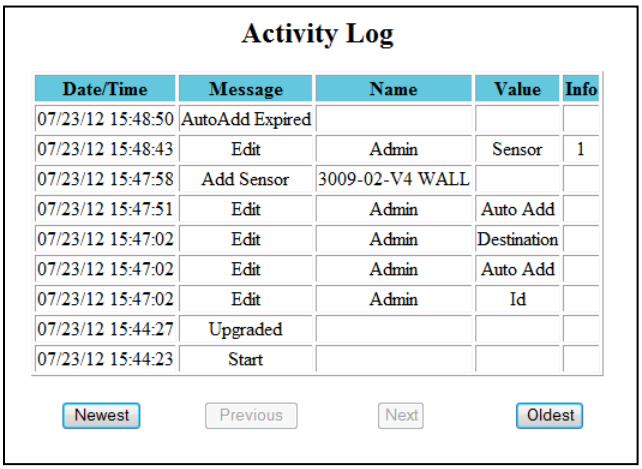
restricted. In other words, you can have password restrictions for 1) Data and Setup, 2) Setup only, or 3) Neither. You **cannot** restrict passwords for Data only.

Click "Submit" to establish password protection in the Link Manager.

WARNING: User Name and Password are case sensitive.

Note: for the Data resources use the username “user”; for Setup resources use the username “admin”.

Activity Log



The Link Manager stores changes in setup and changes in sensor state in an activity log. The activity entries can be viewed to troubleshoot issues or know when a condition for the sensor has changed. The Link Manager shows the latest events first and in descending order. The Link Manager shows 10 events at a time. You can move through the Activity Log by using the following links that are at the bottom of the page:

Newest – the Link Manager shows the latest events. This the default page when first select Events from the menu.

Previous – the Link Manager shows the previous (older) events.

Next – the Link Manager shows the next (newer) events.

Oldest – the Link Manager shows the first events that were logged.

The Activity Log page fields are the following:

Date/Time: date and time when the event occurred.

Message: event description

Name: Name of the sensor or the action.

Value: The target of the activity.

Info: additional information about the event. For sensor this will be the row number in the sensor table for the sensor.

Usage Notes

Notes

1. When a sensor is registered for the first time, the Link Manager only starts contacting the host only when the configuration data and the whole logged data is collected.
2. The Link Manager starts initiating a connection to the host only after the sensor makes contact with the Link Manager. The Link Manager initiates contact after all the data has been collected. The sensor's Transmit Period dictates how often the Link Manager attempts to make contact for that sensor.
3. If the Link Manager cannot contact the host, the Link Manager will retry every 5 seconds.
4. If the sensor's log buffer is full, it takes 2 minutes for the Link Manager to collect all of the sensor's configuration and logged data.
5. The Link Manager has a conversation with one sensor at a time.
6. The Link Manager will transfer a sensor's data to the host one at a time.
7. Using more than one Link Manager within radio range:
    a. ***A sensor must be registered to just one Link Manager.*** If the same sensor is registered to multiple Link Managers, this will cause confusion to the whole system.
    b. Have only one Link Manager in AutoAdd mode at a time.
    c. If using 20 or more sensors in the system, consider assigning a unique radio Hop Table for the Link Manager and the sensors to isolate Link Managers and sensors. The isolation will help reduce interference from sensors which will improve performance (reduced collection times and retries).
8. Make sure Link Manager's 900 Mhz antenna is secured tightly.
9. Sensor configuration information can be sent to the sensor via the Link Manager. When the host sends the sensor configuration when the Link Manger contacts the host application with sensor data, the Link Manager will highlight the sensor row in the I/O Status with the color maroon. On the following contact with the sensor, the Link Manager will send the configuration information to the sensor at which point the Link Manager will show the normal background color for the sensor row. It takes two conversations with the sensor for the configuration information to be transferred.

10. When the sensor configuration is changed locally at the sensor (using the Point Sensor Utility), the Link Manager will read the sensor configuration from the sensor on the following contact and make the information available to the host application.

Development Notes

Overview

The Link Manager follows the "Extended Point Sensor Packet Specification". If you have written an interface for Wifi Point Sensor, then the Link Manager will work with your interface. There are two features that you will want your interface to take advantage of the details that differs from using the Wifi Point Sensor:

1. When the Link Manager recollects the whole sensor buffer, it will set the "Link Manager recollected sensor's buffer" bit in the "status2" byte in the beacon packet. The Link Manager collects the whole sensor buffer under the following conditions:
    a. First time collecting the sensor data.
    b. If the current sensor clock is less than the previous sensor clock value. This can happen when the sensor's log buffer is cleared.
    c. If the sensor has been offline for the time it takes to fill the log buffer to 3/4s full (logging at 2 mins, this is 3 days).
2. The "org" – origin value in the beacon packet is set to 7 to indicate the data came from a Link Manager
3. The Mac field in the beacon packet is set to the Link Manager's MAC address.

"I Am Here Packet"

Link Managers will transmit an "I am here" UDP packet to the host when the Link Manager has not sent a UDP packet on behalf of a sensor for more than 5 minutes. If no sensors are registered, the Link Manager will send the "I am here" packet every 30 minutes. The Link Manager sends the Cmd 5 which is the same command as the Point Sensor Utility sends for the Contact Destination packet. The Link Manager sets the MAC field to its MAC address and sets the "org" field to 7. All other fields are set to 0.

```
Link Manager sends:
C3 3C 00 05 00 00 30 30 3A 39 30 3A 43 32 3A 43 35 3A 31 41 3A 34 30 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 0D 07 00 00 00 00 00 00 00 00
00 00 00

Host responds with:
C3 3C 00 06
```

Common Software Tools

Software

Discover Utility

Discover utility identifies Link Managers on a network. It lists Link Managers found using the UDP Discovery feature. The Discover provides key properties of the Link Manager: name, type, IP address, firmware version and other communication parameters. The Discovery provides a convenient launch pad to launch the web browser pointing to the Link Manager's I/O status web page and launch HyperTerminal or Telnet to connect to the selected Link Manager. Contact your dealer to obtain this utility.

PC Utilities and Tools

The interface to the Link Manager was designed to meet common standards and be easy to use. You can use common software that either comes with your PC operating system or can be purchased to diagnose common problems and to communicate with the Link Manager. You can use a communication program that has terminal emulation to get familiar with the Link Managercommands and communications. Once you are familiar with the commands, you can automate the communications using common development programming languages.

Here are some examples of common software:

Ping – simple program to test the TCP/IP connection.

Telnet – simple program to send commands and see responses via TCP/IP. Note: Link Manager uses port 1000 as default.

Ipconfig – utility that shows the computer's IP address (command line utility).

HyperTerminal – (Windows Only) provides terminal emulation program to communicate via TCP/IP and serial port.

Procomm (Symantec) – (Windows Only) third party program – provides terminal emulation to communicate via TCP/IP and serial port.

Link Manager Advanced Functions

Current I/O Readings

The current readings of the sensors can be obtained by issuing a "D" command. The Link Manager will return the row number in the sensor table, the current readings of the sensors and flags indicating "state of concern". The current reading can be obtained at any time when there is a connection established. Use the "S" command to determine the number of sensors in the sensor table.

Example

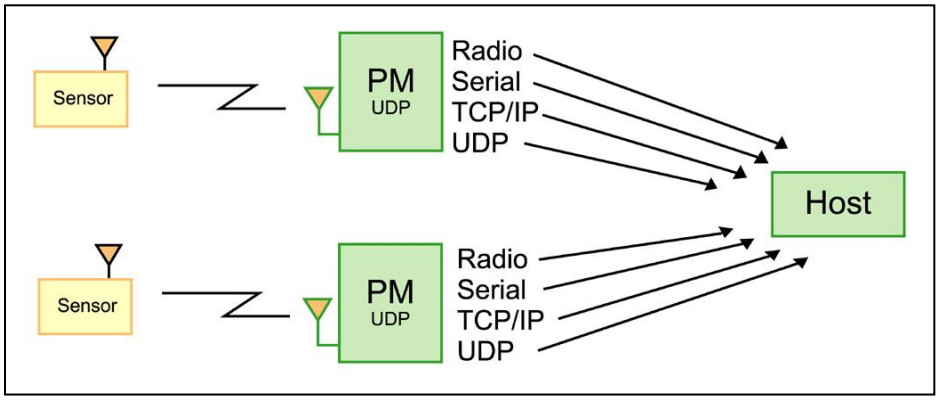
```
Command:   <^B>S<CR>
Response:  <^B>S,2,na,na<CR>
Command:   <^B>D1-2<CR>
Response:  <^B>D1-2,F0600002FFFtrans.|F8|F2,0200021FTF69|F77.0<CR>
Command:   <^B>D1-2<CR>
Response:  <^B>D1-2,F0600008FFFtrans.|F8|F2,0200027FTF69|F77.0<CR>
Remarks: "F" no system alarm; First sensor: "06" – LSX, "00008" – age,
"FF" – no sensor state of concern, no service button, "Ftrans.|F8|F2" –
data with no I/O Point state of concern; Second sensor: "02" –
Humidity/Temperature, "00027" – age, "FT" – no sensor state of concern
but service button was pressed, "F69|F77.0" – data with no states of
concern.
```

Pass-Thru Mode

Overview

Link Manager can be placed in a mode where packet information that it receives can be repeated via Serial, Ethernet, Command Radio, RS-485 or UDP. Link Manager can forward these packets as is or convert the data to engineering units and send it as a comma delimited record. Any packet received either through receiver or any of the media will be repeated through the media that are in Pass-Thru mode. A packet received through a media will not be repeated through that specific media. For instance if a packet was received through the Command Radio, the Link Manager will not repeat the packet through the Command Radio even though it is in Pass-Thru mode.

The Link Manager provides three modes for Pass-Thru: Standard, Extended and Engineering. For Standard mode the Link Manager passes through the sensor packet as is. It also pulls the embedded standard packet out of the extended packet. For Extended mode, the Link Manager passes through extended packets as is and also standard packets. For Engineering mode the Link Manager parses the sensor packet contents and sends the data as a comma delimited record. In Engineering mode, the sensor must be listed in the Sensor table before the Link Manager can send the record.



All Media

To set up the Link Manager for Pass-Thru mode, send the "US" or "UX" command on the media you wish to receive packets. The standard packet is an ASCII Hexadecimal string of 29 characters (or 31 characters if location information from a Point Repeater is included). The extended packet is a 75 binary packet with an embedded standard packet. The type of packet and content depends on the type of transmitter that originally sent the packet. Check the specification for the transmitter for more information.

Use the "UM" command to place other media (other than the one currently connected) in or out of Pass-Thru mode. Use the "UMR" command to determine which media are in Pass-Thru mode.

The Link Manager can also convert the Pass-Thru data to engineering units. Link Manager will only forward packets from sensors that are contained in the Sensor Table. The Sensor Table must be previously set up either by adding sensors using the "CSC" command or Auto Add Mode. The record for Engineering mode is formatted as follows:

*Location,name,type,serial no,warn,service(,warn1,value1,unit1)..(,warn*n,*value*n,*unit*n*)*

Where:

location – Point Repeater Location ID ('a' to 'z'). If not Point Repeater Location ID is available, Link Manager will return 'na'.

name – name of the sensor

Type – type of sensor (enumerated) See the "CS" command for more information

serial no – sensor serial number

warn – is the sensor in a "state of concern" (T or F)

service – packet produced from the Service button on the transmitter being pressed.

*warn*n – is the I/O point in a "state of concern" (T/F)

*value*n – value of the I/O point

*unit*n – engineering units label of the I/O point

Example

```
na,2Humid_Temp,2,D40000000B1FBD28,F,F,F,45,%RH,T,71.6,F
Remarks:
```

warn, *value* and *unit* are repeated for every I/O point of the sensor. For the actual data fields, consult the specification for the transmitter being used.

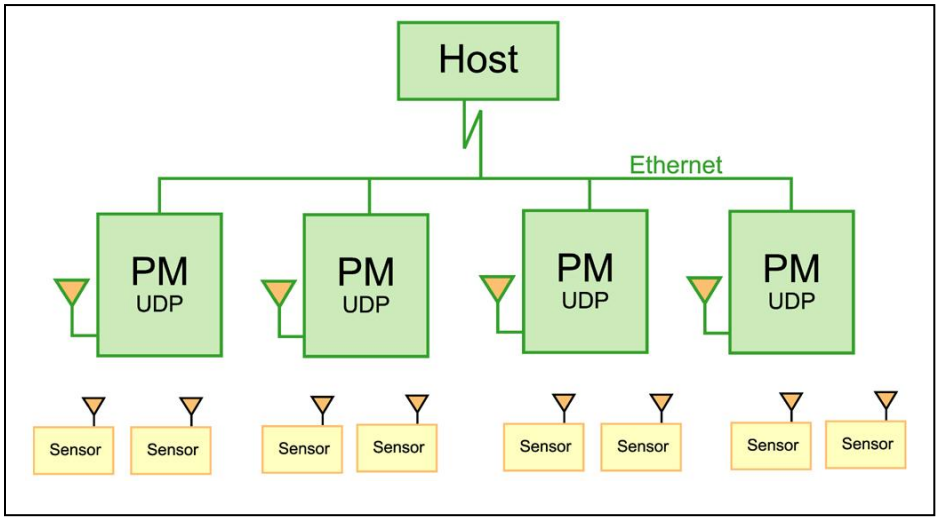
To place the Link Manager in Pass-Thru mode with engineering unit conversion, send the "UE" command on the media you wished to receive packets.

For the media in Pass-Thru mode, the Link Manager does not apply the Inactivity Timeout.

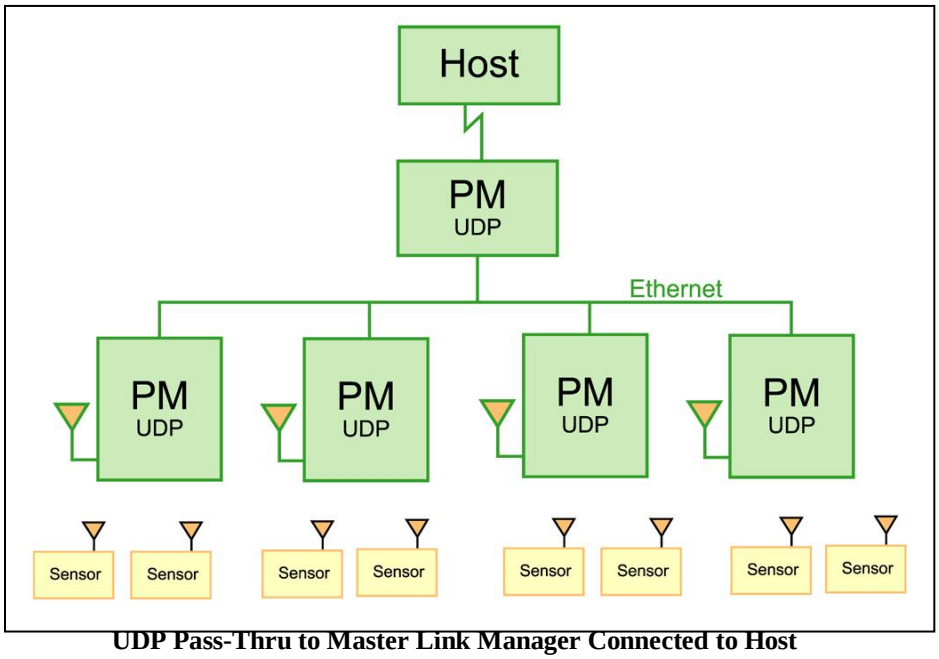
Link Manager can passively wait to be placed in Pass-Thru mode or actively push a connection and then go into Pass-Thru mode. Link Manager has a Pass-Thru Media Callout Table that it uses to place and maintain a connection with the Link Manager in Pass-Thru mode. The "CUS", "CUX", "CUE", "CUR" and "CUC" commands are used to set and maintain the Pass-Thru Media Callout Table. You specify the media to push, the type of Pass-Thru mode and how aggressively to retry the connection if the connection is disrupted.

UDP Pass-Thru

Using UDP Pass-Thru



UDP Pass-Thru to Host



UDP Pass-Thru to Master Link Manager Connected to Host

By using the UDP Pass-Thru feature, Link Managers can be used in a variety of topographies. The Link Manager can be used as essentially as an Ethernet repeater supplementing the RF repeater network therefore the Ethernet networking infrastructure at a facility can be leveraged. The network of Link Managers can be configured to repeat sensor packets to a central Link Manager that may then be configured to connect to the Internet. Instead of a central Link Manager, a PC can be used. Link Manager can pass through sensor packets to one or more destinations.

Link Managers support 3 different modes to balance ease of setup and use of network resources.

UDP Pass-Thru Modes

Broadcast mode: When the Link Manager receives a sensor packet through any of the media, the Link Manager will repeat this packet by broadcasting the packet to the network using UDP. All network devices within this network segment listening on *port* will hear this packet. Some routers may not support UDP broadcast.

Discovery mode: If the Link Manager receives a discovery UDP packet, the Link Manager will take the source IP and add it to the Pass-Thru Destination table. The Link Manager will start repeating sensor packets to the source IP address. If the Link Manager does not receive the discovery UDP packet within 15 minutes, the Link Manager will remove the source IP address form the Pass-Thru Destination table. The Link Manager will then stop repeating packets to that destination. The discovery UDP packet will need to be sent periodically in order for the Link

Manager to continue to repeat sensor packets to the destination. Up to 5 destinations can be supported.

Set destination mode: If the Link Manager receives a Set Destination UDP packet, the Link Manager will add the destination IP address that is embedded as parameter in the packet to the Pass-Thru Destination table. The Link Manager will start repeating sensor packets to the source IP address. If the Link Manager does not receive the discovery UDP packet within 15 minutes, the Link Manager will remove the source IP address from the Pass-Thru Destination table. The Link Manager will then stop repeating packets to that destination. The Set Destination UDP packet will need to be sent periodically in order for the Link Manager to continue to repeat sensor packets to the destination. Up to 5 destinations can be supported.

If the Link Manager has not received a sensor packet within 30 seconds, the Link Manager sends the UDP Pass-Thru packet with sensor packet field set to NULL (0s). The host application can then determine that the Link Manger is still alive but not receiving packets.

Repeater Mode

Link Manager can be placed in a mode where it will resend a received standpacket out the same communication media that it was received (Serial, Ethernet, Radio or RS-485). The Link Manager first passes the packet through a filter to determine if to resend the packet. If the Link Manager receives the same packet within 4 seconds of the original, it will not resend the packet; after 4 seconds it will send the packet. This filter prevents the Link Manager from getting locked up in an infinite loop of sending the same packet again between other repeaters. A typical application for using the Repeater Mode is to extend a 900 Mhz/2.4 Ghz network. The Link Manager can also add a locator identifier (an alpha character) to the sensor packet. This locator identifier can be used to identify where the sensor packets was placed onto the network.

The “CXC”, “CXR”, and “CXS” commands are used to clear, read and set the Repeater Mode. Use the “CYPS” command to set the locator identifier. With the “CXS*m*,SF” command the Link Manager will only repeat standard packet or the embedded standard packet part of an extended packet. With the “CXS*m*,XF” command the Link Manager either standard packets or extended packets.

To setup the Link Manager to “repeat” the 418/433 Mhz packets as well as the 900 Mhz/2.4 Ghz packets, set the Radio media in PassThru mode using the “UMSRS” command and then put the Radio media in Repeater Mode using the “CXSR,ST” command.

Support Functions

Discovery

Using the Discovery feature, Link Managers on a network can be identified by name. The following information is obtained: identifying name, local IP address, port number, number of sensors, HTTP port, UDP port, MAC address, Locator ID and firmware version. The discovery feature is especially useful when the IP address of the Link Manager is set dynamically; there is no convenient way to find the Link Manager otherwise. The Discovery feature is enabled by default. Use the "CYP" command to enable/disable this feature.

When an UDP Discovery Request is received, the Link Manager will respond with a UDP Discovery Response which contains the describing information. An application can send the UDP Discovery Request to a specific Link Manager or typically the application will broadcast the packet across a LAN segment or network where a router will support broadcast packets. The UDP Discovery Response is directed to the sender.

The Discover Utility is a PC Windows application that is provided with the Link Manager. Contact your dealer to obtain a copy of the utility. The Discover Utility will list the found Link Managers. It provides a convenient launching point to start the browser and view the Link Manager web pages or start other communication utilities.

In the Appendix, the sections Packet Formats: UDP Discovery Request and UDP Discovery Response discuss the format of the UDP packet to be able to customize an application to support the Discovery feature.

DHCP

The Link Manager can have its IP address automatically assigned by a DHCP server. The Link Manager can have its IP address, subnet mask, gateway, name server and SMTP server dynamically assigned. By default, the Link Manager is set up for dynamic IP. To enable or disable dynamic addressing, use the "CID" command. If the Link Manager cannot find a DHCP server, the Link Manager will fall back to the static IP address or use the IP address of "0.0.0.0" (depending on the setting of the "CID" command). At power up, if the Link Manager had an IP address previously assigned, the Link Manager will fall back to this address if the DHCP server cannot be found. The Link Manager will periodically try to make contact with the DHCP server until the DHCP server provides the IP address. Use the "IP" command to retrieve the current IP address (whether dynamically assigned or statically assigned).

Note: To determine the dynamically assigned IP address, issue the "IP" command across any of the media or use the Discover utility.

Factory Reset

To reset the Link Manager back to factory settings, do the following procedure:

1. Power down the Link Manager.
2. Press and hold the reset button on the rear communication panel of the Link Manager.

3. While pressing the reset button, power up the Link Manager. The Link Manager will blink the power LED once a second.
4. Release the reset button.

Communicating with the Link Manager

Link Manager Protocol

The system for communicating with the Link Manager is based on a command-response architecture. Every submitted command will receive a response, as long as there is a connection. Successful commands are responded to with an echo of the primary command, and if the command returns data, the data is appended to the primary command echo after a comma (if the comma is part of the command). The primary command is the submitted command string in its entirely or up to but not including the first comma. Sending the next command before receiving a response to the last command is an error.

Each command must be prefixed with an ASCII 02 character (STX) (on most terminal emulation programs, type Ctrl-B) and must end with an ASCII 13 character (CR) (on most terminal emulation programs, type Ctrl-M or Enter). This protocol will work with all the Link Manager communication media: Serial port, Command Radio (option) and TCP/IP.

Example

Command:	<STX>S<CR>
Response:	<STX>S,6,082701111800,na,na<CR>
Remarks:	<STX> is an ASCII 02 (or Ctrl-B on the keyboard)
	<CR> is an ASCII 13 (or Ctrl-M or Enter on the keyboard)

There is an additional layer of communications protocol that is media-specific. This has been added to ensure reliability when using media lacking built-in error detection. This protocol is recommended to be used with the Link Manager's Command Radio, and Serial ports. The command must be prefixed with an ASCII 01 character (SOT) (on most terminal emulation programs, key in Ctrl-A), then following the command with a 4-character ASCII hex CRC16. The command is then terminated with an ASCII 13 character (CR) (on most terminal emulation programs, key in Ctrl-M or Enter). The CRC16 must be calculated using the full command but does not include the ASCII 01 (SOT) or the ASCII 13 (CR). An

ASCII 01 (SOT) prefixed command not followed by a CRC16 will result in an error. Link Manager will respond with a response prefixed with an ASCII (SOT), followed by a 4-character ASCII hexadecimal CRC16 and terminated with the ASCII 13 (CR). The returned CRC16 is calculated using the full response but does not include the ASCII 01 (SOT) or the ASCII 13 (CR).

Note: The letters of the 4-character ASCII hexadecimal CRC16 must be in uppercase.

Example

Command: <SOT>S**3D40**<CR>

Response: <SOT>S,6,082701111800,na,na**3A3E**<CR>

Remarks: <SOT> is an ASCII 01 (or Ctrl-A on the keyboard); <CR> is an ASCII 13 (or Ctrl-M or Enter on the keyboard); "3D40" is the calculated CRC16 value in 4-character ASCII hexadecimal of the command "S"; "3A3E" is the calculated CRC16 value in 4-character ASCII hexadecimal of the response "S,6,082701111800,na,na".

Note: Command Radio requires the <SOT>cmdCRC16<CR> protocol. Command sent using the <STX>cmd<CR> protocol will not be honored. If the "CTB" (<SOT>CTB254F<CR>) command is sent, the Link Manager will process the <STX>cmd<CR> protocol will be honored until the connection closes (usually because of the inactivity time). Issue the "CTF" command to always use the <SOT>cmdCRC16<CR> protocol. The "CTP" command may be used to achieve the same results as the "CTB" and "CTF" commands, but has the ability to configure the protocol for a specific media.

CRC16 Algorithm

The CRC16 Algorithm is a sophisticated method of checking the integrity of transmitted data for transmission errors. The algorithm indicates whether or not the data has any error. It does not indicate which bit or how the error occurred. Link Manager ignores data packets that have errors. The host should resend the command if the response from the Link Manager has errors.

Example C function

```
// on entry:   dataptr – pointer to array of bytes – pointer to start
of the bytes to be CRC16.
//      len – number of bytes in the array to apply CRC16
//      seed – starting seed of the CRC16 (for Link Manager use 0)
// on exit: calculated CRC16 value

const short oddparity[16] = { 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1,
1, 0 };
Word DoCRC16(byte *dataptr, Word len, Word seed)
{
    Word CRC16;
    int i;
    Word data;

    CRC16 = seed;
    for (i=0; i<len; i++)
    {
        data = dataptr[i];
        data = (data ^ (CRC16 & 0xff)) & 0xff;
        CRC16 >>= 8;
        if (oddparity[data & 0xf] ^ oddparity[data >> 4])
            CRC16 ^= 0xC001;

        data <<= 6;
        CRC16 ^= data;
        data <<= 1;
        CRC16 ^= data;
    }
    return CRC16;
}
```

General information

Sensors

All sensors have two unique identifiers:

- Serial Number – Internal, factory assigned, unique, can't be changed.
- Name – a label that the user assigns.

The Link Manager keeps a list of sensors and all configured I/O points in a table. The user can use a command string to associate a sensor's serial number with a label, and configuration information for all of the sensor's I/O points. The row number in the sensor table is used to specify the sensor

I/O Points

In addition to the two identifiers, sensors also contain a varying number and type of I/O points. I/O points collect or contain measurable values such as temperature, identification, count, etc. Each I/O point contains configurable parameters. You can read and change these parameters using the "C" command, which will be explained in more detail below.

Sensor Table: The sensor table can hold up to 100 sensors, having among them a maximum of 200 I/O points.

I/O Point Type

I/O Point Type	Configurable Parameters
Analog	Scale Offset Units Decimal Places
Integer	Scale Offset Units Decimal Places
Data	Presented as ASCII hexadecimal
State	$Name_1$, …, $Name_x$

Analog

Analog I/O points are configured using a **scale** and **offset** to convert the data into engineering units. A **scale** is a multiplier for the data. Before data from a configured I/O point is displayed, it will be multiplied by the scale. The **offset** is then added. In this way the user can control the units in which data from an I/O point is displayed. All temperature I/O points are treated as signed 16 bit values where 1 bit is $1/16^{th}$ of a degree Celsius. All Analog I/O are treated as signed 16 bit values. If the Analog I/O from the sensor is 12 bits, the data value is normalized to 16 bits in the Link Manager (multiply by 16). The value of an Analog I/O point will be displayed as **(raw data * scale) + offset**. The following table contains common scales and offsets:

Common Analog Scales and Offsets

Scale	Offset	Units
0.0625	0	Degrees Celsius (1/16 of a degree)
0.1125	32	Degrees Fahrenheit (1.8 * 0.0625)
0.00305	0	% of full scale
0.125	0	Raw 12 bits
1.0	0	Raw signed 16 bits

Integer

Integer I/O points work similarly as Analog I/O points. A scale and offset is applied before the data is displayed or delivered. However for Integer I/O points the offset is applied before the scale and is an integer value (can be used to zero the reading). The value of an Integer I/O point will be displayed as **(raw data - offset) * scale**. For example, suppose you have a wireless rain gauge and 1 count of the rain gauge equals 0.1 inches. And suppose you want to show in the I/O Status page the amount of rain since the beginning of the year. You set up the scale to be 0.1 and the offset to be the count of the sensor at the beginning of the year and suppose the accumulated count is 233489 at the beginning of the year. So in this example the scale is 0.1 and the offset is 233489.

State

State I/O are discrete I/O points. The number of states for the State I/O depends on the type of Sensor (for instance a Counter has four states and a Discrete has two). The meaning of the states depends on the type of sensor. Each state can be named.

Data

A Data I/O contains 8 bytes of data. How these 8 bytes are used depends on the type of sensor. Link Manager can present this data in one of three ways: as character data, Serial Number as ASCII Hexadecimal or ASCII Hexadecimal.

Command Overview

Command Syntax

The following table describes the shorthand used to define each command.

Syntax Element	Purpose
< >	Enclose a set of options, ones of which is required
|	Separates elements in a set of options
[ ]	Enclose an optional expression
…	Denotes variable length
$_{1}$,…$_{x}$	Marks repeatable expression
n	Only or low row number of a sensor
m	High row number of a sensor
Italics	Strings in italics are place holders for values

Rules governing commands include:

- Command strings may contain no spaces.
- Reserved characters: commas (,), pipes (|), SOT (ASCII 1), STX (ASCII 2), colons (:), carriage returns (ASCII 10), and the bell code (ASCII 7) are reserved, and may only appear as part of the command syntax. Do not use these characters in label names or state names.
- Command strings have a maximum length of 128 characters.
- When specifying a range, the maximum is ten sensors. Specifying a range including more than ten will return an error.

Time representations

Date and Time Stamps

Time and date stamps or times that are set or compared to the real-time clock are always expressed in military time and represented as:

mmddyyhhnnss

Where

mm – month of the year

dd – day of the month

yy – year starting at year 2000

hh – hours

nn - minutes

ss - seconds

Interval or Duration Times

Times that are duration are always expressed in military time and represented as:

hhnnss

ddhhnnss

Where

dd – number of days

hh – number of hours

nn – number of minutes

ss – number of seconds

Future Compatibility

All commands and fields will be maintained for downward compatibility. Future function in the Link Manager will be added by extending commands with commas and adding new commands. These added fields will be optional for the command syntax.

Command Outline

Command List

Command	Description	Options & Parameters
AT[U]|F|R|S[U] >	Auto Add Mode	<True[Unfiltered]|False|Read|Service[Unfiltered]>([,*auto off*])
C<B|E>	Configure Notify	<Begin|End>
CC<S[F|S]|R>	Configure/Read Clock	<Set[Force| Synchronize] |Read>(*mmddyyhhnnss*)
CCN<S|R>	Configure Automatic Time Update	<Set|Read>(host name)
CD<S|R>	Configure/Read Link Manager Identification Label	<Set|Read>(ID Name)
CI<S|R>	Configure/Read Link Manager IP Address	<Set|Read> (IP Address, Subnet [, Gateway][, Name Server][,Port])
CID<S|R|C>	DHCP Enable	<Set|Read|Clear>(dynamic,fallback)
CIP<S|R>	IP Ports	<Set|Read>(httpport, cmdport)
CP<D|C>	Configure Login Passwords	<Data|Configure> (password)
CR<S|R>	Configure Radio	<Set|Read>(hop table, network id)
CS<S|R|C[F]|D[F]>[n]	Configure/Read/Clear /Delete Sensor Setup	<Set|Read|Clear[Force]|Delete[Force]> (sensor index, serialno, label(I/O point setup(s))) Analog: (AScale,Offset,Units,Decimal_Places) Integer: (IScale,Offset,Units,Decimal_Places) Data: (D<*Y*|*N*>) State: (S*Name*$_1$[,…*Name*$_x$]), sensor type
CT<S|R>	Configure Media Ports	<Set|Read>(mediainstanceMedia)
CTB	Set Simple Protocol	
CTC<S|R>	Enable Command Processor	<Set|Read>(InstanceMediaCmdproc)
CTF	Set CRC16 Protocol	
CTP<S|R>	Set CRC16 Protocol Direct	<Set|Read>(InstanceMediaCRC16)

CV<S|R|C>	Configure Enumerated Engineering Unit Conversion	<Set|Read|Clear>
CX<C|R|S>	Configure Media Repeater Mode	<Clear|Set|Read>(Media,RepeaterAck)
CYD<D|R|S>	Configure UDP Pass-Thru Destinations	<Set|Read|Delete>(row)
CYP<R|S>	Configure UDP Pass-Thru Parameters and Discovery	<Set|Read> (mode, discovery, passthrulisten, tries, locator, ptmode, port)
D<n|n-m>	Get Last Data	
EC[A]	Clear Activity Log	[All](*mmddyyhhnnss*)
E<A|F|L|N|P|R[V]	Read a Activity Log Record	<Again|First|Last|Next|Previous|Read using time> [Verbose] (*mmddyyhhnnss*)<*index*>
EU	Activity Log Usage	
IC	Information Counts	
IIU	Information UDP Pass-Thru Destination	
ILR	Information Sensor Log Delivery	
ILT	Information Sensor Log Delivery Table	
IM	Media Information	
IP	Information IP Settings	(isdynamic,successfully bound,IP address, subnet mask, gateway, name server, SMTP server)
IPS	Information DHCP	(DHCP Acquire state, DHCP state, lease time, wait time, link)
IT<S|R>	Time Zone Information	<Set|Read> (time zone *hhmmss*,daylight savings)
ITD<D|R|S>	Daylight Savings Schedule	<Daylightschedule|Read|Set>
IU	Information Pass-Thru	(media state, last action, next action)
IV	Version Information	
IY	Clock Synchronize Information	
L<I|O|OC>	Login/Logout	<In|Out|Out&Disconnect> (password)
PY	Attempt Automatic Time Update	
S	Get Status Data	
U[E|N|Q|R|S]	Pass-Thru Mode	[Engineering Mode|No|Quiet Mode||Read|Standard Mode]
UM[S|R]	Pass-Thru Mode Direct	<Set|Read>(InstanceMediaMode)
V<B|E>	Verbose Mode	<Begin|End>

Commands

A’ - Auto Add Mode command

Command Options

A<T[U]|F|S[U]|R>

Command/Response Syntax

Command:	**AT**[,*auto off*]	turn AutoAdd Mode on
Response:	AT	
Command:	**ATU**[,*auto off*]	turn AutoAdd Mode on
Response:	ATU	
Command	**AF**	turn AutoAdd Mode off
Response:	AF	
Command:	**AS**[,*auto off*]	turn on AutoAdd (add when service pressed)
Response:	AS	
Command:	**ASU**[,*auto off*]	turn on AutoAdd (add when service pressed)
Response:	ASU	
Command:	AR,*remaining time*	Query AutoAdd Mode
Response:	AR,<T|S|F>	

Parameters

Where: ‘T’ – true or yes
‘F’ – false, no or off
‘S’ – service mode
‘R’ - read
auto off – (ddhhnnss) specify the amount of time before auto add mode is turned off. This time is running time (while the Link Manager is powered down this time does not elapse). (optional)
remaining time - (ddhhnnss) the amount of time remaining before the auto add mode is turned off.

Login Level

Login Level: **AR** – Data

AT,**AF**,**AS,** - Configure

Description

If AutoAdd mode is enabled and the Link Manager receives a packet from a sensor not already in the sensor table, it will add the new sensor to the table automatically. When the Link Manager adds a sensor to the sensor table through AutoAdd mode it assumes certain defaults for the parameters based on the type of sensor. You can then modify these parameters using the "CS" command. The Link Manager will add a new sensor to its table either whenever it receives a new sensor's packet [AutoAdd] or when it receives a new sensor's packet sent in service mode [AutoAdd (service)]. AutoAdd (service) gives you a little more control over building your sensor table. You may need to push the service button to transmit the data and have the sensor added. Using AutoAdd (service) you can add sensors to the table in a particular order and segregate sensors between Link Managers. After you have added the sensors you want the Link Manager to use, use the "AN" command to turn off AutoAdd mode to prevent your setup from being changed.

The *auto off* time is used to specify a window of time where the AutoAdd mode is enabled. After this time expires, the Link Manager will disable AutoAdd mode.

NOTE: For the "AT" and "AS" commands, in order for the Link Manager to automatically add the sensor, the Link Manager must receive two packets from the sensor no less than 5 seconds apart for 418 sensors. If "ATU" or "ASU" is used only one packet is needed for the Link Manager to automatically add the sensor.

When a sensor is automatically added to the sensor table because of the AutoAdd mode, Link Manager will assume certain defaults for the setup information for the sensor. For the sensor name, Link Manager prefixes the default name with the row number (sensor index) in the sensor table. Below is a table of the different sensor types with the default setup information. The setup information is expressed as the response to the CSR command.

AutoAdd Mode Default Entries

Sensor Model	Sensor Description	Default Setup (response from the CSR command)
Point Temp	Temperature	1,0700000005B3F528,13Temperature(A0.1125,32.0000,degF,1)
Point Humid	Humidity/ Temperature	2,7D000000059A9328,2Humid_Temp(A1.000,0.000,%RH,0)(A0.1125,32.0000,degF,1)
Point Light	Light	3,230000000348A8328,3Light(A0.02440,0.0000,%,2)
Point PIR	iButton	4.278C000000000000,4iButton(DN)
Point Analog	Analog	5,2A0000000B66C628,1Analog(A0.02440,0.00000,%,2)
Point IR Counter and LSX	Dual Counter with Dual Discretes	6,000000000013D6F1,6Counter(SBlocked,Open,Closed,Error)(I1,0,count,0)(I1,0,open s,0)
AngData	Analog with Data	8,DC00000001F15D27,5Analog_Data(A0.02440,0.00000,%,2)(DY)
Point Analog w/ Temp	Analog / Temperature	9,A500000001E45227,6Analog_Temp(A0.02440,0.00000,%,2)(A0.1125,32.0000,degF,1)
Discrete	Discrete Sensor	11,0110211220200100,16Discrete(Soff,on)
Point Thermistor	Thermistor Sensor	12,0101211220200100,1Thermistor(A0.1125,32.0000,F,1,128)
16-bit Analog	Signed 16 bit Analog sensor	13,010A211220200100,10Analog16(A0.00305,0.00000,%,2,0)
Point Counter Temperature	Counter Temperature	14,00000000000B1534,2CntTemp(STrans.,Open,Closed,Error)(I1,0,count,0)(A0.1

	Sensor	125,32.0000,F,1,0)
Point Fast Counter Temperature	Fast Counter Temperature Sensor	15,00000000001F0FC7,3FastCntTemp(I1,0,count,0)(A0.1125,32.0000,F,1,0)(I1,0,sec,0)(A0.1000,0.0000,Rate,1,0,0)
Alarm Temp	Alarm Temperature	16,00000000000B77F3,1AlarmTemp(SOK,Alarm,0)(SOK,Alarm,0)(A0.1125,32.0000,F,1,0,0)(DT,0)
Space Temp	Space Temperature Override	17,00000000001F2109,SpaceTemp(A0.1125,32.0000,F,1,0,0)(SNormal,Occupy,Unocc.,0)(DT,0)
Directional Counter	Directional Counter	18,0000000080257310,1Direct_Cnt(SBlocked,Okay,PwrAlrm,BattAlrm,0)(I1,0,count,0,0)(I1,0,count,0,0)
ID Reader	ID Reader	20,0000000028806910,1ID_Reader(SBatt OK,LowBatt,0)(STamp OK,Tamper,0)(SClosed,DoorOpen,HeldOpen,HeldOpen,0)(DT,0)
Proximity2	Counter with accumulated time, time in state and Range Status	23,000000009810654C,1Proximity2(Sstate1,Object,NoObject,state2,0)(I1,0,count,0,0)(I1,0,sec,0,0)(I1,0,sec,0,0)(S1,2,3,4,0)
Dual Analog	Dual Analog	27,0000000038202551,1Analog(A0.00305,0.00000,%,2,0,0)
Dual Analog	Dual Analog	28,0000000000602651,1Analog_2(A0.00305,0.00000,%,2,0,0)(A0.00305,0.00000,%,2,0,0)
CounterAnalog	Counter/Analog	29,0000000000504660,1CntAnalog(STrans.,Open,Closed,Error,0)(I1,0,count,0,0)(A0.00305,0.00000,%,2,0,0)
Point Humid2	Humidity/ Temperature	30,0000000004703560,1Humid_Temp(A0.0244,0.0000,%RH,1,0,0)(A0.0549,-40.0000,F,1,0,0)
Dwell	Dwell	31,0000000000803180,1Dwell(SBlocked,NotPres,Pres,na,0)(I1.000,0,count,0,0)(A1.000,0.000,sec,0,0,0)

The sensor is given a default name, which is the name of the physical type of sensor. The Link Manager prefixes the default name with the row number in the sensor table. The following is a table that shows the default names:

Sensor Model	Sensor Description	Default Sensor Name
Point Temperature		"Temperature"
Point Humidity	Humidity / Temperature	"Humid_Temp"
Point Light	Light	"Light"
Point PIR	iButton	"iButton"
Point Analog	Analog	"Analog"
Point IR Counter and LSX	Dual Counter sensor	"Counter"
AngData	Analog with Data	"Analog_Data"
Point Analog Temperature	Analog / Temperature	"Analog_Temp"

Discrete	Discrete Sensor	“Discrete”
Point Thermistor	Thermistor Sensor	“Thermistor”
16-bit Analog	Signed 16 bit Analog sensor	“Analog16”
Point Counter Temperature	Counter Temperature Sensor	“CntTemp”
Point Fast Counter Temperature	Fast Counter Temperature Sensor	“FastCntTemp”
Alarm Temp	Alarm Temperature	“Alarm Temp”
Space Temp	Space Temperature Override	“SpaceTemp”
Directional Counter	Directional Counter	“Direct_Cnt”
ID Reader	ID Reader	“ID_Reader”
Point Proximity2	Proximity Sensor with Time in View and Range Status	“Proximity2”
Dual Analog	Dual Analog	“Analog”
Dual Analog	Dual Analog	“Analog_2”
CounterAnalog	Counter / Analog	“CntAnalog”
Point Humid2	Humidity / Temperature	“Humid_Temp”
Point Dwell	Dwell	“Dwell”

Examples

```
Command:   AT
Response:  AT
Remarks: turn on Auto AddMode.
Command:   AS
Response:  AS
Remarks: turn on Auto AddMode but only add those sensors that have
service button pressed
Command:   AF
Response:  AF
Remarks: turn off Auto AddMode
Command:   AR
Response:  AS
Remarks: The Link Manager is current in AddMode with service
```

‘C’ – Notify Setup

Command Options

C<B[E>
B – begin setup process
E – end setup process

Command/Response Syntax

Command:	**CB**
Response:	CB
Command:	**CE**
Response:	CE

Login Level

Login Level: **CB** – Configure
CE – Configure

Description

Use the “CB” command to suppress logging of individual setup change events to the Activity Log. Each setup command will cause an event to be logged into the Activity Log. If the “CB” command is issued before a series of setup commands is sent, then only one event will be logged. Frame a series of setup commands starting the “CB” command and ending with the “CE” command.

Note: If the “CE” command is never sent, the Link Manager will reset the “CB” mode when either the connection is terminated or the inactivity time expires.

Examples

```
Command:   CB
Response:  CB
        .
        . (series of setup commands)
        .
Command:   CE
Response:  CE
```

‘CC’ – Configure/Read Clock

Command Options

CC<S[F|S]|R>

SF – clear the Activity Log and set the Link Manager clock
SS – synchronize the Link Manager clock
S – set the Link Manager clock
R – read the current clock setting

Command/Response Syntax

Command:	**CCS***mmddyyhhnnss*
Response:	CCS*mmddyyhhnnss*
Command:	**CCSF***mmddyyhhnnss*
Response:	CCSF*mmddyyhhnnss*
Command:	**CCSS***mmddyyhhnnss*
Response:	CCSS*mmddyyhhnnss*
Command:	**CCR**
Response:	CCR,*mmddyyhhnnss,syncflag*

Parameters

Where:

mmddyyhhnnss – date and time to set the clock or the date and time of the read clock

syncflag – Has the Link Manager been syncronized with an SNTP service? “T” – yes, the clock has been updated; “F”- either SNTP is not being used, there was a failure to get time from the SNTP service, or cannot set clock because too much difference in time.

Login Level

Login Level:
CCS – Configure
CCSF – Configure
CCSS – Configure
CCR – Data

Description

The "CC" command configures or reads the Link Manager time of day clock. The Link Manager uses the clock for the Activity Log.

The Link Manager will return an error 16 for the "CCS" command if there are records with timestamps greater than passed timestamp in the Activity Log.

The Link Manager's clock is set at the factory to UTC time and the timezone is set to Eastern Standard Time.

The Link Manager's clock will drift over time. The real-time clock should be set periodically.

The "CCSS" allows you to set the clock without having to clear the Activity Log. If this command is used to set the clock forward in time, the Link Manager will go ahead and set the clock. If this command is used to set the clock back in time, the Link Manager will set the clock if no Events records are recorded in the Logs between the time before the attempted clock change and the desired set time. The Link Manger will return an error code 36 for setting the clock back greater than 15 minutes, otherwise the Link Manager will set the clock in stages as to not allow time to be set less than the time of the last Event record. Use the "IY" to examine the progress of the Link Manager setting the clock in stages. If you issue the "CCS" command while the Link Manager is setting the clock in stages, the Link Manager will return an error code 37 indicating that the Link Manager is attempting to set the clock and cannot honor the command.

The Link Manager clock can be updated twice a day from an SNTP service. See the "CCN" command for more information. The *syncflag* returned in the response to the "CCR" command, indicates if the clock has been updated by an SNTP service.

Note: The Link Manager's clock and internal time registers will rollover in the year 2048.

Note: The Link Manager will return an error if the clock is set within 2 hours of a daylight savings boundary.

Examples

```
Command:   CCS082901224100
Response:  CCS082901224100
Remarks: set the clock to 08/29/01 22:41:00
```

```
Command:   CCR
Response:  CCR,082901224212,F
Remarks: the Link Manager's clock is set to 08/29/01 22:42:12
```

‘CCN’ – Configure Automatic Time Update

Command Options

CCN<S|R>
S – set Automatic Time Update
R – read Automatic Time Update settings

Command/Response Syntax

Command: **CCNS***host name*
Response: CCNS*host name*
Command: **CCNR**
Response: CCNR,*host name*

Parameters

Where: *host name* – is the host name or domain name of the time server (NTP Server). *host name* can be an IP address.

Login Level

Login Level: **CCNS** – Configure
CCNR – Data

Description

The “CCN” command configures the SNTP time client. *host name* can be a domain name or IP address. If domain name is specified, then the Name Server (DNS Server) field must be specified with the “CIS” command. Set *host name* to blank to turn off the time client. Before setting the host name field, make sure the time zone offset and daylight savings mode is set properly (“IT” command). Also make sure the clock is set as well. To use this function you must initially set the clock using UTC Time.

When the command is issued with the *host name*, the Link Manager will initiate a try of the timeserver immediately. If you want the Link Manager to immediately try then send the “PY” command. Use the “IY” command to read the current state of the time client.

The Link Manager indicates the status of the last query attempt in three ways: the *syncflag* in the “CCR” response, the “IY” command, and framing the time of day shown in the header of the web page. If the last query attempt failed the Link Manager will frame the time of day shown in the header of the web page with “*” characters. Just because the query failed does not necessarily mean the clock is wrong but that the clock has not been synchronized.

Examples

```
Command:   CCNR
Response:  CCNR,ntp.dayww.net
Remarks: the time client is active and uses “ntp.dayww.net” as the time
server.
```

```
Command:   CCNS
Response:  CCNS
Remarks: turn off the time client.
```

‘CD’ – Configure/Read Link Manager Identification Label

Command Options

CD<S|R>
S – set the Link Manager Identification Label
R – read the Link Manager Identification Label

Command/Response Syntax

Command: **CDS***label*
Response: CDS*label*
Command: **CDR**
Response: CDR,*MAC*,*label*

Parameters

Where:

label –label name used to identify the Link Manager. (maximum 19 characters)

MAC – Link Manager’s Ethernet MAC address

Login Level

Login Level: **CDS** – Configure
CDR – None

Description

Use the Link Manager Identification Label to uniquely identify the Link Manager. The Identification Label is displayed in the Web pages. The MAC address is permanently part of the Link Manager, cannot be changed and is unique for all Ethernet interfaces.

Examples

```
Command:   CDSMy Link Manager
Response:  CDSMy Link Manager
```

```
Command:   CDR
Response:  CDR,00:90:C2:C0:15:D9,My Link Manager
Remarks: “00:90:C2:C0:15:D9” is the Link Manager’s MAC.  “My Link
Manager” is the identification label for the Link Manager.
```

‘CI’- Configure/Read Link Manager Static IP Address

Command Options

CI<S|R>
S – set the Link Manager static IP address
R – read the Link Manager static IP address

Command/Response Syntax

Command: **CIS***ip address*, *subnet mask*[, *gateway address*][,*name server*][,*port*]
Response: CIS
Command: **CIR**
Response: CIR, *ip address, subnet mask, gateway address, name server, port*

Parameters

Where:

ip address – IP address formatted as xxx.xxx.xxx.xxx

subnet mask – subnet mask formatted as yyy.yyy.yyy.yyy

gateway address – gateway address formatted as zzz.zzz.zzz.zzz. (required for email support)

name server – ip address of the name server formatted as vvv.vvv.vvv.vvv. (required for email support)

port – IP port number (optional) (default is 1000)

Login Level

Login Level: **CIS** – Configure
CIR – Data

Description

In order to use the Link Manager Ethernet interface, the Link Manager must be assigned an IP address and a subnet mask. The gateway address is optional if all communication is on a LAN (if not using email). Consult your network administrator for more information.

Note: Telnet uses port 23 by default.

Note: Use the “CID” command to dynamically set the IP address using DHCP. The “IP” command provides the current IP address whether it is dynamically or statically assigned.

The default IP address is 192.168.1.55
The default subnet mask is 255.255.255.0
The default gateway address is “” (null)
The default name server address is “” (null)
The default port is 1000

Note: The set parameters will not take affect until the current connection for the effected media is closed. If the media is not connected then the parameters will take affect right away. The connection can be closed by the host closing the connection, inactivity time has expired, power down/up or the “LOC” command being received.

Note: The Link Manager defaults to dynamic IP mode.

Examples

```
Command:   CIS192.168.1.46,255.255.255.0
Response:  CIS192.168.1.46
Remarks: set IP address to “192.168.1.46” and the subnet mask
to”255.255.255.0”.  No gateway address and name server were set.
```

```
Command:   CIR
Response:  CIR,192.168.1.46,255.255.255.0,,,1000
Remarks: the Link Manager’s IP address is “192.168.1.46” and the subnet
mask is ”255.255.255.0”.  No gateway address and name server were set.
The default port of 1000 is being used
```

```
Command:
    CIS192.168.1.55,255.255.255.0,192.168.1.200,192.168.1.199,1300
Response:  CIS
Remarks: the Link Manager’s IP address is “192.168.1.55” and the subnet
mask is ”255.255.255.0”.  Gateways is “192.168.1.200” and the name
server is “192.168.1.199”.  Gateway and the name server are necessary
for email.  The port number is 1300.
```

‘CID’- Configure DHCP

Command Options

CID<S|R|C>
S – set the DHCP settings
R – read the DHCP settings
C – clear the saved fallback dynamic IP address

Command/Response Syntax

Command: **CIDS***dynamic,fallbackstatic*
Response: CIS
Command: **CIDR**
Response: CIDR,*dynamic,fallbackstatic*

Parameters

Where:

dynamic – (T/F) use DHCP to dynamically set the IP address, subnet mask, gateway, name server and SMTP server.

fallbackstatic – (T/F) If the Link Manager cannot find the DHCP Server and the Link Manager has not previously had an IP address assigned, it will fall back to the static IP address settings. If this parameter is “F”, the Link Manager will fall back to the IP address “0.0.0.0”.

Login Level

Login Level: **CIDS** – Configure
CIDR – Data
CIDC – Configure

Description

Use the “CID” command, to use the static IP address settings or have the IP address settings dynamically assigned. Use the “IP” command to read the current IP settings. The Link Manager will disconnect the current TCP/IP session if the IP address mode is changed.

Use the CIDC command to clear the saved fallback dynamically assigned IP address so that the static address will be used if dynamic IP fails.

Note: The Link Manager defaults to dynamic IP address mode and fall back to the static address (set with the “CIS” command and defaults to ‘192.168.1.55’) if dynamic IP fails if no previous dynamic IP address was assigned.

Note: The set parameters will not take affect until the current connection for the effected media is closed. If the media is not connected then the parameters will take affect right away. The connection can be closed by the host closing the connection, inactivity time has expired, power down/up or the “LOC” command being received.

Examples

```
Command:    CIDST,T
Response:   CIDST
Remarks: Set to dynamically assign IP address using DHCP.  If the IP
address cannot be assigned then fallback to either the previous dynamic
address or the static address
```

‘CIP’- Configure TCP/IP Ports

Command Options

CIP<S|R>
S – set the TCP/IP ports
R – read the TCP/IP ports settings

Command/Response Syntax

Command: **CIPS***httpport, cmdport*
Response: CIPS*httpport*
Command: **CIPR**
Response: CIPR,*httpport, cmdport*

Parameters

Where:

httpport – the http port (web page port) (default: 80). If set to 0 then the web page is not accessible.

Cmdport – the command TCP/IP port (default: 1000). If set to 0 then the TCP/IP command port will not respond.

Login Level

Login Level: **CIPS** – Configure
CIPR – Data

Description

Great care must be taken when using this command. You can unintentionally change these setting in such a way that you may not be able to access the Link Manager via TCP/IP.

Note: The set parameters will not take affect until the current connection for the effected media is closed. If the media is not connected then the parameters will take affect right away. The connection can be closed by the host closing the connection, inactivity time has expired, power down/up or the “LOC” command being received.

Examples

```
Command:   CIPS0,0
Response:  CIPS0
Remarks: Turn off listening of HTTP and TCP/IP Command ports.
```

‘CPD’ & ‘CPC’ – Configure Login Passwords

Command/Response Syntax

Command: **CPD***data password*
Response: CPD
Command: **CPC***configure password*
Response: CPC

Parameters

Where:

data password – login data password (7 characters maximum). Enter a blank password to clear.

config password – login config password (7 characters maximum). Enter a blank password to clear.

Login Level

Login Level: **CPD** – Configure
CPC – Configure

Description

Link Manager can control access to the medias through passwords. There are two levels of password access. For “Data” login, Link Manager allows the access of the data information of the system such as the current sensor readings, Web pages, Activity Log and setup information. For “Configure” login, Link Manager allows the same access as the “Data” login as well as access to change any of the setup information. If the Configure login password is blank, the Link Manager will assume the Data Login password for the Configure Login. Use the Login command “LI” to control and gain access.

To clear the passwords, you must set the Data password to blank and then the Configure password to blank.

Note: Login password is case sensitive.

Note: The Web page login through a browser requires the Data or Configure password (if set).

Note: If you forget your password, you will not be able to collect the data in the Link Manager. You will have to reset the Link Manager to factory defaults and set up new passwords.

Examples

```
Command:   CPDadata
Response:  CPDadata
Remark:  The “Data” login password was configured to “adata”.
```

```
Command:   CPCaconfig
Response:  CPCaconfig
Remark: The “Configure” login password was configured to “aconfig”.
```

‘CR’ - Configure Radio

Command Options

CR[S|R]
R – read radio parameters
S – set radio parameters

Command/Response Syntax

Command: **CRS** *network id, hoptable*
Response: **CRS** *network id*
Command: **CRR**
Response: CRR,*network id, hoptable*

Parameters

Where:

network id – network identification

hoptable – frequency hop table setting

Login Level

Login Level: **CRS** – Configure
CRR – Data

Description

The Radio media is an option and typically a spread-spectrum 900Mhz radio that can receive sensor packets and exercise the Link Manager’s command/response protocol. The default is 505 for the *network id* and 3 for the *hop table*.

Note: The set parameters will not take affect until the current connection for the effected media is closed. If the media is not connected then the parameters will take affect right away. The connection can be closed by the host closing the connection, inactivity time has expired, power down/up or the “LOC” command being received.

Examples

```
Command:   CRS399,1
Response:  CRS399
Remarks: Set the radio option to hop table 399 and network id 1
```

```
Command:   CRR
Response:  CRR,505,5
Remarks: The radio is set to hop table 505 and network id 5
```

‘CS’ - Configure/Read Sensor Setup

Command Options

CS<S|R|C[F]|D[F]>[*n*]
S – set the sensor setup information
R – read the sensor setup information
C – clear the sensor setup table
D – delete sensor from the sensor table
F – force the sensor setup table to cleared

Command/Response Syntax

Command: **CSS**n,serial no, label(sensor point setup)$_1$…(sensor point setup)$_x$, sensor type
Response: CSS*n*
Command: **CSR***n*

Response: **CSR**n,sensor type,serial no,label(sensor point setup)$_1$…(sensor point setup)$_x$
Command: **CSC**
Response: CSC
Command: **CSCF**
Response: CSCF
Command: **CSD***n*
Response: CSD*n*
Command: **CSDF***n*
Response: CSDF*n*

Parameters

Where:

F – force Link Manager to clear the Activity Log before either clearing the sensor table or deleting the sensor.

n – sensor index. Each sensor is placed in a row in the sensor table.

serial no – unique serial number of the sensor (16 characters)

label – identification label for the sensor. This label is displayed with the sensor information in the I/O Status page. (16 characters maximum)

sensor I/O point setup – described below

x – number of sensor points (5 maximum). This number depends on the type of sensor. See the table below called “Sensor I/O Definitions”.

sensor type – type of sensor enumerated. See table below for possible values.

Sensor Types

Sensor type	Description
1	Temperature
2	Humidity/Temperature
3	Light
4	IButton (Point PIR)
5	Analog
6	Counter
8	Analog with Data
9	Analog with Temperature (compensated)
11	Discrete

12	Thermistor
13	16-bit signed Analog
14	Counter Temperature
15	Fast Counter Temperature
16	Alarm Temperature
17	Space Temperature Override
18	Directional Counter
20	ID Reader
23	Point Proximity2
27	Dual Analog (1 Channel)
28	Dual Analog (2 Channel)
29	Counter Analog
30	Humidity/Temperature2
31	Dwell

More Parameters

Sensor I/O Point Setup

Link Manager supports 4 types of sensor I/O points:

Analog

A*Scale,Offset,Units,Decimal_Places,Correction ID[, Tag]* are Analog I/O point options

A is the flag for an Analog I/O point type

Scale - the raw data is multiplied by this value

Offset - this value is applied to the raw data after the scale has been applied

Units - this is a friendly description of the units used for presentation (6 characters maximum)

Decimal_Places - this is the number of decimal digits used for presentation

Correction ID – determines the type of correction that is applied to the analog value. 0 is Linear (or no correction). Values greater or equal to 128 are predefined in the Link Manager. Values less then 128 are user defined. See the "CO" command for more information.

Tag – user defined tag (0 to 255).

Integer

I*Scale,Offset,Units,Decimal_Places[, Tag]* are Integer I/O point options

I is the flag for an Integer I/O point type

Scale - the raw data is multiplied by this value

Offset - this value is applied to the raw data before the scale has been applied

Units - this is a friendly description of the units used for presentation

Decimal_Places - this is the number of decimal digits used for presentation

Tag – user defined tag (0 to 255).

Data

D<*T*|*F*>*[, Tag]* are Data I/O point options

D is the flag for a Data I/O point type

T - display character data

F - display as Serial Number in ASCII Hexadecimal

A – display as ASCII Hexadecimal

Tag – user defined tag (0 to 255).

State

S*Name*$_1$[,…*Name*$_x$][*, Tag]* are State I/O point options

S is the flag for a State I/O point type

Name – name used to describe each state used in presentation (8 characters maximum)

Tag – user defined tag (0 to 255).

Login Level Login Level: **CSS** – Configure
CSR – Data
CSC – Configure

Description

Each sensor fills an entry or row in the Link Manager sensor table. The sensor index then is used to both originally define where the sensor is located in the sensor table and then used to retrieve sensor information (both data and setup). Once a sensor has been defined and placed in the sensor table, the sensor I/O point type cannot be changed. The Link Manager will return an error 6 when the sensor type or the I/O type is attempted to be changed. You will have to delete the sensor or clear the sensor table and send the setup information again for all sensors. You can change the other attributes of the sensor.

The value of an Integer I/O point will be displayed as **(sensor data - offset) * scale**.

The value of an Analog I/O point will be displayed as **(sensor data * scale) + offset**. For some specific types of Analog I/O points, the scale and offset are provided with the documentation for sensor. For example, the scale and offset for the Humidity I/O point of the Point Humidity is 1 and 0. For more general-purpose Analog I/O points, you will have to calculate the scale and offset. You need to know the resolution of sensor and span of what you measuring. If you know or can calculate two points of measurement, you can use the following formula to calculate the scale and offset:

Scale = (Engr Value2 – Engr Value1)/ (Sensor Reading2 – Sensor Reading1)

Offset = Engr Value2 – Sensor Reading2 * scale

Where:

Engr Value – engineering value expressed in engineering units (such as PSI, volts and so on).

Sensor Reading – reading directly from the sensor that is associated with the corresponding engineering value.

All temperature I/O points are treated as signed 16 bit values where 1 bit is $1/16^{th}$ of a Degree Celsius. For units of Celsius Degrees, use a scale of 0.0625 and an offset of 0. For units of Fahrenheit Degrees, use a scale of 0.1125 (1.8 * 0.0625) and an offset of 32.

All Analog I/O points are treated as signed 16 bit values. If the sensor is a 12-bit Analog Sensor it is normalized to 16 bits (multiplied by 16). The exception is Humidity where the Humidity value is given in 8 bits and then passed on as 8 bits (0 to 255).

Note: If Link Manager is in Auto Add mode (either “AT” or “AS”), the Link Manager may place sensor setup information automatically into the sensor table. When the Link Manager does this, it will append the sensor setup to the end of the sensor table and it will assume default values for the setup. For more information see the command “A” – Auto Add Mode.

Sensor I/O Definitions

Sensor Type	Type Description	No. I/O Pts	I/O Point Types	Example I/O Point Setup String
1	Temperature (Point Temp)	1	Analog	(A0.1125,32.0000,degF,1,0)
2	Humidity/ Temperature (Point Humid)	2	Analog, Analog	(A1,0,%RH,0,0) (A0.1125,32.0,degF,1,0)
3	Light (Point Light)	1	Analog	(A0.02440,0.00000,%,2,0)
4	IButton (Point PIR)	1	Data	(DF)
5	Analog (Point Analog)	1	Analog	(A0.02440,0.00000,%,2,0)
6	IR Counter, and LSX	3	State, Integer, Integer	(SBlocked,Open,Closed,Error) (I1,0,open,0) (I1,0,close,0)
8	Analog with Data	2	Analog, Data	(A0.02440,0.00000,%,2) (DT)
9	Analog / Temperature	2	Analog, Analog	(A0.244,0.0,PSI,1,0) (A0.1125,32.0000,degF,1,0)
11	Discrete	1	State	(Soff,on)
12	Thermistor	1	Analog	(A0.1125,32.0000,degF,1,0)
13	16-bit signed Analog	1	Analog	(A0.02440,0.00000,%,2,0)
14	Counter Temperature	3	State, Integer, Analog	(STrans.,Open,Closed,Error) (I1,0,count,0) (A0.1125,32.0000,F,1,0,0)
15	Fast Counter Temperature	4	Integer, Analog, Integer Analog	(I1,0,count,0) (A0.1125,32.0000,F,1,0,0) (I1,0,sec,0) (A0.1000,0.0000,Rate,1,0,0)
16	Alarm Temperature	4	State, State, Analog, Data	SOK,Alarm,0) (SOK,Alarm,0) (A0.1125,32.0000,F,1,0,0,0) (DT,0)
17	Space Temperature Override	3	Analog, State, Data	(A0.1125,32.0000,F,1,0,0,0) (SNormal,Occupy,Unocc.,0) (DT,0)
18	Directional Counter	3	State, Integer, Integer	(SBlocked,Okay,PwrAlrm,BattAlrm,0) (I1,0,count,0,0) (I1,0,count,0,0)
20	ID Reader	4	State, State, State, Data	(SBatt OK,LowBatt,0) (STamp OK,Tamper,0) (SClosed,DoorOpen,HeldOpen,HeldOpen,0) (DT,0)
23	Proximity2	5	State, Integer, Integer, Integer, State	(Sstate1,Object,NoObject,state2,0) (I1,0,count,0,0) (I1,0,sec,0,0) (I1,0,sec,0,0) (S1,2,3,4,0)
27	Dual Analog	1	Analog	(A0.00305,0.00000,%,2,0,0)
28	Dual Analog	2	Analog	(A0.00305,0.00000,%,2,0,0)

			Analog	(A0.00305,0.00000,%,2,0,0)
29	CounterAnalog	3	State Integer Analog	(STrans.,Open,Closed,Error,0) (I1,0,count,0,0) (A0.00305,0.00000,%,2,0,0)
30	Humidity/ Temperature (Point Humid2)	2	Analog Analog	(A0.0244,0.0000,%RH,1,0,0) (A0.0549,-40.0000,F,1,0,0)
31	Dwell	3	State Integer Analog	(SBlocked,NotPres,Pres,na,0) (I1.000,0,count,0,0) (A1.000,0.000,sec,0,0,0)

The "CSC" command clears all the entries in the sensor table. This includes both event information for all sensors and I/O points and sensor setup. If the Activity Log has entries, Link Manager will give an error "16" when processing the "CSC" command. The "CSCF" command clears the Activity Log before clearing the entries in the sensor table.

The "CSD" command removes a single sensor from the sensor table. If the Activity Log has entries, Link Manager will give an error "16" when processing the "CSD" command. The "CSDF" command clears the Activity Log before clearing the entries in the sensor table.

If a sensor has been set up with the wrong type of I/O Point Type, the Link Manager will display "BAD CFG" for the I/O data in the I/O Status page and the response to the "D" command. If this condition occurs, you will have to delete the setup entry in the sensor table.

Sensors of type unknown can be added through Auto Add Mode but cannot be set using the "CSS" command.

Examples

```
Command:
    CSS1,7D000000059A9328,1Humid(A1,0,%RH,0)(A1.8,32.0,degF,1),2
Response:  CSS1
Remarks: configure row 1 in the sensor table as a Humidity/Temperature
sensor.  "7D000000059A9328" is the serial number.  "1Humid" is the
sensor label.  "(A1,0,%RH,0)" is the first I/O point which is Analog
type and is the humidity portion of the sensor.  "(A1.8,32.0,degF,1)"
is the second I/O point which is an Analog type and is the temperature
portion of the sensor.
```

```
Command:   CSR1
Response:
    CSR1,2,7D000000059A9328,1Humid(A1,0,%RH,0,0)(A1.8,32.0,degF,1,0)
```

```
Command:   CSS1,7D000000059A9328,HmdA23-2(A1,0,HUM,0)
(A1.8,32.0,FAR,1),2
Response:       CSS1
```

```
Command:   CSR2
Response:  CSR2,8,87000000002D0A27,1AngD(A0.02,0.00,%,2,0)(DY,0)
```

```
Command:   CSD2
Response:  CSD2
Remark: Clear the second sensor in the sensor table
```

‘CT’ – Configure Media Ports

Command Options

CT<S|R>

S – set the Media port parameters

R – read Media parameters

Command/Response Syntax

Serial Commands

Command: **CTS***meidainstance***S***baud, parity, data*
Response: CTS*meidainstance***S***baud*
Command: **CTR***meidainstance***S**
Response: CTR*meidainstance***S** *,baud, parity, data*

Radio Commands

Command: **CTS***meidainstance***R***radiocommands*
Response: CTS*meidainstance***R***radiocommands*
Command: **CTR***meidainstance***R**
Response: CTR*meidainstance***R** *, radiocommands*

Parameters

Where: (Serial)

mediainstance - 1 – serial port; 2 – receiver port

baud – baud rate of the serial port (1200,2400,4800,9600,19200,38400,57600 and 115200) (default is 2400 baud.)

parity - ‘N’ – no parity; ‘O’ – odd parity; ‘E’ – even parity; ‘2’ – two stop bits and no parity. (default is no parity)

data – data bits: 7 or 8 (default is 8 data bits)

(Radio)

mediainstance - 1 – command radio port

radiocommands – radio command separated by the ‘;’ delimiter. The radio commands are commands that are normally sent with the AT command. (18 characters maximum).

Login Level

Login Level: **CTS** – Configure
CTR – Data

Description

The "CT" command sets and reads particular media parameters. Use the "CT" command to set the serial and radio media parameters.

Note: The set parameters will not take affect until the current connection for the effected media is closed. If the media is not connected then the parameters will take affect right away. The connection can be closed by the host closing the connection, inactivity time has expired, power down/up or the "LOC" command being received.

Media Designation	Physical
T	Ethernet
S (or 1S)	418/433 Mhz Receiver and RS485 port
2S	Serial Port
R	900 Mhz or 2.4 Ghz transceiver

Examples

```
Command:   CTS1S9600,N,8
Response:  CTS1S9600
Remarks: set the first serial port to 9600 baud, no parity and 8 data
bits.
```

```
Command:   CTSS2,9600,N,8
Response:  CTSS2
Remark:    set the receiver serial port to 9600 baud, no parity and 8
data bits.
```

'CTB' – Set Simple Protocol

Command/Response Syntax

Command: **CTB**
Response: CTB

Login Level

Login Level: **CTB** – None

Description

With some of the media like the Command Radio, the Link Manager requires the use of the <SOH>CRC16<CR> protocol. If the "CTB" command is received, the Link Manager will allow commands to be processed sent using the simple protocol (both protocols are honored). The Link Manager remains in this mode until the media is closed usually from inactivity timer expiring.

Examples

```
Command:   <SOH>CTB254F<CR>
Response:  <SOH>CTB254F<CR>
Remarks:   Link Manager will now accept command sent using the simple
protocol.
```

‘CTC’ – Enable Command Processor

Command Options **CTC[R|S]**

Command/Response Syntax

Command: **CTCS**[*Instance*]*MediaCmdproc*
Response: **CTCS**[*Instance]MediaCmdproc*
Command: CTCR
Response: CTCR,*InstanceMediaCmdproc,….*

Parameters Where:

Instance – media instance. For serial: 1 – serial port; 2 – receiver port. Always 1 for TCP/IP, Modem and Radio. If not supplied, the Link Manager will assume *Instance* to be 1.

Media – media choices: 'M' – Modem; 'T' – TCP/IP; 'R' – Command Radio; 'S' – serial port (two serial ports: 1 – serial port; 2 – receiver port)

Cmdproc – command processor: 'T' – True; 'F' – False.

Login Level Login Level: **CTCS** – Configure
CTCR – Data

Description The CTC command is used to enable/disable the ability for the Link Manager to process commands on the specified media.

Use the "CTCR" command to get a listing of all the media's command processor modes. Use the "CTCS" command to set the command processor mode for a media.

Media Designation	Physical
T*	Ethernet
S (or 1S)**	418/433 Mhz Receiver and RS485 port
M*	Serial Port with Modem support
2S*	Serial Port with no Modem support
R**	900 Mhz or 2.4 Ghz transceiver

* Media is always enabled
**Media disabled from the factory

Examples

```
Command:   CTCS1RF
Response:  CTCS1RF
Remarks:   Set the command processor mode for the 900 Mhz radio to
False
```

```
Command:   CTCS1ST
Response:  CTCS1ST
Remarks:   Set the command processor mode for the 418/433 Mhz Receiver
and RS485 port to True
```

```
Command:    CTCR
Response:   CTCR,1TT,1SF,1MT,1RF
Remarks:    Read the command processor modes for all media.
```

‘CTF’ – Set CRC16 Protocol

Command/Response Syntax

Command: **CTF**
Response: CTB

Login Level

Login Level: **CTF** – None

Description

When the “CTF” command is received, the Link Manager will require the CRC16 version of the protocol (versus the Simple Protocol). The protocol will follow the <SOH>CommandCRC16<CR> protocol and disallow the <STX>Command<CR> protocol. See the “CTB” command to set the Simple Protocol.

Examples

```
Command:    <SOH>CTF<CR>
Response:   <SOH>CTF<CR>
Remarks:    Link Manager will now accept commands only using the
<SOH>CommandCRC16<CR> protocol.
```

‘CTP’ – Set CRC16 Protocol Direct

Command Options **CTP[R|S]**

Command/Response Syntax

Command: **CTPS**[*Instance*]*MediaCRC16*
Response: **CTPS**[*Instance]MediaCRC16*
Command: CTPR
Response: CTPR,*InstanceMediaCRC16,….*

Parameters Where:

Instance – media instance. For serial: 1 – serial port; 2 – receiver port. Always 1 for TCP/IP, Modem and Radio. If not supplied, the Link Manager will assume *Instance* to be 1.

Media – media choices: 'M' – Modem; 'T' – TCP/IP; 'R' – Command Radio; 'S' – serial port (two serial ports: 1 – serial port; 2 – receiver port)

CRC16 – protocol: 'T' – CRC16; 'F' – simple.

Login Level

Login Level: **CTCS** – Configure
CTCR – Data

Description

The “CTP” command supplements the “CTB” and “CTF” commands.

Link Manager can be placed in a mode where the Link Manager will require the CRC16 version of the protocol (versus the Simple Protocol). The protocol will follow the <SOH>CommandCRC16<CR> protocol and disallow the <STX>Command<CR> protocol.

Use the "CTPR" command to get a listing of all the media protocol modes. Use the "CTPS" command to set the protocol to CRC16 or simple.

Media Designation	Physical
T*	Ethernet
S (or 1S)	418/433 Mhz Receiver and RS485 port
M	Serial Port with Modem support
2S	Serial Port with no Modem support
R	900 Mhz or 2.4 Ghz transceiver

*TCP/IP is always set to false; the simple protocol is only accepted.

Examples

```
Command:   CTPS1RT
Response:  CTPS1RT
Remarks:   Set the CRC16 Protocol for the 900 Mhz radio. Radio will
now accept commands only using the <SOH>CommandCRC16<CR> protocol.
```

```
Command:   CTPS1SF
Response:  CTPS1SF
Remarks:   Disallows the CRC16 protocol and Link Manager begins to
allow the simple <STX>Command<CR> protocol.
```

```
Command:   CTPR
Response:  CTPR,1TF,1SF,1MT,1RF
Remarks:   Lists the protocol mode for all media.
```

‘CV’ – Configure/Read Enumerated Engineering Unit Table

Command Options

CV<S|R|C>
S – set the Enumerated Engineering Unit Table parameters
R – read the Enumerated Engineering Unit Table parameters
C – clear the Enumerated Engineering Unit Table parameters

Command/Response Syntax

Command:	**CVS***eeu, scale, offset, units, decimals*
Response:	CVS*eeu*
Command	**CVRC**
Response:	CVRC, *no_entries*
Command	**CVR***row*
Response:	CVR*row, eeu,scale, offset, units, decimals*
Command:	**CVC**
Response:	CVC

Parameters

Where:

eeu – (Enumerated Engineering Units) – number from 0 to 63 that identifies the type of Engineering Unit conversion to be performed See description below.

scale – Engineering scale. The raw sensor data is multiplied by this value.

offset – Engineering offset. The value is added to the raw data after the scale has been applied.

units – Engineering units label. Description of the units for presentation.

decimals– number of decimal places to display.

no_entries – number of entries in the table

row – row number of an entry in the table. (starts at 1)

Login Level

Login Level: **CVS** – Configure
CVR – Data
CVC – Configure

Description

Some sensors provide a number (called an Enumerated Engineering Units) that allows the Link Manager to convert the raw sensor data to engineering units. The Link Manager has predefined enumerators 61-63. Additional Enumerated Engineering Units can be added starting at 1 and ending at 31. 0 is the default Enumerated Engineering unit if no number is assigned to the sensor. The predefined enumerators can be overridden. Currently only the Dual Analog (27 & 28) and CounterAnalog(29) sensors use the Enumerated Engineering Units construct. The following is a table showing the predefined enumerations:

Enum	Bin1	Engr1	Bin2	Engr2	Scale	Offset	Units	Description
0	0	0	4095	100	0.0244	0	%	Generic
63*	0	-40	4095	85	0.030525	-40	degC	Temperature
62	0	-40	4095	185	0.0549	-40	degF	Temperature
61	0	0	4095	100	0.0244	0	%RH	Humidity

*Note: Link Manager converts the temperature to degrees F as the default temperature units.

Use the “CVRC” command to obtain the number of Enumerated Engineering Units entries in the table. (This includes all the predefined enumerations.)

Use the “CVR” command with the row number (starting at 1) to read an entry in the table.

Use the “CVS” command to set or override an entry (including predefined entries) using the enumerated number.

Use the “CVC” command to clear the table. The Link Manager will repopulate the table with the predefined Enumerated Engineering Unts entries.

Examples

```
Command:   CVC
Response:  CVC
Remarks: clear the Enumerated Engineering Units table.
```

```
Command:   CVRC
Response:  CVRC,4
Remarks : read the number of entries in the Enumerated Engineering
Units table
```

```
Command:   CVR1
Response:  CVR1,0,0.00305,0.00000,%,1
Command:   CVR2
Response:  CVR2,61,0.02440,0.00000,%RH,1
Command:   CVR3
Response:  CVR3,62,0.05495,-40.00000,degF,1
Command:   CVR4
Response:  CVR4,63,0.05495,-40.00000,degF,1
Remarks:   read 4 entries from the Enumerated Engineering Units table
```

```
Command:   CUR
Response:  CUR,30,3,30,na,00000000
Remarks: Pass-Thru Media Callout table is empty
```

```
Command:   CVS2,0.0244,0,psi,1
Response:  CVS2
Remarks:   Add a new entry for Enumerated Engineering Units value #2.
At 100 PSI the raw sensor reading is 4095.
```

‘CX’ - Set Media Repeater Modes

Command Options **CX[C|R|S]**

Command/Response Syntax

Command: **CXC**
Response: **CXC**
Command: **CXR**
Response: **CXR**, [*Instance*]*Media*$_1$*Repeater*$_1$ *ActExtPkt*$_1$ ... [*Instance*]*Media*$_n$*Repeater*$_n$ *ActExtPkt*$_n$
Command: **CXS**[*Instance*]*Media,Repeater*$_1$ [*ActExtPkt*]
Response: **CXS**[*Instance]Media*

Parameters Where:

Instance – media instance. For serial: 1 – serial port; 2 – receiver port. Always 1 for TCP/IP, Modem and Radio. If not supplied, the Link Manager will assume *Inst* to be 1.

Media – media choices: 'M' – Modem; 'T' – TCP/IP; 'R' – Command Radio; 'S' – serial port (two serial ports: 1 – serial port; 2 – receiver port)

Repeater – Pass-Thru mode: 'N' – do not repeater packet; 'S' – repeat standard packet 'X’ – repeater standard and extended packets..

ActExtPkt – Acknowledge extended packet: 'N' – do not acknowledge extended packet; 'T’ – send acknowledgement when an extended packet is received; ‘R’ – send acknowledgement when an extended packet is received and if the sensor is registered in the Sensor Table..

Login Level Login Level: CXC - Config

CXR – Data

CXS - Config

Description

Repeater Mode

Each Media instance can be placed in Repeater Mode using the "CXS" command. To clear all Media of being in Repeater Mode use the "CXC" command. To read the state of theRepeater Mode use the "CXR" command.

Link Manager can be placed in a mode where it will resend a received packet out the same communication media that it was received (Serial, Ethernet, Radio or RS-485). The Link Manager first passes the packet through a filter to determine if to resend the packet. If the Link Manager receives the same packet within 4 seconds of the original, it will not resend the packet; after 4 seconds it will send the packet. This filter prevents the Link Manager from getting locked up in an infinite loop of sending the same packet again between other repeaters. A typical application for using the Repeater Mode is to extend a 900 Mhz or 2.4 Ghz network. The Link Manager can also add a locator identifier (an alpha character) to the sensor packet. This locator identifier can be used to identify where the sensor packets was placed onto the network. Use the "CYPS" command to set the locator identifier.

Acknowledge Extended Packet

The Link Manager will send an acknowledgement packet through the same nedia that the extended packet is received. There are three options: do send acknowledgement (N), always send an acknowledgement (T) and send an acknowledgement if the sensor is registered in the sensor table (R).

Media Designation

Media Designation	Physical
T	Ethernet
S (or 1S)	418/433 Mhz Receiver and RS485 port
M	Serial Port with Modem support
2S	Serial Port with no Modem support
R	900 Mhz or 2.4 Ghz transceiver

Examples

```
Command:   CXC
Response:  CXC
Remarks:   Disable all media of Repeater Mode
```

```
Command:   CXR
Response:  CXR,1TFT,1SFT,2SFT,1RTF
Remarks:   Read the state of Repeater Mode and Acknowledge Extended
Packet mode for all Media – Radio is in repeater mode
```

```
Command:   CXSR,XT
Response:  CXSR
Remarks:   Set Repeater Mode for the Radio media and acknowledge
Extended Packets.
```

‘CYD’ – Configure UPD Pass-Thru Destinations

Command Options

CYD<S|R|D>
S – set UDP Pass-Thru Destination entry
R – read the contents of the UDP Pass-Thru Destination entry
D – delete UDP Pass-Thru Destination entry

Command/Response Syntax

Command: CYDD*row*
Response: CYDD*row*
Command: CYDR
Response: CYDR,*count*,*domainname*,*destination_ip*$_1$[:*port1*]
[,..,*destination_ip*$_n$[:*port*$_n$]]
Command: CYDS*destination_ip*$_1$[,..,*destination_ip*$_n$]
Response: CYDS*destination_ip*$_1$

Parameters

Where:

row – row number starting at 1 of the entry in the UDP Pass-Thru Destinations table.

count – number of entries in the UDP Pass-Thru Destinations table.

domainname – optional domain name of the destination. (maximum 60 characters)

destination_ip$_n$ – destination IP address entry (5 maximum entries)

Login Level

Login Level: **CYDD** – Configure
CYDS – Configure
CYDR – Data

Description

UDP Pass-Thru Destination table contains a list of destinations that the Link Manager will pass through (repeat) sensor packets to. The Link Manager manages the UDP Pass-Thru Destination table differently depending on the mode.

Broadcast mode: Only one entry will exist in the table: "255.255.255.255".

Discovery mode: The Link Manager will add entries into the UDP Pass-Thru Destination table when it receives discovery UDP packets.

Set destination mode: The Link Manager will add entries into the UDP Pass-Thru Destination table when it receives the "set destination" UDP packet. Additional entries can be added using the "CYDS" command. While in this mode, the Link Manager will accept a domain name as an entry. Only one domain name entry will be accepted. The Link Manager will place "0.0.0.0" in the first entry in the table until the domain name is resolved to an IP address. The resolved IP address is then placed in the first entry. In order for the Link Manager to use the domain name, the "name server" field must be specified through the "CIS" command or dynamically assigned through DHCP. Additional destination IP addresses can be added.

If the Link Manager has not received a sensor packet within 30 seconds, the Link Manager will send the UDP Pass-Thru packet with sensor packet field set to NULL (0s). The host application can then determine that the Link Manger is still alive but not receiving packets.

Examples

Broadcast mode

```
Command:   CYDR
Response:  CYDR,1,,255.255.255.255
Remarks:   The Link Manager returns the broadcast address in the first
entry
```

```
Set desintation mode
Command:   CYDSwww.acme.com
Response:  CYDSwww.acme.com
Remarks:   set a destination domain name
Command:   CYDR
Response:  CYDR,1,www.acme.com,0.0.0.0
Remarks:   the domain name has not been successfully resolved yet
Command:   CYDR
Response:  CYDR,1,www.acme.com,127.0.0.1
Remarks:   the domain name has been successfully resolved.
```

‘CYP’ – Configure UDP Pass-Thru Parameters and Discovery

Command Options

CYP<S|R>
S – set UDP Pass-Thru Parameters and Discovery
R – read UDP Pass-Thru Parameters and Discovery

Command/Response Syntax

Command: CYPR
Response: CYPR*mode,discovery,passthrulisten,tries,locator,ptmode,port*
Command: CYPS*mode,discovery,passthrulisten*[,*tries,locator,ptmode,port*]
Response: CYPS*mode*

Parameters

Where:

mode – UDP Pass-Thru mode:
"N" – no Pass-Thru;
"B" – broadcast;
"D" – discovery;
"S" – set destination.

discovery – ("T" or "F") respond to UDP discovery requests

passthrulisten – ("T" or "F") listen for upd Pass-Thru packets

tries – number of times to transmit sensor packets via UDP (1 to 255)

locator – character that represents where a sensor packet entered the repeater network. (" ", "a"-"z" and "A"-"Z").

ptmode – Pass-Thru mode: 'S' – Standard; 'E' – Engineering (not currently supported)

port – port to receive or send Pass-Thru packets and discovery request.

Login Level

Login Level: **CYPS** – Configure
CYPR – Data

Description

You can select from 4 modes that instruct the Link Manager how to repeat packets received through any of the media through the UDP channel.

Broadcast mode: When the Link Manager receives a sensor packet through any of the media, the Link Manager will repeat this packet by broadcasting the packet to the network using UDP. All network devices within this network segment listening on *port* will hear this packet.

Discovery mode: If the Link Manager receives a discovery UDP packet, the Link Manager will take the source IP and add it to the Pass-Thru Destination table. The Link Manager will start repeating sensor packets to the source IP address. If the Link Manager does not receive the discovery upd packet within 15 minutes, the Link Manager will remove the source IP address from the Pass-Thru Destination table. The Link Manager will then stop repeating packets to that destination. The discovery UDP packet will need to be sent periodically in order for the Link Manager to continue to repeat sensor packets to the destination.

Set Destination mode: If the Link Manager receives a Set Destination UDP packet, the Link Manager will add the destination IP address that is embedded as parameter in the UDP packet to the UDP Pass-Thru Destination table. The Link Manager will start repeating sensor packets to the source IP address. If the Link Manager does not receive another Set Destination UDP packet within 15 minutes, the Link Manager will remove the source IP address from the Pass-Thru Destination table. The Link Manager will then stop repeating packets to that destination. The Set Destination UDP packet will need to be sent periodically in order for the Link Manager to continue to repeat sensor packets to the destination.

If the Link Manager has not received a sensor packet within 30 seconds, the Link Manager will send the UDP Pass-Thru packet with sensor packet field set to NULL (0s). The host application can then determine that the Link Manger is still alive but not receiving packets.

Examples

```
Command:   CYPR
Response:  CYPR,N,T,F,1, ,S,6767
Remarks:   default: passthru disabled, respond to discovery requests,
do not listen for udp passthru sensor packets.
```

```
Command:   CYPSS,T,F,1,z,S,6767
Response:  CYPSS
Remarks:  set to "set destination mode", response to discovery
requests, do not listen for udp passthru sensor packets, repeat once,
locator is 'z', use Standard passthru mode and use port 6767
```

‘D’ - Get Last Data command

Command Options **D<n|n-m>** specify one sensor or a range of sensors

Command/Response Syntax
Command: **D***n* or **D*x-y***
Response: D*n*,[*A*][*ttiiiiias<bbb>C*1*DATA*1|...|$C_m DATA_m$],[....]

Parameters Where:

n – row number in the sensor table

x-y – range of rows that correspond to the sensor table (maximum of 10 for the range)

tt - type of sensor. See the Sensor Type table below.

iiiii - age of sensor reading in seconds. If the Link Manager has never received a packet for this sensor the value here will be 65535. The age parameter will always be 5 characters with leading 0s.

a - sensor in a “state of concern” (T/F). For Link Manager will always set this to ‘F’.

s – service button on sensor was pressed (T/F)

<*bbb*> - battery life percentage of sensor (000 to 100 or 200 if the sensor does not support the battery meter).

C – a “T” of “F” will prefix *DATAn* indicating whether or not the I/O point is in a “state of concern”. For Link Manager will always set this to ‘F’.

DATA - data for each of I/O points for the sensor. The data points are separated by a ‘|’ (pipe). The order and number of I/O points corresponds with the sensor’s setup in the sensor table.

m – number of I/O Points. The number is defined by the type of sensor. See the “Sensor I/O Definitions” table for more information.

Login Level Login Level: Data

Description When the Link Manager receives this command, the Link Manager will return the last reading it received for the specified sensor. Use the “S” command to determine the number of sensors in the sensor table.

The Link Manager gives Analog I/O point data in engineering units and Integer I/O point data in the raw counts.

If the Link Manager has never received any transmissions from the specified sensor, the Link Manager will respond with “na” for the sensor’s data. If the sensor has been set up incorrectly, the Link Manager will respond with “BAD CFG” for the specified sensor.

Sensor Types

Sensor type	Description
0	Unknown
1	Temperature
2	Humidity/Temperature
3	Light
4	IButton (Point PIR)
5	Analog
6	Counter
8	Analog with Data
9	Analog with Temperature (compensated)
11	Discrete
12	Thermistor
13	16-bit signed Analog
14	Counter Temperature
15	Fast Counter Temperature
16	Alarm Temperature
17	Space Temperature Override
18	Directional Counter
20	ID Reader
23	Proximity2
27	Dual Analog (single channel)
28	Dual Analog (two channel)
29	Counter Analog
30	Humidity / Temperature2
31	Dwell

Examples

```
Command:   D1
Response:  D1,F0500000FFF0.78
Remarks:  D1- echo of the primary command; 1 signifies the position of
the sensor in the table.
    F - no system alarms
    05 - type of sensor.  In this case it is an Analog.
    00000 - age of reading; here, 0 seconds.
    F - no sensor alarm
    F - sensor was not in service mode when it transmitted.
    F - I/O point was not in a "state of concern"
    0.78 - the analog reading
```

```
Command:   D1
Response:  D1,F0800029FTF0.68|FTKA49332
Remarks: D1 - get last data for sensor 1
    F - no system alarms
    08 - type of sensor.  In this case it is an analog with data.
    00029 - age of reading in seconds
    F - no sensor alarm
    T - sensor was not in service mode when it transmitted.
    F - I/O point was not in a "state of concern"
    0.68 - I/O point 1 of 2 is analog
    | - a delimiter between the sensor's I/O points
    F - I/O point was not in a "state of concern"
    TKA49332 -I/O point 2 of 2 is data
```

```
Command:   D3-5
Response:  D3-5,F0500000FFF1.93,0100016FFF74.3,0100790FTF74.3
Remarks: D3-5 request for last data for sensors 3 thru 5.  Note that
each sensor's data is comma delimited. "F0500000FFF1.93" is Sensor 3
data; "0100016FFF74.3" is Sensor 4 data; "0100790FTF74.3" is Sensor 5
data.
```

```
Command:   D7
Response:  D7,F0600061FFFopen|200302|200309
Remarks: example LSX at sensor position 7
    F - no system alarms
    06 – sensor type: LSX.
    00061 – age of reading in seconds
    F – no sensor alarm
    F – no service mode
    F – I/O point not in "state of concern"
    Open – state of the LSX
    200302 – open counts
    200309 – close counts
```

```
Command:   D2
Response:  D2,Fna
Remarks: requested data from sensor 2.  "na" indicates that the Link
Manager has never received any packets from this sensor.
```

```
Command:   D1
Response:  D1,FBad Cfg
Remarks: Sensor at row 1 was not set up properly.  The I/O Point type
was not set up according to the type of sensor.
```

‘EC’ – Clear Activity Log

Command Options **EC[A]**

Command/Response Syntax

Command: **EC***time stamp*
Response: EC*time stamp*

Command: **ECA**
Response: ECA

Parameters Where:

A – clears all events from the Activity Log.

time stamp – clears every record OLDER than the *time stamp*. (mmmddyyhhnnss)

Login Level Login Level: **EC** – Configure

Description Link Manager clears all records or clears records in the Activity Log that are OLDER then *time stamp*. Once the Link Manager clears the records, the data is lost and cannot be retrieved.

Example

```
Command:   EC082101120000
Response:  EC082101120000
Remarks: This command tells the Link Manager to clear all records older
than or equal to 08/21/00 12:00:00
```

‘ER’ – Read an Activity Log Record

Command Options

E<A|F|L|N|P|R[V]
A – request same record again
F – request first record in the Activity Log
L – request last record in the Activity Log
N – request next record in the Activity Log
P – request previous record in the Activity Log
R – request record later than the passed time
V – verbose response

Command/Response Syntax

Command:	**EA**
Response:	EA*time stamp<index>,rec time stamp,event id[event data]*
Command:	**EAV**
Response:	*EAVtime stamp<index>,rec time stamp,event string[verbose event data]*
Command:	**EF**
Response:	EF*time stamp<index>,rec time stamp,event id[event data]*
Command:	**EFV**
Response:	EAV*time stamp<index>,rec time stamp,event string[verbose event data]*
Command:	**EL**
Response:	EA*time stamp<index>,rec time stamp,event id[event data]*
Command:	**ELV**
Response:	EAV*time stamp<index>,rec time stamp,event string[verbose event data]*
Command:	**EN**
Response:	EA*time stamp<index>,rec time stamp,event id[event data]*
Command:	**ENV**
Response:	EAV*time stamp<index>,rec time stamp,event string[verbose event data]*
Command:	**EP**
Response:	EA*time stamp<index>,rec time stamp,event id[event data]*
Command:	**EPV**
Response:	EAV*time stamp<index>,rec time stamp,event string[verbose event data]*
Command:	**ER***time stamp<index>*
Response:	ER*time stamp<index>,rec time stamp,event id[event data]*
Command:	**ERV***time stamp<index>*
Response:	ERV*time stamp<index>,rec time stamp,event string[verbose event data]*

Parameters Where:

time stamp – Link Manager reads the first record whose time stamp/index is greater than the `time stamp/index`. (mmddyyhhnnss)

index – two digit ASCII Hexadecimal number ("00" to "FF") starting at 01. Used to access multiple records that have the same time stamp.

rec time stamp – time stamp of the returned record

event id – identifies the type of event. See table below for list and description of event ids.

event string – identifies the type of event. See table below for list and description of event strings.

event data – the contents of the data varies with the *event id* field. See the table below for the list of parameters for each *event id*.

verbose event data – the contents of the data varies with the *event string* field. See the table below for the list of parameters for each *event string*.

sensor row – row number of the sensor in the sensor table

sensor name – name of the sensor.

i/o value – data value that triggered the event. For analog types, the value is given in engineering units. For integer types, the value is given in raw counts.

i/o units label – label describing the units of the i/o value.

sample no – indicates which I/O point caused the event. The first I/O point starts at 1.

event no – indicates which event series for the I/O point caused the event. Some I/O points have multiple event series. Starts at 1.

span – the number seconds since the analog threshold event fired.

alarm – will always be 0. Not used by the Link Manager.

downinterval – the amount of time the Link Manager was powered down (mmmddyyhhnnss).

Event ID	Event String	Description	Parameters
1	Start	Link Manager Startup	*event id,alarm*
6	Manage	"CB" and "CE" Commands; notification that a series of setup commands are occuring	*event id,user,no items,alarm*
7	Add	Add an item (like a sensor or an output)	*event id,user,item id, item row,alarm*
8	Edit	Edited item (like a sensor or an output)	*event id,user,item id, item row,alarm*
9	Delete	Deleted an item (like a sensor or an output)	*event id,user,item id,alarm*
13	AutoAdd Expired	AutoAdd time expired and AutoAdd was disabled	*event id,alarm*
14	Upgraded	Firmware was upgraded	*event id,alarm*
16	Startup	Link Manager Startup	*eventid,downinterval,alarm*
50	Service	Service button pressed	*event id,sensor row,alarm*
51	Offline	Sensor age too large	*event id,sensor row,alarm*
54	Online	Sensor came online after old fired	*event id,sensor row,alarm*
57	AddSensor	Sensor has been added to sensor table through Auto Add mode.	*event id,sensor row,alarm*

Managed Description Table

Item ID	Item Description	Command	Comments
1	Auto Add	"A"	
2	Clock	"CC"	
3	Id	"CD"	
7	IP Address	"CI"	
11	Password	"CP"	
12	Radio	"CR"	
13	Sensor	"CS"	
16	Activity Log	"EC"	
19	Timezone	"IT"	
28	Pass Thru	"U"	
29	Verbose	"V"	

Login Level

Login Level: **EA** – Data
EF – Data
EL – Data
EN – Data
EP – Data
ER – Data

Description

Use the "A","F","L","N", and "P" command to iterate and read the Activity Log. For the "R" command, the Link Manager uses a time stamp as index to have "random-access" to the Activity Log. Link Manager reads the first record in the Activity Log whose time stamp/index is greater than the passed *time stamp/index*. If the Link Manager cannot find any records, then it will respond with the command followed by the passed *time stamp* parameter. The *index* parameter is used to access multiple records with the same *time stamp.* The first record has an index of "01" but use "00" to get the first record. When the 'V' option is include, the Link Manager will return the names of the events and sensors. The "R" option is recommended when writing an application to read the Activity Log.

Hint: When using the ER command, enter the preceding *time stamp*/*index* from the response to the ER command to obtain the next record.

Examples

```
Command:   ERV05230109282800
Response:  ERV05230109282800,08310108202401 Start
Remark: Request the first record by providing a date in the past that
would not be in the Activity Log: 05/23/01 09:28:28.  Link Manager
found the first record with a time stamp of 08/31/01 08:20:24.  This
event was a "start up" event where Link Manager logged when it started.
```

```
Command:   ER08310108202400
Response:  ER08310108202400
Remark: Continuing in the process of reading the Activity Log, the time
and date stamp of the previous event was used in the "ER" command to
get the next record.  Link Manager indicates there are no more records
by responding with the command and not data.
```

```
Command:   ER06170122363100
Response:  ER06170122363100,0925012233000150,2,F
Remarks: Service Mode button pressed (50) for the sensor 2 at 9/25/01
22:33:00.
Command:   ER09250122330001
Response:  ER09250122330001,0925012234070160,1,5300000008184C0C,2,T
Remarks: Data changed (90) for sensor 1 at 9/25/01 22:34:07 which is
the 2nd I/O Point and caused an alarm
Command:   ER09250122340701
Response:  ER09250122340701,0925012234070251,2,F
Remarks: Multiple Record example: Sensor age event (51) for sensor 2 at
9/25/01 22:35:10.
Command:   ER09250122340702
Response:  ER09250122340702,092501223524011,F
Remarks: Link Manager start up at 9/25/01 22:35:24
Command:   ER09250122352400
Response:  ER09250122352400
Remarks: no more events in the Activity Log
```

```
Command:   ERV06170122363100
Response:  ERV06170122363100,09250122330001 Service,2Humid
Command:   ERV09250122330000
Response:  ERV09250122330000,09250122332201
Change,libtn,5300000008184C0C
Command:   ERV09250122332201
Response:  ERV09250122332201,09250122340701 High,2Humid,82.4 degF
Command:   ERV09250122340701
Response:  ERV09250122340701,09250122351001 Old,2Humid
Command:   ERV09250122351001
Response:  ERV09250122351001,09250122352401 Start
Command:   ERV09250122352401
Response:  ERV09250122352401
Remarks: These events are the same as the above example except that the
Verbose (V) option was used.
```

‘EU’ – Activity Log Usage

Command/Response Syntax

Command: **EU**
Response: EU, *bytes used*/ *max bytes*

Parameters

Where:

bytes used – the number of bytes used in the Activity Log

max bytes – maximum number of bytes the Activity Log will hold

Login Level

Login Level: **EU** – Data

Description

The Link Manager provides a relative indicator of the usage of the Activity Log. By dividing the *bytes used* and the *max bytes*, you can determine the percentage of how much is used in the Activity Log.

Example

```
Command:   EU
Response:  EU,11/70956
Remarks: 11 bytes out of the 70,956 bytes of the Activity Log is used.
```

‘IC’ – Information Counts

Command/Response Syntax

Command: **IC**
Response: IC,*commissioned date*,*Powered up date*,*Powered up*,*hard resets*, *soft resets*,*watchdog resets*

Parameters

Where:

commissioned date – the date of when the Link Manager started operations (*mmddyyhhnnss)*

Powered up date – the date of when the Link Manager powered up (*mmddyyhhnnss)*

Powered up – number of times the Link Manager has powered up

hard resets – number of hardware resets the Link Manager has had

soft resets – number of software resets the Link Manager has had

watchdog resets – number of watchdog resets

Login Level

Login Level: Data

Description

The “IC” command gives information about the performance of the Link Manager. This information is given for diagnostic purposes.

Example

```
Command:   IC
Response:  IC,090501130703,090601221649,4,3,0,0
Remarks: Link Manager commissioned data: 09/05/01 13:07:03; Link
Manager last powered up date: 09/06/01 22:16:49; 4 power ups; 3
hardware resets; 0 software resets; and 0 watchdog resets.
```

‘IIU’ – Information UDP Pass-Thru Destination

Command/Response Syntax

Command: **IIU**

Response:

IIU,*mode,pktcnt,pktdisccnt,errcnt,lasterr,,resolved,nextresolveat,lasterrorat ,errormsg*

Parameters

Where:

mode – UDP Pass-Thru mode:
"N" – no Pass-Thru;
"B" – broadcast;
"D" – discovery;
"S" – set destination

pktcnt – current packet count of the last transmission (rolls over after 65535).

pktdisccnt – current count of discovery packet received (rolls over after 65535).

errcnt – current count of the number of errors encounter when attempting to transmit a packet through UDP (discovery or Pass-Thru) (rolls over after 65535).

lasterr – if less than 0 this is an error code of the last UDP transmit attempt. If greater than 0, this value is internal handle.

resolved – (T/F) has the host name specified in the UDP Destination been resolved.

nextresolveat – number of seconds before the next host name resolution takes place.

lasterrorat – (mmddyyhhnnss) date and time stamp of when the last error occurred when attempting to resolve the host name.

errormsg – last error message when attempting to resolve the host name: "DNS Timeout" – lost contact with DNS server; "No DNS Contact" – name server was not specified as part of the IP parameters.

Login Level

Login Level: Data

Description

The “IIU” command provides information about the status of the UDP Pass-Thru Destination attempt. With every UDP Pass-Thru packet, the Link Manager tags a packet count. An application can then use the packet count to determine if packets are being missed. *pktcnt* is the current count at the Link Manager.

Use the *pktdisccnt* parameter to determine if the Link Manager is receiving packets.

Use the *errcnt* and *lasterr* to determine if the Link Manager is having difficulties sending packets via UDP.

resolved, nextresolveat, lasterrorat, errormsg parameters pertain to using a host name in the UDP Pass-Thru Destination table.

Example

```
Command:    IIU
Command:    IIU,S,1025,32440,0,63,F,13,011607173312,DNS Timeout
Remarks: Set Destination Mode, packet counter = 1025, discovery packet
counter = 32440, errcnt = 0, lasterr = 63, not resolved yet, next in 13
seconds, 01/16/07 17:33:12 was time of last error, could not contact
DNS Server.
```

'ILR' – Current Sensor Log State

Command/Response Syntax

Command: **ILR**

Response:

ILR,*currradiosensor*,*currradiosensorsn*,*currsensorstate*,*currsensortransid*,*currsensorblock*,*destip*,*resolved*,*resolveerrorAt*,*resolvedmsg*,*destretry*,*destsensor*,*destsensorsn*,*desttries*,*iamherestate*

Parameters

Where:

currradiosensor – current radio sensor index

currradiosensorsn – current radio sensor serial number

currsensorstate – radio sensor state machine state

currsensortransid – radio sensor transaction id

currsensorblock – radio sensor log block index

destip – destination ip address (set or resolved from hostname)

resolved – ('T' or 'F') did the host name get resolved

resolveerrorAt – timestamp when resolving of the hostname failed

resolvedmsg – resolved error message string

destretry – ('T' or 'F') is Link Manager retrying the destination host?

destsensor – destination sensor index

destsensorsn – destination sensor serial number

desttries – number of try attempts to contact destination (on error)

iamherestate – I Am Here state machine state

Login Level

Login Level: Data

Description

The "ILR" command retrieves information about the state of the Link Manager collecting data from sensors and delivering data to the host application

Example

```
Command:    ILR
Response:
ILR,255,389035A0,0,167,242,192.168.0.7,70,,,F,0,144020B0,10435,0
```

‘ILT’ – Destination Sensor Table List

Command/Response Syntax

Command: **ILT**
Response: *tablecount*/*lasttry*,*sensor*$_1$,…,*sensor*$_{tablecount}$

Parameters

Where:

tablecount – number of sensors in the table

lasttry – last sensor tried

sensor$_x$ – pending sensor to be delivered to host

Login Level

Login Level: Data

Description

The “ILT” command is used to determine what sensors in the sensor table where the Link Manager is queued to send the sensor data to the host application. There will typically be entries when the Link Manager has troubles delivering data to the host application.

Example

```
Command:   ILT
Response:  ILT,3/1,4,3,2
```

‘IM’ – Media Information

Command/Response Syntax

Command: **IM**
Response: IM,*name,login level,state,last activity*,…

Parameters

Where:

name – name of the media

login level – current login level (none, data, configure)

state – message that describes the current state of the media. The possible messages are the following: “Disabled”, “Configuring”, “Waiting”, “Pushing”, “Connected”, “Talking” and “Closing”.

last activity – duration of the last connection in seconds.

… - this information is repeated for every media. The media listed is dependant on the options and version of the Link Manager.

Login Level

Login Level: Data

Example

```
Command:   IM
Response:  IM,TCP/IP,C,Connected,0,Serial,C,Waiting,445,Serial,C,
Waiting,na,Radio,C,Waiting,na
```

‘IP’ – IP Address Settings

Command/Response Syntax

Command: **IP**
Response: IP, *dynamic,successfully bound,IP address, subnet mask, gateway, name server, SMTP server*

Parameters

Where:

dynamic – the IP address parameters are to be dynamically assigned

successfully bound – has the IP address parameters been successfully assigned. If “F” then the Link Manager has fallen back to either the previously assigned dynamic address or the static address.

IP address – the current IP address (static or dynamic)

subnet mask – the current subnet mask (static or dynamic)

gateway – the current gateway (static or dynamic)

name server – the current name server (static or dynamic)

SMTP server – the current SMTP server (static or dynamic). Not used for the Link Manager

Login Level

Login Level: Data

Description

Use the “IP” command to determine the current IP address settings.

Note: the “CIR” and “CIS” commands now only refer to the static ip address settings.

Example

```
Command:   IP
Response:  ip,F,F,192.168.0.55,255.255.255.0,,,
Static, never bound, default ip address, subnet mask, no gateway and no
DNS
```

```
Command:   IP
Response:  ip,T,T,192.168.1.44,255.255.255.0,,64.90.1.10,
Dynamic address, address dynamically assigned, 192.168.1.44 – ip
address, 255.255.255.0 - subnet mask, no gateway assigned, 64.90.1.10 –
DNS address
```

‘IPS’ – DHCP State Information

Command/Response Syntax

Command: **IPS**
Response: IPS, *DHCP acquire state*, *DHCP state*, *lease time*, *wait time*, *link*

Parameters

Where:

DHCP Acquire state – None, Wait Acquire, Acquiring

DHCP state – Inform_Send(3), Inform(4),BootP_Init(6), BootP_Send(7), BootP_Wait(8), ToBInit(10), Init(12), Sel_Send(13), Sel (16), Req_Send(17), Req(20), Arp_Send(23), Arp(24), Bound(28), Renew_Send(29), Renew(32), Rebind_Send(33), Rebind(36), Release(40), Timeout(101), Expired(103)

lease time – the amount of time in seconds when the lease will be renewed or “expired”.

wait time – number seconds before next state is executed.

link – (T/F) – indicates if there is a link to the hardware Ethernet interface.

Login Level

Login Level: Data

Example

```
Command:   IPS
Response:  IPS,None,28,259110,0,T
Remark: None – state machine is not running; 28 – Bound: DHCP state;
259110 – lease time; 0 – wait time for the next time; Ethernet
connected
```

‘IT’ – Time Zone Information

Command Options

IT<S|R>
S – Set the time zone information
R – Read the time zone information

Command/Response Syntax

Command: **ITS**[*s*]*hhmmss*[*daylightsavings*]
Response: ITS[*s*]*hhmmss*
Command: **ITR**
Response: ITR,[*s*]*hhmmss*,*daylightsavings*

Parameters

Where

s – optional sign character: ‘-‘

hhmmss – offset to apply to displayed time to account for timezone. The clock must be set to UTC time in order to use the timezone offset otherwise set the timezone offset to zero.

daylight savings – (T/F) adjust for daylight savings time.

Login Level

Login Level: **ITS**: Configure
ITR: Data

Description

Both the timezone offset and the *daylight savings* parameters are used to tell the Link Manager how to display time.

Examples

```
Command:   ITS-050000
Response:  ITS-050000
Remark: This command sets the time zone value to Eastern Standard Time
Zone (-5 hours from UTC).
```

```
Command:   ITS-050000,T
Response:  ITS-050000
Remark:  Link Manager was set to Eastern Standard Time Zone Offset and
Daylight savings is enabled.
```

```
Command:   ITR
Response:  ITR,-050000,T,F
Remark:  Time zone offset is -5 hours; Daylight savings time mode is
set; current date and time is not in daylight savings time.
```

'ITD' – Daylight Savings Schedule

Command Options

ITD<S|R>
S – Set the current daylight savings schedule
R – Read the current daylight savings schedule

Command/Response Syntax

Command:	**ITDS***row*,(*BegDLS*$_1$,*EndDLS*$_1$)…(*BegDLS*$_5$,*EndDLS*$_5$)
Response:	ITDS*row*
Command:	**ITDSD***schedule*
Response:	ITDSD*schedule*
Command:	**ITDR***row*
Response:	ITDR*row*

Parameters

Where

row – row number (1 to 3). The Link Manager can accept 5 years (pairs) of daylights savings times. Use *row* to select which 5 year group of daylight savings information you want to access.

BegDLS – beginning daylight savings time in "mmddyyhhmmss" format.

EndDLS – ending daylight savings time in "mmddyyhhmmss" format.

Schedule – enumerated schedule where 1 – USA (default); 2 – old USA, 3 Greenwich Mean Time; 4 – Central European Time; 5 – Eastern European Time.

Login Level

Login Level: **ITS**: Configure
ITR: Data

Description

The Link Manager contains a 15 year daylight savings schedule. Because of limitation of command size, the Link Manager uses 3 rows of 5 year daylight savings schedules. You can specify your own schedule by using the "ITDS" command. You select between one of 5 pre-established schedules using the "ITDSD" command.

Examples

```
Command:   ITDR1
Response:
    ITDR1,(040206020000,102906020000)(031107020000,110407020000)(030908
020000,11020
8020000)(030809020000,110109020000)(031410020000,110710020000)
Command:   ITDR2
Response:
    ITDR2,(031311020000,110611020000)(031112020000,110412020000)(031013
020000,11031
3020000)(030914020000,110214020000)(030815020000,110115020000)
Command:   ITDR3
Response:
    ITDR3,(031316020000,110616020000)(031217020000,110517020000)(031118
020000,11041
8020000)(031019020000,110319020000)(030820020000,110120020000)
Remark: Read the current daylight savings schedule
```

```
Command:   ITDSD3
Response:  ITDSD3
Remark:  Set a new daylight savings schedule using the Greenwich Mean
Time schedule
```

```
Command:
    ITDS1,(032606030000,102906030000)(032507030000,102807030000)(033008
030000,102608030000)(032909030000,102509030000)(032810030000,1031100300
00)
Response:  ITDS1
Command:
    ITDS2,(032711030000,103011030000)(032512030000,102812030000)(033113
030000,102713030000)(033014030000,102614030000)(032915030000,1025150300
00)
Response:  ITDS2
Command:
    ITDS3,(032716030000,103016030000)(032617030000,102917030000)(032518
030000,102818030000)(033119030000,102719030000)(032920030000,1025200300
00)
Response:  ITDS3
Remark:  Set new daylight savings schedule (for 15 years)
```

‘IU’ – Information Pass-Thru

Command/Response Syntax

Command: **IU**
Response: IU,*state,last action,next action*

Parameters

Where:

state – current state of the Pass Thru Callout table: “Disabled”, “Configuring”, “Waiting”, “Pushing”, “Connected”, and “Closing”.

last action – the last time a connection was attempted or if connected when the connection was made (*mmddyyhhnnss).*

next action – time of the next attempt or if the currently connected “na” (*mmddyyhhnnss).*

Login Level

Login Level: Data

Description

The “IU” command provides information about the state of the Pass-Thru Media Callout Table when it is trying to make a connection with host.

Example

```
Command:   IU
Response:  IU,(Connected,012903105644,na)
Remarks: Successful connection
```

```
Command:   IU
Response:  IU,(Waiting,012903105638,012903105833)
Remark:  The connection was terminated.  Waiting because of the delay.
```

‘IV’ – Version Information

Command/Response Syntax

Command: **IV**
Response: IV,*version number,supported media list,server type,copyright notice*

Parameters

Where:

`version number` – version number of the firmware of the Link Manager

`supported media list` – list of the supported media for the Link Manager delimited by ‘|’.

`Server type` – the type of server: Link Manager.

`copyright notice` – copyright notice for the Link Manager software.

Login Level

Login Level: None

Example

```
Command:   IV
Response:   IV,2.1|Serial|Radio|TCP/IP,Link Manager,"Copyright Jun 09
2004 16:05:35 Point Six, Inc."
```

‘IY’ – Information Synchronize the Clock

Command/Response Syntax

Command: **IY**
Response: IY,*sync adjust,next attempt,current time, lastsntp,nextsntp,sntpcomment*

Parameters

Where:

sync adjust – amount of time in seconds to adjust the clock. As the function runs this is the remaining time left to adjust.

next attempt – the number of seconds till the next attempt to adjust the clock. The Link Manger is adjusting the time in stages.

current time – time of the clock (*mmddyyhhnnss).*

Lastsntp – last time the Link Manager attempted to get the time from the SNTP service.

Nextsntp– next time the Link Manager will attempt to get the time from the SNTP service.

Sntpcomment – status of the SNTP Client: “Off”, “Success”, “Trying to get time”, and “Error: “.

Login Level

Login Level: Data

Description

Use the “IY” command to examine the state of the Link Manager setting the clock in stages. See the “CCSS” command for more information.

Example

```
Command:   IY
Response:  IY,0,,032105154603,na,na,Off
Remarks: Link Manager is not currently synchronizing the clock
```

```
Command:   IY
Response:  IY,57,3,032105154603,na,na,Off
Remark:  Link Manager is synchronizing the clock in stages.  It needs
to adjust the time by 57 seconds.  The next attempt to adjust the clock
will occur in 3 seconds.  03/21/05 15:46:03 is the current time of the
clock
```

```
Command:   IY
Response:  IY,0,0,111705192414,111705122408,111805002404,Success
Remarks: The SNTP client has successfully got the current time at
11/17/05 12:24:08 and then next time the Link Manager will get the time
is 11/08/05 00:24:04.
```

‘L’ – Login/Logout Commands

Command Options

LI

LO[C]

Command/Response Syntax

Command:	**LI***password*	Log in command
Response:	LI*password,level*	
Command:	**LO**	Log out command
Response:	LO	
Command:	**LOC**	Log out command and disconnect
Response:	LOC	

Parameters

Where:

password – either a data or configure password as set up with the Configure Login Password (‘CPD’ and ‘CPC’). The password parameter for this command is case sensitive.

level – level of access authorized by the Link Manager: 1 – ‘Data’; 2 – ‘Configure’

Login Level

Login Level: none

Description

Link Manager will allow access to a set of commands based on the entered password. There are two levels of access ‘Data’ and ‘Configure’. With the ‘Data’ login, a user can access the current readings, the I/O Status page, Activity Log and other information. With the ‘Data’ login, the Link Manager will not allow access to commands or Web page that change the setup information. With the ‘Configure’ login, the Link Manager will allow all commands to be processed.

For the “LI” command, if the password does not match the Data or Configure password the Link Manager will return a 17 error code.

The “LOC” command causes the Link Manager to log out and then close the connection.

Note: Login is case sensitive.

Note: If you forget your password, you will not be able to collect the data in the Link Manager. You will have to reset the Link Manager to factory defaults and set up new passwords.

Example

```
Command:   LInow
Response:  LInow,1
Remarks: Login using the password “now”.  Logged in at level 1 which is
the “Data” login level.
```

‘PY’ – Attempt Automatic Time Update

Command/Response Syntax

Command: **PY**
Response: PY

Login Level

Login Level: **PY** – Data

Description

The “PY” command causes the Link Manager to initiate a connection to an NTP Server to update the clock. See the “CCN” and “IY” commands for more information.

Examples

```
Command:   PY
Response:  PY
Remarks: Tell the Link Manager to get the latest time from the NTP
Server.
```

‘S’ - Get Status Data Command

Command Options **S**

Command/Response Syntax

Command: **S**

Response: S,*sensor count, last setup change time, alarm time, periodic time, job count, output count, timer count, match count, scheduled output count*

Parameters Where:

sensor count – number of sensors in the sensor list

last setup change time – time and date of the last setup change (*mmddyyhhnnss)*

alarm time – na – Not used by the Link Manager.

periodic timer – na – Not used by the Link Manager.

job count – number of jobs in the job list. Not used by the Link Manager.

output count – number of outputs in the output table. Not used by the Link Manager.

timer count – number of timer outputs in the timer table. Not used by the Link Manager.

match count – number of matches in the match table. Not used by the Link Manager.

scheduled output count – number of schedule outputs. Not used by the Link Manager.

failed – resetting the periodic alarm time failed: “,F”; blank if succeeded. Not used by the Link Manager.

Login Level Login Level: Data

Description Returns the number of sensors in the configuration table.

The *last setup change time* can be used by host to determine if the setup has been changed by a second host.

Examples

```
Command:   S
Response:  S,6,082503153753,na,na,0,22,0,6,2
Remarks: 6 sensors are set up; last setup change occurred at 08/25/03
15:37:53.
```

‘U’ - Set Pass-Thru Mode

Command Options **U[E|N|Q|R|S]**

Command/Response Syntax

Command:	**UE**
Response:	UE
Command:	**UN**
Response:	UN
Command:	**UQ**
Response:	UQ
Command:	**UR**
Response:	UR,*mode*
Command:	**US**
Response:	US
Command:	**UX**
Response:	UX

Parameters Where:

mode – “E”, “F”, ”N”, “S”, “T”, “Y” or “X”

Login Level Login Level: Data

Description

"UE" tells Link Manager to set the current media connection to Pass-Thru mode using engineering mode. See the section "Link Manager Functions: Pass-Thru Mode" for information about the fields sent.

"UN" turns off Pass-Thru mode for the current media.

"UQ" temporarily turns off Pass-Thru mode for the current media. Link Manager will resume Pass-Thru mode when the connection is terminated or when the log off command ("LO") is issued. Send this command first in a sequence of commands if you do not want to process the asynchronous data from Pass-Thru mode.

"UR" reads the current setting of the Pass-Thru mode for the current media. The Link Manager will respond with:

"E" - engineering mode

"F" - engineering mode temporarily quieted

"N" – Pass-Thru off

"S" – standard mode

"T" – standard mode temporarily quieted

"X" – extended packet standard mode

'Y" - extended packet standard mode quieted

"US" tells Link Manager to set the current media connection to Pass-Thru mode using standard mode (standard packets received will be passed through). If an extended packet is received, then the Link Manager will only send the standard packet embedded in the extended packet.

"UX" tells Link Manager to Pass-Thru extended packets are received and standard packets when standard packets are received.

When in engineering mode, the Link Manager will convert the I/O data received from a Point sensor and then forward the converted record across the current media.

When in standard mode, the Link Manager will send the packet it received from a Point sensor as is across the current media.

For more information about the format of the data sent via Pass-Thru mode, see the documentation for your specific Point sensor.

Examples

```
Command:   US
Response:  US
Remarks: Turn on standard pass thru mode for the current media.  Link
Manager will start sending asynchronous packets:
5428769D1B000000C30158B68E0A
11301020024F0C0029560232B334
11301020024F0C0029560232B334
```

```
Command:   UE
Response:  UE
Remarks: Turn on engineering pass thru mode for the current media.
Link Manager will start sending converted data asynchronously:
na,2Humid_Temp,2,D40000000B1FBD28,F,F,F,45,%RH,T,71.6,F
na,3Limit_Switch,6,0000000000181032,F,F,T,trans.,state,F,186,open,F,106
,close
```

```
Command:   UQ
Response:  UQ
Remarks: Temporarily turn off pass thru mode until log off or
Disconnect
```

‘UM’ - Set Pass-Thru Mode Direct

Command Options **UM[R|S]**

Command/Response Syntax

Command:	**UMS**[*Instance*]*MediaMode*
Response:	**UMS**[*Instance]MediaMode*
Command:	UMR
Response:	UMR,*InstMediaMode*

Parameters Where:

Instance – media instance. For serial: 1 – serial port; 2 – receiver port. Always 1 for TCP/IP and Radio. If not supplied, the Link Manager will assume *Inst* to be 1.

Media – media choices: 'T' – TCP/IP; 'R' – Command Radio; 'S' – serial port (two serial ports: 1 – serial port; 2 – receiver port)

Mode – Pass-Thru mode: 'N' – no Pass-Thru; 'S' – Standard; 'E' – Engineering; ‘X’ - Extended.

Login Level Login Level: Data

Description

The “UM” command supplements the “U” and “CUM” commands.

Link Manager can be placed in a mode where packet information that it receives can be repeated via Serial, Ethernet and/or Command Radio. Link Manager can forward these packets as is (Standard or Extended) or convert the data to engineering units and send it as a comma delimited record (Engineering).

Use the "UMR" command to get a listing of all the media's Pass-Thru modes. Use the "UMS" command to set Pass-Thru mode for a media.

The Pass-Thru mode can also be changed using the “US”, “UE” or “UX” command.

Note: the Link Manager can change the Pass-Thru mode depending on the parameters entered in the Pass-Thru Media Callout Table ("CUS" command). Use the "UMR" command to read the current state of the media Pass-Thru mode.

See the section "Pass-Thru Mode" for more information.

Media Designation	Physical
T	Ethernet
S (or 1S)	418/433 Mhz Receiver and RS485 port
2S	Serial Port
R	900 Mhz or 2.4 Ghz transceiver

Examples

```
Command:   UMSTS
Response:  UMSTS
Remarks:   Set the passthru mode for the TCP/IP media to Standard Link
Manager will start sending asynchronous packets:
5428769D1B000000C30158B68E0A
11301020024F0C0029560232B334
11301020024F0C0029560232B334
```

```
Command:   UM2SS
Response:  UM2SS
Remarks:   Set the passthru mode for the second serial port media to
Standard
```

```
Command:   UMR
Response:  UMR,1TS,1SN,2SS,1RN
Remarks:   Read the passthru modes for all media.  TCP/IP and the
second serial port are set to Standard.
```

‘V’ – Verbose

Command Options **V<B|E>**

Command/Response Syntax

Command:	**VB**	Start Verbose Mode
Response:	VB	
Command:	**VE**	End Verbose Mode

Parameter None

Description Verbose Mode is used to troubleshoot and diagnose problems with the Link Manager. When in Verbose Mode, the Link Manager will send asynchronously message strings out through the media in which the “V” command was sent. These string messages show information such as when a packet of data is received, when events are triggered, when Media Callout Table is initiated, when connects are made attempted to a host and so on.

Verbose Mode should only be used for troubleshooting. Do not use this mode with a program. The message strings might change in future firmware releases of the product.

The Link Manager when in Verbose Mode does not use the Inactivity Timer. Link Manager in this mode will not automatically disconnect from a media when there is not activity.

Since the Serial port and the Command Radio is active all the time and the Link Manager does not automatically turn off Verbose Mode, programs should send a “VE” command to the Serial port to start a conversation. If Verbose Mode is enable while a program is sending commands, verbose messages might sent ahead of the command response thus creating errors and confusion for the program.

The “V” command is very useful in combination with the “P” command.

Examples

```
Command:   VB
Response:  VB
Remarks: Start Verbose Mode
```

```
Command:   VE
Response:  VE
Remarks: End Verbose Mode
```

```
Remarks: Example conversations with Verbose Mode on
CSR1
OD - CfgSet_Sensor
CSR1,2,7D000000059A9328,1Humid(A1.000,0.000,%RH,0)(A0.1125,32.0000,degF
```

Error Codes

Overview

When the Link Manager encounters a problem with the command string it will write out an error response. This response takes the form **<BEL>*ee,Cmd*** where **<BEL>** is the ASCII 07 code (Ctrl-G on most terminal emulation programs); ***ee*** is the specific error (see below); ***Cmd*** is an echo of the primary command that contained the error. The primary command is the entire command string or the first part of the string up to but not including the first comma.

Error Code List

Error Code	Meaning
1	Invalid command
2	Position or Range Error
3	Command syntax error; command cannot be parsed
4	Syntax error inside parentheses for sensor configuration
5	Wrong type specified; specified type does not exist
6	Type cannot be changed or new sensor cannot be this type
7	Table is full
8	Invalid command configuration
9	No password – did not previously logged in
10	Not configured
13	Illegal parameter
14	Syntax error with the sample
15	Illegally changing sample type
17	Password given with the "LI" command does not match the Data or Configure passwords
20	Write to flash memory failed. Internal Error or flash memory has failed.
22	No correction entry table found
23	Out of dynamic memory
24	No match for the media kind / instance specified
25	Internal Error
26	Sensor serial number is already in use
28	Correction parameter is out of range
36	Cannot Synchronize the clock

37	Link Manager is synchronizing the clock and cannot execute command.
38	Cannot set time near a Daylight savings boundary
"BAD CFG"	A Sensor has been set up incorrectly. The sensor's setup of the I/O Point types does not match the sensor's type of I/O Points.

Appendix

Models

Model	Media	Description
4010-43	Ethernet Port 1 Serial Port Built in 900 Mhz transceiver Built in 418 Mhz receiver 1 RS485 Port	Link Manager is ready to receive transmissions from 900 Mhz sensors, 900 Mhz Point Repeaters., 418 Mhz sensors and wired RS485 sensors. (Shown on cover page of manual.) Transmissions can be sent through the 900 Mhz transceiver or RS485 port to output sensors.

Troubleshooting

Sensor Issues

Cannot Register Sensor via AutoAdd

1. Make sure the Point Sensor has been configured using the Point Sensor Utility (make sure the Point Sensor Utility has been configured properly). Reconfigure the Point Sensor using the Point Sensor Utility.
2. Make sure the Point Sensor and the Link Manager are using the same Hop Table setting. The default is 3.
3. Make sure the AutoAdd mode is enabled. The Link Manager will display the line "AutoAdd: *xxxx* seconds" if AutoAdd mode is enabled. If AutoAdd mode is disabled, no sensors will be added via radio.
4. Make the sensor is turned on.
5. The sensor can only be added if the service button is pressed or magnet swiped.

Sensor is Registered But Only the Beacon Packet is Being Received

1. The Point Sensor may not have been configured properly. Use the Point Sensor Utility to configure the sensor making sure the Utility is configured properly.
2. Make the Link Manager antenna and the sensor antenna are installed properly. Temporarily bring the sensor closer to the Link Manager.

Not Receiving Any Packets from the Sensor. Sensor Is Offline.

1. The Point Sensor is out of range. Temporarily bring the sensor closer to the Link Manager. Readjust the sensor's antenna. Remove obstacles that might be interfering with the sensor radio.
2. The Point Sensor might have powered off.
3. The Point Sensor's batteries might have been exhausted.
4. The Point Sensor's transmit period might have been changed either using the Utility or over the air.

Point Sensor Sends Packets Only When Service Button is Pressed.

1. The Point Sensor's transmit period may have set to a large value than expected either through the Utility or over the air.

Delivery Issues to the Host Application

1. Destination Status Always Indicate Timeout
2. Verify that the Destination hostname or IP address is valid.
3. Verify that the Destination hostname or IP address is routable. Is there a firewall blocking UDP traffic for example. Try to ping the host PC.
4. Is the Host Application listening on the Destination port? Is there a software firewall that is blocking traffic?
5. Verify the Link Manager IP address settings. Make sure the gateway address and the DNS address (if hostname is used) is correct.

Connection Issues

Discover cannot find the Link Manager

1. The Link Manager may not be attached to the same subnet as the computer running the Discover Utility.
2. The ports 6767 or 6768 may be used by another application or blocked by the operating system.
3. Obtain the Link Manager's IP address via the serial port using the IP command.
4. Is the Link Manager powered and connected to the network? If set to dynamic IP address, is there a DHCP server in the network.

UDP Packet Formats

UDP Discovery Request

Identifier		Cmd	
0	1	2	3
C3	3C	00	00

UDP Discovery Response

Identifier		Cmd		Data
0	1	2	3	4
C3	3C	00	01	*XML String*

Where: *XML String – has this schema*

<DISC>

<ID>DeviceName</ID

<Type>DeviceType</Type

<NoSens>NumOfSensors</NoSens>

<IP>IPAddr</IP>

<CmdP>CommandPort</CmdP>

<HP>HTTPPort</HP>

<UDPP>UDPPassThruPort</UDPP>

<Mac>DeviceMAC</Mac>

<Loc>Locator</Loc>

<Ver>Version</Ver>

</DISC>

Where:

DeviceName – name assigned to the device. For Link Manager, it is the name settable with the "CDS" command.

DeviceType – for Link Manager this will be "PM". For an application this will be "APP".

NumOfSensors – number of sensors for the device

IPAddr – IP address of the device

CommandPort – TCP/IP port that responds to Link Manager commands. (typically port 1000)

HTTPPort – port where the Link Manager will respond to HTTP requests.

UDPPassThruPort – port to receive UDP PassThru packects. If the devices does not want to receive UDP PassThru packets, then the device will set *UDPPassThruPort* to 0.

DeviceMAC – MAC identifier of the device

Locator - character that represents where a sensor packet entered the repeater network. (" ", "a"-"z" and "A"-"Z").

Version – firmware version of the device

UDP PassThru & Wifi Sensor UDP Packet

Point Six Wireless Wifi sensors send a standard sensor packet contained in a UDP wrapper. This UDP wrapper contains information about the sender. See the document "**Point Six Wireless Transmitter Packet Data Specification**" for information about the standard sensor packet. Wifi sensors normally send UDP packets with a command of 2. The Wifi Sensor Utility has a mode where it will send UDP packets on behalf of a sensor using command 5. The host application (like Link Managers, OneSix OPC Server or other applications) will respond with the UDP Host Acknowledgment packet. The acknowledgment packet allows the Wifi Sensor Utility to confirm that a host is receiving the UDP packets.

Identifier		**Cmd**		**Data1**						**Data2**				
0	1	2	3	4	6	24	32	33	34	63	64	67	70	72
C3	3C	00	*Cmd (1)*	*PktCnt* (2)	*MAC* (18)	*Reserved* (8)	*Locator1* (1)	*Locator2* (1)	*Sensor Pkt* (29)	*Org (1)*	*Transmis-sions (3)*	*Max Transmis-sions (3)*	*Period (2)*	*Reserved (3)*

Where

C3 3C - 2 byte identifier

Cmd – (1 bytes) Command: 2 – UDP Sensor Data; 5 – UDP Sensor Data asking for host ack.

PktCnt^{+} – (2 bytes) packet count. The device will increment this count every time it transmits a UDP PassThru packet.

MAC – (18 bytes) device MAC address. If the MAC address does not apply this field will contain a unique identifier for the device. If not used, this field will be set to all zeros. (ex: "00:23:b4:39:03:47") (NULL terminated)

MediaDest – (8 bytes) specifies what media the Link Manager will send the sensor packet (Sensor Pkt) to. The Media Designations are listed below and placed consecutively. If no Media Destinations are specified the field will contain a single NULL and the sensor packet will be sent to those media that are in Pass-Thru mode. Example: "TSR"

Locator1 – character that represents where a sensor packet entered the repeater network. (" ", "a"-"z" and "A"-"Z"). Normally set to NULL(0) for Wifi sensors.

Locator2 - character that represents where a sensor packet entered the repeater network. (" ", "a"-"z" and "A"-"Z"). Will be identical to Locator1. Normally set to NULL(0) for Wifi sensors.

Sensor Pkt – (29 bytes) sensor packet. (includes the CR terminator) Set to all 0's (NULL) if no sensor packet is received in 30 seconds. See the document "Point Six Wireless Transmitter Packet-Data Specification" for more information about specific sensors.

Org – originator type that generated the packet. 0 – Wifi Sensor; 1 – Link Manager; 2 – Ethernet Point Repeater; 3 - Application

Transmissions[+] – (3 bytes) number of transmissions since last reset. 0 for UDP PassThru packet.

Max Transmissions[+] – (3 bytes) maximum number of transmissions for the power source (0 to 16777216 where 0 is unlimited) 0 for UDP PassThru packet.

Period[+] – (2 bytes) transmit period in seconds. 0 for UDP PassThru packet.

Reserved – (3 bytes) set all bytes to 0.

[+] Most significant byte is first.

Estimated Battery Life Percentage = 100 – *Transmissions/ Max Transmissions**100

Estimated Battery Expiration = (*Max Transmissions – Transmissions)* Period*

Note: UDP Sensor Packets that include only Data1 are 63 bytes. UDP Sensor Packets that include Data1 and Data2 are 75 bytes. Older sensors contained Data1 but not Data2. Newer sensors include Data1 and Data2.

UDP Host Acknowledgement

Identifier		Cmd	
0	1	2	3
C3	3C	00	06

Where

C3 3C - 2 byte identifier

00 06 – (2 bytes) UDP Host Acknowledgement

UDP Set Destination

Identifier		Cmd		Data
0	1	2	3	4
C3	3C	00	04	*Destination String*

Where: *Destination String* - takes the form: *ipaddress*[:*port*]

Where:

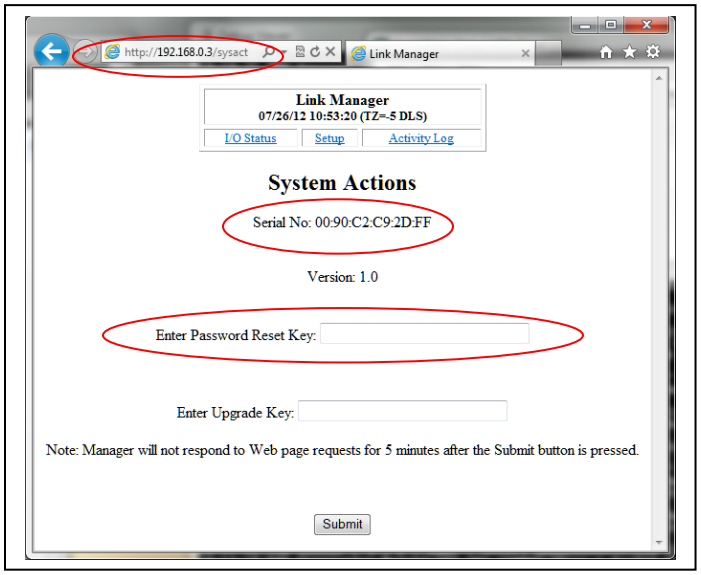
ipaddress – destination IP address in dot form

port – optional destination port address. ":" must delimit the IP address and the port number

Reset Password

If you do not know the passwords for the Link Manager, you can clear the passwords by following this procedure:

1. Go to the System Actions page. Add "/sysact" to the end of the IP address in the Address Bar (URL) of your web browser (ex. http://192.168.0.3/sysact).



2. Send the Link Manager's Serial No (MAC address) to your dealer. Your dealer will create a password reset key.
3. Enter the password reset key and click Submit. Link Manager will clear the passwords.

Note: the only change to the Link Manager is the clearing of the passwords.

Ethernet Firmware Download

Overview

The Link Manager firmware can be upgraded using the Ethernet connection. The process takes less than a minute to complete on a LAN and 3 to 5 minutes on a WAN or across the internet.

A Microsoft Windows PC utility is used to perform the firmware download. The Link Manager must be accessible to the utility on the network LAN. Both the TCP/IP Command Port (typically located at port 1000 by default) and the Ethernet Download UDP port at 2000 must be accessible. Typically the Link Manager and the utility must be located on the same LAN or accessible via a VPN connection. If trying to upgrade the Link Manager from behind a firewall, changes to the firewall setup may be needed to allow communications.

Preparation

1. Confirm that communications with the Link Manager is possible.
2. Obtain the IP address and the MAC address of the Link Manager. Send the MAC address to your dealer. The dealer will generate a Security Code. The Security Code is used to enable the Link Manager for Ethernet firmware download mode. Once the function is enabled, all Link Manager functions except for communications and command processing are disabled. Use the Discover tool to obtain the IP and the MAC address or access the System Actions page (ex: http://192.168.1.55/sysact). You can also connect through one of the media and issue "IP" command to get the IP address and "CDR" to obtain the MAC address.
3. **IMPORTANT: The Link Manager setup will be reset to factory defaults except for the communication parameters.** After the Ethernet firmware download process is completed, the Link Manager will have to be reconfigured. Save the Link Manager setup before implementing the Ethernet firmware download process or confirm that the Link Manager setup has been saved in your application.

Procedure

1. Obtain the IP address, MAC address and Security Code. (Obtain the Security Code from your dealer).
2. Confirm that the Link Manager setup parameters are saved by your application
3. Enter the Security Key (choose one of the following):
    a. Access the System Actions page (place "/sysact" after the IP address in your browser: ex. "http://192.168.1.55/sysact"). Enter the Security Code in the "Enter Upgrade Key" and click Submit.
    b. –Or- Use the Security Code and enable the Ethernet firmware download function by sending the "11S" command.

        11S*enabledtime*,*securitycode*

    Where

enabledtime – (ddhhmmnn) amount of time in seconds the Link Manager will be enabled to accept the Ethernet firmware download.

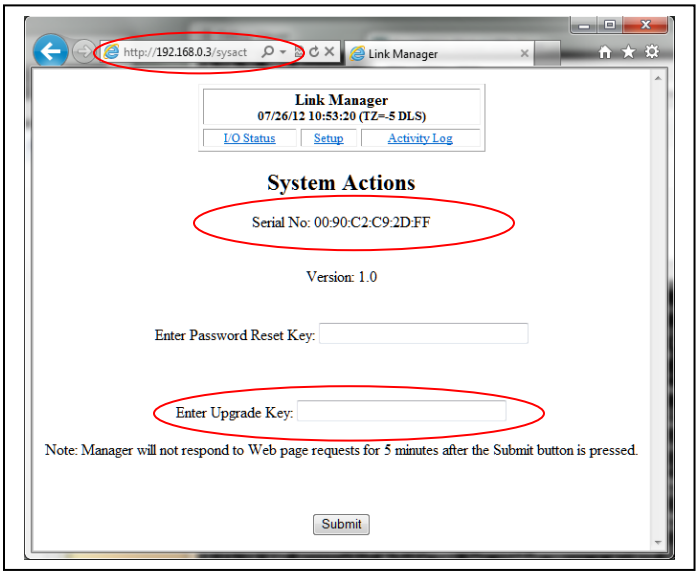
securitycode – 16 character string obtained from your dealer.

```
Command:    11S00001500,A07C10492EC7301F
Response:   11S00001500
```

4. At the PC, start the program "LMFirmwareDownload". If the utility finds the Link Manager, an entry will appear in the center main window like:

"Link Manager 00:90:C2:C9:2D:FF; Link Manager 1.0 PI=129.168.1.55:2000".

5. If no entry exists, then select from the menu "Ping/Config" and "Ping Specific IP". Enter the Link Manager's IP address and click OK. Check to see if an entry is present in the main window.
6. Click "Download" from the main menu. The utility will attempt to download the firmware. The download is successful when the utility finishes showing the two progress bars and displays the message "Download complete" and "Board at xxx.xxx.xxx.xxx is rebooting".
7. Once the download is successfully completed, verify the version number of the Link Manager either by using the Discover tool, accessing the System Actions page or issuing the "IV" command.
8. Reapply your Link Manager setup using your application.



Specifications

Parameter	Value
Power Supply Voltage	5 volts DC regulated
Power Supply Current	600 milliamps @ 5 volts
Receiver Frequency	418/433 Mhz or 900/2.4 Mhz/Ghz
Receiver Range with Sensor	900 feet line of sight for 418/433 Mhz or 3 miles line of sight for 900/2.4 Mhz/Ghz
Ethernet	10BaseT (10 Mhz)
Serial Port	19200 baud, no parity, 8 data bits, 1 stop bit
RS-485 Port	2-wire 19200 baud, no parity, 8 data bits, 1 stop bit
Battery	3 Volt Lithium CR2032 Backup of the SRAM & real time clock: 1.5 years without power (10 years with power)
Number of Sensors	60 sensor

Acknowledgements

Trademarks

Windows is a registered trademark of Microsoft Corporation.

Procomm is a registered trademark of Symantec Corporation.

Glossary of Terms

Auto Add Mode

When in this mode, the Link Manager receives sensor information from a sensor and then automatically appends the sensor to the sensor table with default setup information.

CRC-16 error-checking

An algorithm designed to check for errors in a data stream.

DHCP

***D**ynamic **H**ost **C**onfiguration **P**rotocol*, a protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. In some systems, the device's IP address can even change while it is still connected.

Ethernet

The physical and electrical interface for connecting computers together on a network.

Activity Log

The Link Manager stores events selected by the user in the Activity Log. These events might include changes in sensor values, sensor performance or system performance. events recorded in the Activity Log are stamped with time and date information, and include a message describing the event.

HTML

HyperText Markup Language - fundamental language used in creating web pages.

HTTP

***H**yper**T**ext **T**ransfer **P**rotocol*, the underlying protocol used by the World Wide Web. HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands. For example,

when you enter a URL in your browser, this actually sends an HTTP command to the Web server directing it to fetch and transmit the requested Web page.

Inactivity Timeout

The amount of time the Link Manager will wait for a command before terminating the connection. Inactivity Timeout applies to all media connections. For the local serial ports, Link Manager will automatically log out a user if a command is not received within this time.

IP address

32-bit address usually represented as a series of 4 numbers that uniquely identifies a device that is using the TCP/IP protocol.

ISP

Internet Service Provider - provides the means to interfacing to the Internet.

MAC

The MAC address is permanently part of the Link Manager cannot be changed and is unique for all Ethernet interfaces.

Name Server

A function that provides the service of translating a domain name to an IP address.

NTP

Network Time Protocol. Protocol that Link Manager uses to get the current time from a time service.

Ping

TCP/IP diagnostic utility used to determine if connection with another TCP/IP host is possible.

RS232

Standard electrical interface used for serial ports.

Sensor

900 Mhz wireless transmitter

Sensor Age

The amount of time since the Link Manager has received a data packet from the sensor.

Sensor I/O point(s)

I/O points collect or contain measurable values such as temperature, identification, count, etc.

Sensor Table

Each row in the sensor table contains a sensor's current readings, event states and setup information. Commands either read or set information to and from the sensor table.

Service

Point transmitters have a Service button that when pressed forces the Point sensor to transmit its readings.

SNTP

Simple Network Time Protocol. Protocol that Link Manager uses to get the current time from a time service.

TCP/IP

Transmission Control Protocol. TCP is one of the main protocols in TCP/IP networks. Whereas the IP protocol deals only with packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent.