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INTELLILOGGER CELLULAR MODEM CONFIGURATION

APPLICATION NOTES

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OVERVIEW

These notes are designed to provide a quick guide to setting up and using the IntelliLogger (logger) and the accompanying HyperWare software when using these in conjunction with an Airlink Raven-E or Raven-X cellular modem. Note that this application note also applies to Airlink Pinpoint-E and Pinpoint-X cellular modems (similar products but equipped with GPS features).

When using this configuration, users can set up the logger to connect to the Internet and send emails, send data to an FTP server, or simply connect from a computer to the logger to view its status or configure it.

SUPPORTING DOCUMENTATION

This document used in conjunction with the Cellular Modem User Manual (from Sierra Wireless) and the IntelliLogger User Manual should enable activation and configuration of the CP-62-V (which is the LBI Part Number for the Raven-X) Cellular Modem. The IntelliLogger User Manual is provided on the CD that accompanies the IntelliLogger at time of purchase.

For reference, the Cellular Modem User Manual should be downloaded from the Sierra Wireless Website:

http://www.sierrawireless.com/support/

As of this writing, the User Manuals, software utilities, etc can be downloaded specifically from the following URLs. Note that this path may change as Sierra updates their Website:

Alltel CP-62-A For EV-DO networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=3,23,1,1

Bell Mobility CP-62-B For EV-DO networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=5,23,1,1

AT&T / Cingular CP-62-C For HSDPA networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=4,24,1,1

AT&T / Cingular CP-62-C For HSUPA networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=4,55,1,1

Rogers CP-62-R For HSDPA networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=11,24,1,1

Rogers CP-62-R For HSUPA EMEA networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=11,37,1,1

Sprint CP-62-S For EV-DO networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=13,23,1,1

TELUS CP-62-T For EV-DO networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=17,23,1,1

Verizon Wireless CP-62-V   For EV-DO networks:
http://www.sierrawireless.com/support/show_support_and_downloads.aspx?id=19.23.1.1

In the event that any of the above links do not work, the information is under the Support and Downloads menu. Select the Carrier (Verizon for the CP-62-V) and the product model Raven-X. This should then route to a download page where the desired documentation and utilities can be accessed.

CELLULAR MODEM ACTIVATION

Prior to commencing modem and IntelliLogger configuration for cellular and Internet connectivity, the cellular modem must be activated on the cellular network.

Data Plan

To activate the cellular modem, contact the cellular network provider and set up a Telemetry / Data plan (i.e. NOT a voice plan). As the CP-62-x modem is purchased specific to a particular cellular provider network (e.g. Verizon, Sprint, etc as specified by the -x suffix in the part number), it is critical that the modem and cellular network match.

In procurement of a data plan, the ESN # on the cellular modem label will be required.

Modem Activation

Once the plan has been purchased and the username, password and modem 'phone' number are known, the modem antenna should be connected and the modem powered up. At this time, the modem will enter into an 'over the air service provisioning' sequence (OTAPS) in which the modem will use its ESN to contact the network and register with the purchased account. Upon successful activation, the 'Network' LED on the front of the modem will light.

If the OTASP process should fail and the Network LED does not light **steadily** after a few minutes, it may be necessary to manually activate the modem. To perform this process manually, refer to the procedure defined in Section 3 of the Raven-X User Guide, which can be downloaded from the www.sierrawireless.com Web site.

MODEM IP SETUP USING ACE MANAGER

In order to configure your modem you will need to download and install the Ace Manager software from the Sierra Wireless website, www.sierrawireless.com. Once you have the software installed you will use it to connect to the modem and configure it for use with the logger.

There are two communications methods that can be used to connect to the modem, RS-232 and Ethernet.

RS-232 Connection (PPP)

1. If your PC has a serial port, this is the recommended connection method for modem configuration. To connect via RS-232, connect the modem to your PC's serial port and follow the following steps:
2. Launch the Ace Manager software.
3. Click on the Connect button
4. Select PPP.
5. Select the correct port number. Note: leave the other fields in the connection dialog box unchanged. Note: the default password is 12345.
6. Click OK.
7. Once the connection is established, proceed to the section titled "Configuring the modem for use with the logger" below.

Ethernet Connection

If your PC does not have a serial port, an Ethernet connection must be established. This requires a few more steps than an RS-232 connection. By default, the modem is configured to act as a DHCP server. This means that the modem wants assign an IP address to the PC as soon as a connection is established between the two. In order for this to work properly, the PC must be configured to accept its IP address from the modem.

To connect to the modem via Ethernet, connect an Ethernet cable between the modem and the PC and follow the following steps:

1. Open Control Panel in windows.
2. Select Network Connections
3. Right click on Local Area Network and select properties.
4. Select Internet Protocol (TCP/IP) and click the Properties button.
5. If "Use the following IP Address" is selected. Write down the IP Address, Subnet Mask, and Default Gateway settings. These will be temporarily changed, but will need to be set back to the original settings. If "Obtain IP address automatically" is selected, proceed to step 8
6. Select "Obtain IP address automatically"
7. Click Ok.
8. Launch the Ace Manager software.
9. Click on the Connect button
10. Select TCP.
11. Enter 192.168.0.100 as the IP address. Leave the password unchanged. Note: the default password is 12345.
12. Click connect.
13. Once the connection is established, proceed to the section titled "Configuring the modem for use with the logger" below.

CONFIGURING THE CELLULAR MODEM FOR USE WITH THE LOGGER

Once a connection between the modem and the PC running Ace Manager has been established, select PPP/Ethernet from the list on the left side of the screen in Ace Manager. Adjust the modem's settings as described below.

Figure 1; PPP/Ethernet Page

1. Set HOSTPRIVATEMODE to 1.

This is required to put the modem in the proper mode to communicate with the logger.

2. Set HOSTPRIVIP to match the loggers IP address

When connecting to a logger that is connected to the modem, the modem needs to know the IP address of the logger in order to forward messages to it. This address is known as the private IP address. This private IP address must be assigned in the modem configuration to match the logger as shown. In this example we've chosen 192.168.13.101 as the loggers address (to be set into the IntelliLogger later). Since the modems default address is 192.168.13.31 these two are compatible addresses. In reality 192.168.13.x will work as long as x does not match the modem's x (in this case 31).

3. Note the HOSTPEER IP address.

Also take note on this configuration page that the Modem Local IP address is defined as 192.168.13.31 by default. This is the IP address that devices (such as the logger) inside the local area network can use to communicate with the modem. This IP address is also known as the "Default gateway" (since the IntelliLogger uses the modem as a "gateway" to the internet) and will be used when configuring the logger.

4. Set the HOSTNETMASK

The Host network mask must also match the settings used by the logger, so this should be changed to 255.255.255.0

5. Keep Alive Ping

Cellular providers may shut down the network connection of modems that have not communicated in a long period of time. This may mean that incoming connections to the modem may not immediately be connected. To prevent this, there is an option to use called 'Keep Alive Ping', which periodically sends a test out to the Internet to verify the connection, re-establishing it if necessary.

On the "Other" page in Wireless ACE, the *IPPING setting should be set to a value of 60 (units are minutes) to enable this feature, and *IPPINGADDR should be set to the IP address or URL of a reliable website that will be used to verify Internet connectivity.

With the above settings completed, once every 60 minutes, a test message will be sent to the site (or IP address) specified which will maintain continuous Internet connectivity.

6. Dynamic DNS (optional setting depending on application requirements)

Dynamic DNS is required in order to connect to the logger over the Internet via the cell modem. It is not required if the cell modem is only going to be used for logger originated outgoing communications (e.g. FTP and Email)

Each time the cell modem powers up and automatically registers with the cellular network, it receives an IP address from the cellular network. This IP address most likely will NOT be the same each time the modem joins the cellular network. In order to establish communication from HyperWare-II and/or a Web browser to the logger this IP address must be known.   If this address never changed this would not be a problem. However, the address is very likely to change from time to time, especially after a modem power cycle.

The system used to allow a connection to a logger/modem system with a changing IP address is called Dynamic DNS. DNS is essentially a big look-up table relating an Internet connected device Name and its current IP address. As long as the table is current, the IP address of an Internet connected device can change but it can still be accessed via the static name.

To enable Dynamic DNS, select the "Dynamic IP" page in Wireless ACE.

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Figure 2; Dynamic IP Page

*MODEMNAME should be set to a unique DNS name. This name must be globally unique to avoid conflict with other modems that may be using the same name.

*DOMAIN should be set to *eairlink.com* to use the default domain.

*IPMANAGER1 setting should be changed to *edns2.eairlink.com*

*IPMGRUPDATE1 should be set to a value of *60*.

Once these settings are made, the modem (and therefore the logger connected to it) can be referred to using the dynamic address from the Name specified. For example if the modem name specified was 'Compressor18', then to connect to the logger from HyperWare, you would use the following URL in place of an IP address:

Compressor18.eairlink.com

By using this Dynamic IP address method, whenever the modem detects that its IP address has changed, the new IP address will be automatically (a modem feature) be communicated to the Airlink DNS server. When attempting to connect to Compressor18.earlink.com, the traffic is routed through the Airlink DNS server and redirected to the current logger IP address.

7. **Write Settings to modem**

Once the settings have been changed, click the Write button to send them to the modem. Ace Manager can be closed, as modem IP configuration is complete and the logger will be configured using HyperWare-II per the following section.

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CONFIGURING THE INTELLILOGGER FOR CELLULAR MODEM USE

The logger must be reconfigured slightly to work with the cellular modem. The modem expects the logger to have a certain IP address to work correctly, so this must be changed if it is not already set.

To change the logger IP address, connect to the logger from a PC running HyperWare-II using your preferred **direct** connection method – this can be serial, USB or Ethernet cable. If you need help with this step, please refer to the HyperWare-II manual.

Enabling Logger Ethernet

Once connected, from the Communications Window in HyperWare-II, double-click on the Logger Configuration/Settings icon (looks like a hammer image) to open the Logger Configuration Dialog. Select the "Communication" tab.

Insure that the "Enable Ethernet (Network)" checkbox has been checked then switch to the "Network" Tab.

Figure 3; IntelliLogger Configuration - Communication Tab

Configuring Logger IP Settings

On the Network Tab page, enter the following information:

1. IP ADDRESS

This address must match the address entered as "HOSTPRIVIP" during modem configuration (from modem configuration steps above).

2. SUBNET MASK

Enter 255.255.255.0

3. DEFAULT GATEWAY

This must be the address contained in the "HOSTPEERIP" during modem configuration. By default this value will be 192.168.13.31

4. DOMAIN

This field is not used and can be left blank.

5. PRIMARY SERVER AND SECONDARY SERVER

Enter the current addresses of the DNS servers. These addresses can be found by clicking the *DNS* menu link on the left side of the window. At the time of this writing, these values for Verizon are 66.174.92.14 for the Primary Server and 69.79.96.14 for the Secondary Server.

The values shown in the image below are addresses of alternate DNS servers that are publicly available on the Internet. At the time of this writing these servers are available and working well. However, this is not guaranteed to be the case in the future hence it is advised to use the Verizon DNS Server addresses first mentioned.

Figure 4; IntelliLogger Configuration - Network Tab

6. HTTP PORT

Conventionally, all HTTP communications (e.g. Web page communication) is routed through a software communication port within equipment and applications identified as

'Port 80'. Some cellular providers disable Port 80 communications to prevent heavy traffic (i.e. Web page content) from congesting their networks.

To work around this problem and assuming that it is desired to access the IntelliLogger via a Web browser, the HTTP Port setting should be changed within the IntelliLogger. The Port that the IntelliLogger is to use for HTTP type communications is specified in the Network tab of the Logger Communication dialog under "Advanced Network Settings".
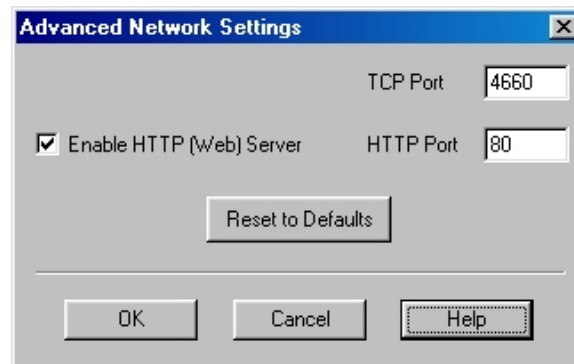

Figure 5; IntelliLogger Configuration - Network Tab - Advanced Network Settings

The HTTP Port can be set to 8001 which can then be specified when accessing the IntelliLogger with a browser (details below)

7.   SEND THE CONFIGURATION TO THE INTELLILOGGER
After entering the above logger IP settings, click the "Send to Logger" button at the button of the dialog which will write these settings to non-volatile memory within the logger.

At this point, the logger should be configured in a way that is compatible with the cellular modem. Notice that in the above settings we did not select the "Enable modem" checkbox on Communications tab – this is because the cellular modem behaves more like a network router than a dial-up modem. You don't need to worry about the details of this, however it is an important distinction.

8.   CYCLE THE MODEM POWER
Power to the modem must be turned off/disconnected and then turned back on/reconnected before it can be used. This is required for the network and the modem to register its addresses and name on the DNS server. This process typically only takes a few minutes to complete but could take as long as an hour so the modem may not work right away.

CONNECTING THE MODEM TO THE INTELLILOGGER

The Airlink modem is configured to register with the cellular network automatically after power-up and maintain this connection permanently without needing to have the logger connected.

Connect the antenna to the mating coax connector on the back of the modem. Omni-directional antennas should be oriented vertically for best performance. Yagi type directional antennas will need aiming.

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Connect the modem to the logger using the special "crossover" Ethernet cable provided.

Note that this crossover cable is not the same as a normal Ethernet cable connecting computers to a LAN via a hub or switch, the wiring is slightly different. Typically, cross-over cables are marked accordingly. If there is doubt, procure a known cross-over cable as the modem/logger configuration will NOT work if a standard cable is used.

Connect one end of the crossover cable to the 10/100 port on the rear of the modem, and the other end of the cable to the Ethernet port of the logger.

> **Caution:** Note that the BBus connector on the IntelliLogger will also accept the standard RJ-45 type plug on Ethernet cables. Insure that the cable is plugged into the connector labeled "Ethernet" and NOT into the BBus socket.

Connect the power source to the modem mating connector. The PWR LED on the front panel should illuminate as soon as power is applied, then after a minute or two, the Link LED's should come on indicating a connection and registration to the cellular network has been established.

Figure 6; Raven E Cellular Modem

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Figure 7; Raven X Cellular Modem

ESTABLISHING A COMMUNICATION LINK VIA THE MODEM

After the above modem and logger configurations are complete and assuming that the cellular modem has been activated on your carrier's network with a selected rate plan, communication between a PC and the logger via the cellular modem is possible.

Making a Browser Connection to Logger

Launch a browser (Internet Explorer or Firefox for example) and in the Address bar, enter the following URL:

http://modemname.eairlink.com:8001/

where 'modemname' is the name of the cellular modem as assigned earlier in the Configuring the Cellular Modem, DNS section above. Also, note the colon before and the slash after the :8001/. The 8001 specifies the port to use for the HTTP type communication (as browsers use). This port number needs to specified in the URL if the IntelliLogger HTTP Port setting has been changed from the default Port 80 to this recommended Port 8001 per the Logger Configuration section above. Note that if using the default HTTP port of 80 (as defined in the logger's advanced network settings) then the **:8001** suffix is not required. Using the colon followed by a port number is only required when not using the default port 80 for HTTP.

After a few seconds, you should see something similar to the following screen, displaying the status of the logger. This web page is actually being served from inside the logger and is using the HTTP connection. The "http:// " in the address indicates this is a http type request to the browser.
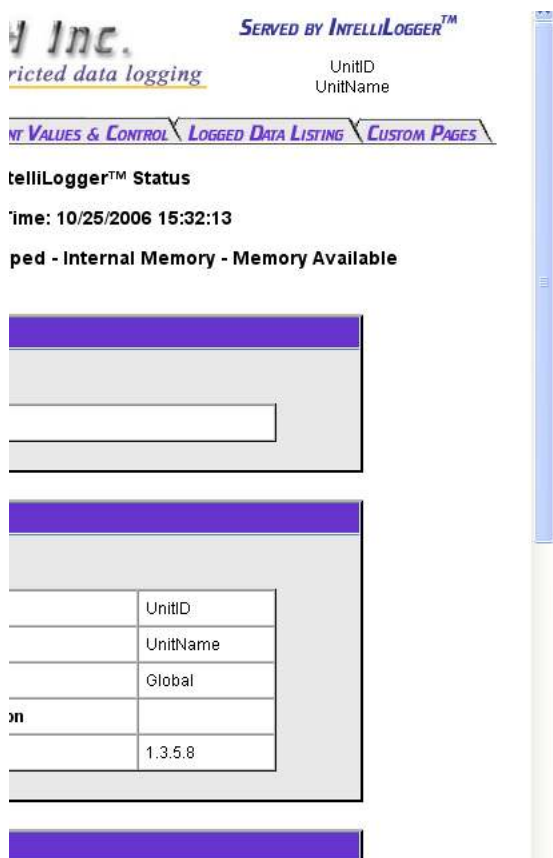
Figure 8; HTTP Connection to the IntelliLogger Via a Modem

Making a HyperWare-II Connection to Logger

From within HyperWare, open the Logger connection dialog, and select "Add" to create a new connection for the cellular modem equipped IntelliLogger .
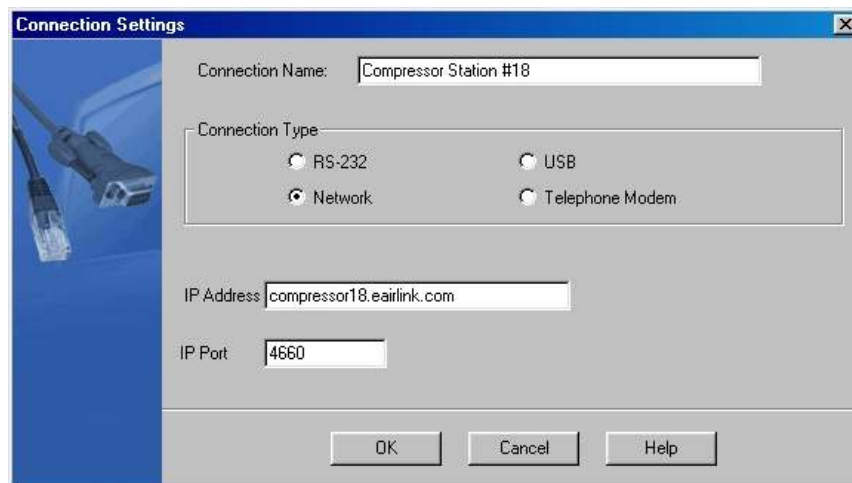

Figure 9; Connection Settings

The Connection Name is only used in the Connection directory and can be any appropriate name. The IP address uses the ModemName.eairlink.com which directs the connection to the DNS server that was described above.

HyperWare-II uses a different protocol (TCP) and port than HTTP for communication with the IntelliLogger. For this reason, the IP Port 4660 is specified and it should match the "TCP Port" specified in the Advanced Network Settings dialog (see above). 4660 is the conventional port for TCP and in most cases will not need to be changed.

Keep in mind that it is possible to reassign both this port and the HTTP port used by the logger as may be required in certain unusual situations per the Advanced Settings dialog within the Configuration/Network Tab as described above.

After entering these settings, click OK to save them, then select the name of the Connection you just created from the Logger Connection dialog and click on the Connect button to establish a connection with the logger. After the connection is made, you should be able to perform all regular functions you would normally be able to do on a logger using any other connection method.

Making a GreenWater Connection

The GreenWater application that accompanies the HyperWare application can be used to view the HTTP (web) status pages in the logger in much the same way as a regular web browser would do, and in addition to this allows access to any custom web pages stored in the logger.

To connect GreenWater to the logger over the cellular connection, use the same connection string that was used in the example given for the browser, namely:

http://modemname.eairlink.com:8001/

This will connect to the logger's initial status page. From here you can navigate to the other pages, including any custom web pages.

If you need help creating custom web pages, please refer to the HyperWare help manual.

EMAIL VIA A CELLULAR CONNECTED INTELLILOGGER

The IntelliLogger can be configured to send emails via the cellular network by use of the Email icon in a Program Network. This section adds some additional information to augment that provided in the IntelliLogger Users Manual. Please refer to the manual as well for supporting documentation.

Configuration Details related to Sending Emails

To allow emails to be sent, an outgoing SMTP mail server must be specified within the logger. This tells the logger where to send emails for routing onto the Internet.

Once connected, from the Communications Window in HyperWare-II, double-click on the Logger Configuration/Settings icon (looks like a hammer image) to open the Logger Configuration Dialog. Select the "Network" tab.

Once on the Network page, click the *SMTP (Email) Settings…* button to open the *SMTP Settings* dialog. Enter the values for your email (SMTP).

The "Use SMTP Authentication" checkbox needs to be checked and the username and password entered. These values are connected to your cellular modem account and can be obtained from your service provider.

After entering these values, click OK to save them, then click "Send to Logger" to update the configuration in the logger.

Making an Email Net

Now we can configure an email icon to test the email connection by going to the "Net Config" screen.
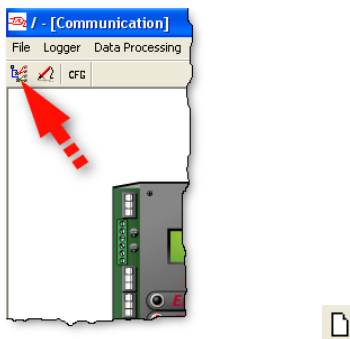

Figure 10; Going to the "Net Config" screen and click Query Logger Configuration button

From here click the Query Logger Configuration toolbar button to scan the logger's hardware before continuing.

Next, drag an Email icon, a Sample Rate Clock icon and a POI icon from the tool palette, then use the two LED icons that appeared after the hardware poll to create the simple net in Figure 11.
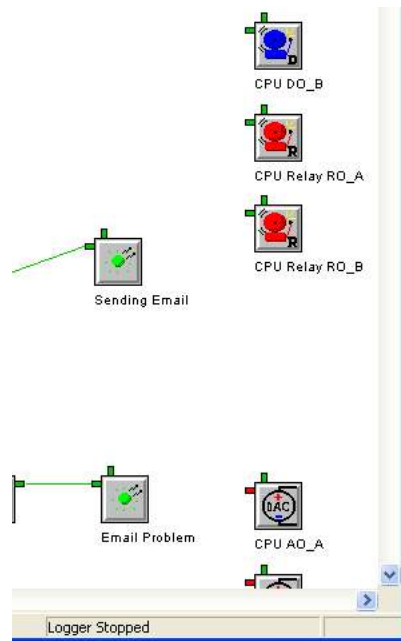
Figure 11; HyperWare-II Program Net

Don't worry about the Sample Rate Clock icon's output not being connected. This is fine. We're not actually using it, but the net needs to have at least one Sampler Rate Clock icon in order to operate.

Configuring the Periodic Output Icon (POI)

Leave the default settings for the Sample Rate Clock (Output Trigger Pulse every one second), but change the settings for the POI as shown in Figure 12. This forces the output of this icon on for 5 seconds, then off for 45 seconds, or in other words, once every 50 seconds there will be an output from this icon. So the result of this net program will send a test email once every 50 seconds.
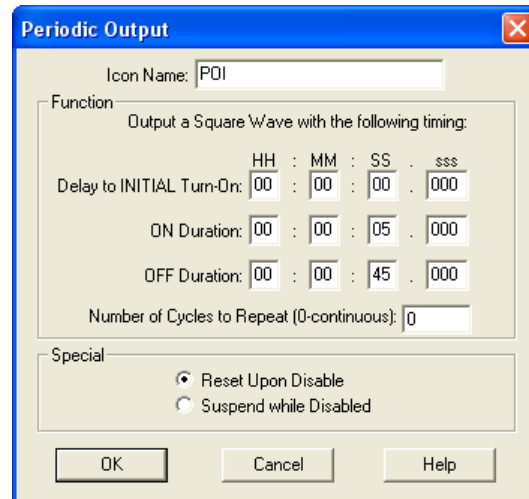
Figure 12; Periodic Output Icon Configuration Dialog

Configuring the Email Icon
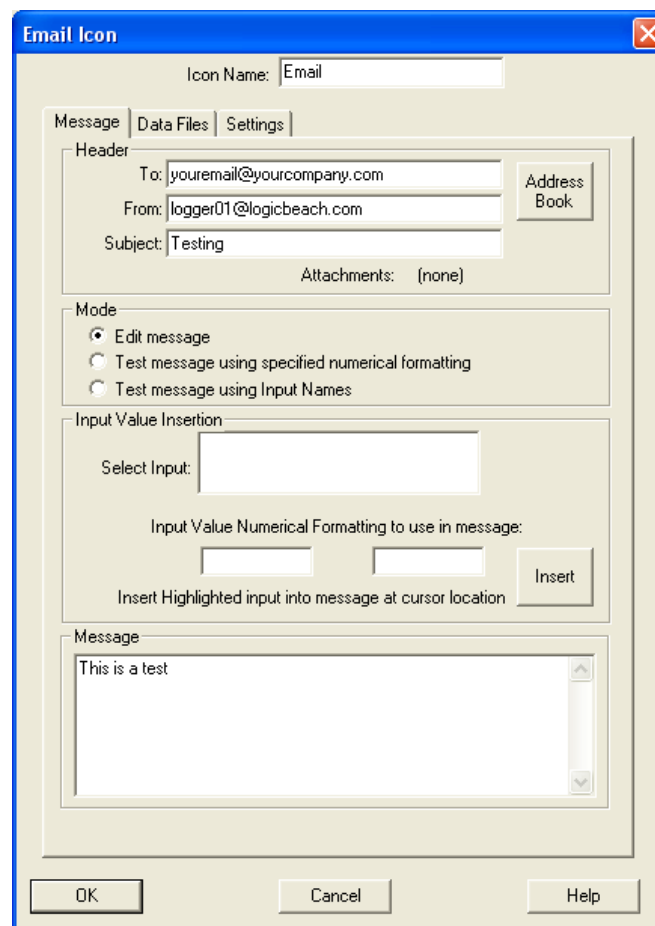
Configure the Email icon as shown in Figure 13.

Figure 13; Email Icon Configuration Dialog

Note that in the To: area you should enter your own email address instead of the dummy one shown in the picture.

The 'From' email address <u>must</u> be a valid email address. Any valid email address can be used.

Because we are sending a simple test email, the subject and Message text simply contain dummy text as shown here, but in a real application this can be tailored to suit your needs.

In a more realistic application, the Data Files tab would typically be used to attach recorded data to these emails, but this is beyond the scope of this simple test – refer to the HyperWare Users Manual for more details. Additionally, actual sampled values can be embedded into the email message using the Input Value Insertion feature. Refer to the IntelliLogger Users manual for details.

The two LED icons do not require any configuration, other than renaming the icons.

Uploading the Net

Once this is complete, you should save the net, then switch back to the main communications screen and send this new net to the logger by dragging the net image from the computer over to the logger.

Figure 14; HyperWare-II Communication Window

Running the Net

Now run the new net by double clicking on the ENABLE button on the logger image and answering Yes when the confirmation dialog appears.

Stopping the Net

After a minute or two you should begin receiving emails. At this point you may want to stop the logger to prevent getting more emails by double clicking on the STOP button on the logger image.

FTP OF DATA USING THE CELLULAR MODEM

FTP is a reliable type of data transfer that has been used across networks and on the Internet for some time. It is particularly useful for sending large amounts of data over networks. The logger is designed to make use of this type of data transfer to send logged information when programmed to do so. This section adds some additional information to augment that provided in the IntelliLogger Users Manual. Please refer to the manual as well for supporting documentation.

Before any data can be sent using FTP, you must ensure there is a suitable FTP server available to receive this data.

FTP servers are typically configured by IT departments within organizations and require some specialized knowledge of the network on which they are connected. Once they are configured, these FTP servers will be given an IP address describing where they are on a network, and also a port number.

In addition to this information, you will generally need a username and password to connect to an FTP server. There may even be a specified directory or folder name to use when storing data.

These questions must be answered before attempting to set up a logger to cater for FTP, otherwise it will not work correctly.

Making a Simple Net

Before sending any data, we need to configure a net to collect data first. We can do this by creating a very simply net from the "Net Config" screen again, click the check hardware toolbar button, just as we did when we made an Email Net earlier.
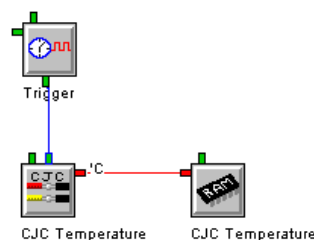

Figure 15; Simple Net

Drag a Sample Rate Clock icon and a RAM icon from the tool palette and use the CJC temperature icon that appeared after the hardware poll to create the net shown in Figure 15. Using the default icon values, this simple net will record the temperature of the on-board CJC every second.

Adding an FTP icon

Now that we have a simple net that records data, we need to add an FTP icon to send this recorded data to the FTP server. Dragging an FTP icon from the tool palette can do this, however we also need to drag a Periodic Output Icon (POI) too so that we can control how often the FTP messages are sent.
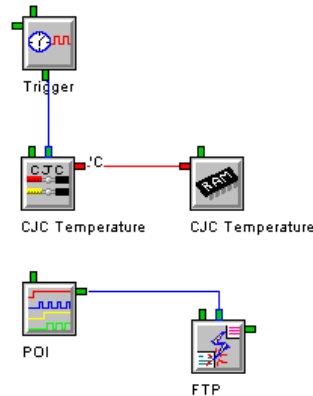

Figure 16; Program Net with an FTP Icon

Your final net should look something like Figure 16. We now need to configure the POI icon and the FTP icon so that they are configured correctly.

Configuring the Periodic Output Icon

We are using the Periodic Output Icon in this instance to control how often the FTP icon sends it's data. Copy the settings shown below to make the FTP icon send data to the server every 50 seconds.
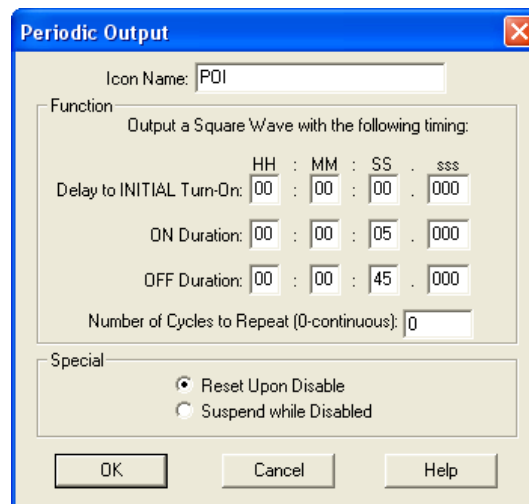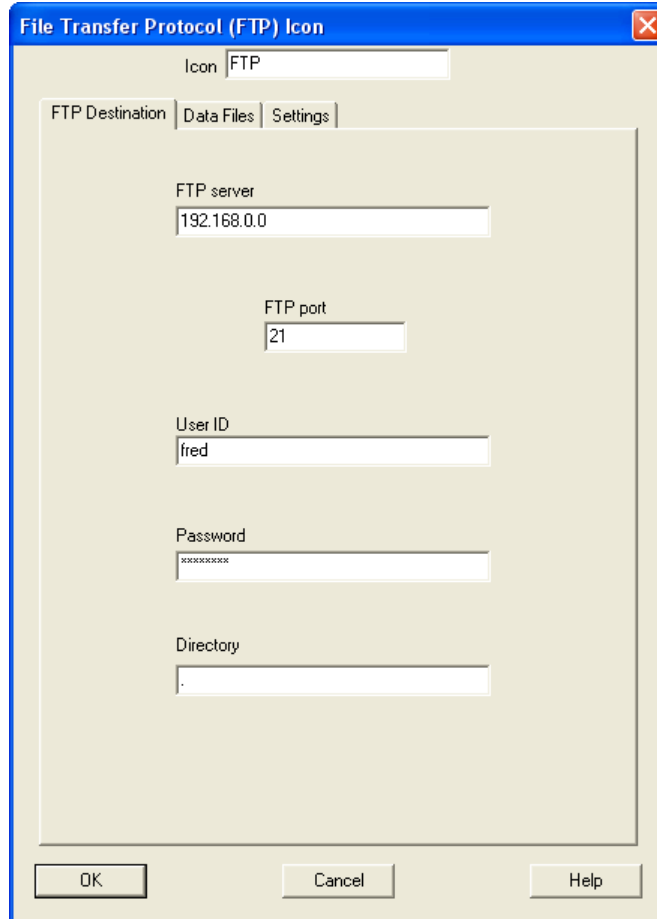

Figure 17; Periodic Output Icon Configuration Dialog

Configuring the FTP Icon

The settings on the FTP Destination tab of the FTP icon should be configured in accordance with your specific FTP server settings. The names and numbers you use will probably not match those shown in Figure 18. You may need to consult with your IT department for specific details.

Figure 18; FTP Icon Configuration Dialog – FTP Destination Tab

Note that the Directory entry shown here is a single period (.) indicating that the directory (folder) to use should be the default login folder.

Data Files Tab

Configure the Data Files tab as shown below. This will essentially send all recorded data since the last successful transfer, so that every 50 seconds the net will send 50 second's worth of data.
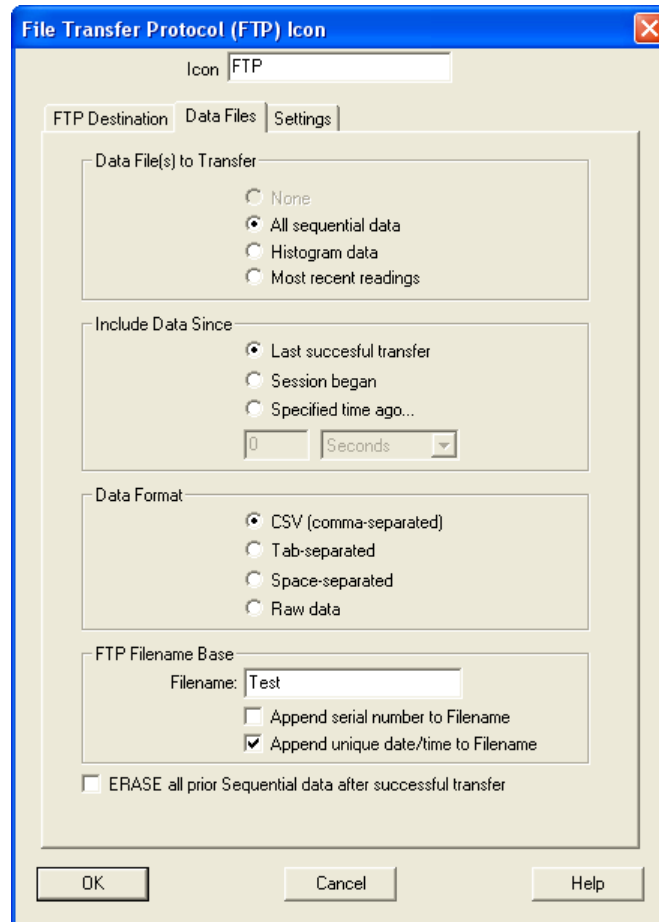
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Figure 19; FTP Icon Configuration Dialog - Data Files Tab

The Filename entry towards the bottom provides a prefix for the filenames that arrive. Appending the unique date/time to the Filename allows you see when the data was recorded.

The Settings tab is not important for this simple test, so can be ignored for now.

Uploading the Net

Once this is complete, you should save the net, then switch back to the main communications screen and send this new net to the logger by dragging the net image from the computer over to the logger.
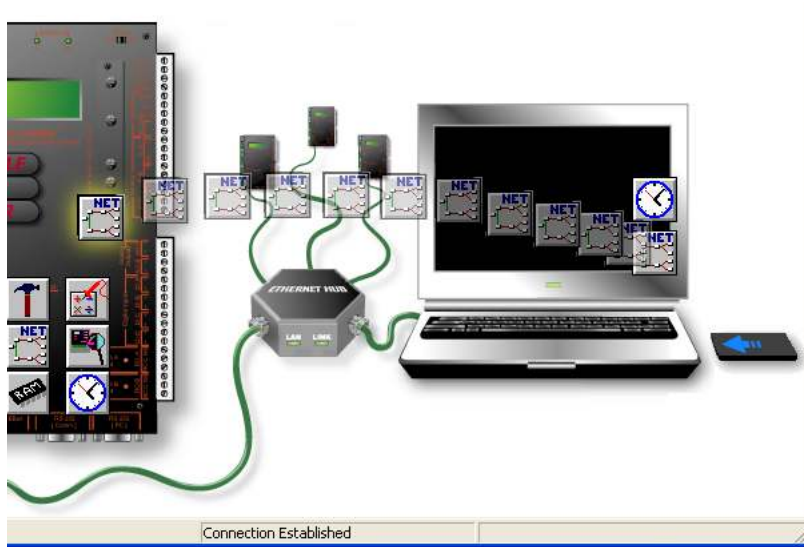
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Connection Established

Figure 20; HyperWare-II Communication Window - Uploading the Net

Running the Net

Now run the new net by double clicking on the ENABLE button on the logger image and answering Yes when the confirmation dialog appears.

After a couple of minutes, you should see data files appearing in the incoming FTP data folder. Your IT department may be able to help you in identifying where to look for this.

Stopping the Net

At this point you may want to stop the logger to prevent getting more FTP data by double clicking on the STOP button on the logger image.

DOCUMENT REVISION HISTORY

2-13-07:	Initial Release
2-20-07:	Added private IP address configuration details
3-13-07:	Added APN, IPPING, and Dynamic IP configuration details
7-18-08tm:	Edited unique to Verizon, Raven E, Pinpoint X, and Raven X supported.
7-24-08dp:	Extensive edits for clarity and various corrections.
7-28-08dp:	Modem activation section added.
4-20-09jds:	Added links to Raven-X modems for other service carriers.
5-18-09jds:	Made edits for accuracy/clarity. Added images. Reformatted to conform with current LBI doc styles.
6-9-09jds:	Made more edits for conformity and uniformity. Added pics and labels. Trying to make this universal.
6-10-09jds:	Replaced some pics and fixed some captions.