

Installation, Operation, and Maintenance

Lifetime Power® Wireless Sensor System

System Overview

The Lifetime Power® Wireless Sensor System provides environmental information to building automation systems (BAS) for HVAC control, lighting control, and other automation functions. The system consists of wireless sensors, wireless repeaters, and wireless gateways.

Wireless Sensor Nodes

The Lifetime Power® Wireless Sensors collect readings of environmental conditions and transmits that data to an access point/gateway which provides the information to a building automation system (BAS).

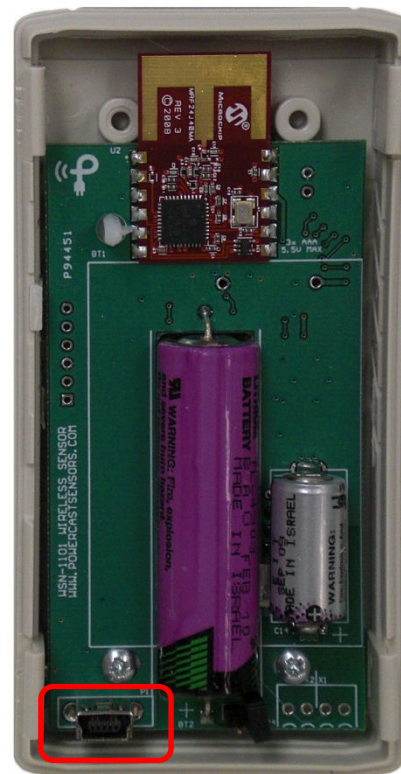
2.4GHz – Each WSN-1101 sensor transmits one packet to the WSG-101 receiver (repeater or gateway) on a pre-designated channel and network. The channel and network ID are programmed by the gateway.

900MHz -Each WSN-1201 sensor transmits two packets at a time, one at a channel on the lower end of the unlicensed 900MHz ISM band, and one on another channel at the upper end. The WSG-102 receivers have the ability to automatically change channels in the event of interference. It is extremely unlikely that both channels will simultaneously be blocked.

Various configurations and sensor types are available. The sensors need to be configured to a gateway prior to use. Connect the USB port inside the enclosure using a USB cable with a mini-B connector to the “Sensor Interface” port on the WSG gateway.



WSN-1x01



USB Configuration Port

Building Automation System Gateway

The WSG Building Automation System Gateway is the device that receives data from the wireless sensor nodes and interfaces to a BAS through industry standard protocols. The gateway is also used to configure the sensor nodes prior to deployment. Each gateway supports 26 Network IDs and 100 wireless sensors. The WSG-101 supports 4 communication channels in the 2.4GHz ISM band.

Installing and Operating a Gateway

The WSG has integrated mounting flanges and can be mounted to surfaces such as wood or drywall with appropriate screws. Avoid mounting the gateway directly to a metal surface as this can affect wireless reception. If mounting on a metal surface is the only option, it is recommended to insert non-metallic material of at least 1/4" between the gateway and metal surface to create a stand-off distance. The gateway can be powered by 24VAC or 24VDC. (**PS-24V-T** 24VDC power supply sold separately.)

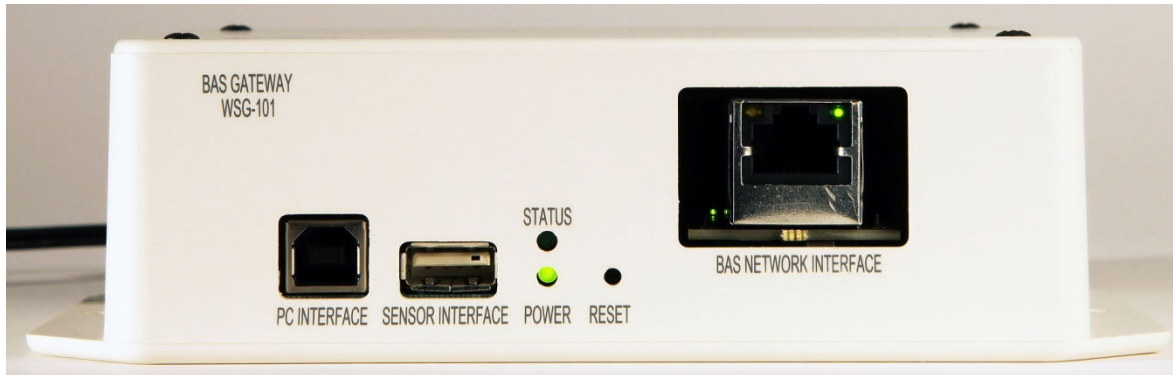
Gateway Configuration

Note - see Appendix A and Appendix B in order to install the USB driver and HyperTerminal. This MUST be completed in order for a PC to communicate to a gateway. Each WSG BAS gateway is pre-configured with a Network ID and a communication channel. The Network ID can be changed as needed, or to configure a gateway as a redundant node for higher availability BAS operation. The gateway is configured through two ports as follows:

| Parameter | Configuration Port |
|--------------------------------------|--|
| Network ID | USB port - "PC INTERFACE" There are 26 pre-set values for the Network ID designated by the letters A-Z. |
| Communication Channel (WSG-101 only) | USB port - "PC INTERFACE" There are 4 communication channels designated by numbers 1-4. (The channels are based on the IEEE 802.15.4 standard.) |
| Sensor Binding | USB port - "SENSOR INTERFACE" Sensors are configured (bound) to the gateway through a USB cable from the gateway to the sensor node. |
| Wired Network ID | Ethernet port (models with external RS485 or FTT-10 connector have an internal Ethernet port) |
| IP address | Ethernet port (models with external RS485 or FTT-10 connector have an internal Ethernet port) |

Configuring and Associating a Wireless Sensor Node to a BAS Gateway

A wireless sensor node must first be configured and associated to a particular gateway (access point) before data will be received by that gateway. This is a simple procedure that only takes a few seconds per sensor node. The items that are configured are Network ID and Sensor ID, and these items are automatically assigned by the gateway.



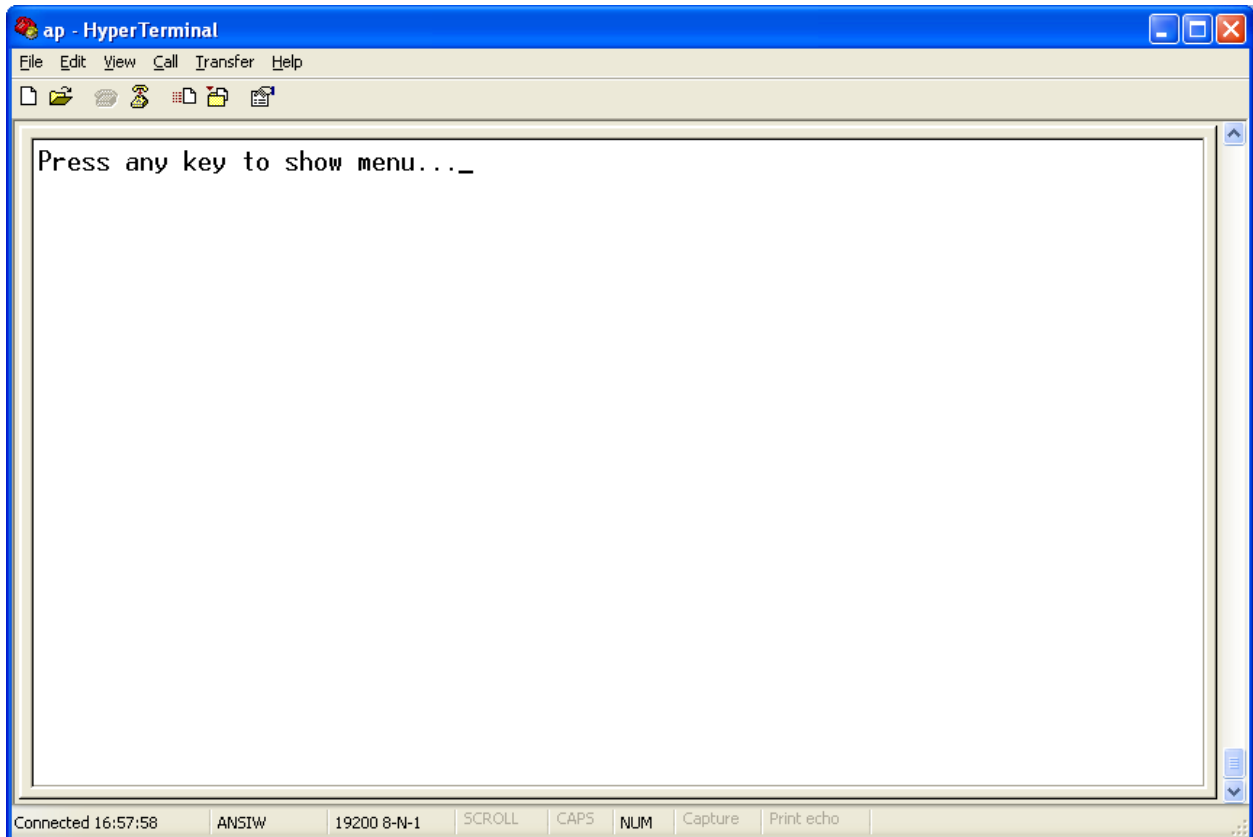
WSG Gateway – Interface Ports and Status LEDs



WSG Gateway – Power Connector

Welcome Screen

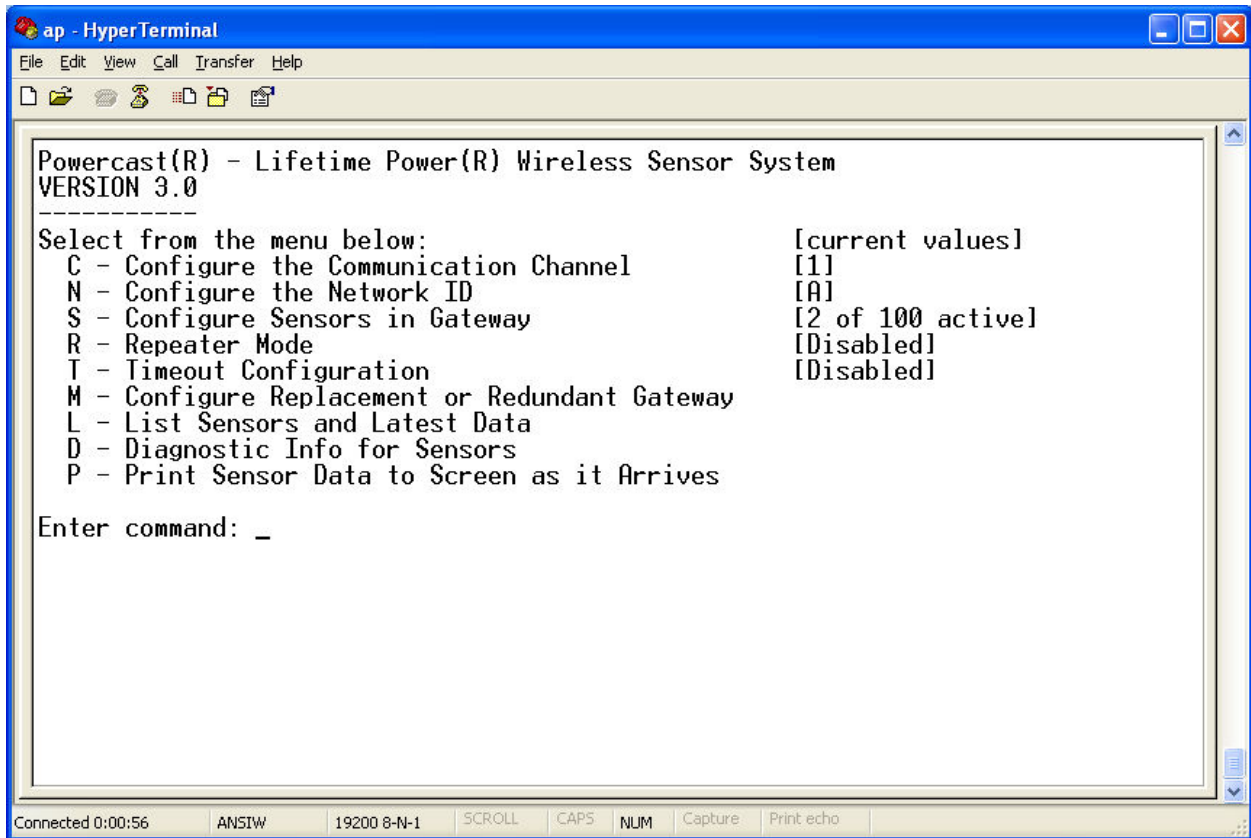
When the USB driver has been properly installed and HyperTerminal is properly configured, the message “Press any key to show menu...” will display in the HyperTerminal window.



Note – if you see information from wireless packets appearing on the screen and want to see the main menu, type SHIFT+P to cancel “print mode”.

Main Menu – WSG-101, 2.4GHz

When any key is pressed the system menu will appear as shown below. The system menu also provides an indication of the Communication Channel, Network ID, and the number of devices configured to the gateway.



```

ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
Select from the menu below:                [current values]
C - Configure the Communication Channel    [1]
N - Configure the Network ID              [A]
S - Configure Sensors in Gateway          [2 of 100 active]
R - Repeater Mode                        [Disabled]
T - Timeout Configuration                 [Disabled]
M - Configure Replacement or Redundant Gateway
L - List Sensors and Latest Data
D - Diagnostic Info for Sensors
P - Print Sensor Data to Screen as it Arrives

Enter command: _

```

Connected 0:00:56 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

To continue, enter the number shown on the left side of the screen for the desired command.

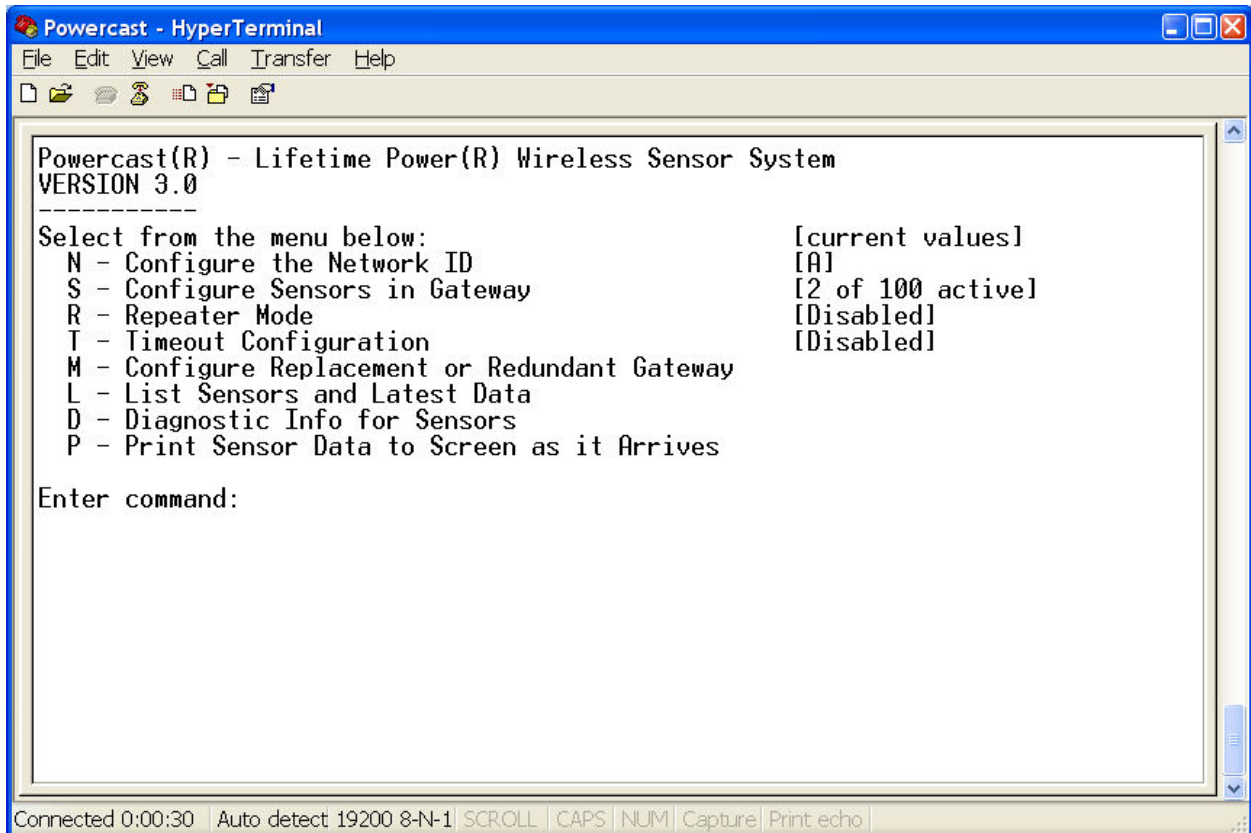
Note – The wired network parameters are not configured through this menu. See the following manual for configuring the wired BAS interface (e.g. BACnet, Modbus, LonWorks)

<http://www.powercastsensors.com/files/WSG-NetworkConfigurationGuide.pdf>

The file is also found on the following page:
<http://www.powercastsensors.com/support/>

Main Menu – WSG-102, 900MHz

When any key is pressed the system menu will appear as shown below. The system menu also provides an indication of the Network ID, the number of devices configured to the gateway, and other settings.



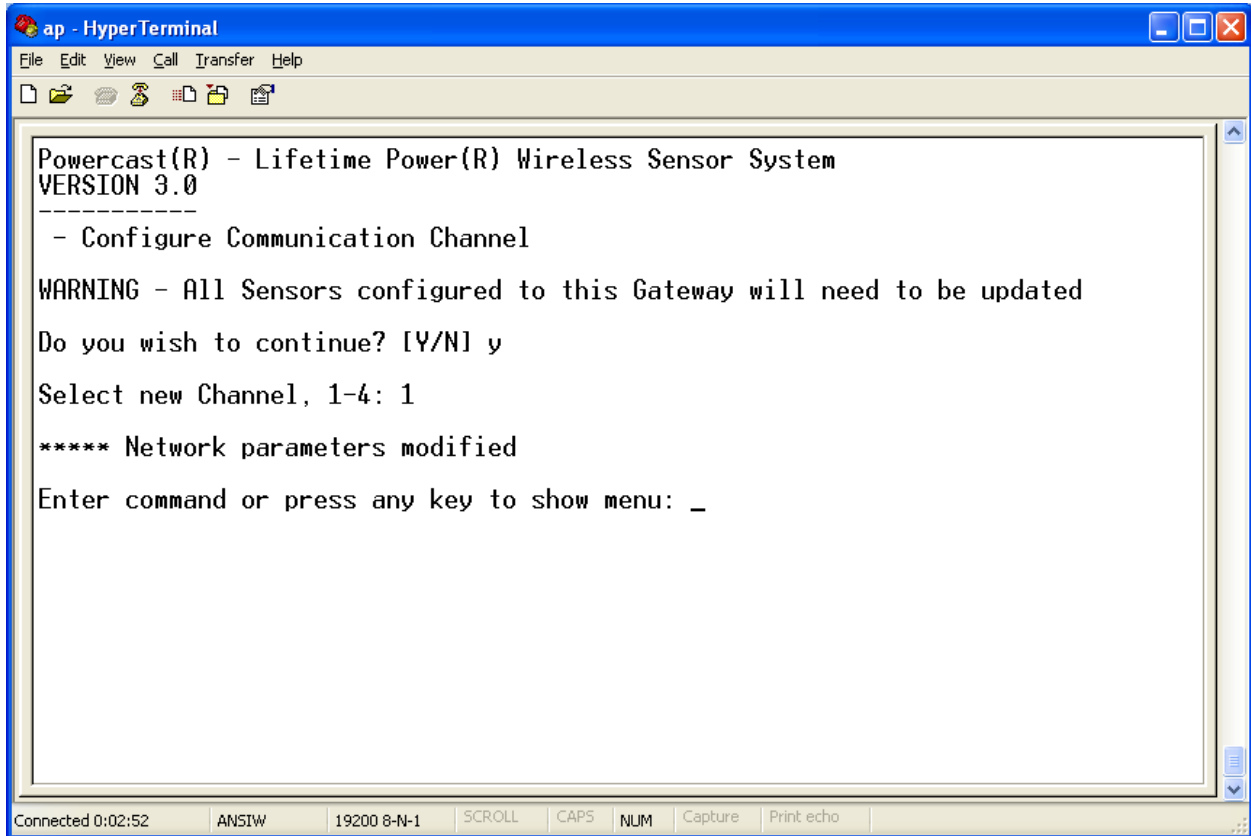
```
Powercast - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
Select from the menu below:
N - Configure the Network ID [current values]
S - Configure Sensors in Gateway [A]
R - Repeater Mode [2 of 100 active]
T - Timeout Configuration [Disabled]
M - Configure Replacement or Redundant Gateway [Disabled]
L - List Sensors and Latest Data
D - Diagnostic Info for Sensors
P - Print Sensor Data to Screen as it Arrives

Enter command:

Connected 0:00:30 | Auto detect 19200 8-N-1 | SCROLL | CAPS | NUM | Capture | Print echo
```

Option C – Configure the Communication Channel (WSG-101 ONLY)

Menu option **C** is for configuring the Communication Channel. Four communication channels are available from which to choose use. The screen capture below highlights the entries needed to change the communication channel.



```

ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Configure Communication Channel
WARNING - All Sensors configured to this Gateway will need to be updated
Do you wish to continue? [Y/N] y
Select new Channel, 1-4: 1
***** Network parameters modified
Enter command or press any key to show menu: _
  
```

The system will warn you about changing channels, and you must select if you want to continue. If you press Y for yes, at the next prompt, press 1-4 to designate your channel preference, and the channel will be immediately changed. If you press N or press any other key, configuration will be cancelled and you will return to the main menu options. Wireless communication for the system is based on 802.15.4 radios (also used for ZigBee devices). The four channels represent the 802.15.4 channels as follows:

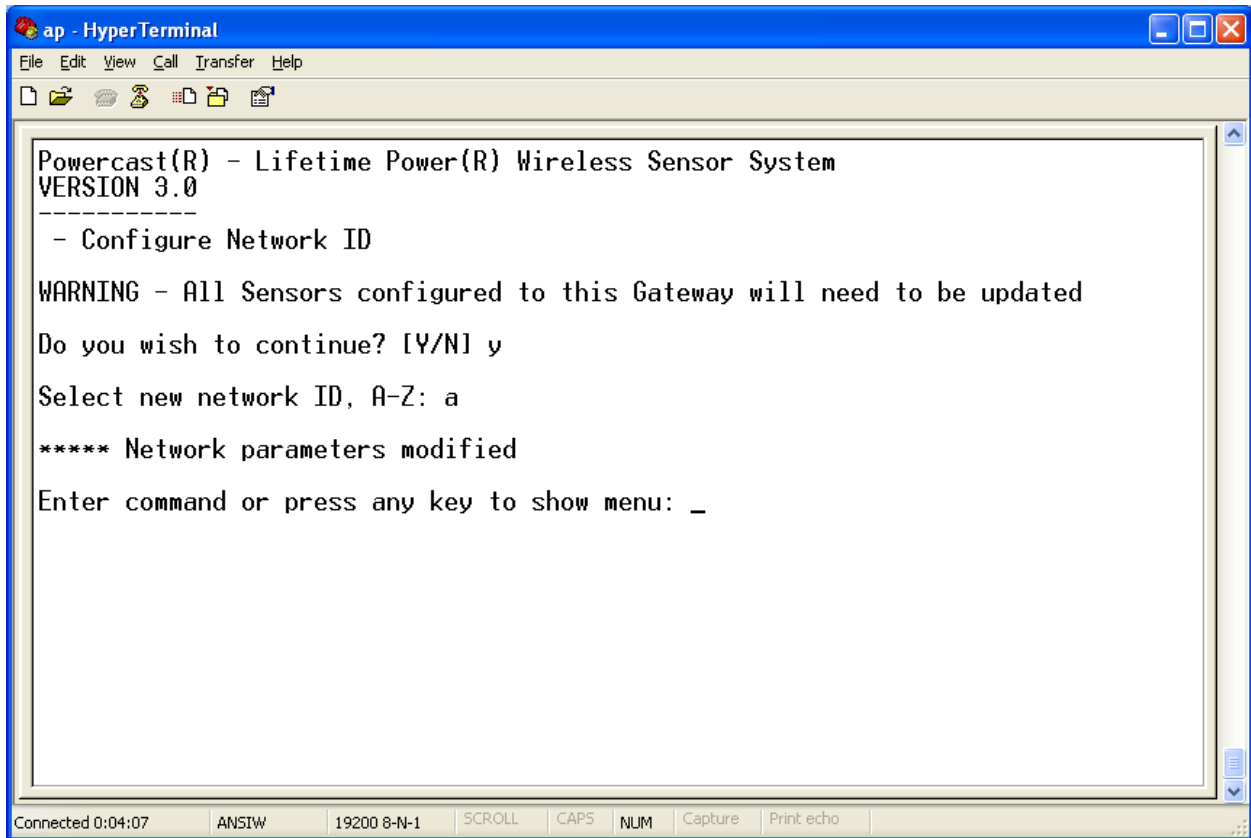
| System Channel | 802.15.4 channel | Center Frequency |
|----------------|------------------|------------------|
| 1 | 26 | 2480 MHz |
| 2 | 25 | 2575 MHz |
| 3 | 15 | 2425 MHz |
| 4 | 20 | 2450 MHz |

Channels 25 and 26 are outside the range of Wi-Fi channels in North America and will not interfere with or be interfered by Wi-Fi networks. The channel width for 802.15.4 is 2 MHz per channel.

Note - Selecting the Communication Channel should be done before any sensors are configured by the gateway as the gateway assigns the Communication Channel to the sensors through the USB port.

Option N – Configure the Network ID

Menu option **N** is for configuring the Network ID. The Network ID is a unique identifier so that data packets are received by the proper wireless gateway. There are 26 ID's available for use in the system, which are represented by the letters A-Z.



```
ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Configure Network ID
WARNING - All Sensors configured to this Gateway will need to be updated
Do you wish to continue? [Y/N] y
Select new network ID, A-Z: a
***** Network parameters modified
Enter command or press any key to show menu: _
Connected 0:04:07  ANSIW  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

The system will warn you about changing the Network ID and you must select if you want to continue. If you press Y for yes, at the next prompt, press A-Z to designate your Network ID preference, and the Network ID will be immediately changed. If you press N or press any other key, configuration will be cancelled and you will return to the main menu options.

This option allows for easy user selection as well as a range of choices that is large enough to accommodate large-scale deployment of sensors and gateways in close proximity. Selecting the Network ID can be done in upper or lower case.

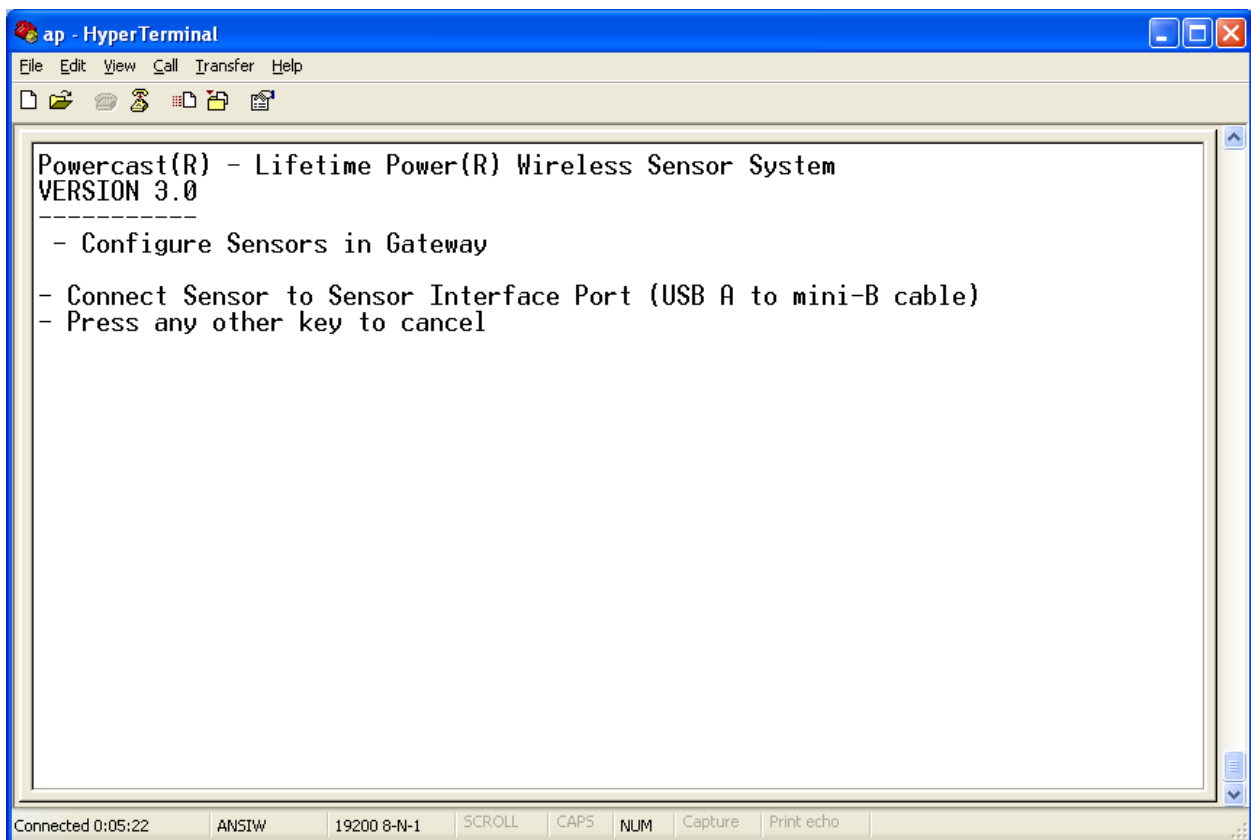
Note - Selecting the Network ID should be done before any sensors are configured by the gateway as the gateway assigns the Network ID to the sensors through the USB port.

Option S – Configure Sensors to Gateway

Menu option **S** is for adding or removing sensors that are configured (associated) to the gateway. Up to 100 sensors can be configured to a gateway and the Sensor IDs (1-100) are typically assigned automatically by the gateway. The configuration process assigns the Sensor ID and Network ID to each node, and also tells the gateway the model number of the node. Configuration must be performed before a node is deployed.

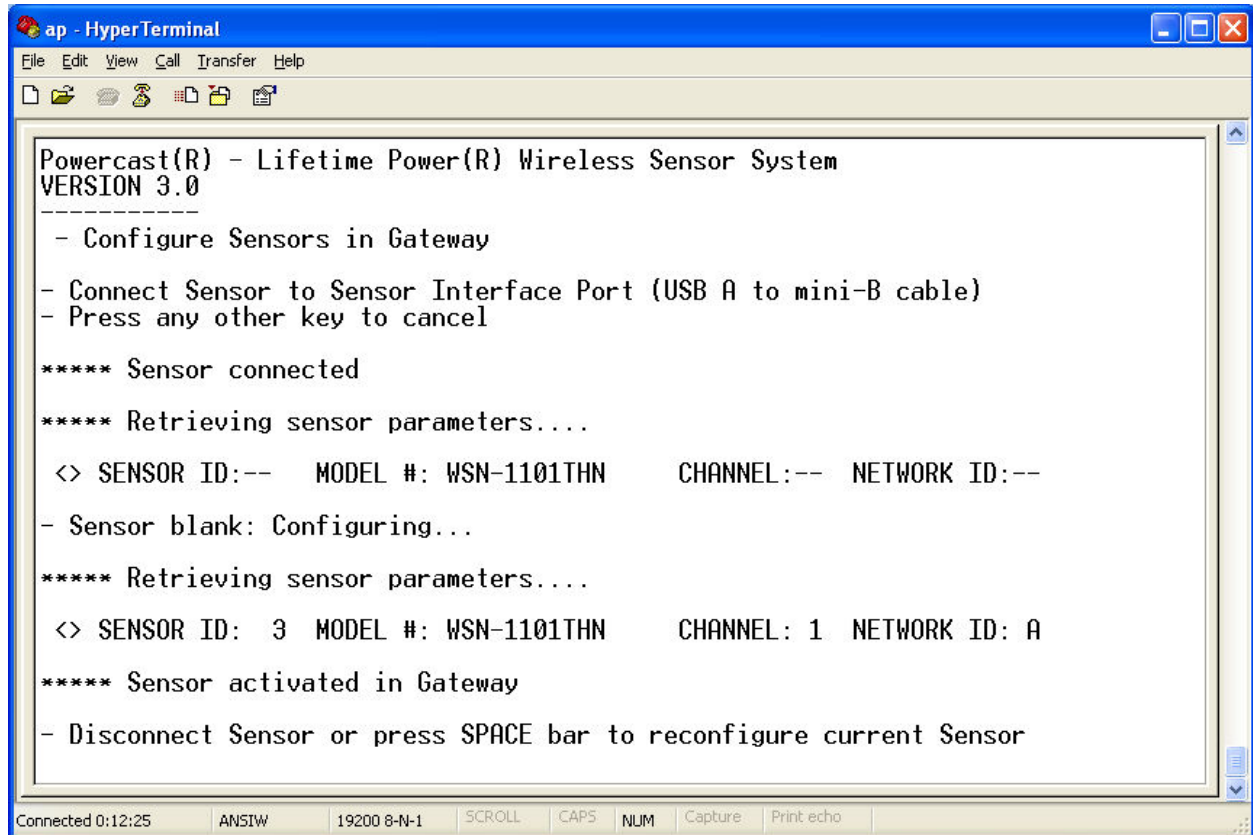
A sensor can be connected to the gateway with a USB cable at any time before or after selection menu option S. The USB connector on the sensor is located inside the enclosure (lower-left inside corner) for battery-powered devices. Open the enclosure using a screwdriver or other tool with the tabs provided.

When the USB configuration port is connected, the status light on the gateway will BLINK continuously until the sensor is configured. The light will be solid when the sensor configuration is complete, and turn off when the sensor is disconnected. When the message below is displayed, the gateway is waiting for a sensor to be connected via USB cable to the gateway through the gateway port labeled “SENSOR INTERFACE”.



```
ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Configure Sensors in Gateway
- Connect Sensor to Sensor Interface Port (USB A to mini-B cable)
- Press any other key to cancel
Connected 0:05:22  ANSIW  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

The system will wait until a sensor is connected, a key is pressed to cancel, or the operation times out and returns to the main menu. Once a blank sensor is connected, the screen will look like the following.



```
ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Configure Sensors in Gateway
- Connect Sensor to Sensor Interface Port (USB A to mini-B cable)
- Press any other key to cancel

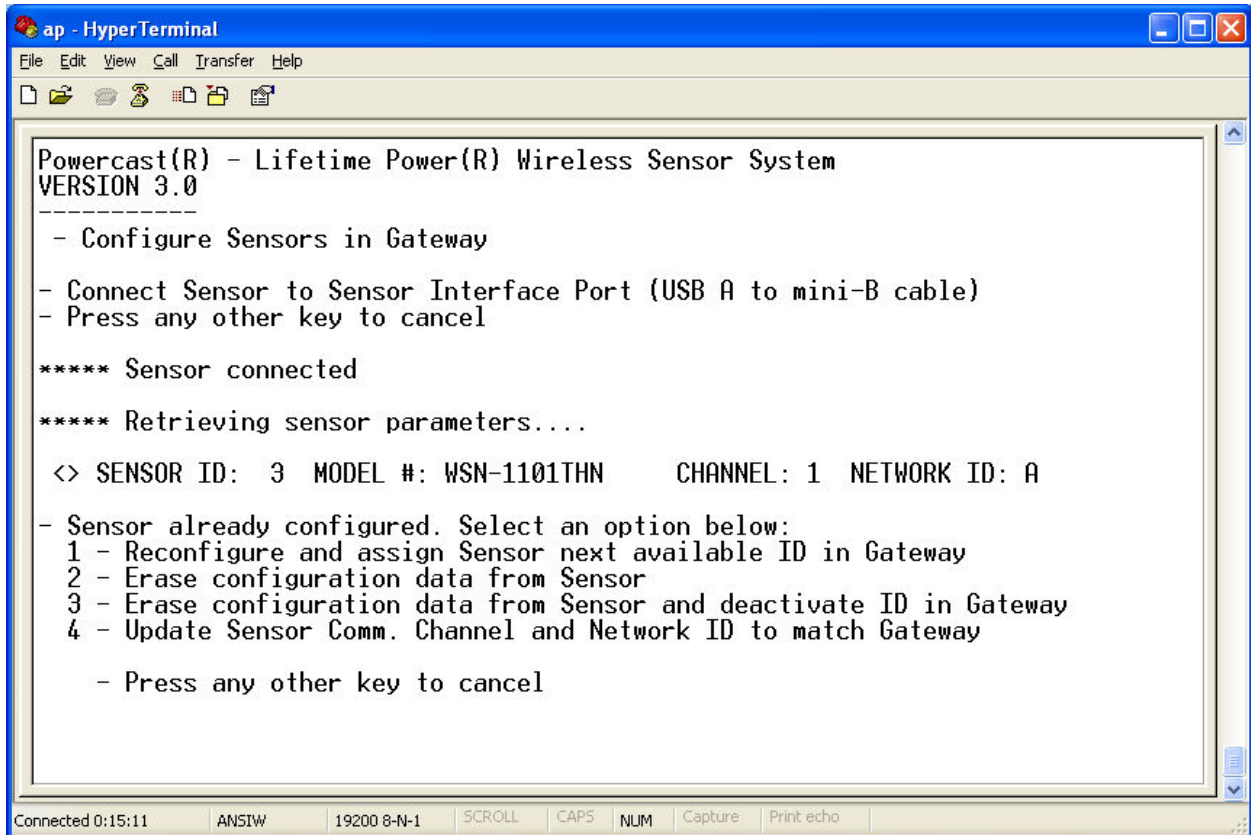
***** Sensor connected
***** Retrieving sensor parameters....
<> SENSOR ID:--  MODEL #: WSN-1101THN  CHANNEL:--  NETWORK ID:--
- Sensor blank: Configuring...
***** Retrieving sensor parameters....
<> SENSOR ID: 3  MODEL #: WSN-1101THN  CHANNEL: 1  NETWORK ID: A
***** Sensor activated in Gateway
- Disconnect Sensor or press SPACE bar to reconfigure current Sensor

Connected 0:12:25  ANSIW  19200 8-N-1  SCROLL  CAPS  NUM  Capture  Print echo
```

Above screen is for WSG-101. For a WSG-102, CHANNEL is removed from the screen.

Information is retrieved from the sensor, which is blank, and the system will automatically assign it the next Sensor ID available, in this case, 1. The gateway also assigns the sensor its Network ID for communication. This sensor is now functioning normally and transmitting data to the gateway.

The message below is displayed when the connected sensor has a Sensor ID that is already configured in the gateway. When this occurs, additional options are provided as shown.



Press the corresponding number to perform the action described.

- Option 1 will reconfigure the sensor with the next Sensor ID available in the system. Do this when adding a sensor to a network that was already part of a different network, but was not erased from the previous gateway.
- Option 2 will erase all configuration data from the Sensor.
- Option 3 will erase all configuration data from the Sensor and remove it from the gateway.
- Option 4 will update the sensor to match the gateway's communication configuration.
 - o Note - this option is only available if the configuration data is different between the sensor and gateway.

Note - If a configuration error occurs due to a faulty connection of the USB port/cable such as electrical noise, the system may display some unknown data but will conclude with a message that the sensor configuration has not been changed. Press the SPACE BAR to try configuration again, or disconnect and reconnect the USB cable.

After the primary gateway is configured with the desired sensors, it is recommended to capture the configuration data by using Option L, discussed below, to list the sensors on the screen. Using either the "Print Screen" button or copying/pasting the data from the screen into a text file can be used.

Option M – Configure Replacement of Redundant Gateway

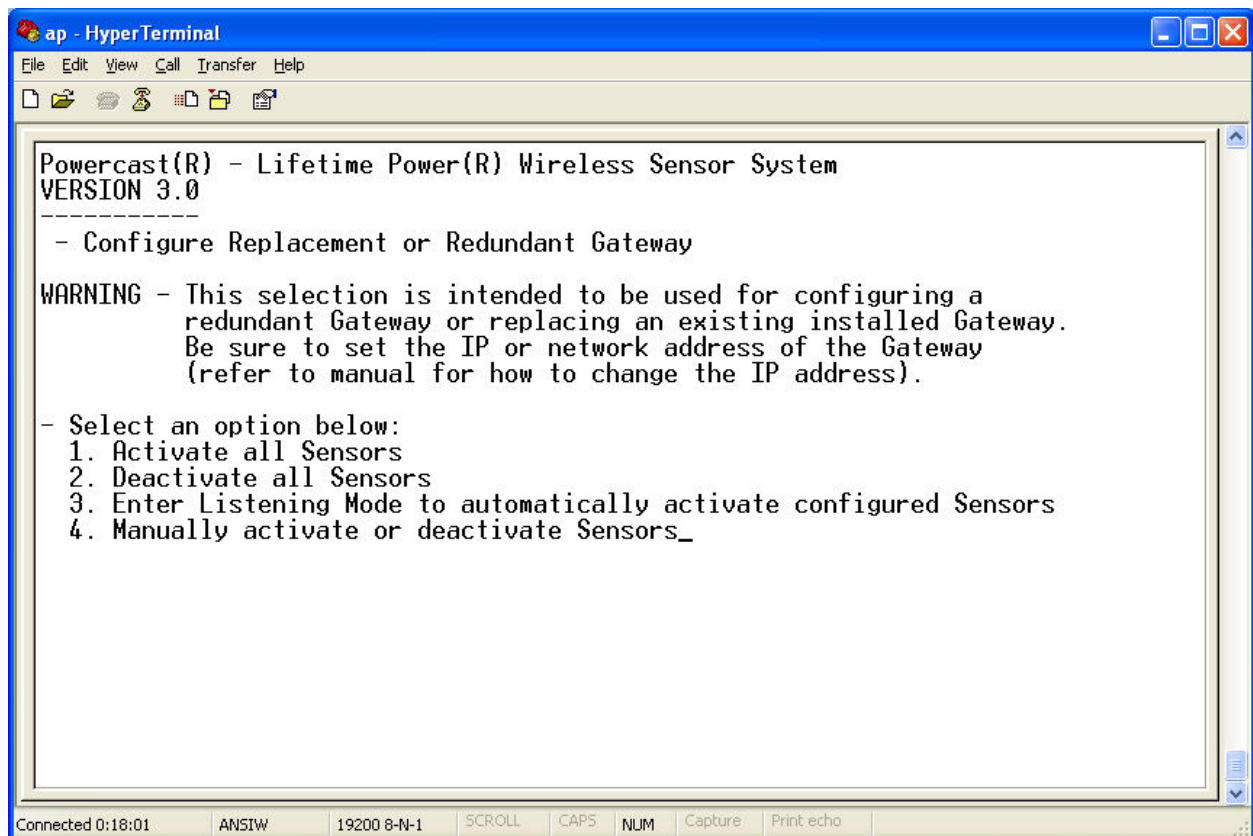
A unique capability of the gateway is the ability to configure one for redundant operation. The redundant gateway can be on “hot stand-by” for a remote switchover, or on “warm stand-by” where the network cable needs to be moved from the primary to the stand-by unit. The configuration for redundancy is also the same as configuring for replacement in the unlikely event a gateway fails or is damaged. A redundant or replacement gateway can be configured in just a few minutes.

Note – the descriptions below only show how to configure the gateway for the wireless network parameters and wireless sensors. The wired network parameters need to be configured through the “Remote User Interface” software utility from FieldServer Technologies. Wired configuration parameters are recommended as follows:

| Implementation | Wired Network Address | IP address |
|----------------|------------------------|------------------------|
| Hot Stand-By | Different than primary | Different than primary |
| Warm Stand-By | Same as primary | Same as primary |

Note – When using warm stand-by mode both gateways should not be connected to the wired network at the same time.

There are multiple actions that can be performed under Option M.



```

ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Configure Replacement or Redundant Gateway

WARNING - This selection is intended to be used for configuring a
          redundant Gateway or replacing an existing installed Gateway.
          Be sure to set the IP or network address of the Gateway
          (refer to manual for how to change the IP address).

- Select an option below:
  1. Activate all Sensors
  2. Deactivate all Sensors
  3. Enter Listening Mode to automatically activate configured Sensors
  4. Manually activate or deactivate Sensors_
  
```

Press the corresponding number to perform the action described.

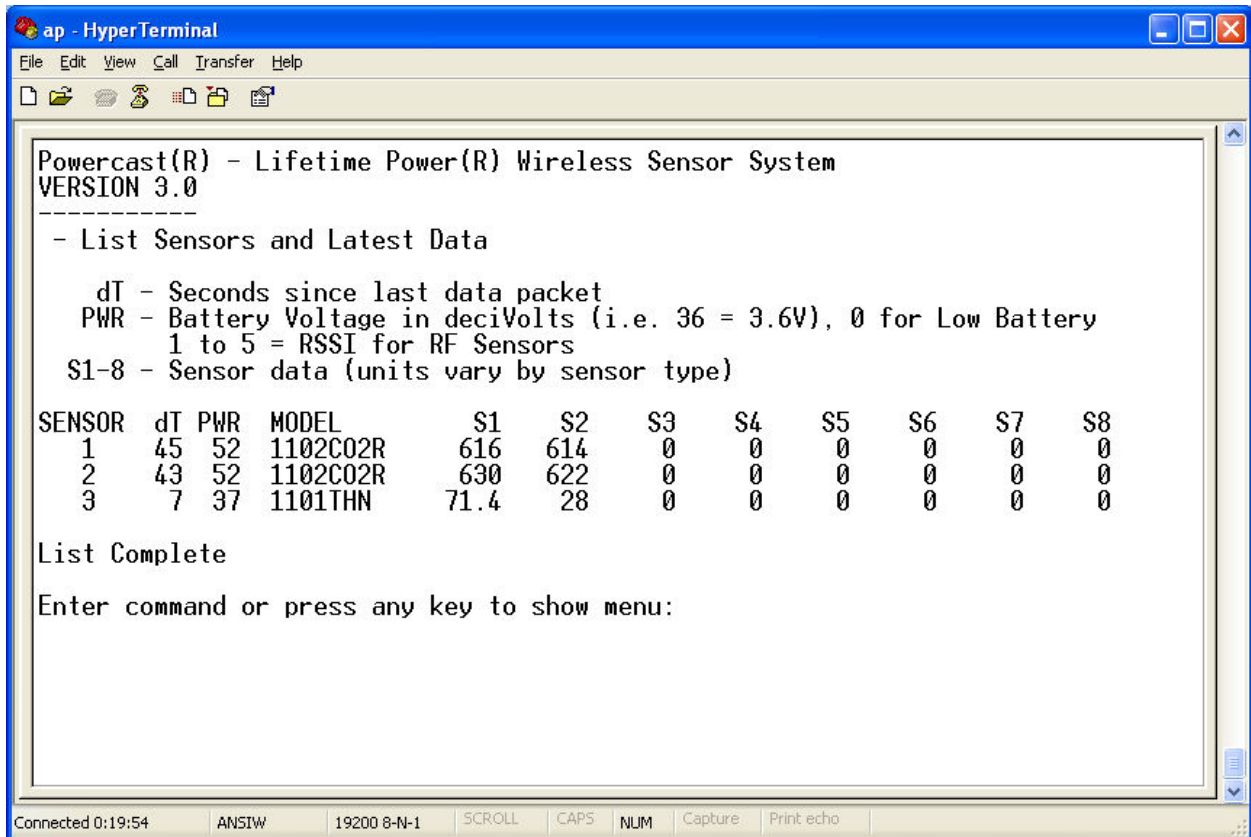
- **Option 1** will activate all sensors in the gateway up to the maximum available
- **Option 2** will deactivate all sensors in the gateway, allowing for a quick reboot of the system
- **Option 3** put the gateway into Listening Mode. This is extremely useful if a gateway in a deployed network malfunctions or is damaged, because it allows you to simply replace the bad gateway with a new one by listening for any sensors that were talking to the previous gateway. All you need to input is the network configuration and Network ID that the deployed sensors were operating on. The gateway will listen for 5 minutes, and automatically add sensors as they are “heard.” This mode can be terminated at any time by pressing Shift+L, or repeated if all sensor devices have not been found.
- **Option 4** allows you to manually add or remove sensors from the gateway. Also, use this option to update a sensor’s model number (helpful if Listening mode was used to activate sensors).

Note – the operation described here does not configure the wired network parameters of the replacement / redundant gateway, but only the wireless sensors that are to be configured to it. See the following manual for configuring the wired BAS interface (e.g. BACnet, Modbus, LonWorks)

<http://www.powercastsensors.com/files/WSG-NetworkConfigurationGuide.pdf>

Option L – List Sensors and Latest Data

Menu option L displays the list of sensors configured to the gateway, including the sensor model and data from the latest packet received.



```

Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- List Sensors and Latest Data

  dT - Seconds since last data packet
  PWR - Battery Voltage in deciVolts (i.e. 36 = 3.6V), 0 for Low Battery
        1 to 5 = RSSI for RF Sensors
  S1-8 - Sensor data (units vary by sensor type)

SENSOR dT PWR MODEL          S1    S2    S3    S4    S5    S6    S7    S8
  1    45  52 1102C02R      616   614    0    0    0    0    0    0
  2    43  52 1102C02R      630   622    0    0    0    0    0    0
  3     7  37 1101THN       71.4   28    0    0    0    0    0    0

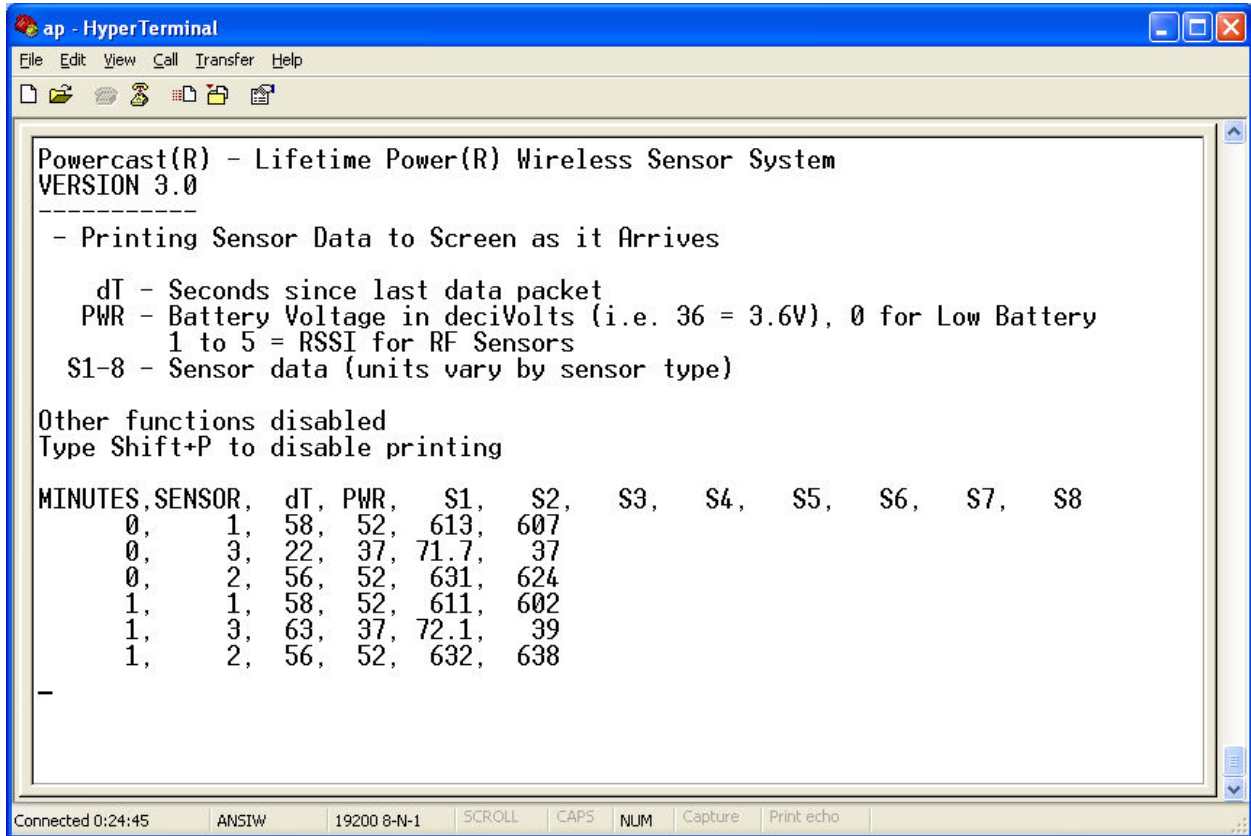
List Complete

Enter command or press any key to show menu:
  
```

Note – if the model number is not entered during manual configuration of the gateway, the model number of the sensor will be blank. This does not impact the operation of the system in any way with regard to the BAS interface (e.g. BACnet, Modbus, LonWorks).

Option P – Print Sensor Data to Screen

Menu option P displays the incoming sensor data on the screen and allows for capturing this data to a text file (data logging) through HyperTerminal, another terminal emulator program, or a custom designed application. When this mode is enabled it will continue until terminated by typing SHIFT+P.



```

ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Printing Sensor Data to Screen as it Arrives

  dT - Seconds since last data packet
  PWR - Battery Voltage in deciVolts (i.e. 36 = 3.6V), 0 for Low Battery
        1 to 5 = RSSI for RF Sensors
  S1-8 - Sensor data (units vary by sensor type)

Other functions disabled
Type Shift+P to disable printing

MINUTES,SENSOR,  dT, PWR,  S1,  S2,  S3,  S4,  S5,  S6,  S7,  S8
  0,      1,  58,  52,  613,  607
  0,      3,  22,  37,  71.7,  37
  0,      2,  56,  52,  631,  624
  1,      1,  58,  52,  611,  602
  1,      3,  63,  37,  72.1,  39
  1,      2,  56,  52,  632,  638
-
  
```

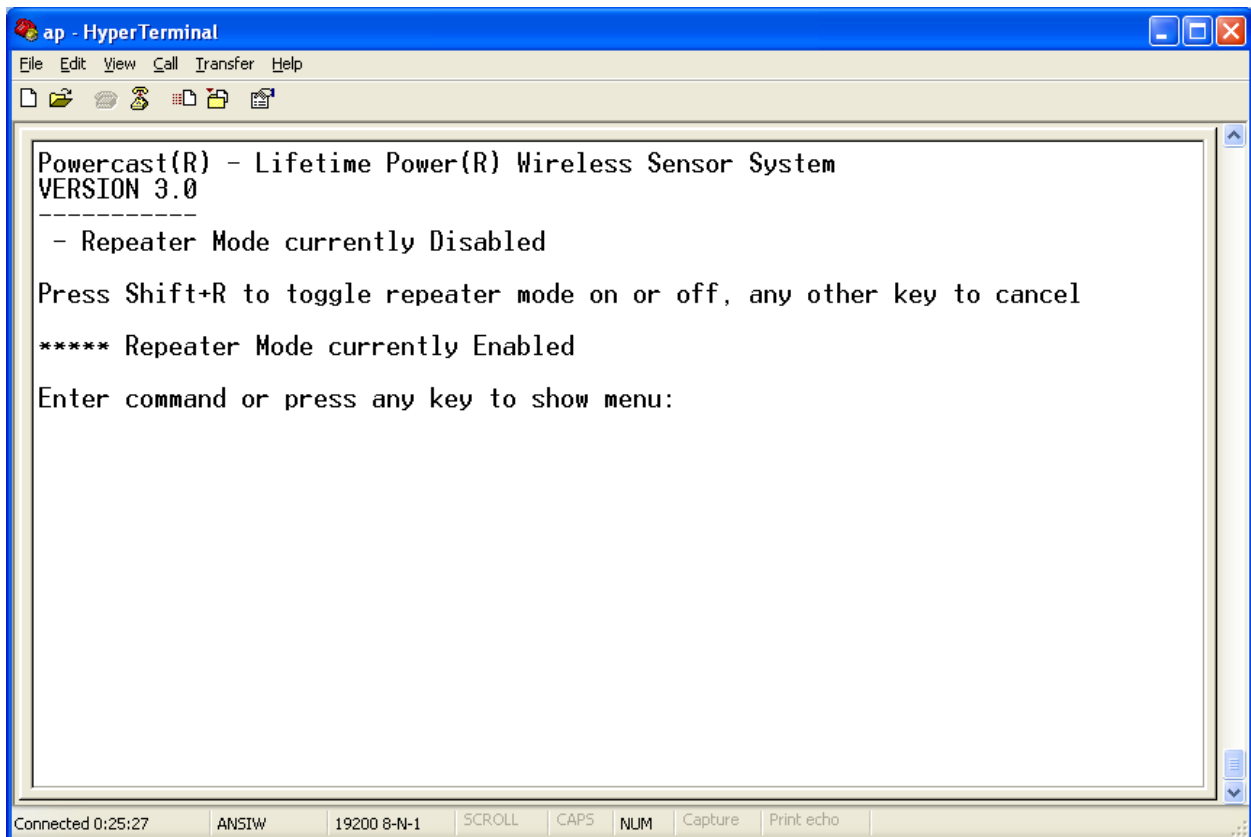
Connected 0:24:45 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

Note – the header information and oldest data will scroll off the top of the screen as new information is added to the bottom.

Option R – Repeater Mode

Menu option **R** is Repeater mode and allows the WSG device to function as a repeater for extended range. Multiple repeaters can be used with a single BAS gateway and allow for an unlimited extension of data range from the wireless sensors in any topology. The repeaters do not form routes for each sensor; they simply repeat data that arrives using the same Network ID for which they are configured. Repeaters will not repeat data from other repeaters and the gateway and repeaters will not display repeated data from the same sensor node.

Proper use of the WSG as a repeater requires the use of the same Network ID as is used for the gateway. These parameters can be selection through menu option N as listed earlier in this guide. The repeater should be located within range of the gateway, and a range of 300 feet is recommended for most environments. Some environments may require short distance.

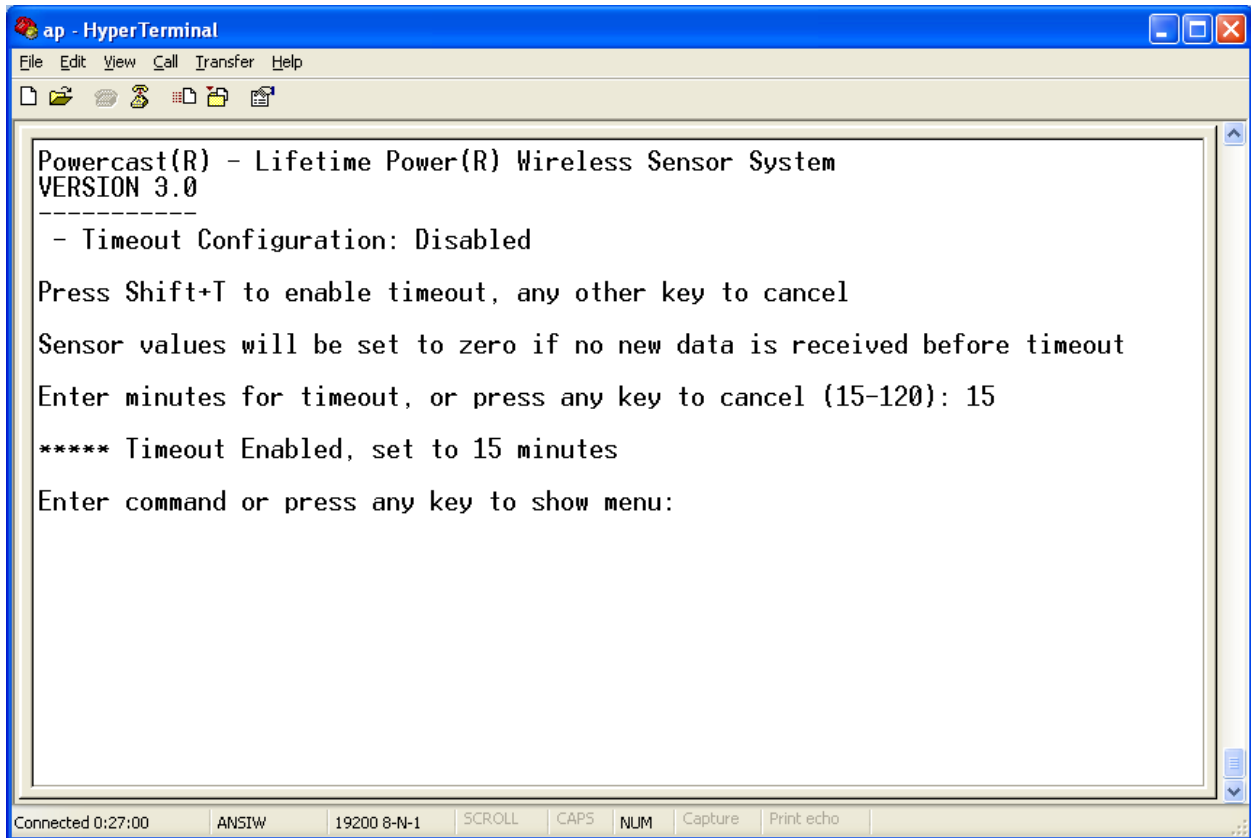


```
ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Repeater Mode currently Disabled
Press Shift+R to toggle repeater mode on or off, any other key to cancel
***** Repeater Mode currently Enabled
Enter command or press any key to show menu:
Connected 0:25:27 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Pressing SHIFT+R will toggle repeater mode on or off.

Option T – Timeout Configuration

Menu option **T** allows you to enable a global timeout for the sensors activated in the system. This timeout will set the data of a sensor, which has not been heard from in the specified time, to zero. This can be used to set alarms for sensors that have stopped communicating.

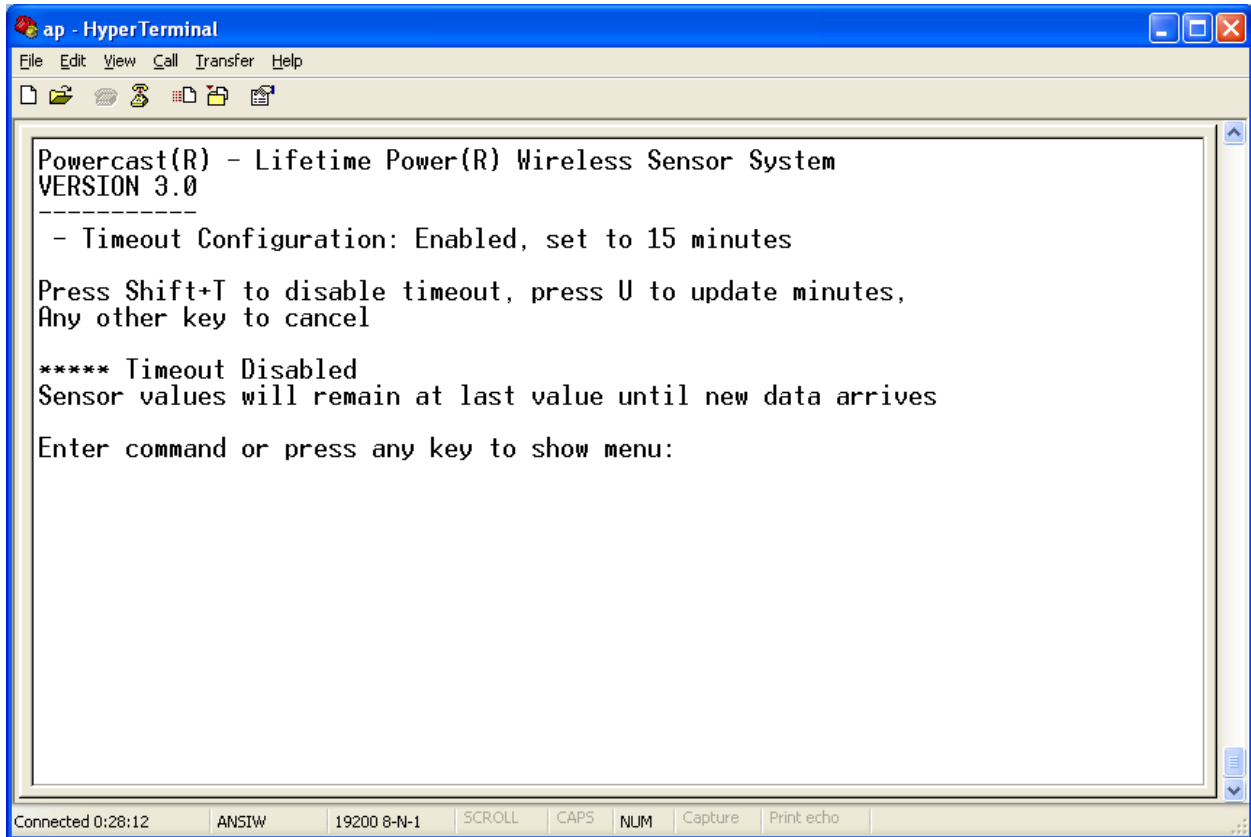


```
ap - HyperTerminal
File Edit View Call Transfer Help
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Timeout Configuration: Disabled
Press Shift+T to enable timeout, any other key to cancel
Sensor values will be set to zero if no new data is received before timeout
Enter minutes for timeout, or press any key to cancel (15-120): 15
***** Timeout Enabled, set to 15 minutes
Enter command or press any key to show menu:
```

Connected 0:27:00 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

Press **SHIFT+T** to enable the timeout. Once enabled, you are required to set the number of minutes before a sensor gets timed out. This can be 15 – 120 minutes (2 hours). This is a global timeout, so all sensors activated in the system will be subject to this setting.

To deactivate, reenter this option, and press SHIFT+T again.

A screenshot of a HyperTerminal window titled 'ap - HyperTerminal'. The window contains the following text:

```
Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Timeout Configuration: Enabled, set to 15 minutes

Press Shift+T to disable timeout, press U to update minutes,
Any other key to cancel

***** Timeout Disabled
Sensor values will remain at last value until new data arrives

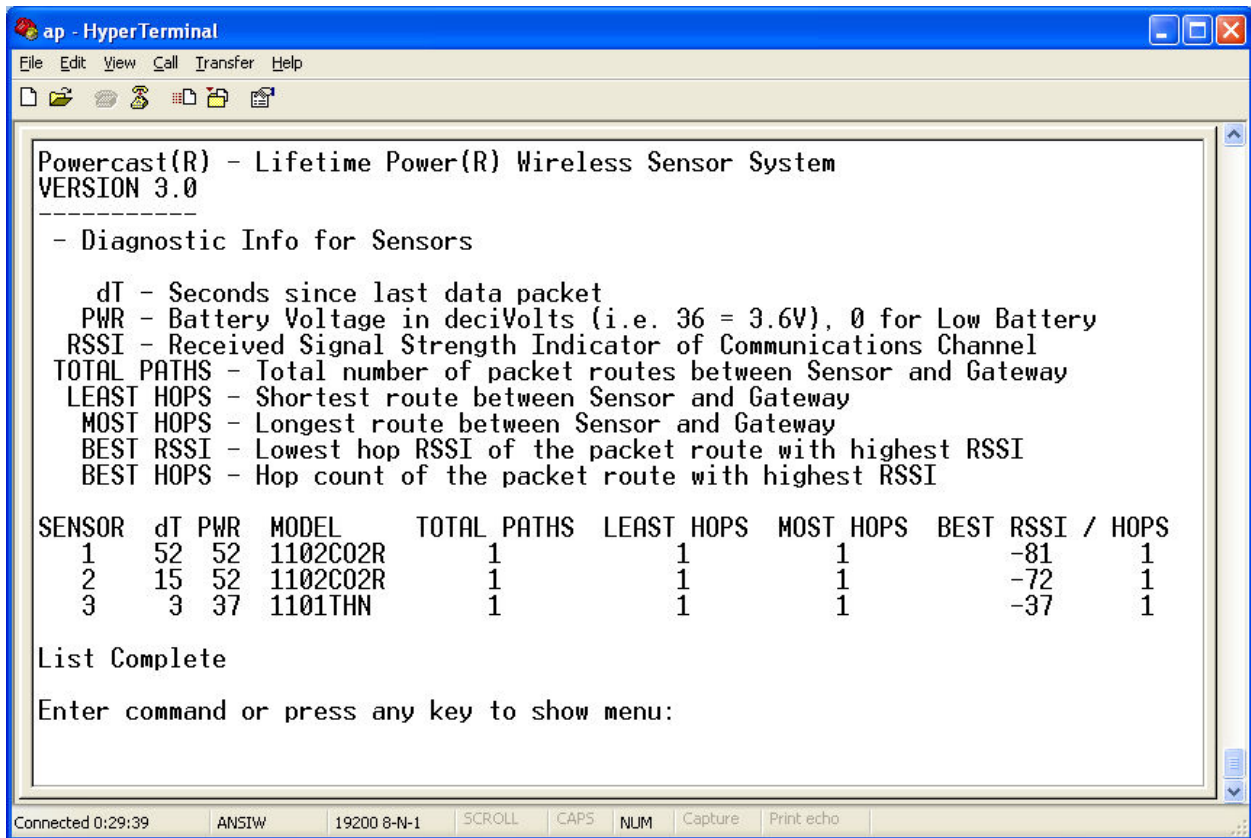
Enter command or press any key to show menu:
```

The window also shows a menu bar (File, Edit, View, Call, Transfer, Help), a toolbar with various icons, and a status bar at the bottom with the text: 'Connected 0:28:12 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo'.

You can also update the timeout setting at this point as well. Press U to update the timeout.

Option D – Diagnostic Information for Sensors

Menu option **D** provides network diagnostic information for each sensor for monitoring network robustness, performance, and troubleshooting. Each repeater node in the network increments a hop counter and updates the received signal strength for each data packet. Diagnostic information could be used to determine if additional repeaters are needed to meet certain network specifications such as having more than one path to the gateway or potentially reducing the number of hops to the gateway.



```

Powercast(R) - Lifetime Power(R) Wireless Sensor System
VERSION 3.0
-----
- Diagnostic Info for Sensors

  dT - Seconds since last data packet
  PWR - Battery Voltage in deciVolts (i.e. 36 = 3.6V), 0 for Low Battery
  RSSI - Received Signal Strength Indicator of Communications Channel
  TOTAL PATHS - Total number of packet routes between Sensor and Gateway
  LEAST HOPS - Shortest route between Sensor and Gateway
  MOST HOPS - Longest route between Sensor and Gateway
  BEST RSSI - Lowest hop RSSI of the packet route with highest RSSI
  BEST HOPS - Hop count of the packet route with highest RSSI

SENSOR  dT  PWR  MODEL      TOTAL PATHS  LEAST HOPS  MOST HOPS  BEST RSSI / HOPS
  1     52  52   1102C02R      1           1           1         -81 / 1
  2     15  52   1102C02R      1           1           1         -72 / 1
  3      3  37   1101THN       1           1           1         -37 / 1

List Complete

Enter command or press any key to show menu:
  
```

Connected 0:29:39 ANSIW 19200 8-N-1 SCROLL CAPS NUM Capture Print echo

Appendix A

Data from the sensors is mapped as follows in the gateway.

Data Arrays

The gateway is capable of supporting multiple protocols depending on the specific module that is used and how it is configured.

BACnet Object Definitions

| Device Object | Description |
|--------------------------|--|
| COMM_CHANNEL | Communication channel of system |
| COMM_NET_ID | Communication network ID of system |
| ACTIVE_SENSORS | Number of sensors active in system |
| SENSORS_WITH_LOW_BATTERY | Number of sensors that are sending a low battery signal |
| REPEATER_MODE | “1” means gateway is set as a repeater |
| TIMEOUT_CONFIG | Value (minutes) of timeout setting; “0” means mode is disabled |
| SENSORS_IN_TIMEOUT | Number of sensors currently in timeout, if mode enabled |
| SOFTWARE_VERSION | Version of gateway software |
| Nx_PWR | Battery voltage, or RSSI of RF powered sensors |
| Nx_DELTA_T | Time (seconds) since the last packet was received |
| Nx_S1 | Sensor input 1 |
| Nx_S2 | Sensor input 2 |
| Nx_S3 | Sensor input 3 |
| Nx_S4 | Sensor input 4 |
| Nx_S5 | Sensor input 5 |
| Nx_S6 | Sensor input 6 |
| Nx_S7 | Sensor input 7 |
| Nx_S8 | Sensor input 8 |
| Nx_TXID | Transmitter ID (only valid in RF powered sensors) |

Note – “x” is a number from 1 – 100, corresponding to the each sensor node in the system. A BACnet object is defined for all nodes, regardless of whether or not they are active in the system.

MODBUS Register Map

| Array | Starting Address | Length | Type | Description |
|--------|------------------|--------|---------|--|
| TXID | 30001 | 100 | Integer | Transmitter ID - only used for RF-powered nodes |
| PWR | 30101 | 100 | Integer | Battery voltage, displayed as 2-digit integer (e.g. 3.6V = 36, 5.4V = 54) or RSSI (1-5) or received RF-power. |
| SECS | 30201 | 100 | Integer | Time (seconds) since last update. This is refreshed at 10 second intervals in groups of 10 (e.g. 1-10, 11-20, 21-30, etc). |
| S1 | 30301 | 100 | Integer | Sensor input 1, scaled up 10x |
| S2 | 30401 | 100 | Integer | Sensor input 2, scaled up 10x |
| S3 | 30501 | 100 | Integer | Sensor input 3, scaled up 10x |
| S4 | 30601 | 100 | Integer | Sensor input 4, scaled up 10x |
| S5 | 30701 | 100 | Integer | Sensor input 5, scaled up 10x |
| S6 | 30801 | 100 | Integer | Sensor input 6, scaled up 10x |
| S7 | 30901 | 100 | Integer | Sensor input 7, scaled up 10x |
| S8 | 31001 | 100 | Integer | Sensor input 8, scaled up 10x |
| STATUS | 31101 | 10 | Integer | Gateway Status Parameters, not used in this demo |

The Sensor ID is the index in the above arrays. For example, to find the S1 data for Sensor 15, go to address 30315.

STATUS Descriptions

| ADDRESS | STATUS | DESCRIPTION |
|---------|--------------------------|--|
| 31101 | COMM_CHANNEL | Communication channel of system |
| 31102 | COMM_NET_ID | Communication network ID of system |
| 31103 | ACTIVE_SENSORS | Number of sensors active in system |
| 31104 | SENSORS_WITH_LOW_BATTERY | Number of sensors that are sending a low battery signal |
| 31105 | REPEATER_MODE | "1" means gateway is set as a repeater |
| 31106 | TIMEOUT_CONFIG | Value (minutes) of timeout setting; mode disabled if "0" |
| 31107 | SENSORS_IN_TIMEOUT | Number of sensors currently in timeout, if mode enabled |
| 31108 | SOFTWARE_VERSION | Version of gateway software |
| 31109 | RESERVED | |
| 31110 | RESERVED | |

SNMP Object Definitions – MIB File

The WSG MIB file is available for download at the following page:

<http://www.powercastsensors.com/support/>

| Object Identifier | Description |
|--------------------------|--|
| STATUS | Array containing the below info |
| COMM_CHANNEL | Communication channel of system |
| COMM_NET_ID | Communication network ID of system |
| ACTIVE_SENSORS | Number of sensors active in system |
| SENSORS_WITH_LOW_BATTERY | Number of sensors that are sending a low battery signal |
| REPEATER_MODE | “1” means gateway is set as a repeater |
| TIMEOUT_CONFIG | Value (minutes) of timeout setting; mode disabled if “0” |
| SENSORS_IN_TIMEOUT | Number of sensors currently in timeout, if mode enabled |
| SOFTWARE_VERSION | Version of gateway software |
| Data Arrays | |
| PWR | Battery voltage, or RSSI of RF powered sensors |
| DELTA_T | Time (seconds) since the last packet was received |
| S1 | Sensor input 1 |
| S2 | Sensor input 2 |
| S3 | Sensor input 3 |
| S4 | Sensor input 4 |
| S5 | Sensor input 5 |
| S6 | Sensor input 6 |
| S7 | Sensor input 7 |
| S8 | Sensor input 8 |
| TXID | Transmitter ID (only valid in RF powered sensors) |

Note – Each data array contains points, all labeled “node_XXX” where XXX is a number from 001 to 100, representing every sensor available in the system. All array points are available regardless of whether or not they are active in the system. Each data array is configured for up to 8 sensor inputs per device.

XML Configuration

A WSG Gateway with XML configured as the output can be accessed using HTTP-GET and HTTP-POST commands. Using this method, the data arrays in the Processor unit are accessed directly. The following table identifies the arrays and the info contained within. **NOTE: Ethernet port for XML connection is internal to the WSG unit. Remove cover to access Ethernet port. The enclosure has a notch in the side wall to seat the Ethernet cable so the lid can be re-attached.**

| Data Array | Description |
|------------|--|
| DA_STATUS | Array containing the below info |
| - Offset 0 | Communication channel of system |
| - Offset 1 | Communication network ID of system |
| - Offset 2 | Number of sensors active in system |
| - Offset 3 | Number of sensors that are sending a low battery signal |
| - Offset 4 | “1” means gateway is set as a repeater |
| - Offset 5 | Value (minutes) of timeout setting; mode disabled if “0” |
| - Offset 6 | Number of sensors currently in timeout, if mode enabled |
| - Offset 7 | Version of gateway software |
| DA_PWR | Battery voltage, or RSSI of RF powered sensors |
| DA_SECS | Time (seconds) since the last packet was received |
| DA_S1 | Sensor input 1 |
| DA_S2 | Sensor input 2 |
| DA_S3 | Sensor input 3 |
| DA_S4 | Sensor input 4 |
| DA_S5 | Sensor input 5 |
| DA_S6 | Sensor input 6 |
| DA_S7 | Sensor input 7 |
| DA_S8 | Sensor input 8 |
| DA_TXID | Transmitter ID (only valid in RF powered sensors) |

Note – Each data array contains 100 points (except DA_STATUS which has only 8) which are addressed through an offset. Offset 0 = Sensor node 1, offset 1 = sensor node 2 ... offset 99 = sensor node 100.

For an example of how to implement XML go here: <http://12.49.212.180/>

Appendix B

Installing the USB Driver for the WSG BAS Gateway

A USB driver file is required for the WSG BAS Gateway to communicate with a PC for configuration and data output. The driver is located at the following link:

<http://www.powercastsensors.com/files/WSG-101-USB-Driver.zip>

The same USB driver file is used for either the WSG-101 (2.4GHz) or WSG-102 (915MHz).

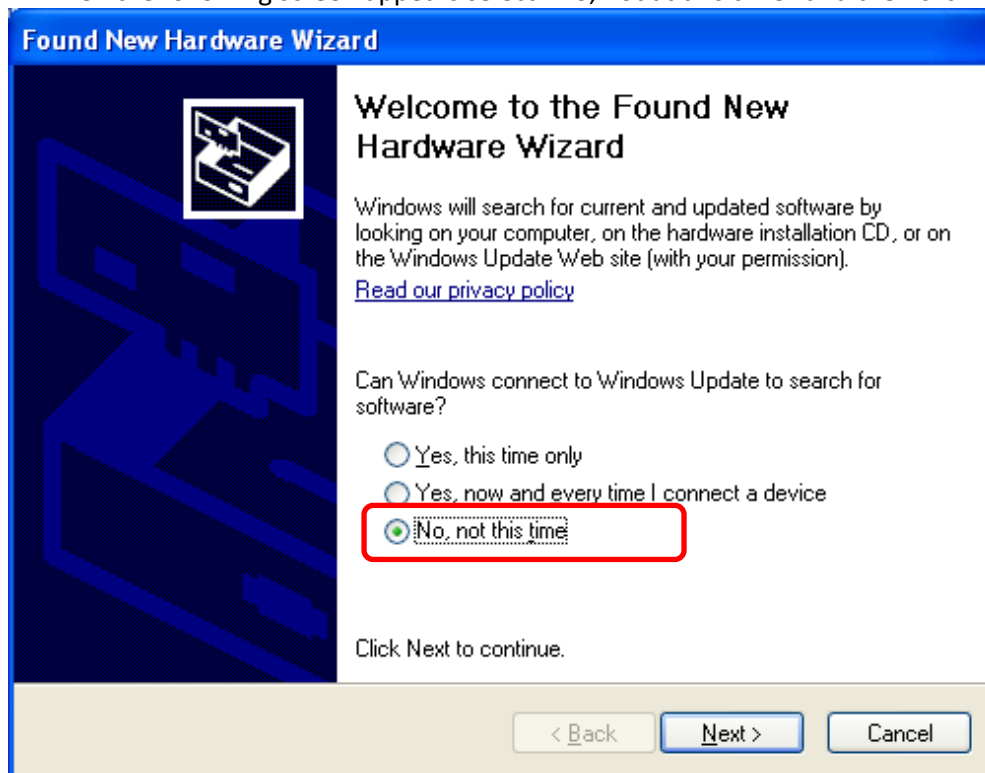
The file is also found on the following page:

<http://www.powercastsensors.com/support/>

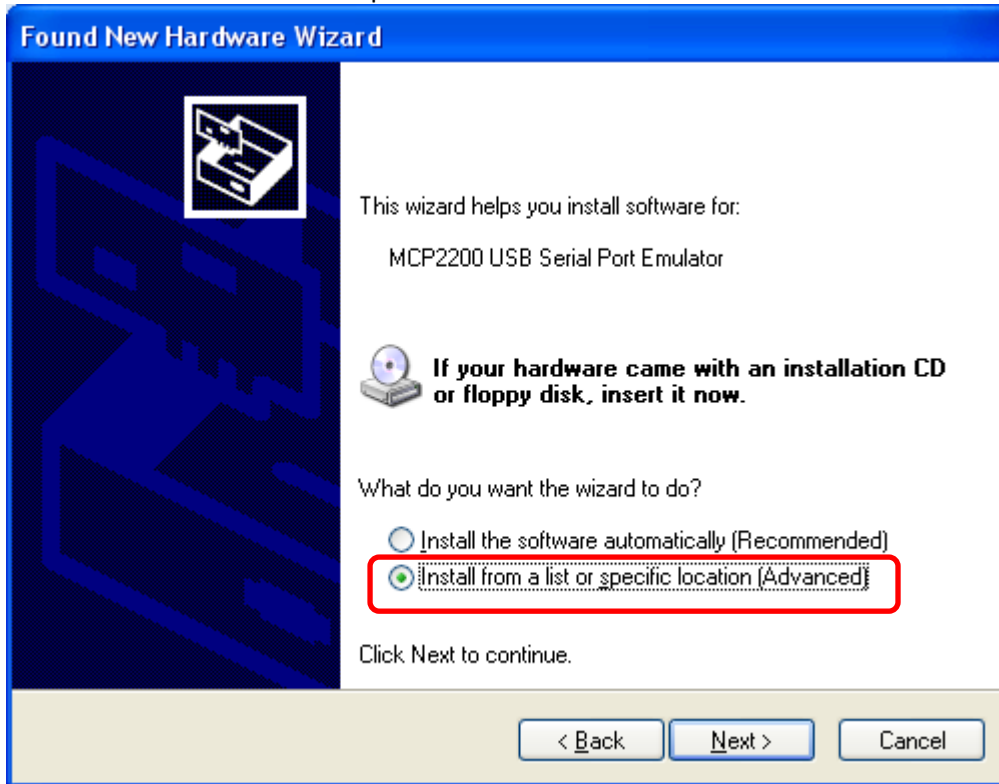
USB driver installation

1. Download the file and unzip to a preferred location.
2. Plug in the 24V power supply to the gateway. (**PS-24V-T** 24VDC power supply sold separately.)
3. Connect the WSG BAS Gateway to the PC using a USB cable.
Plug the USB cable into the computer, then plug the other end into the “PC INTERFACE” port on the WSG gateway.
4. The computer should recognize new hardware and ask for a driver. **Manually** install the driver as shown below. DO NOT use Windows automatic driver search.

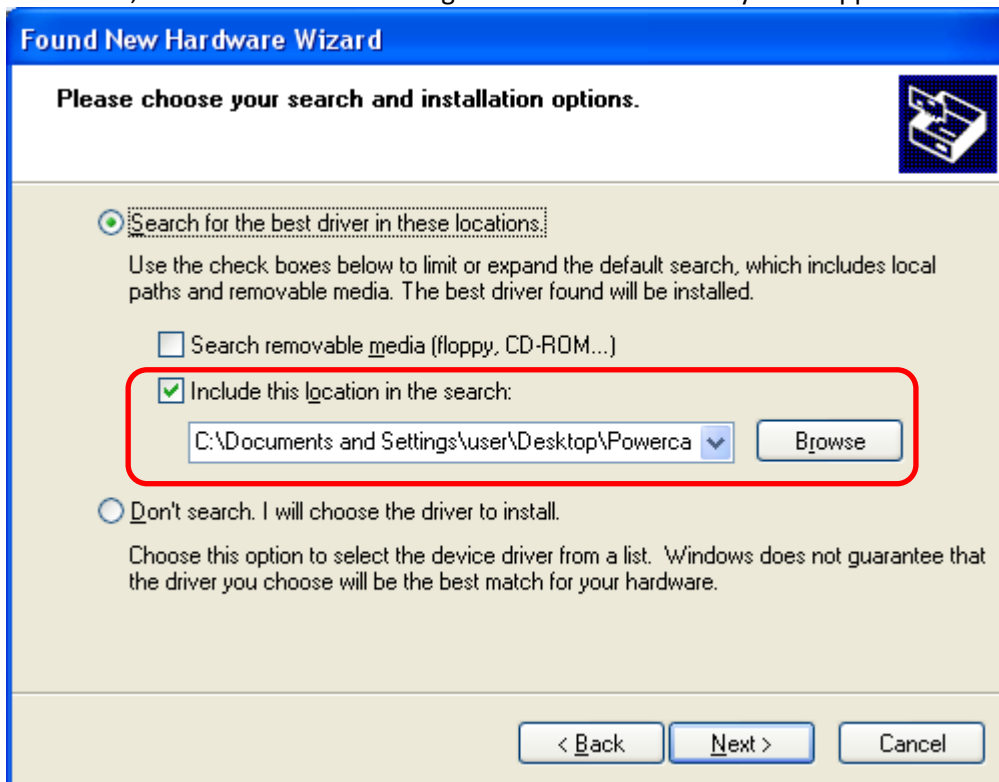
When the following screen appears select “No, not at this time” and then click “Next”.



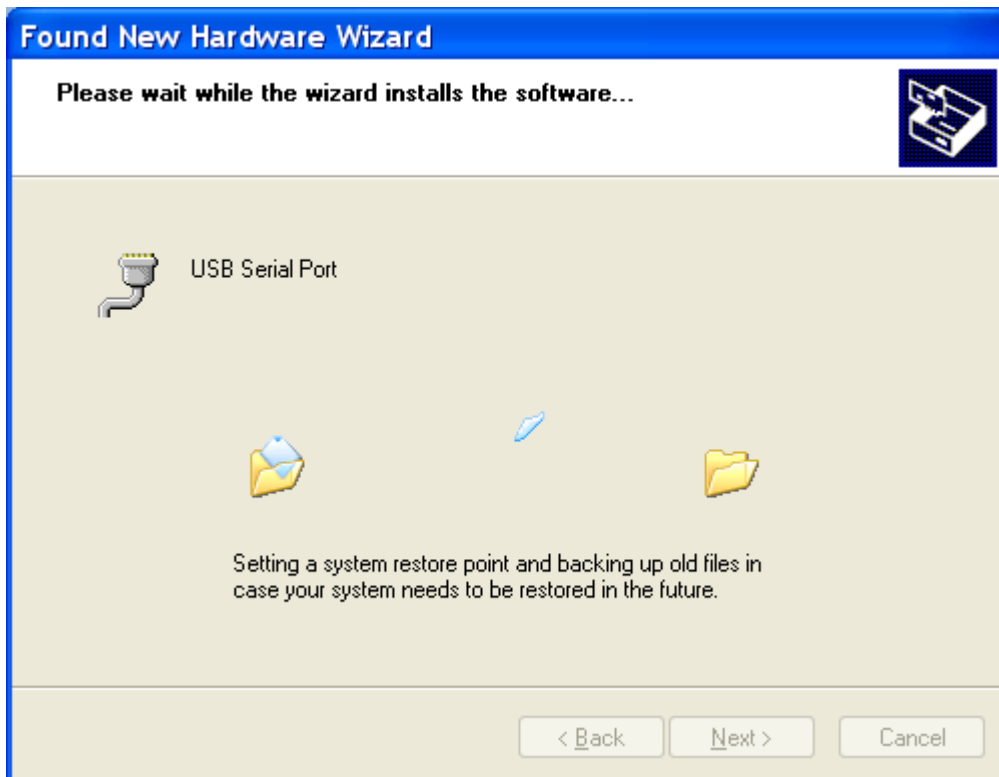
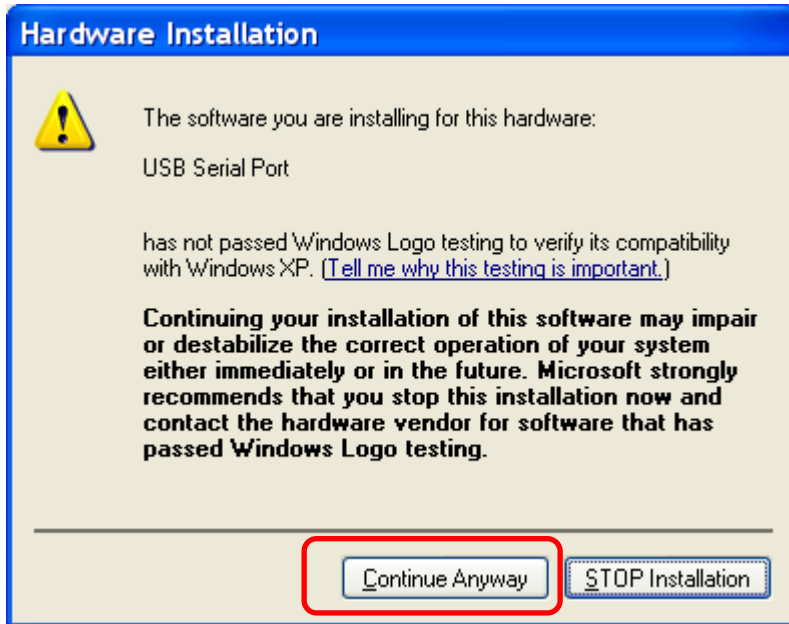
5. Select “Install from a list or specific location” and then click “Next.”



6. Select the “Search...” option, deselect the “... removable media” option, and select “Include this location...”, then click browse to navigate to the folder where you unzipped the USB driver. Click “Next.”



6. The following screens will appear. Click “Continue Anyway” to proceed.



7. When completed you should see this screen. Click “Finish” to proceed.



After clicking “finish” your PC should provide a message bubble indicating the new hardware is found and ready to use.

Note – the driver only needs to be located and installed once. After the initial installation, if you connect a new WSG gateway to the same computer, you can have Windows automatically find the correct driver without locating it manually.

Appendix C

Installing and Configuring HyperTerminal

HyperTerminal or an equivalent terminal emulator program is needed to display data from the WSG BAS gateway and for configuration of certain parameters

HyperTerminal is included with Windows XP and earlier versions and no installation is required. Windows Vista and Windows 7 users can download HyperTerminal from the following link
<http://www.powercastsensors.com/files/HyperTerminal.zip>

The download file is also found on the following page:
<http://www.powercastsensors.com/support/>

There are only two files in this ZIP package:
hypertrm.dll
hypertrm.exe

1. Unzip the files to a location of your choice and be sure to keep these files in the same directory. Do not launch HyperTerminal until after the USB driver has been installed according to Appendix B. This appendix describes how to configure HyperTerminal, but the following settings are needed with any terminal emulator that is used:

| | |
|---------------|---------------------|
| Baud rate: | 19200 bps |
| Data bits: | 8 bits |
| Parity: | None |
| Stop bits: | 1 bit |
| Flow control: | None |
| Emulation: | ANSI or Auto Detect |

Windows XP or Windows 2000

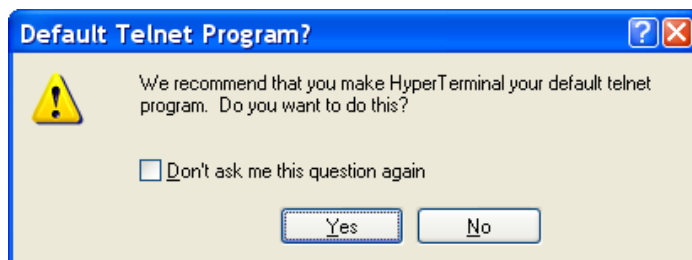
HyperTerminal is provided with Windows XP and earlier versions. To access the program use the following menu options:

Start Menu > All Programs > Accessories > Communications > HyperTerminal

Windows Vista or Windows 7

Go to the directory where HyperTerminal was installed from and double click on **hypertrm.exe** to launch the program.

2. Upon starting the program the dialog box may ask you if you would like to make HyperTerminal your default telnet program. Select Yes or No to proceed.



3. Next, you will be shown the following dialog box in which to enter a name for the connection. You can choose any name, “Powercast WSG-101” is used in this manual. Enter a name into the dialog box and select “OK” to continue.



4. The following dialog box will appear. Select the COM port which is being used for the access point and click “OK”. (COM 14 is used in this example. If there is more than one COM port the one for the gateway is usually the highest number.)

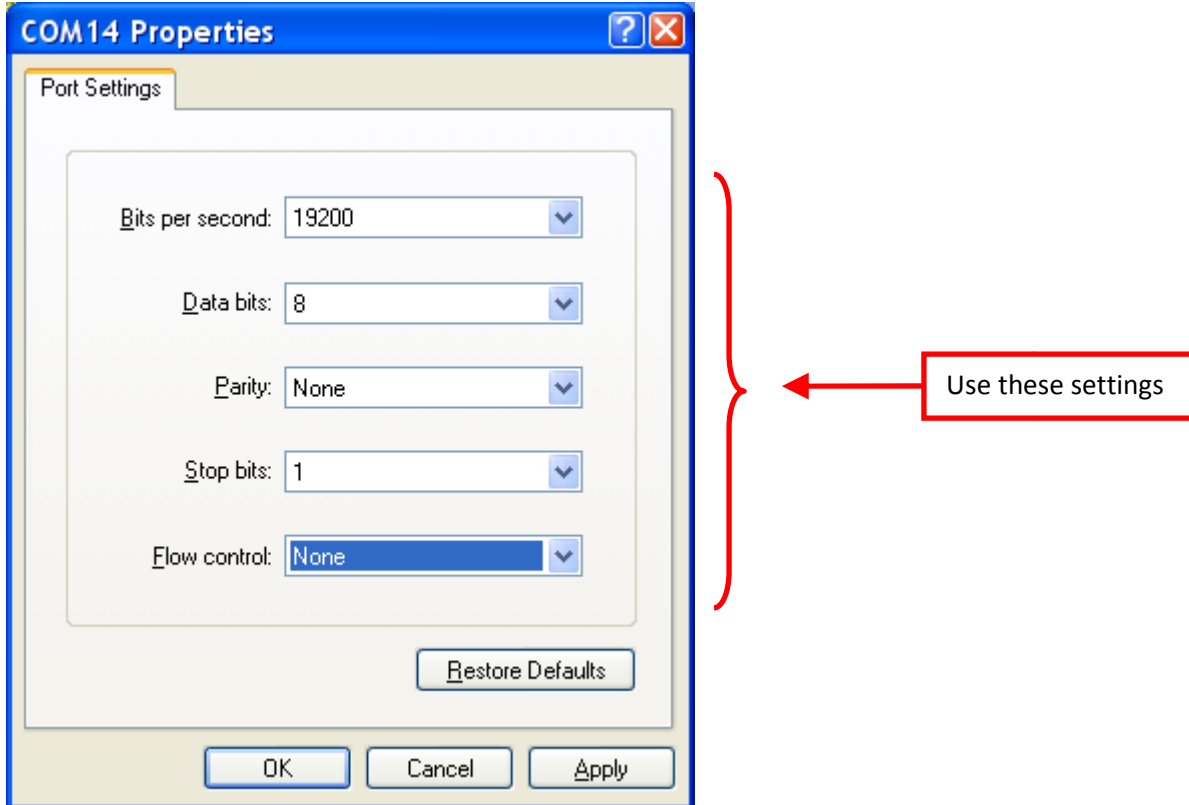


Note:

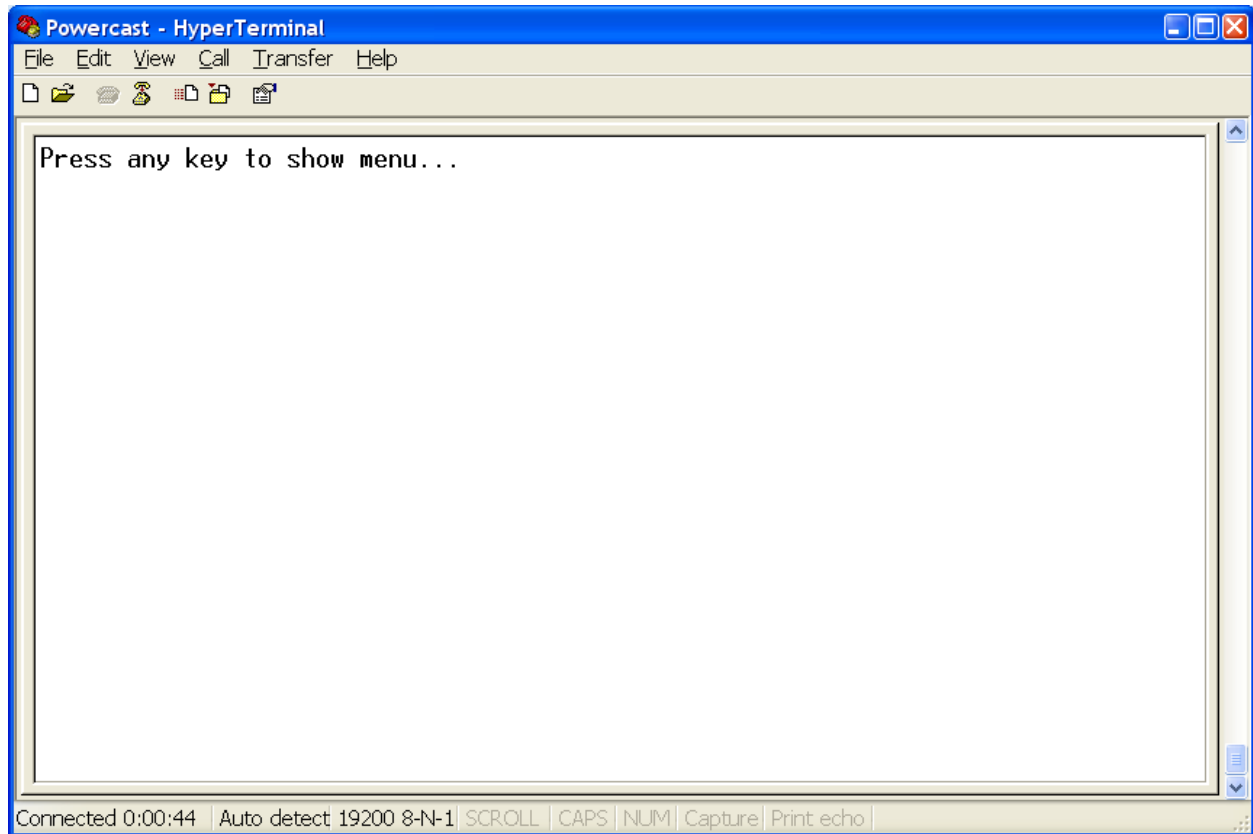
If more than one COM port is shown you can use System Properties through Windows Control Panel to determine which is the correct COM port. To access System Properties on your PC (using Windows XP) select the following menu options:

1. Start Menu > Control Panel > System
2. Click on the “Hardware” tab and then “Device Manager”
3. Scroll down until you see “Ports (COM & LPT)” and click the “+” sign to expand the list.

5. Choose the port settings as shown below and click “OK”.



6. Now that Hyperterminal is properly configured, if you aren't immediately connected, press the "Call" button, or use the menu option **Call -> Call**. Once you are connected you should see the startup message depicted below.



7. After pressing a key you will be show the options menu. Return to the main section of this guide for further information.

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