



Retriever & Pup Wireless Network **PRODUCT MANUAL**

Items 3900, 3901, 3902, 3910, 3910S
3905, 3906, 3907, 3911, 3911S



Spectrum[®]
Technologies, Inc.

INTRODUCTION

Thank you for purchasing a WatchDog Retriever & Pups Wireless Sensor Network.

The WatchDog Retriever & Pups Wireless Sensor Network is a technologically advanced solution that provides growers the ability to capture real-time, site-specific data in various microclimates.

The Wireless Network consists of one Retriever and many Pups. There are three types of Pups: Sensor Pups, Station Pups, and Repeater Pups.

Each Sensor Pup within the network is compatible with a diverse number of sensors and offers flexibility by allowing the grower to monitor the sensor inputs they care about in the locations they care about.

Station Pups are compatible with existing WatchDog 2000 Series Weather & Mini Stations and offer the ability to plug in and transmit the full data set to the end receiver along with data from other Sensor Pups across the growing environment.

Repeater Pups do not have sensor inputs. They can be used to provide additional paths to extend the network.

All data acquired by the Pups is transmitted back to the Retriever—the central point that collects, logs, and transmits the data.

The communication options are cellular modem, Wi-Fi, direct connection to PC, and USB flash drive. Communication options allow for automatic upload of the data to a computer or the web for further analysis.

Growers can monitor their crops on their computer or smartphone and make real-time decisions that improve yield and quality, conserve resources, and increase profits.

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This manual will familiarize you with the features and operation of your new WatchDog Retriever & Pups Wireless Network. Please read this manual thoroughly before launching the units.

For customer support or to place an order, call Spectrum Technologies, Inc. at 800-248-8873 or 815-436-4440, FAX at 815-436-4460, or e-mail at info@specmeters.com.

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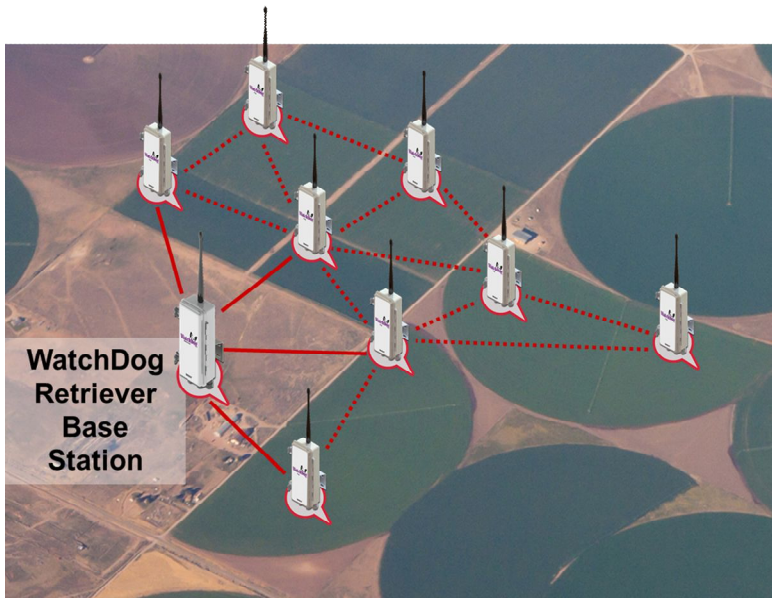
GENERAL OVERVIEW

Wireless Mesh Network

The Retriever & Pups wireless sensor network uses a mesh style of communication, which allows any Pup within the network to wirelessly route data from another Pup back to the Retriever.

The size of a network can vary by growing conditions, topography, and user preference. The mesh network is constrained to a maximum number of 16 Pups per network at a distance of 2500 ft (about $\frac{1}{2}$ mile or $\frac{3}{4}$ kilometer), or less between Pups, with no more than four hops back to the Retriever for the most remote Pups.

Pups have the ability to send their sensor data to the Retriever within minutes of measurement. The data can be sent directly to the Retriever, which logs the sensor data, or hopping via other Pups within the mesh network. All Retriever and Pup units are time synchronized. Because of this, the entire wireless network can 'go to sleep' for periods of time to conserve battery life. When the network 'wakes up', the Pups all communicate to the Retriever and share any sensor data they have recorded while the network was sleeping.



Components

The mesh network is made up of one Retriever and a user-defined number of Pups. It may include Item #'s 3900, 3901, 3902, 3910, or 3910S using 900 MHz radios or 3905, 3906, 3907, 3911 or 3911S using 2.4 GHz radios.

Item	Description
3910 Retriever	Receives all data from Pup network and communicates the data via three options -USB flash drive
3910S Retriever Solar	-Direct to PC -DataScout modem (sold separately)
3900 Sensor Pup	Up to 4 sensor inputs, transmit data to Retriever (direct or hopping via other Pups)
3901 Station Pup	*Plug in a WatchDog 2000 Series Weather Station or Mini Station and transmit all sensor data to Retriever (direct or hopping via other Pups)
3902 Repeater Pup	No sensor inputs, serves as a hopping node to help provide a path for the transmission signal around obstacles

*Requires firmware: Weather Station ≥ v7.6 (2800 - v3.5), Mini Station ≥ v4.1

Your WatchDog Retriever & Pups package should contain the following components:

- Product Manual
- Retriever and Pup units (labeled on enclosure & inside)
- USB flash drive, preloaded with Retriever and Pup Launch Utility software
- USB to 3.5mm Stereo Plug Cable (item 3661U)

Each Retriever or Pup unit should also be accompanied by a parts box containing the following:

- Antenna & antenna stabilizer sleeve
- 6 AA batteries (OR rechargeable battery pack — 3910S/3911S only)
- Mounting bracket
- U-bolt, clamp, and nuts
- Screws (2) for back of unit
- Station connection cable (Station Pup only)

EXTERNAL PORTS

Retriever

The Retriever ports are identified in figure 1

1. DC port for power cord (item 3926 or 3927) or DC adapter to connect solar panel*
2. USB port for external USB flash drive (external memory & configuration file transfer)
3. 3.5mm stereo port for PC interface cable (item 3661U or 3927)*
4. AUX port for wireless communication connection (DataScout Cellular or WiFi) or data power cord (item 3927C75)



Figure 1. Retriever External Ports

*To connect a solar panel or PC direct connection cable, the cable must pass through the gland before inserting the bare wires into the DC adapter terminals. Tighten the two terminal screws using a small screwdriver to secure the wires.

RED - positive (+)

BLACK - negative (-)



Sensor Pups

With the Sensor Pup, any WatchDog environmental sensor can be connected to any port.



Station Pups

The Station Pup is shipped with a cable with 2 modular connectors. One end plugs into the weather station's "AUX" port. The other end plugs into the Station Pups "Aux2" port. The Aux1 port is not used.



GETTING STARTED

Get your wireless network running in the following nine steps.

- Use the **My Network Library** planning tool inside (p. 33) to plan the configuration and layout of your Pups (*recommended*)
- Find a tutorial video online at www.specmeters.com/videos/

1 Power-up Retriever

Retriever should be in Setup mode (flashing amber)

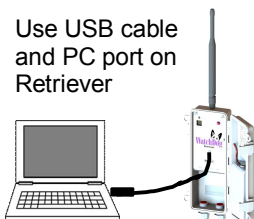
Connect its antenna



pg. 9

2 Connect to PC or DataScout

Use USB cable and PC port on Retriever



pg. 10

3 Open launch software or power up DataScout

RPLU program loaded on USB flash drive or on Spectrum website



pg. 10

4 Put batteries in Pups

They will join the Retriever's network (3 green flashes)



pg. 9

5 Configure units

Use RPLU or SpecConnect



pg. 10-17

6 Save to Retriever

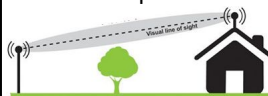
Save settings from RPLU or SpecConnect



pg. 10-17

7 Deploy Retriever

Place in a position to achieve line-of-sight communication to nearest Pups



pg. 21

8 Deploy Pups

Check signal strength (2-second press) at their desired locations. Adjust as necessary



pg. 21-22

9 Change to Active mode

Return to Retriever and switch mode (2-second press)



pg. 22

SETUP

Installing the Retriever & Pup Launch Utility software (RPLU)

The installation program is available on the USB flash drive that shipped with the Retriever and on the Spectrum website. Run the RPLU setup.exe file to install the launch utility. The RPLU desktop icon (right) can then be used to open the program.



Powering Up and Syncing the Retriever and Pups

Follow these steps to set up the Retriever and Pups wireless network.

1. Verify that all the Retriever and Pup units are on the same channel by checking the Network Channel Selection switch. If not, use a screwdriver to change the channel selection. If using multiple wireless networks, each network should use a unique channel.
2. Attach the antenna **only to the Retriever**.
3. Install batteries in the Retriever. The LED will flash green while powering up. Following power-up, the Retriever should be in Setup mode (flashing amber). If it isn't, hold Retriever's button for 2 seconds.
4. Put the Pups within proximity of the Retriever and power them up by installing the batteries. The LED will flash green several times. They will automatically broadcast a request to join the Retriever's network following power-up. This is indicated by several amber flashes (request to join) followed by 3 quick, green flashes (successful reply). If the Pups don't automatically join within one minute, hold the Pup's button for 8 seconds to manually join. The Retriever's amber flash sequence will accelerate. The Pup's connection status can also be seen in the RPLU software (p. 10)
5. See **Configuration** (pg. 10 - 17) for details on configuring Retrievers, Sensor Pups, and Station Pups. Configuration can be done with RPLU software. Retrievers connected to a DataScout modem can also be configured with the SpecConnect web utility.



CONFIGURATION

A Pup can be configured by connecting directly to a PC, a USB flash drive, or the SpecConnect web portal. The flash drive is used when adding a Pup to a previously configured system that is already in the field.

Configuration via Direct Connection to Retriever

If the Retriever is not in Setup mode (amber light flashing continuously), hold the button for 2 seconds (see **Retriever/Pup Operation**, pg. 18). Connect the Retriever to a Windows computer using the USB to 3.5mm stereo plug cable (item 3661U, included). Open the RPLU program using the desktop icon.

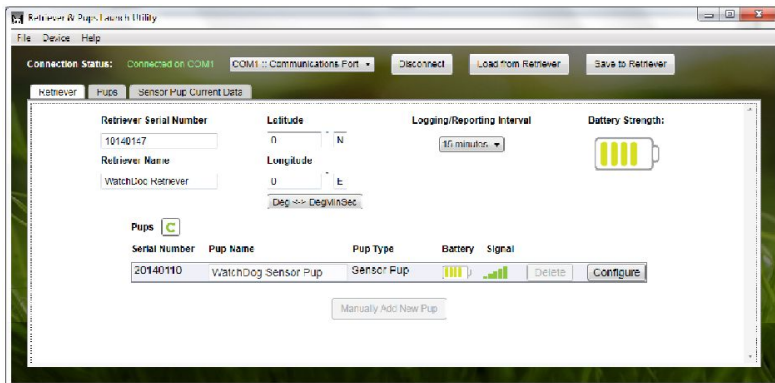


Figure 2. Retriever Settings Screen

1. Upon start-up, the RPLU will automatically recognize any COM ports on your computer. If the Retriever doesn't automatically connect, select the COM port of the USB serial cable and click the "Connect" button to establish communication to the Retriever. If the list includes more than one COM port, you can check in your computer's Device Manager or simply go through them one by one.

2. From the Retriever Settings screen (fig. 2), set the Retriever parameters. The Retriever's name is entered in the text box. The logging interval is selected from the dropdown menu. Entering latitude and longitude is optional. These can be entered in decimal or Degree/Minute/Second format.

3. A list of Pups will be visible on the Retriever settings screen. Verify that the Pups are communicating with the Retriever. When a Pup becomes active, the battery and signal icons will change from gray to colored.

4. Clicking a **Configure** button will bring up Settings screen for that specific Pup (fig. 3). The Pups settings screens can also be brought up by clicking on the Pups tab.

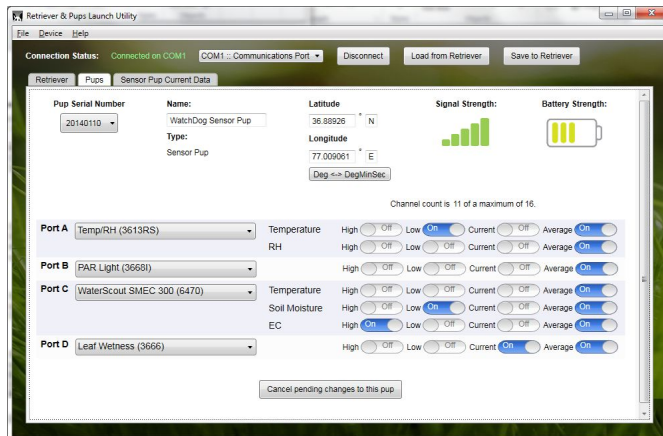


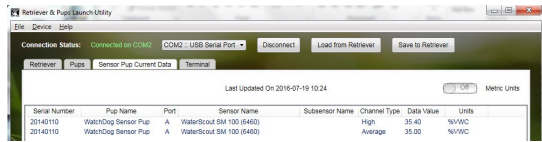
Figure 3. Pup Settings Screen

5. Set the Pup's parameters in the Pup Settings screen. The Pup's name is entered in the text box. The type is automatically determined from the Pup's serial number. Entering latitude and longitude is optional. These can be entered in decimal or Degree/Minute/Second format. Select the sensor type from the drop down menu for each port. Select up to 4 channels per port using the toggle buttons (see **Data Logging & Storage**, p. 24). Note that most Pup stations have most sensors pre-defined.

6. To configure additional Pups, select each serial number in turn from the "Pup Serial Number" dropdown menu on the Pup setting screen. Alternately, you can select a Pup from the list on the Retriever settings screen (see step 3).

7. Once the Retriever and all Pup units are set, click the "Save To Retriever" button. The Retriever will wirelessly send the settings to the Pups.

8. Go to the Sensor Pup Current Data tab to verify the expected data parameters are coming in from each pup. If a sensor is not connected, a dash will be displayed in the Data Value column. For Station Pups, the current condition can only be seen in the Pups tab.



The Retriever can now be disconnected from computer.

Configuration via USB Flash Drive

The Retriever configuration can be stored to a flash drive and transferred to a Retriever in the field. The configuration process is similar to the one for the direct PC connection except the Retriever and Pup information must be entered manually.

1. Insert the flash drive into the PC and bring up the RPLU software. Open the “File” menu (fig. 4).

2. If a configuration for the desired Retriever is already stored on the flash drive, click the “Open Configuration” option to modify that configuration. Skip to step 5.

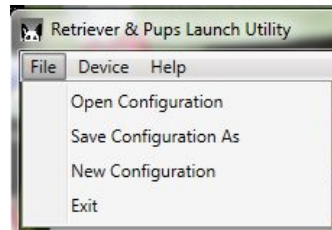
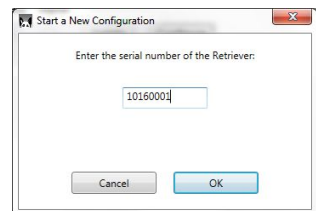
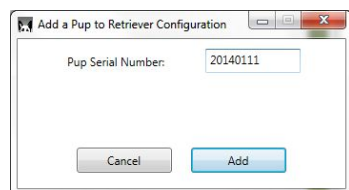


Figure 4. RPLU File menu

3. For new setups, click the “New Configuration” option to configure a new Retriever. This will bring up the “Start a New Configuration” screen. Enter the serial number for the Retriever and click “OK”.



4. In the Retriever Settings screen, click the “Manually Add New Pup” Button. This will bring up the “Add a Pup to Retriever Configuration” screen. Enter the serial number for the Pup and click “Add”. Repeat this process for all Pups.

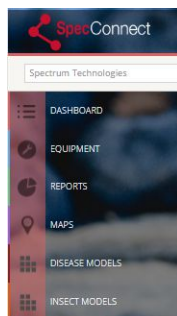


5. The Pup(s) will appear in the Retriever Settings screen and as an option in the Pup Settings screen. Begin the process as in step 3 of the configuration for a directly connected Retriever (p. 10). When all Pups have been configured, click the “Save Configuration As” option from the File menu (fig. 4). The program will bring up a browser screen. Save the configuration to the root directory of the flash drive. The configuration file will have the name *setup.txt*.

Eject the flash drive from computer. In the field, put the Retriever in Setup mode by pressing the button for 2 seconds (LED will flash amber). Plug the flash drive into the Retriever. Initiate the transfer of configuration settings with a short press of the button (see **Retriever/Pup Operation**, pg. 18).

Configuration via the SpecConnect Web Portal

1. Log in to your account at www.SpecConnect.net.
2. Open the Retriever configuration page by clicking the “Equipment” option in the upper left corner. Click on the “Configure” button for the Retriever to bring up the Configure WatchDog screen.



3. In the “Configure Retriever” screen (fig. 5), set the Retriever parameters. The latitude, longitude & altitude (optional) can be keyed in. Alternately, if the pindrop icon is clicked, a map image will be displayed that allows you to locate the device. The logging interval is how often a Pup sends data to the Retriever. The Upload interval is how often the DataScout reports records to SpecConnect. In most installations, it is recommended for the logging interval to match the upload interval. See **Data Logging & Storage** (p. 24) for details on the logging and web upload intervals. Click “Save” to store any changes.

A screenshot of the 'Configure Retriever' screen. At the top, a green status bar says 'Configuration synchronization successful at 1/29/2016, 5:36:24 PM'. Below this, there are several input fields: 'Retriever Name' (Paul's Desk - GPRS), 'Latitude' (41.739730), 'Longitude' (-88.227780), 'Altitude' (217), 'Logging Interval' (5), 'Upload Interval' (5), and 'Time Zone' (UTC-06:00 Central Time (US & Canada)). On the right side, there are read-only fields: 'Serial Number' (10140002), 'Model #' (1014), and 'Firmware Rev' (01.05.10 (Modem: 01.04.41)). At the bottom, there are 'Cancel' and 'Save' buttons. A 'DST' toggle switch is also visible on the right.

Figure 5. SpecConnect Retriever Configuration Screen

4. Return to the equipment list and open the first Pup configuration page.

5. In the “Configure Sensor Pup” screen (fig. 6), set the Pup parameters. The latitude, longitude & altitude (optional) can be keyed in. Alternately, if the pindrop icon is clicked, a map image will be displayed that allows you to locate the device. See **Data Logging & Storage** (p. 24) for details on setting the data channels. Click “Save” to store any changes. Repeat for all Pups.

Configure Sensor Pup

Configuration synchronization successful at: 1/29/2016, 6:04:32 PM

Sensor Pup Name

Latitude **Longitude** **Altitude**

Serial Number
20140001

Model #
2014

Firmware Rev
01.05.01

Port# Channel Count: 11/16

A * **High** ☒ **Low** ☐ **Current** ☒ **Average** ☒ [Calibrate](#)

B * **High** ☐ **Low** ☐ **Current** ☒ **Average** ☐ [Calibrate](#)

C *

... 1 * **High** ☒ **Low** ☒ **Current** ☐ **Average** ☐ [Calibrate](#)

... 2 * **High** ☒ **Low** ☐ **Current** ☒ **Average** ☒ [Calibrate](#)

... 3 * **High** ☒ **Low** ☐ **Current** ☐ **Average** ☒ [Calibrate](#)

D * **High** ☐ **Low** ☐ **Current** ☐ **Average** ☐

[Cancel](#) [Save](#)

Figure 6. SpecConnect Pup Configuration Screen

6. The configuration will be sent to the DataScout modem which communicates the settings to the Retriever.

Configuring Weather Station Connected to a Station Pup

WatchDog 2000-series stations used with a Station Pup must be configured* with SpecWare Pro software or with the WatchDog Configuration Utility.

- Requires SpecWare Pro v9.6 or later, update online at www.specmeters.com/updates/
- Minimum firmware requirements

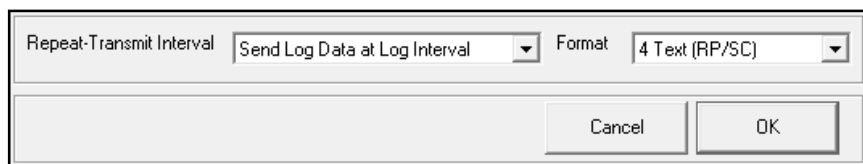
Weather station (except model 2800) v 7.6

2800 Weather Station v 3.5

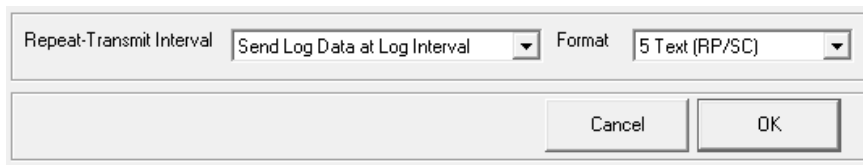
Mini Station v 4.1

Configure the WatchDog mini or full weather station using Spec9 Pro by following the steps below:

1. Connect the WatchDog mini or weather station to a PC.
2. In Specware 9 Pro, open the WatchDog Properties using the WatchDog Manager or the 'Launch/Set Properties for 1000 or 2000 Series' button. In the WatchDog Configuration Utility, click the "Configure" button.
3. Enter the name, logging interval, and sensor configuration
4. Set **Repeat-Transmit Interval** to **Send Log Data at Log Interval**.
5. For mini stations set **Format** to **4 Text (RP/SC)**.



6. For full weather stations set **Format** to **5 Text (RP/SC)**.



7. Save the settings by clicking 'OK'.

* No configuration is necessary if only the internal sensors are used.

8. Connect the 2000-series station to the Station Pup using the provided cable.
9. The 2000-series station will send its logged data to the Station Pup at the selected interval and the Station Pup will send this log to the Retriever as part of the wireless network. This can be confirmed by connecting the Retriever to the Retriever & Pup Launch Utility. The latest data record will appear in the Pups tab under the Station Pup's serial number. These values are updated every time the station logs a new data record.

The screenshot displays the 'Retriever & Pup Launch Utility' software interface. At the top, the 'Connection Status' is 'Connected on COM2', and the 'COM2' port is set to 'USB Serial Port'. Buttons for 'Disconnect', 'Load from Retriever', and 'Save to Retriever' are visible. The 'Pups' tab is selected, showing a list of pups. The 'Pup Serial Number' is '30140116'. The 'Name' is 'WatchDog Station Pup'. The 'Type' is 'Station Pup'. The 'Latitude' is '0' and the 'Longitude' is '0'. The 'Signal Strength' is shown as a bar graph with four bars. The 'Battery Strength' is shown as a battery icon with three bars. A 'Cancel pending changes to this pup' button is located below the pup details. At the bottom, the 'Last Record' is 'SL4E247511487' with a timestamp of '2016-02-18 14:00' and a data string '0000 005.9 074.3 0000A89'.

Pup Serial Number	Name	Latitude	Longitude	Signal Strength	Battery Strength
30140116	WatchDog Station Pup	0° N	0° E	4 bars	3 bars

Cancel pending changes to this pup

Last Record: SL4E247511487 2016-02-18 14:00 — 0000 005.9 074.3 0000A89

RETRIEVER/PUP OPERATION

The LED on the Retriever or Pup is used to convey information about the status and functioning of each device. The small red button can be used to request most of this information. For Retrievers, the button can also be used to prompt the device to perform certain actions. A label summarizing these features is affixed to the inside door of the device. These are explained in greater detail below.

Retriever

The Retriever operates in one of two modes; Setup and Active. In Setup mode, the Retriever interacts every 20 seconds with the Pups. Therefore, information will be sent to, and received from, the Pups more quickly. This mode is used when configuring the system or when troubleshooting. This mode is indicated by a flashing amber LED. While in Active mode, the Retriever and Pups communicate every 5 minutes. This longer communication interval is used to conserve battery life. To switch between Active mode and Setup mode, press and hold the button for two seconds. The LED will initially blink slowly but transition to rapid amber flashing when the unit is in the new mode.

Retriever configuration and data transfer can be done with the Retriever & Pup Launch Utility (p. 10), the SpecConnect Web Portal (p. 14), or a USB flash drive (p. 12). If the Retriever is in Setup mode, a short button press will instruct the Retriever to read a USB flash drive for new configuration settings. If the Retriever is in Active mode, a short button press will initiate two actions; 1.) The LED will briefly indicate the battery strength and 2.) Any new data will be offloaded to the flash drive (see **Data Export - USB Flash Drive**, pg. 26).

The Retriever will periodically flash green when it communicates with the network of Pups. These green flashes will occasionally overlap with other LED indications. The explanation of the different LED colors is shown in figure 7.

Pup

The red button on the Pup is used for in-field diagnostics. A short press requests the battery strength. Pressing and holding for 2 seconds, until the LED turns on, prompts the Pup to indicate if it has optimal communication with network. If the Pup does not have desirable signal strength, find another location to deploy the Pup or follow the recommendations in **Installation** (pg. 20). The requested status is indicated by the LED. The explanation of the different LED colors is shown in figure 8. Additionally, the LED on the Pup will flash green when it is receiving data from the Retriever and amber when it is transmitting data to the Retriever. These green flashes will occasionally overlap with other LED indications.

WatchDog Retriever Button and LED Information

Button Push	Active Mode	Setup Mode
Short Press	Battery State & Download to USB	Load Settings from USB
2 Sec Hold	Toggle Between Active and Setup Mode	

LED Color	Battery State	USB Activity	Flashing
Green	Good	Done	Data TX/RX
Amber	Low	Working	Setup Mode
Red	Replace	Error	Error

Figure 7. Retriever button and LED information label.

WatchDog Pup Button and LED Information

Button Push	Response
Short Press	Battery State
2 Sec Hold	Signal Strength

LED Color	Battery State	Signal Strength	Flashing
Green	Good	Good	Data RX
Amber	Low	Marginal	Data TX
Red	Replace	Bad or None	Error

Figure 8. Pup button and LED information label.

Factory Reset

To issue a factory reset to either the Retriever or Pup units, disconnect power and power-up the unit while holding the button for 8 seconds, until the LED flashes red & green. Pups must rejoin the network after disconnecting power, see instructions above. If a Retriever is factory reset, the configuration of the unit must be re-sent using the RPLU or SpecConnect (see **Setup**, pg. 9)

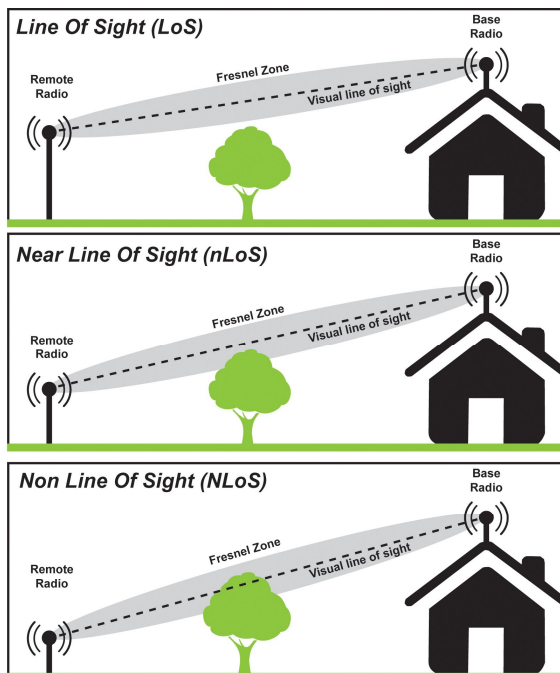
INSTALLATION

The Retriever and Pups will function optimally when the units are placed in a condition that allows direct line-of-sight. The optimum signal will occur when the football-shaped Fresnel Zone is clear of obstructions such as hilly terrain, foliage, and structures.

- The recommended clearance above crop height is at least 3 feet (1 meter). Higher installations give better performance.
- The maximum range between Pups is 2500 ft (about ½ mile or ¾ kilometer) for 900 MHz and 300 m for 2.4 GHz. The most remote Pup should not exceed 4 hops back to the Retriever.

To achieve line-of-sight communication when obstructions are present, we recommend using:

- Repeater Pups (item 3902/3907, see **Components**, pg. 5)
 - ⇒ Route communication around obstructions
- Antenna extensions (Item 3925 see **Accessories**, pg. 30)
 - ⇒ Route communication above obstructions and allow unit to be lower to ground, giving better access to sensor ports and batteries.



The Retriever and Pups should be configured before deployment. Configuration should be done while communicating in Setup mode (see **Configuration**, pp. 10 - 17).

Tools recommended for installation

- 7/16-inch (11-mm) wrench
- Phillips screwdriver for tightening the mounting bracket screws on back of units
- Antenna stabilizer (included) prevents antenna from bending when mounted vertically but can be removed to allow a bent antenna for horizontal mounting (see fig. 9).

Deploy the Retriever

1. It is important that the Retriever antenna be placed as high and clear of obstructions as possible, since all Pup data is routed to the Retriever.
2. Mount using provided hardware (bracket, u-bolt, nuts, screws).
3. Mount solar panel (if being used). Connect to Retriever with DC adapter (see p. 6).

Deploy the Pups

1. It is recommended to start with the Pup that will be nearest to the Retriever and move outwards to create the mesh network.
2. Upon arrival at each desired location, attach an antenna to the Pup.
3. Check the signal strength of the Pup at the location by holding the Pup's button for 2 seconds until the LED turns on (see **Retriever/Pup Operation**, pg. 18).
4. If signal strength is poor, move closer to either the Retriever or nearest Pup, use an antenna extension, or add a Repeater.



Figure 9. Retriever and DataScout setup with solar panel. Stabilizer shown in inset photo

5. Mount using provided hardware and tighten screws using a Phillips screwdriver (see fig. 10). Although the antenna should be vertical, the housing can be oriented horizontally or vertically.



Figure 10. Attaching the mounting bracket.

6. Attach sensors - make sure the cable glands are tightened around the sensor cables

Final Steps

1. After the last Pup is deployed, return to the Retriever and hold the button for 2 seconds to enter Active mode (the LED's will stop flashing amber) which saves battery life. Otherwise, the Retriever will automatically transition to Active mode after 4 hours.

2. After at least one logging interval, check that all the Pups are communicating with the Retriever.

- If using SpecConnect, check for current data on the web portal.
- If using a direct connection from the Retriever to a PC, use the RPLU to check for current data.
- If using the USB flash drive for data transfer, check it in a PC to confirm Pup data files are being logged on the flash drive (see **Data Export**, p. 26). Re-insert flash drive in the Retriever.

Adding a Sensor or Station Pup to an established network

Be sure the Retriever is in Setup mode (flashing amber). If it isn't, press the button for 2 seconds. It may take up to 5 minutes for the Retriever to transition to Setup mode.

- Install batteries in the new Pup. The Pup will flash amber while it tries to join. When successful, it will flash green 3 times. If it doesn't join, hold the red button on the Pup for 8-10 seconds. This will re-start the meshing sequence. The Pup may or may not flash amber but will flash green 3 times when it has meshed.
- Once meshed, the Pup will periodically flash green and amber to indicate communication to the Retriever.

DATA LOGGING & STORAGE

Data Logging

- The Retriever logs sensor data from its network of Pups (maximum of 16 Pups per network).
- The Pup logging intervals are: 5, 10, 15, 30, or 60 minutes.
- Pups read the sensors every 15 seconds. So, for example, the logged value for a Pup on a 5 minute interval will be composed of 20 measurements.
- A single logging interval is selected in the Retriever Settings screen because all Pups have the same interval.
- If communication to a Pup is lost for a period of time, all other Pups will continue functioning normally. When non-communicating Pups are reconnected, they will send all their missing data to the Retriever.
- Shorter intervals allow for more frequent updates to SpecConnect, but also consume more modem battery power.
- For installations with many Pups (10 or more), it may be beneficial to set the upload interval to be shorter than the logging interval.

Data Channels

- Up to four data types, can be recorded for each sensor measurement. These data channels are defined as follows:
 - Average:** The average of all measurements taken during the logging interval
 - Current:** The most recent measurement
 - High & Low:** The maximum and minimum values measured during the logging interval
- Each Sensor Pup can log a maximum of 16 data channels.
- When using multi-sensors, a different configuration of data channels can be chosen for each parameter.
- Rain and wind sensors have pre-selected data channels.

Data Storage

- The flash memory on the Retriever will hold approximately 6 months of data for a 10 Pup network using 15 minute logging intervals. When the logging capacity is reached, older data on the Retriever will be overwritten. To avoid loss of data if the internal memory fills, it is recommended that the Retriever always be connected to a USB flash drive.

- If communication to the Retriever is interrupted, the internal memory on the Pups buffers sensor data for at least 21 hours until a connection to the Retriever is re-established.
- Non-volatile memory on the Retriever preserves the logged data, even when power is lost.

UPDATING FIRMWARE

A summary of the firmware update procedures are given below. Full details on updating are available at

<http://www.specmeters.com/assets/1/22/>

[Technical_Bulletin_20141204_Update_Retriever_Pups_Firmware.pdf](#)

Retriever

- Load the latest version of the Retriever firmware (retFw.bin) onto the flash drive.
 - Remove all power from the Retriever and insert flash drive.
 - While holding the button, re-attach the battery.
 - Release the button when LED glows amber.
 - Update is complete when LED flashes green.
- Retriever will return to Setup mode (flashing amber)

Pup

- Load the latest version of the Pup firmware (sPupFw.bin for the Sensor Pups and wsPupFw.bin for the Station Pups and Repeater Pups) onto the flash drive.
 - Pups must be paired with Retriever and the Retriever must be in Setup mode (flashing amber).
 - Plug USB flash drive with firmware file into USB port on the Retriever.
 - Press and quickly release button on Retriever to initiate file transfer to the Pup. Retriever LED will flash red/green.
 - When the Pup's firmware is updated, its LED will briefly flash red/green then return to normal operation.
- Delete the Pup firmware from the flash drive.

DATA EXPORT

Gathering Data on a USB Flash Drive

The USB flash drive can be left in the Retriever or temporarily inserted to offload data stored in the Retriever's memory. While the flash drive is inserted, data is automatically saved to it. If the flash drive is inserted only at the time of data collection, a manual dump of the data is necessary. This is also true for instances when the drive is normally left in the Retriever, but must be taken off site temporarily to transfer the data. In that case, a quick data dump should be done at insertion to capture data recorded during that interval and before automatic data collection begins.

The Retriever creates a single file with all the historical data on the Retriever. The name for this file will be the serial number of the Retriever. This is the only file available for a flash drive inserted at the time of data collection.

A flash drive left in the Retriever will also contain a unique data file for each day of data stored on the Pups since it was last plugged into the Retriever. Data files are in semicolon-delimited text format. These daily files will have the naming convention "YYYYMMDD.txt" where Y is the year, M is the month and D is the day.

To offload data to a newly inserted flash drive, the Retriever must be in Active mode (no regular LED flashing) before initiating the download. If the Retriever is in Setup mode (LED flashing amber), press and hold the button for two seconds to put it into Active mode. While in Active mode, initiate the download by quickly pressing and releasing the button. The LED will show the battery state, then glow amber until the data transfer is complete.

It is recommended that data be cleared from the USB stick once it is saved in a safe location.

Importing Data with SpecWare Pro Software

(requires v. 9.6 or greater)

Pup data can be imported into Specware Pro. From the main Specware screen, click the Retriever & Pups icon from the toolbar. This will bring up the **Retriever & Pups** screen (fig. 11).

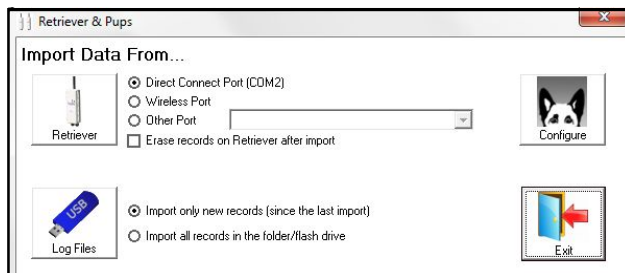


Figure 11. Specware Retriever & Pups screen

There are 3 possible data sources

1. PC connected directly to Retriever

Connect the PC direct-connection cable to the “PC” port on the Retriever. The COM port is selected in the File - Preferences - Communication tab - Direct Connection field (fig. 12).

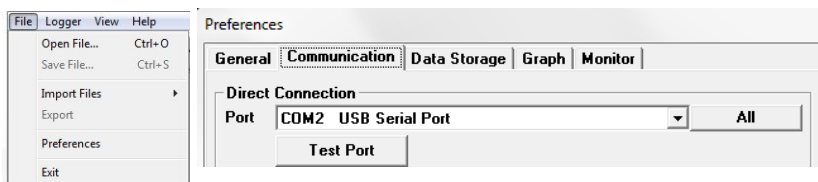


Figure 12. Specware port selection screen

Click the **Retriever** button (fig. 11) to download the data received from the Pups. The **Erase records from Retriever** option is recommended to speed up download times

2. Transferring data from USB flash drive

Click the **Log Files** button (fig. 11) to browse for the data files saved to a flash drive (see p. 26). You must browse to the directory to pull data from. The default is the Specware directory, not the flash drive.

3. SpecConnect Exports

In SpecWare, click File - Import Files - Import SpecConnect Data Files to import a SpecConnect export file (fig. 13). See **SpecConnect Web Portal** (below) for information on exporting data from the web portal.

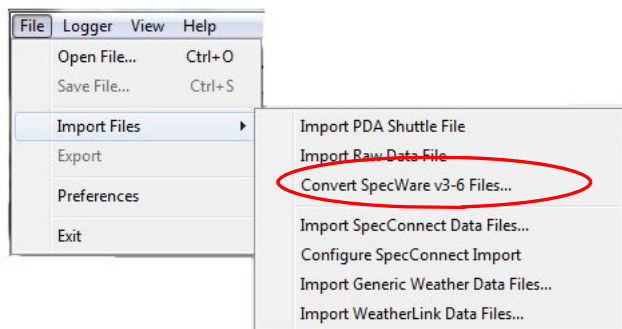


Figure 13. Import SpecConnect Data Files button

Exporting Reports From the SpecConnect Web Portal

Data exports from SpecConnect are done from the **Reports** feature. Select the desired report type from the **Reports** screen (fig. 14). Select the Pup date range and any other necessary parameters (equipment, sensors, ...) for the exported data file (fig. 15). Use the export button to download the data. The data is stored in .csv format.

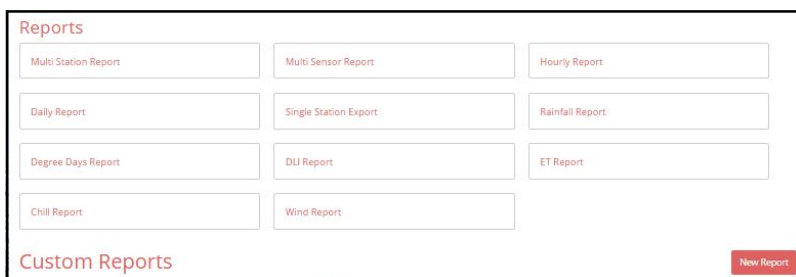


Figure 14. Reports screen

Single Station Export

Date Range to

Equipment

Figure 15. Sample report options screen

ACCESSORIES

Optional Accessories

- Tripod, item 3396TP
- Antenna extension 10-ft cable and mounting hardware (item 3925)
- AC-DC power cord (item 3926)
- PC Direct-connection 50-ft cable kit (item 3297)
- USB flash drive (item 3388USB)
- 75' Powered Direct Connect 75 ft Retriever Extension Cable Kit (3927C75)
- DataScout Cellular or WiFi modem (multiple item numbers)



Tripod (item 3396TP)



*AC-DC power cord
(item 3926)*



*10-ft antenna extension cable and
mounting kit (item 3925)*

SPECIFICATIONS

Mounting Hardware	1¼ inch u-bolt, aluminum bracket
Enclosure	3.75 x 2 x 8 in (9.5 x 5.2 x 20.2 cm) IP65, UV resistant ABS plastic
Weight	Non Solar: 1.6 lb (0.7 kg) Solar: 5.5 lb (2.5 kg)
Power Options (non solar)	6 x AA batteries, DC power port (maximum 17 VDC)
Power Options (solar)	5W solar panel with Rechargeable battery pack (2200 mAh, 7.2 NiMH)
Battery Life	8 months (typical)
Operating Temperature	-22 to 130 °F (-30 to 55 °C) (with non-rechargeable AA batteries) 14 to 130 °F (-10 to 55 °C) (with rechargeable NiMH battery pack)
PC/Aux Port Baud Rate	9600 bps (default, adjustable)
Frequency bands	902-928 MHz ISM band: (3900, 3901, 3902, 3910, 3910S) 2.4 GHz ISM band: (3905, 3906, 3907, 3911, 3911S)
Antenna	Reverse polarity SMA
Range	900 MHz: 2500 ft (~750 m), line of sight 2.4 GHz: 300 m
Output Power	900 MHz: 2500 27dBm (500mW) with omni-directional antenna (included) 2.4 GHz: 10 dBm (10 mW)

POWER

Pups

Standard Pups are powered by 6 AA batteries. The battery status can be checked by quickly pressing and releasing the button. Any time the batteries are changed on a Pup, it must rejoin the network. This is done when the unit powers on or by holding the button for 8 seconds. The LED will rapidly flash green 3 times when it has joined.

Retrievers

Standard non-solar retrievers are powered by 6 AA batteries. A solar retriever uses a 6-cell NiMH battery pack. When connected to a DataScout, the units will share power. If using an AC-DC adapter or PC direct-connection cable to power the Retriever, it is recommended that the 6 AA batteries be removed after the DataScout (or other constant power source) is connected. The solar panel or AC-DC adapter will keep the attached unit powered without need of additional batteries. While no immediate damage will occur if the alkaline batteries are left in, unused alkaline batteries tend to corrode over time and can damage the device.

A solar Retriever (3910S) can also be connected to an AC-DC adapter or PC direct-connection cable. However, the rechargeable battery pack must remain connected at all times.

Changing batteries in a Pup in the field

The procedure is the same as for adding a new Pup (p. 23).

Changing batteries in Retriever or restarting a system if Retriever powers off

Simply replace the batteries in the Retriever. The Retriever will start up in Setup mode (flashing amber) and begin looking for all the Pups it has previously communicated with. If a new Pup is being added to the system, it is recommended that the new Pup be powered up after powering up the Retriever so it meshes faster. Otherwise, the Pup can be put into setup mode by pressing the button for 8-10 seconds. In that case, it may take up to 5 minutes for the Retriever to transition to Setup mode.

MY NETWORK LIBRARY

Use this table to keep track of information about your Retriever & Pups Wireless Sensor Network.

- Plan out your sensor network before deploying
- Take notes while deploying the network
- Keep an equipment library for future reference

Serial Number	Name / Location	Sensors	
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:
		A:	C:
		B:	D:

TROUBLESHOOTING GUIDE

1. The RPLU will not communicate with the Retriever.

Check your PC's Device Manager to see if the computer recognizes the USB cable. The driver should automatically download if the PC is connected to the internet. Also available at www.specmeters.com/updates/

Only one program can communicate with the USB cable at a time (SpecWare and RPLU can interfere with each other. In this case, close both programs then reopen the one to be used

2. The LED doesn't flash at all.

Check that the snap connector is securely connected to the battery holder and that all the AA batteries are inserted in the correct orientation.

3. Single Pup not being updated in SpecConnect

- Confirm that the Pup is on the same channel as the rest of the network.

- The batteries may be dead. Check last reported value for battery strength in SpecConnect and/or visit the site and perform a quick press.

- Check to see if the Pup is knocked to the ground or damaged. This includes water damage or corrosion inside the housing.

- Check the signal strength of the Pup at location.

*See **Setup** (p. 9) for instructions on how to sync the Pup with the Retriever. After successfully meshing the Pup, perform a 2-second press on the Retriever button to return it to Active mode (flashing amber).*

4. Single Pup being updated intermittently in SpecConnect

Check that the antenna is firmly attached in an upright orientation, is not blocked by foliage, and is sufficiently above the crop canopy.

5. No Pups are being updated in SpecConnect

This is most likely the result of a problem with the modem or the Retriever.

- Check for damage or water in the Retriever and modem enclosures.*
- Check that the Retriever is getting power (batteries or solar panel).*
- Check that the modem has power (quick push of button) and good signal strength (2-second button push).*
- Check that the modem and Retriever antennas are firmly attached in an upright orientation.*

6. Not seeing data from an individual Pup sensor

- Check that sensors are fully seated in port connectors.*
- Check sensor wires for damage.*
- Swap sensors (and reconfigure through SpecConnect or RPLU) to check for potential port failure.*

REGULATORY INFORMATION

900 MHz:

USA: FCC ID – MCQ-XB900HP

Canada: IC – 1846A-XB900HP

2.4 GHz:

Europe: CE, ETSI approval

Japan: Telec R201WWog215111

Australia: C-Tick approval

WARRANTY

This product is warranted to be free from defects in material or workmanship for one year from the date of purchase. During the warranty period Spectrum will, at its option, either repair or replace products that prove to be defective. This warranty does not cover damage due to improper installation or use, lightning, negligence, accident, or unauthorized modifications, or to incidental or consequential damages beyond the Spectrum product. Before returning a failed unit, you must obtain a Returned Materials Authorization (RMA) from Spectrum. Spectrum is not responsible for any package that is returned without a valid RMA number or for the loss of the package by any shipping company.



DECLARATION OF CONFORMITY

Spectrum Technologies, Inc.
3600 Thayer Court
Aurora, IL 60504 USA

Model Numbers: 3900, 3901, 3902, 3910, 3910S, 3905, 3906, 3907, 3911, 3911S
Description: WatchDog Retriever & Pup Mesh Network
Type: Electrical equipment for measurement, control, and laboratory use
Directive: 2014/30/EU EMC
Standards: EN 61000-6-1: 2007
EN 61000-6-3: 2007
IEC 61000-4-2: 2008
IEC 61000-4-3: 2006, +A1:2007 +A2:2010
EN 55022:2010

Paul Martis, Project Manager—Weather

March 11, 2015

USA and Canada Conformity Standards:

FCC Part 15 CFR Title 47: 2014
ICES-003: 2012 Digital Apparatus (Industry Canada)

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