Maintenance Guide

RainWise Weather Stations

Maintain your weather station in good working condition according to the manufacturer's recommendations for optimum data integrity.

Calibrate weather stations every two years; contact the station manufacturer for calibration.

Routinely inspect your weather station to make sure all sensors are clean, free of debris, and in good working condition. It is recommended that the solar panels which power the battery are periodically cleaned with an alcohol wipe, but if none are available a soft, clean, damp cloth. Inspect mounting brackets, poles, posts, etc. to make certain they are stable, vertical, sound and the instrument is securely fastened. Jostling during strong winds can negatively affect radio transmission and precipitation data.

Protect weather instruments, sensors, and cables from pruning, spraying and harvesting activities that may damage the sensors, cut cables, or cause weather stations to lean.

Relative humidity (RH) and temperature sensors:

These sensors are delicate instruments that should be periodically checked, according to the manufacturer's recommendations, to make certain they are accurate. Compare the readings of the weather station sensors with a calibrated thermometer or with another nearby weather station. During dewy mornings or rainy weather, low RH readings indicate a sensor malfunction. Contact RainWise to replace bad or broken sensors.

Precipitation (rain) gauges:

Leaves, moss, algae, and debris will cause clogging of the tipping bucket screen. The tipping bucket should be checked and cleaned routinely (at least twice a year). The surrounding environment will affect how often it should be cleaned. For example, where weather stations are placed in an open area near an orchard, vineyard, or woods, make sure that tipping bucket rain gauges are not subject to filling with leaf litter from adjacent areas.

For RainWise weather stations, to clean the rain gauge, start by turning off the weather station. Loosen the 4 screws holding the bucket to the base of the rain gauge and twist counter-clockwise to remove it. Straighten the cotter pin legs holding the screen, pull the cotter pin out, remove the screen, and clear the drain hole. You can clean the collector and tipping bucket with warm soapy water if necessary. Make sure you rinse it well afterwards. When putting it back together, the cotter pin legs MUST be bent securely up so they don't interfere with the tipper. Remember to turn the weather station back on after cleaning.

Wasps may build nests in tipping bucket rain gauges. A small piece of vapona strip may be used as a deterrent.

If improperly mounted, the weather station may be jostled during strong winds and this may cause the tipping bucket arm to tip and record a small amount of precipitation during dry weather.

If the rain gauge continues to malfunction after cleaning, it is possible the reed switch is bad. Refer to the Troubleshooting Guide or contact RainWise Technical Support.

Leaf wetness sensors:

NEWA suggests that you place plastic grid type leaf wetness sensors facing north and angled 45 degrees from horizontal. If they are attached close to the weather station, this protects the sensor and cables from pruning, spraying and harvesting activities. Periodically check the plastic grid for cracks that would expose the metal wire grid. Contact RainWise to replace any broken or cracked leaf wetness sensors.

Wind speed, anemometers:

The anemometer should spin freely and be free of debris of any kind. Periodically inspect the anemometer in strong wind conditions and calm conditions and check the data being recorded to make certain it is working correctly. Contact RainWise Technical Support for replacement.

Wind direction, weather vane:

The weather vane should be set to zero on due north in order for the readings to be accurate. Any time the weather station is moved or bumped, check the orientation of the weather vane relative to north. The weather vane should move freely and be free of debris of any kind.

Solar radiation:

The solar radiation sensor must be kept clean to ensure accurate readings. Clean the glass diffuser with an alcohol wipe, but if none are available use a soft, clean, damp cloth. Replace the diffuser when it yellows (usually after several years of service). It is essential to have good solar radiation readings in order to run the apple carbohydrate thinning model. If your station does not appear in the selection list of stations for that model, the solar radiation data are out-of-range. Should this become an issue, contact RainWise about sensor calibration or replacement.

The sensor ships from RainWise with a green plastic cover on it. This cover must be removed when the weather station is installed.

Calibration:

Every two years, at the end of the growing season, it is highly advisable to send your weather station to RainWise for a full calibration check and service. The cost is $150 plus a $65 shipping charge. During the calibration, RainWise will check and verify all sensors using standard production tests.

Troubleshooting Guide
RainWise Weather Stations

It is advisable to turn off the weather station if the work performed will cause erroneous data to be transmitted. (Ex. measured rainfall data when it isn't raining.)
However, for some troubleshooting it is necessary to have the weather station on. This is indicated in the guide.

There are three types of weather stations that are currently in use in the NEWA system:

- AgroMET (MK-III-SP1LR, 2.4 GHz, 1 mile)
- MK-III-SP2, 900 MHz, 7 mile
- MK-III-SP1, 418 MHz, 400 ft

AgroMET is the trade name for the MK-III-SP1LR, 2.4 GHz, 1 mile. The model type can be found underneath the rain gauge on the support pole.
Your RainWise weather station Model _____

There are three types of connections that are used for NEWA to get your data:

- FTP – FTP is being phased out of the NEWA network, but you may have one. This connection uses RainWise WLcom and Cornell ftp software on your dedicated computer.
- IP-100 – The IP-100 uses your high speed internet connection and RainwiseNet.
- Cellular – This uses a cellular network supported by RainWise and RainwiseNet.

Your RainWise weather station Connection_____

Having the serial number of the weather station is essential for proper technical support at RainWise. The serial number is located underneath the rain gauge on the support pole.

Your RainWise weather station Serial Number _____

This guide covers the following:

If you encounter a problem that cannot be solved by this guide or need further guidance, please contact RainWise Technical Support, call (207) 801-4036 or 1-800-762-5723, or fill out a technical support ticket http://www.rainwise.com/about/contact/index.php#contactform.

Rainfall Data Not Collected

There are four issues that can cause the system to not collect rainfall data:

1. Rain Gauge is Clogged
2. Cotter Pin is Loose and Obstructing the Tipping Arm
3. Reed Switch is Faulty
4. Issue with the Motherboard

1. Rain Gauge is Clogged

This is when the screen above the drain or the drain itself has clogged. Usually the bucket will be filled with water.

First, check the bucket for standing water. If there is no standing water, look at the screen above the drain and, if there is debris on it, clean it off. This can be done with a small vacuum, moist paper towels, etc. If there is standing water, follow the steps below.

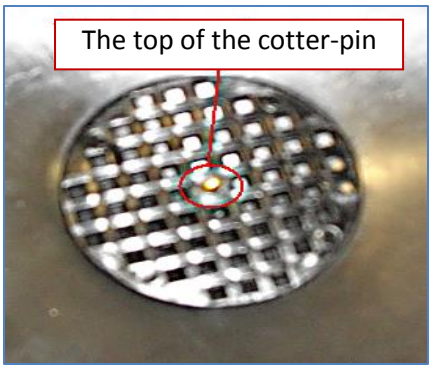
a) Turn off the weather station power switch.

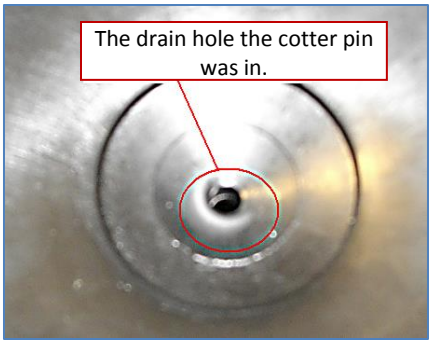
b) Loosen the four screws around the perimeter of the base of the bucket.

c) Once these screws are loose, turn the bucket counter-clockwise and lift it off the base. Now that the bucket is removed, the screen can be removed and the drain cleaned out.

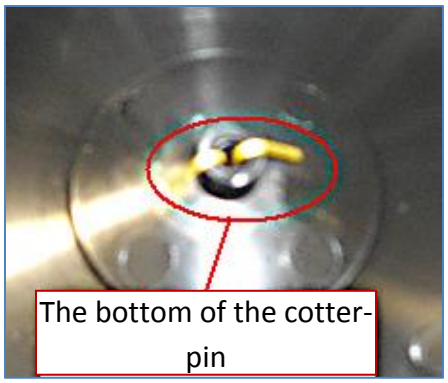
d) Remove the cotter-pin holding the screen in place by bending the legs at the bottom, straight and pushing it towards the top of the bucket. Once the cotter pin is removed you can pop out the screen. You may need a small tool such as a knife to help pop the screen out. Once the screen is removed you will be able to see the drain hole.

e) Use a sturdy probe to clear out the drain hole (Example: screw driver). Once the drain is cleared, re-insert the screen and cotter-pin.





f) Make sure the legs of the cotter pin are bent back, tight up against the collector. If not, the cotter-pin will **BLOCK** the tipping arm from tipping as rain flows through the bucket drain hole. The cotter-pin **MUST** be bent back upwards, securely, as shown in the picture.



g) Reassemble the rain gauge and switch the power back on.

2. Cotter Pin is Loose and Obstructing the Tipping Arm

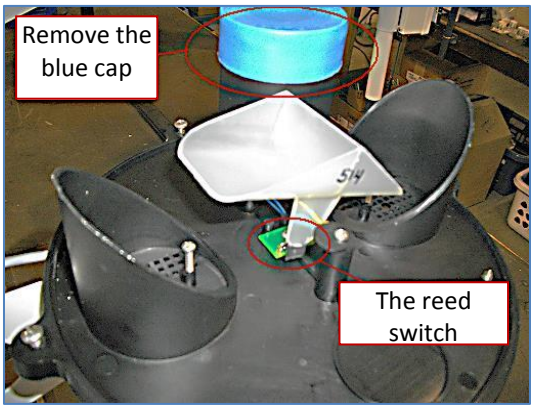
This is not common, but it can happen. It may occur if the rain gauge drain is cleaned improperly. Use the above steps a-c, f and g to ensure the cotter-pin is installed correctly.

3. Reed Switch is Faulty

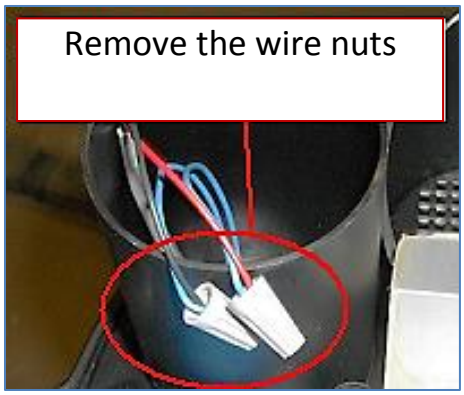
It is recommended that you contact RainWise Technical Support for assistance with this. The reed switch assembly is a small circuit board below the tipping arm. These are inexpensive to replace and it may be a good idea to keep a spare on hand. To test it, the weather station needs to be switched on.

a) Remove the bucket from the base of the rain gauge (follow steps b-c, page 2). Set the bucket aside and work on the base of the rain gauge.

b) Remove the blue cap by lifting upwards. Look at the wire connection that attaches the reed switch assembly to the wire that goes to the motherboard of the station.



c) Remove the wire nuts from the connections. Touch the wires together multiple times (these will not arc). This procedure bypasses the reed switch. After touching the wires together, check for rainfall data on RainwiseNet, (follow steps a-c, page 6) it should show within a few minutes. If rainfall data show up, the reed switch assembly is faulty and will need to be replaced. Contact RainWise Technical Support to describe the problem. If no rainfall data show up, the problem may be with the motherboard.



d) After testing the reed switch, reassemble the weather station and switch the power back on. If needed, contact RainWise and NEWA, newa@cornell.edu, to delete the reed switch bypass test data from the weather database.

4. Issue with the Motherboard

It is recommended that you contact RainWise Technical Support for assistance with this. Before you begin working on the interior of your weather machine or handling the motherboard, make sure you discharge any electrostatic charge you may have and make sure that you are grounded. In this step, the rain gauge will be completely bypassed and the motherboard tested. This test is done with the weather station on.

a) Remove the solar panel from the sensor assembly. This is done by loosening the four screws located in the corners of the solar panel. Once the solar panel and cover are free from the housing, disconnect the solar panel connection and **TAKE NOTE** of the way the connectors clip together so you can reconnect them. The motherboard inside the unit is now exposed to view.

b) Working with the motherboard, remove the rain gauge connection shown in the picture.

c) Once the connection has been removed, you will see two gold legs. Use a metal screwdriver to short out these two pins. Make sure the screwdriver touches both pins at the same time, do this multiple times. After shorting the pins, check for rainfall data on RainwiseNet (follow steps a-c, page 6), it should show within a few minutes. If rainfall data show up, there is an issue with the wire going to the rain gauge, the connection from that wire to the reed switch is not well connected, or the reed switch is faulty. If no rainfall data show up, then there is an issue with the motherboard.

d) After testing the motherboard, reassemble the weather station and switch the power back on. If needed, contact RainWise and NEWA, newa@cornell.edu, to delete the motherboard test rainfall data from the weather database.

Excess Rainfall Data Collected

There are two situations that can take place when this problem occurs:

1. Rainfall Data Collected when No Rain Occurs
2. Abnormally Large Amount of Rainfall Data Collected

1. Rainfall Data Collected when No Rain Occurs

a) The weather station may not be properly mounted, allowing for the station to sway in the wind. This is usually indicated by rainfall data being logged on windy, rainless days. This problem is solved by securing the station and the mount properly, so that it does not sway.

b) The reed switch may be faulty, causing erroneous data. To test this, follow the steps below or replace the reed switch if you have a spare.

I. Disconnect the reed switch from the motherboard by following steps a-b, page 4.

II. Monitor the rainfall data collected on RainwiseNet by following steps a-c, page 6. If the erroneous data is no longer being uploaded, the reed switch needs to be replaced. If the erroneous data continues contact RainWise Technical Support for assistance.

2. Abnormally Large Amount of Rainfall Data Collected

a) The reed switch may be faulty, causing erroneous data. Follow steps I and II above.

b) There may be cross communication from another nearby weather station. This can occur even if that station is beyond the range stated by RainWise. Check the NEWA weather station map on newa.cornell.edu to see if any NEWA RainWise weather stations are in your vicinity. Contact RainWise Technical Support for assistance with verifying the problem. Fixing it will require changing the D.I.P. switch settings, according to RainWise recommendations. (See page 8, Part 3 *Check D.I.P. Switch Settings*.)

Station is Not Transmitting

This is usually indicated when the red light on the receiving base fails to blink every 2 seconds.

There are four issues that can cause the station to not transmit properly:

1. Low Battery Voltage
2. Check Motherboard Status Light
3. Check D.I.P. Switch Settings
4. Radio Needs to be Reseated

1. Low Battery Voltage

a) Download the station data from the RainwiseNet webpage. You must be logged into your account.

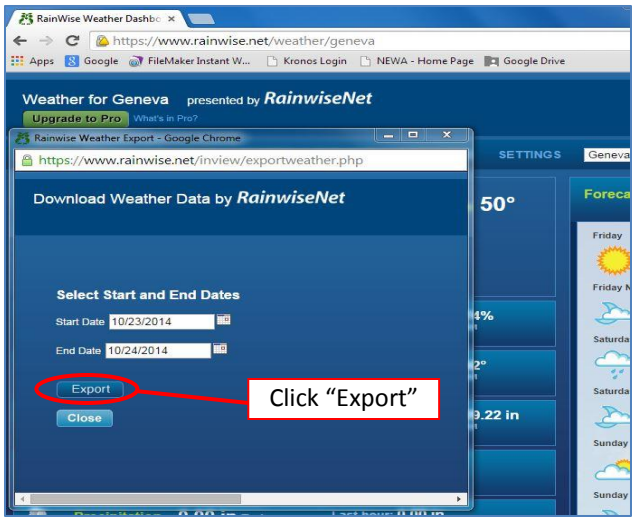
b) Make sure the date range includes the time the system last communicated. Click Export.

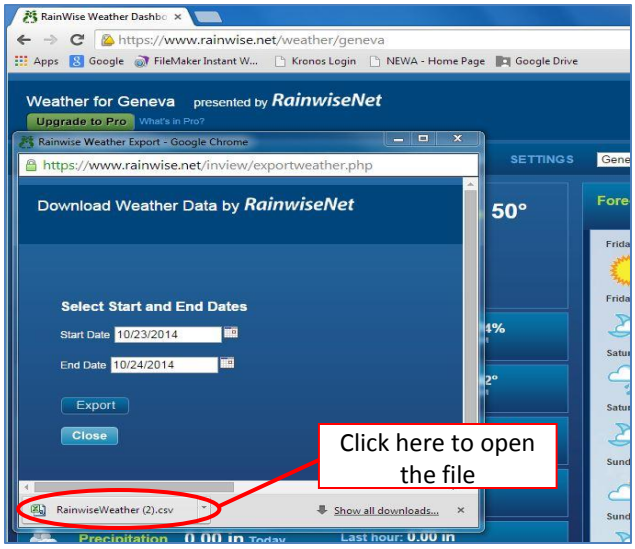
c) Click the downloaded, exported file to open it. The file will open in an Excel spreadsheet. The "Station Voltage" column is the last column on the right. Look for the last recorded battery voltage which will be at the bottom of the Excel sheet.

Because the battery is solar powered, the voltage should rise during the day and fall during the night. Voltage will be lowest when the solar panel receives little sunlight, on cloudy days, during winter, and at night.

Battery voltage that drops below 5.9 volts is insufficient and indicates the battery needs to be replaced (continue with step d).

If the battery is less than 3-7 years old, there may be a bigger issue. Contact RainWise Technical Support for assistance.





d) **Battery installation:** The replacement 6 volt battery is a Werker WKA6-5F. These batteries will lose charge if they are left sitting on the shelf; install it soon after purchase. It is also best to charge them before installation, or to install them on a sunny day to ensure maximum performance.

I. Turn off the weather station power switch.

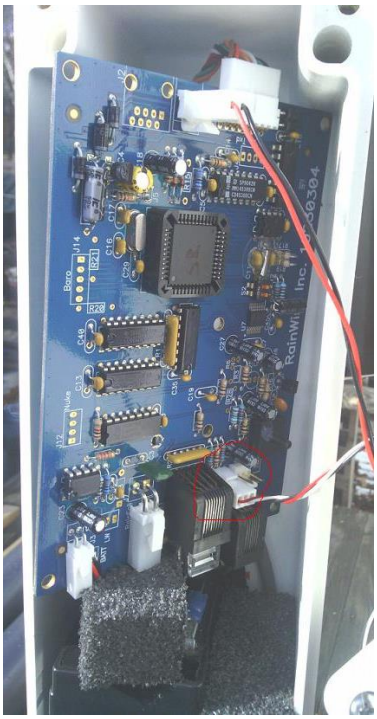
II. Remove the solar panel from the sensor assembly. This is done by loosening the four screws located in the corners of the solar panel. Once the solar panel and cover are free from the housing, disconnect the solar panel connection and **TAKE NOTE** of the way the connectors clip together so you can reconnect them.

III. Remove the battery from the compartment and disconnect the two leads from the battery.

IV. Install the new battery by connecting the leads on the battery and placing it back into the compartment.

V. Reassemble the weather station. Switch the power on.

Note If your weather station was purchased before 2014 the motherboard may look like the one pictured to the right, which is different than the motherboards in Parts 2,3, and 4; those Parts of the Guide will not apply to your weather station.



2. Check Motherboard Status Light

It is recommended that you contact RainWise Technical Support for assistance with this. Before you begin working on the interior of your weather machine or handling the motherboard, make sure you discharge any electrostatic charge you may have and make sure that you are grounded. The station will need to be on for this test.

a) Remove the solar panel from the sensor assembly, as described in step II above.

b) Check the status light and make sure it is blinking every two seconds.

c) If the status light is NOT blinking, try the three steps below. After each step, turn the weather station on and check the status light, if blinking, the problem is solved.

I. Reboot the system by turning the weather station power switch off for at least one minute.

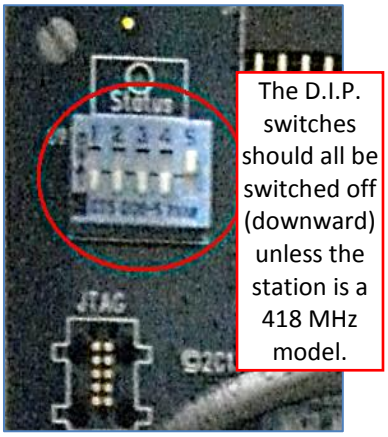
II. Turn the weather station off and check the motherboard for loose connections. Disconnect and reconnect everything, one connection at a time.

III. Turn the weather station off and check that the battery voltage is above 6 volts with a multimeter. If voltage is low, replace the battery. Follow steps I, III, and IV under *Battery Installation* above.

d) If this solved the problem, turn off the weather station, reassemble it and switch the power back on. If this did not solve the problem, continue on to Part 3.

3. Check D.I.P. Switch Settings

It is recommended that you contact RainWise Technical support for assistance with this. Before you begin working on the interior of your weather machine or handling the motherboard, make sure you discharge any electrostatic charge you may have and make sure that you are grounded. The D.I.P. switch settings control what software the motherboard is currently using.



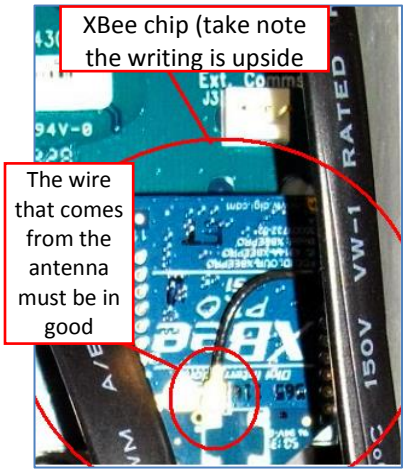
a) Turn off the weather station and, if not already removed, remove the solar panel from the sensor assembly, as described in step II under *Battery Installation*, page 7.

b) Unless you are aware of the station being “coded” due to interference, the system should normally have all the D.I.P. switches in the off position (downward). If this is an MK-III-SP1, 418 MHz, 400 ft model, all of the D.I.P. switches will be down except #5.

c) If this solved the problem, reassemble the weather station and switch the power back on. If this did not solve the problem, either continue on to part 4 for long range (LR) weather station models (such as MK-III-SP1LR, 2.4 GHz, 1 mile or AgroMET) or check the data receiving device (such as the IP-100 or computer interface.)

4. Radio Needs to be Reseated

It is recommended that you contact RainWise Technical support for assistance with this. Before you begin working on the interior of your weather machine or handling the motherboard, make sure you discharge any electrostatic charge you may have and make sure that you are grounded. This step is only for long range (LR) models (such as MK-III-SP1LR, 2.4 GHz, 1 mile or AgroMET). The radio is a blue chip labeled "XBee."



a) Turn off the weather station and, if not already removed, remove the solar panel from the sensor assembly, as described in step II under *Battery Installation,* page 7.

b) Remove the XBee chip and re-insert it to ensure a good contact is being made.

c) Reassemble the weather station and switch the power back on.

d) If the data transmission issue has not been resolved at this point, the next step will be to check the data receiving device (such as the IP-100 or computer interface) or to contact RainWise Technical Support directly.

The Receiving Base is Not Uploading Data to RainwiseNet

This problem is usually indicated when data are not being uploaded to RainwiseNet or NEWA. The red light on the receiving base may either blink every 2 seconds or not blink. If data are being uploaded to RainwiseNet but not to NEWA, contact NEWA, newa@cornell.edu.

There are several issues that can cause the station to not transmit properly that can be solved in the following three troubleshooting steps:

1. FTP Interface Troubleshooting (Being phased out of NEWA, but you may have one.)
2. IP-100 Troubleshooting
3. Restore IP-100 to Factory Settings

Before proceeding, make sure the battery in the weather station is good. Refer to page 6 in *Station is not Transmitting*, Part 1 *Low Battery Voltage*.

1. FTP Interface Troubleshooting

Perform the following checks to troubleshoot your FTP connection.

a) Check to see if data are being transmitted from your weather station to the computer interface and uploaded into WLcom on your computer. When the CC-2000 computer interface is receiving data, the receiver indicator light blinks every two seconds. If not, please contact RainWise Technical Support for help resolving the issue.

b) Make sure the computer is on and the Cornell FTP software is running. Remember: automatic upgrades, power outages, or anything else that causes a computer restart will require manual restart of the Cornell FTP software.

c) Check the physical cabling between the computer interface and your computer for damaged or loose connections. Do not replace cables without contacting RainWise Technical Support to make sure you get the right cable.

d) Check that the connection between your computer and the internet is active. For hard-wired connections, check the cabling for damaged or loose connections. If necessary, contact your internet service provider for help.

2. IP-100 Troubleshooting

Perform the following checks to troubleshoot your IP-100 data connection:

a) Check whether you have access to the Internet. If necessary, contact your internet service provider for help.

b) Check the physical cabling between the IP-100 and your internet router for damaged or loose connections. Do not replace cables without contacting RainWise Technical Support to make sure you get the right cable.

c) Check if data are being transmitted from your weather station to the IP-100 and uploaded to RainwiseNet. When the IP-100 is uploading data, the RADIO DATA indicator light blinks every two seconds. Visit your RainwiseNet webpage and check that the database is up-to-date (follow steps a-c, page 6.) If not, please contact RainWise Technical Support for help resolving the issue.

d) Make sure the Upload Rate is set at 15 minutes on RainwiseNet, under Settings, and Save changes.

3. Restore IP-100 to Factory Settings

Restoring the IP-100 is always a good test with internet connection and signal issues or if you made a mistake during changes to the settings of the IP-100. **Please note that the reset button will be held down for this ENTIRE procedure.**

a) Press and continue to hold the reset button. Disconnect power to the IP100 for about 10 seconds. Then reconnect power to the IP100.

b) Continue to hold the reset button until the front three lights turn off (Radio Data, Ethernet, Status). Once the lights go off, release the reset button.

c) It will take a few minutes for the IP-100 to talk to the server and reload its information and connect again.

d) **DO NOT** unplug the IP-100 for the next 10 minutes. Doing so during an update or original boot-up will brick the IP-100 and it will have to be sent back to RainWise to be corrected.

e) The Factory Settings Restore has now been completed.