



3000 Series Wireless Stations

PRODUCT MANUAL

3210xx, 3220xx, 3240xx, 3250xx
xx=MU, ME, HU, WF, DU, DE, DA, DR



Spectrum[®]
Technologies, Inc.

GENERAL OVERVIEW

Thank you for purchasing a WatchDog 3000 Wireless Weather Station. With internal modem/radio, integrated solar power, and Bluetooth connectivity to smartphones running the free WatchDog Mobile app to configure the station and check current conditions, the 3000 Series stations are easy to install and operate.

To translate WatchDog 3000 model numbers into sensor and modem/radio configurations, please see the Specifications on pages 18-19.

CONTENTS

Installation	
Preparation	3
Assembly	3
Initial Power-up	6
Winterizing	6
Configuration	
WatchDog Mobile Using Bluetooth	7
Set North for the Wind Vane	9
Connecting to a WiFi Network	10
Connecting to a Retriever & Pup Network	11
SpecConnect	12
Downloading Data to a Flash Drive	13
Status LED Meaning	14
Using the SELECT Button	15
External Sensors	16
Rain Collector Adjustment	17
Specifications	18
Warranty, CE Certificate	20

INSTALLATION

Preparation

The weather station should be located in an open, unobstructed, grassy area to ensure accurate measurement of wind, rainfall, sunlight, and evapotranspiration.

Mounting hardware is provided to attach the weather station to a mast/pole with a 1.25 to 1.66" (32 to 42mm) outside diameter and a wall thickness of at least 0.13" (3.3mm). The mounting pole should be securely anchored perpendicular to the ground.

For mounting at an approximately 6 foot (1.8m) height, a 1.5 inch (40mm) OD or larger pole should be used for any station with a rainfall sensor. If that size is not available, then the station should be mounted on a tripod, such as Spectrum Technologies item # 3396TPS. Mounting the station at a greater height requires both the 1.5 inch (40mm) OD or larger pole and guy wires to keep the station from swaying in the wind.

If you are using the mounting tripod, open it and place it where the weather station is to be located. The tripod feet can also serve as mounting brackets if the unit is located on a solid surface. Slide the 3' post through both center screw clamps, adjust the height as desired and tighten the screws so that the post is perpendicular to the ground.

Assembly

Tools Required: 1/2 inch (13mm) wrench
 #2 Phillips screwdriver

The majority of the assembly of each 3000 Series Wireless Station is completed prior to shipment. Some parts are not attached to protect them from damage in shipping. The final assembly can be done either at the installation site or on a table for convenience.

If final assembly is being done at the installation site, mount the station to the pole with the provided U-bolts. Use a 1/2 inch (13mm) wrench to tighten the nuts. Face the solar panel south in the Northern Hemisphere or north in the Southern Hemisphere.

INSTALLATION

Assembly — Continued

1. For all models except 32nnDR: Attach the antenna to the top of the bracket by twisting it into the SMA connector. Tighten finger tight so that the antenna does not unscrew. See images below.



Temperature Alert Station

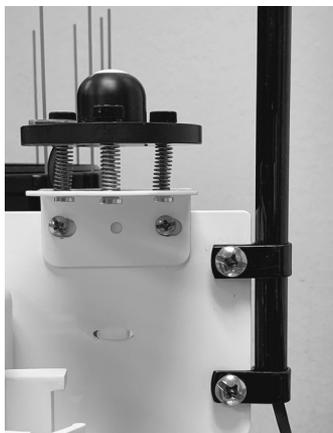


ET Station. The Weather Station and Rain Station have the same design with different sensor sets.

2. For Weather and ET Stations: Attach the anemometer arm to the front of the bracket using the provided screws (see image on facing page). The arm should extend parallel to the bracket (see images above). Attach the wind cups and wind vane using the included Allen wrench.

INSTALLATION

3. For ET Stations: Slightly loosen the left screw and remove the right screw from the Solar Radiation Sensor bracket, then rotate the sensor into position and replace the right screw.
4. For Rain, Weather, and ET Stations: Open the Bird Guard packaging and follow the included instructions.
5. Unlatch the enclosure latches and open the front door of the enclosure. The sensor connection requirements are as follows:



- Temperature/RH: Already connected on all models.
 - Rain: Already connected on Rain, Weather, and ET Stations.
 - Wind: For Weather and ET Weather Stations, connect the cable from the anemometer.
 - Solar Radiation Sensor: For ET Weather Stations, connect the cable from the sensor to the EXT port after station is deployed.
 - Optional external sensor. If one was purchased, connect it to the EXT port (the ET Station does not have an available external sensor port).
6. Confirm that all sensor cable connectors are securely pushed into their sockets.
 7. If not already installed onsite, mount the station to the pole with the provided U-bolts. Use a 1/2 inch (13mm) wrench to tighten the nuts. Face the solar panel south in the Northern Hemisphere or north in the Southern Hemisphere.

INSTALLATION

Initial Power-Up

1. Open the door and turn the power switch “ON”.
2. Monitor the LED. You should see the following signals. The LED will be off for several seconds between these.
 - Long Green to indicate startup is occurring.
 - Fast Green/Amber/Red to indicate startup is complete.
 - Short Amber flash when initial data is sent to SpecConnect.
 - Short Green flash indicating the transmission was successful, or a short Red flash to indicate that it failed.
3. Configure the device with one of the two options: Bluetooth with the WatchDog Mobile app on a smartphone (see page 7) or SpecConnect with computer (see page 10). Please note that for the Weather and ET Stations, the Wind Vane can only be configured (to identify “North”) using WatchDog Mobile.

WINTERIZING

If you are removing the station at the end of the growing season and storing it until spring, be sure to open the door and turn the power switch “OFF”. This will preserve the battery until you need it again. Leaving the station powered on without providing sunlight will discharge the battery completely, and destroy at least half of its charging capacity.

CONFIGURATION

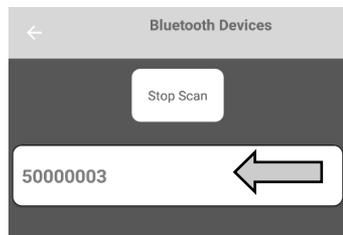
WatchDog Mobile (Bluetooth)

1. Download the free WatchDog Mobile app from the app store (Apple or Google Play) to your phone. If it has been installed for a while, check that you have the latest version installed.
2. Turn Bluetooth on in the station by pressing and holding the red “Select” button until the Status LED lights (less than 1 second). The LED will repeatedly quick flash until it connects to a smartphone. The flash will be green if the battery level is 80% or above, amber if it is below 80%, and red if it is below 40%.
3. Open the WatchDog Mobile app and log in with SpecConnect credentials.
4. Tap the menu button (3 parallel lines) on the top left corner and select “BLUETOOTH” from the list of options.

5. Tap



“Start Scan” and select the station’s serial number once it appears.



6. Click on the settings (gear-shaped) icon. This will take you to the configuration page.



CONFIGURATION

WatchDog Mobile - Continued

- Click the “General” tab located on the top left of the screen.
- Set Latitude and Longitude by clicking the “Use My Location” button. Alternatively, the “Locate on Map” button can also be used for setting Latitude and Longitude.
- Set the Time Zone using the drop-down menu at the bottom of the screen.
- For the 3000 Pup stations (item numbers ending DU, DE, DA), “Upload Interval” and “Time Zone” above are replaced with “Radio Channel”. Set it to the channel used by your Retriever (it defaults to 0).
- If an additional sensor is connected to an external port (“Port D”, “Port E”, or “EXT”), configure it by tapping the “Ports” tab at the top of the page.
- Once complete, tap the Save icon in the top right corner. Changes will appear in SpecConnect within 5 minutes.

The screenshot shows the 'Configuration' screen with the following elements and annotations:

- Configuration Header:** Includes a close button (X) on the left and a save icon on the right. A grey arrow points to the save icon.
- Navigation Tabs:** 'General' and 'Ports'. A grey arrow points to the 'Ports' tab.
- Description:** A text field containing '3000 Watchdog Rain Station'.
- Serial Number:** A text field containing 'Sn: 50000016'.
- Location:** Fields for 'Latitude' (41.739420) and 'Longitude' (-88.227897).
- Location Buttons:** 'Locate On Map' and 'Use My Location'. A grey arrow points to the 'Use My Location' button.
- Intervals:** 'Upload Interval (mins)' and 'Logging Interval (mins)', both set to 15.
- Time Zone:** A dropdown menu showing '(UTC-06:00) Central Time (US &...)'. A grey arrow points to the dropdown.
- Buttons:** 'Edit Write Password' and 'Save Write Password' at the bottom.

CONFIGURATION

Set North for the Wind Vane

The Wind Vane on the Weather and ET Stations senses where it is pointing with respect to the anemometer arm, not the Earth. You must use the WatchDog Mobile app to configure the station to “know” which way is North.

1. If you configured your station using SpecConnect, please follow all the instructions on page 7 to use the WatchDog Mobile app with Bluetooth connectivity.
2. Click the “Other” tab located on the top right of the configure page. A button will appear to “Set North”.
3. Tap the “Set North” button.
4. Point the wind vane in the north direction. When the “Are you ready?” prompt appears, tap “Yes”.
5. You should see “Success—North Set”. Tap OK, then tap the Save icon in the top right corner.



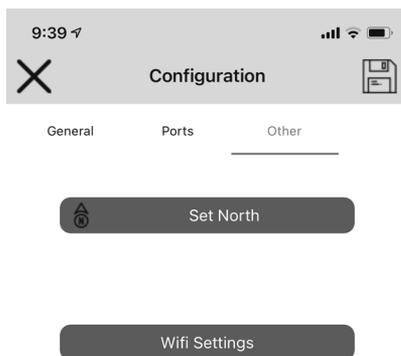
CONFIGURATION

Connecting to a WiFi Network

In order to connect your station to a WiFi network you will need the network's Access Point name (SSID) and its passphrase (password).

1. If you haven't already, please follow all the instructions on page 7 to use the WatchDog Mobile app with Bluetooth connectivity.

2. Click the "Other" tab located on the top right of the configuration screen.

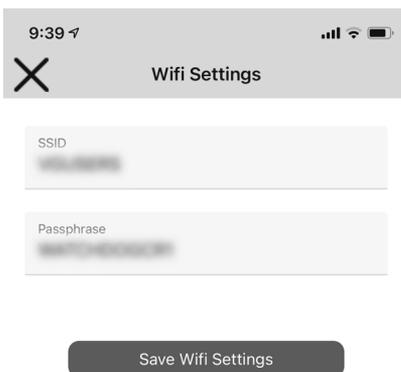


3. Tap the "WiFi Settings" button.

4. Enter the SSID and the Passphrase. Tap the "Save WiFi Settings" button. Then tap the "X" in the upper left corner to exit configuration and display the "Bluetooth Devices" screen.

5. To confirm your connection, tap the serial number, then the "thermometer" icon to get current conditions.

6. Tap the "Upload to the Cloud" icon in the upper right and wait up to 30 seconds for the current conditions to display with the "Time Since Last Upload" changed to "0 minutes".



CONFIGURATION

Connecting to a Retriever & Pup Network

If you are setting up a new network, please see the “WatchDog Retriever & Pup Product Manual” for complete instructions. To add a 32x0DU, 32x0DE, or 32x0DA station to an existing network, use the following steps.

1. Change the Radio Channel to the one set in the Retriever. Tap the Save icon.
2. If the network’s Retriever is not already in Setup mode (LED flashing AMBER continuously), press and hold its button for 2 seconds.
3. With the 3000 Station at its desired location, press and hold its SELECT button for 2 seconds. The LED will display the signal strength. If the LED is RED or AMBER, move the station, use an antenna extension, or add a Repeater.
4. 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). This saves battery life.

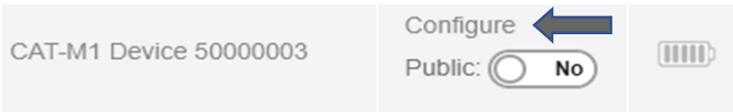
The screenshot shows a configuration interface for a device. At the top, there is a title bar with a close button (X), the title "Configuration", and a save icon. Below the title bar are two tabs: "General" (selected) and "Ports". The main content area includes a "Description" field with the value "WatchDog Wireless 123", a "Sn" field with the value "51100011", and two "Latitude" fields with values "41.7400 4" and "-88.228237". There are two buttons: "Locate On Map" and "Use My Location". Below these are two dropdown menus: "Logging Interval (mins)" set to "15" and "Radio Channel" set to "6".

NOTE: If the 3000 Series Station is part of a Retriever and Pup network that uses SpecWare (instead of SpecConnect), then SpecWare 10 is required.

CONFIGURATION

SpecConnect

1. Open a web browser and navigate to www.specconnect.net. Log in with credentials.
2. Click on the “Equipment” tab on the left side of the screen.
3. Navigate to the device on the equipment page and click the “Configure” button.



4. Set the time zone.
5. Configure any additional sensors connected to an external port (for an “EXT” port, configure it in Port D).
6. Make any other desired changes including station or sensor.
7. Once complete, tap the save button in the bottom left corner.
8. The device setup is almost complete, except that the wind vane must be calibrated for North. This must be done at the installation site using a Bluetooth connection to the WatchDog Mobile app on a smartphone (see page 9).

A screenshot of the "Configure" form for a device. The form is divided into several sections: "Device Name" (WatchDog WiFi Station ESD), "Latitude" (41.73973) and "Longitude" (-88.2277) with an "Altitude" field, "Logging Interval (mins)" and "Upload Interval (mins)" (both set to 5), "Time Zone" (UTC-06:00 Central Time (US & Canada)), and "Port#" sections A through E. Each port section has a sensor type dropdown, a "Sensor Nickname" field, and a location pin icon. Port A is Rainfall (3665), Port B is Temp/RH (3613THS/ARS), Port C is Wind, Port D is Solar Radiation Light (3670I), and Port E is Select. At the bottom are "Cancel" and "Save" buttons.

Device Name
WatchDog WiFi Station ESD

Latitude Longitude Altitude
41.73973 -88.2277

Logging Interval (mins) Upload Interval (mins)
5 5

Time Zone
(UTC-06:00) Central Time (US & Canada)

Port#

A Rainfall (3665)
Sensor Nickname

B Temp/RH (3613THS/ARS)
Sensor Nickname

... 1 Temperature ✕

... 2 Relative Humidity ✕

C Wind
Sensor Nickname

... 1 Wind Direction ✕

... 2 Wind Gust ✕

... 3 Wind Speed ✕

D Solar Radiation Light (3670I) ✕
Sensor Nickname

E Select
Sensor Nickname

Cancel Save

DOWNLOADING DATA TO A FLASH DRIVE

Logged data can be collected from a WatchDog 3000 station using a USB flash drive. The data will be stored in a file named ssssssss.WD3, where “sssssss” is the station’s serial number. Note that if there is a previous file by that name on the flash drive, the new file will erase and write over it.

Open the door and insert the flash drive in the USB port.

Downloading without a smartphone:

1. Press and hold the “Select” button. The Status LED will light green. When it changes to amber, release the button.
2. The Status LED will return to green while the download is occurring. Three green flashes will indicate the download was successful; three red flashes will indicate a problem (probably either a formatting error (it should be FAT32) or the drive is full).
3. Remove the drive and close and latch the door.

Downloading using the WatchDog Mobile smartphone app:

1. Follow the instructions on page 7 through step 5 to use the WatchDog Mobile app with Bluetooth connectivity.
2. Click the “USB Drive” icon to take you to the “Save to USB Drive” page.
3. Tap the “Save New Records to USB Drive” button to only download data logged since you last downloaded. Or, tap the “Save All Records to USB Drive” button to download all logged data on the station.
4. The Status LED will turn to green while the download is occurring. Three green flashes will indicate the download was successful; three red flashes will indicate a problem (probably either a formatting error (it should be FAT32) or the drive is full).
5. Remove the drive and close and latch the door.

STATUS LED MEANINGS

Depending on the current state of the station, the STATUS LED conveys different information. Except as noted below, the LED color indicates the battery status.

- GREEN = 81-100%
- AMBER = 41-80%
- RED = 0—40%

When connecting or connected via Bluetooth to a smartphone running WatchDog Mobile:

- Quick flash, once per second: Bluetooth is active, but it is not connected to a smartphone.
- On for 1 second, off for four seconds: Connected.

During normal processing with a modem, WiFi, or Pup connection:

- Quick AMBER flash: Start of record upload process.
- Quick GREEN flash: Upload successful.
- Quick RED flash: Upload failed or other communication issue.

During WiFi Configuration:

- Fast flashing: WiFi is connected to the Access Point.
- GREEN on for 3 seconds: WiFi configuration successful.
- RED on for 3 seconds: WiFi configuration failed.

During Power-up (turning the ON/OFF switch ON):
Continuous RED: Fatal firmware error.

USING THE SELECT BUTTON

Short (under 2 second) press (LED turns GREEN):

Turns Bluetooth on.

2 to 4 second press (LED turns AMBER):

Export Logged Data

- Save all records in station flash memory to a plugged-in USB drive. Time varies by the volume of data stored on the station and the USB flash drive used, generally under one minute.
- 5 rapid Green flashes indicate success; 5 rapid RED flashes indicate failure.
- Bluetooth is turned on.

4 to 9 second press (LED turns RED):

Connection Status

- If the button is released while the LED is RED, cellular and WiFi units test the modem's signal strength. GREEN for 3 seconds if good, AMBER for OK, and RED for poor or no signal.

Over 9 second press (LED turns off):

Bluetooth firmware update or WiFi configuration

- After the button is held for over 9 seconds, the LED turns off. When the button is released, the Bluetooth firmware will be loaded from the USB drive and the Bluetooth update process will begin. If the firmware is successfully loaded from USB then the LED will perform 5 rapid GREEN flashes, RED for failure. The actual update process takes about 30 seconds. When complete there will be 5 rapid LED flashes, GREEN for success and RED for failure. If successful, Bluetooth is turned on.
- If the USB luetooth file cannot be accessed, and if the device is WiFi, the Access Point WiFi configuration is started and the LED begins to rapidly flash.

Clearing all records from flash memory:

- With the ON/OFF switch set to OFF, press and hold the SELECT button while setting the switch to ON.
- The LED will turn RED.
- Continue holding the button for at least three seconds.

EXTERNAL SENSORS

The WatchDog 3000 Wireless Stations have an external port for additional sensor input. The following table lists some of the available optional sensors. See www.specmeters.com for a complete list. Most sensors include a 6-foot cable with pin-type connector. Items 3667-20, 6460-20, 6470-20 and 6450WD20 have 20 foot cables.

Item #	Description	Measurement Range	Accuracy
3665R	Tipping Bucket Rain collector	N/A	±2%
3666	Leaf Wetness Sensor	0(Dry) - 15(Wet)	N/A
3667, 3667-20	External (Soil) Temperature Sensor	-40 to 185°F -40 to 85°C	±1.1°F ±0.6°C
3670i	Silicon Pyranometer	1-1250 W/m ²	±5%
3668i, 3668i3, 3668i6	Quantum Light Sensor and Sensor Bars	0-2500 μmol m ⁻² s ⁻¹	±5%
3676i	UV Light Sensor	0-200 μmol m ⁻² s ⁻¹	±5%
6460, 6460-20	WaterScout SM 100 Soil Moisture Sensor	0% to saturation (typically 50%)	±3%
6470, 6470-20	WaterScout SMEC 300 Soil Moisture/EC/Temperature Sensor	VWC: 0% to sat. EC: 0 to 10 mS/cm, Temp: 0 to 122 °F (-18 to 50 °C)	VWC ±3% EC: ±2% Temp: ±1.4 °F (0.8 °C)
3669	Soil Moisture Transducer	0-100 kPa	±2%
6450WD 6450WD20	Watermark Soil Moisture Sensor	0 - 200 cbars	N/A
6451	Irrigation Sensor	Switches at 5 psi	±1 psi
3673 3674	Input Cables for user-supplied sensor	0-2.5V 4-20mA	±0.005V ±1%

RAIN COLLECTOR ADJUSTMENT

If rain collector is not reading correctly (or at all):

1. Check the inside of the rain bucket for debris such as leaves that may be blocking the grid at the bottom of the bucket. Remove the rain bucket from the base by loosening the four screws, rotating the bucket slightly counter-wise, and lifting it off. Check for any obstacles (spider webs, debris, etc.) that may be preventing the tipping spoon from moving freely. If the hole beneath the grid gets clogged with dirt, the cotter key can be removed to allow it to be cleared.
2. Using the WatchDog Mobile app, connect to the station via Bluetooth using steps 1 through 5 of the instructions on page 7. Then tap the current conditions (thermometer) icon.
3. Note the current rainfall value. Manually move the tipping spoon back and forth several times. Wait up to 20 seconds for the rainfall value to change. Check that these tips have been recorded. Do this several times.
4. If the tips are being counted, skip to step 6.
5. If the app is not showing any or all of the manual tips of the spoon, it may be that the magnetic sensor on the tipping spoon is too far from the read switch or that the sensor cable is bad. There are two cams holding the axle of the tipping spoon that can be rotated to move the tipping spoon closer to or further away from the read switch. Make this adjustment and repeat step 3. If the app shows that the station recorded the manual tips of the spoon, proceed to step 6. If not, the sensor may need to be sent in for service.
6. If all the tips are being counted, replace the rain bucket and trickle a known amount of water into the bucket. 84 ml of water should register 0.1 inches of water (2.5 mm). This is equivalent to 10 tips of the tipping spoon. The best results are attained when the water is added slowly. It is recommended that the water be put in a ziplock bag which is then punctured with a pin to allow the water to slowly enter the rain bucket.
7. If the reading is slightly high or slightly low, the sensor can be calibrated. When the spoon tips, it lands on screws on either side. If sensor is reading high, lower the screws. If it is reading low, raise the screws. It is recommended to adjust the screws a quarter turn and again run a known amount of water through the bucket to determine if additional adjustment is necessary.

SPECIFICATIONS

Included Sensors by Model

	3210 Temp Alert	3220 Rain Station	3240 Weather Station	3250 ET Station
Air Temperature	✓	✓	✓	✓
Relative Humidity	✓	✓	✓	✓
Rainfall	Optional	✓	✓	✓
Wind Speed	Optional	✗	✓	✓
Wind Direction	Optional	✗	✓	✓
Solar Radiation	Optional (ext. port)	Optional (ext. port)	Optional (ext. port)	✓
Available External Sensor Ports	2/(1*)	2/(1*)	2/(1*)	1/(0*)

* First generation stations

	Measurement Range	Accuracy
Air Temperature	-40° to 257°F (-40 to 125°C)	±0.54°F (-40 to 194°F) ±0.3°C (-40 to 90°C)
Relative Humidity	10% to 100%	±2% @ 77°F (25°C)
Rainfall	0.01" (.0254mm) resolution	±2% at <2" (5 cm) /hr
Wind Speed	0, 1 to 200 mph (0, 1 to 322 km/h)	±2 mph (±3 km/h), ±5%
Wind Direction	0 to 359°, 1° increments	±3°
Solar Radiation	0 to 1500 W/m ²	±5%

SPECIFICATIONS

Bluetooth 5.2	For WatchDog Mobile app on smartphones
External Interfaces	USB Type A Port, for Flash Drive AUX Port, Modular connector (RS-232 9600bpi, 6VDC Power out) Power In, 5.5/2.1mm Barrel, 12VDC
LED	3-color (Red, Amber, Green)
External Sensor Port	1 x 2.5mm stereo jack , 0 to 3.0VDC analog input
Data Capacity	30,000 records (312 days at 15 minute inter- vals)
Power	Integrated 3.5W solar panel, optional 12VDC, Rechargeable 6V/4.5AH SLA battery
Battery Life	14 days minimum with no solar power
Waterproof	IP65
Operating Temperature	-22° to 130°F (-30° to 55°C)
Dimensions (HxLxW)	12x19.5x11.25in (30.5x49.5x28.6cm) (Without 7.25 in (18.4 cm) antenna)
Weight	9.90 lbs. (4.49 kg)

<u>Model # Suffix</u>	<u>Modem/Radio Type</u>
nnnn MU	Cellular LTE-M (CAT-M1, NB-IOT) US, Canada
nnnn ME	Cellular LTE-M (CAT-M1, NB-IOT) Export
nnnn HU	Cellular 3G/HSPA+
nnnn WF	Wi-Fi
nnnn DU	Pup, 900MHz Mesh Network
nnnn DE	Pup, 868MHz Mesh Network
nnnn DA	Pup, 900MHz Australia Mesh Network
nnnn DR	Data Recorder (No Radio)

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: 3210ME, 3220ME, 3240ME, 3250ME
3210HU, 3220HU, 3240HU, 3250HU
3210DE, 3220DE, 3240DE, 3250DE
3210DR, 3220DR, 3240DR, 3250DR

Description: WatchDog 3000 Wireless Station
Type: Electrical Equipment for Measurement, Control, and
Laboratory Use

The undersigned hereby declares that the above referenced product is in conformity with the provisions of:

Directive: 2014/30/EU
Standards: EN 55032: 2015
EN 55035: 2017
EN 61000-6-1: 2019
EN 61000-6-3: 2007+ A1:2011/AC:2012

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