WatchDog®

Wireless Crop Monitor

Operation Manual

Spectrum

Technologies, Inc.

CONTENTS

General Overview

Congratulations on your purchase of the WatchDog Wireless Crop Monitor. Please read this user's guide before using your new Wireless Crop Monitor. The Watchdog Wireless Crop Monitor measures temperature and humidity. It is designed to prevent radio field interference and network obstruction and can be set to sound an alarm when a pre-determined alarm condition exists. The units are easy to use and install, and will transmit up to 1000 ft. with line of sight.

CAUTIONS

- **In a greenhouse environment the sensing unit requires a radiation shield.**
- **Do not place near water or expose to moisture.**
- **Avoid static electricity**
- **Sub-freezing temperatures can affect battery strength and transmission range.**

Accessories

A basic Wireless Crop Monitor system (item #'s 3450 or 3545) consists of a monitoring unit and a sensing unit. The sensing units measure air temperature only or air temperature and relative humidity. Additional sensing units can be added to a system. SpecLog software (see **SpecLog Software** p. 19) is required to configure the system and to collect/process data. A radiation shield is required for sensing units placed in a greenhouse environment. (See **System Configuration** p. 5) for details on the system setup.

Main Components

Item #	Description
3540	WatchDog Wireless Crop Monitor-T/RH (monitoring and sensing unit)
3545	WatchDog Wireless Crop Monitor-Temp (monitoring and sensing unit)
3541	WatchDog Temp/RH Sensing Unit
3546	WatchDog Temp Sensing Unit

Sensors/Accessories

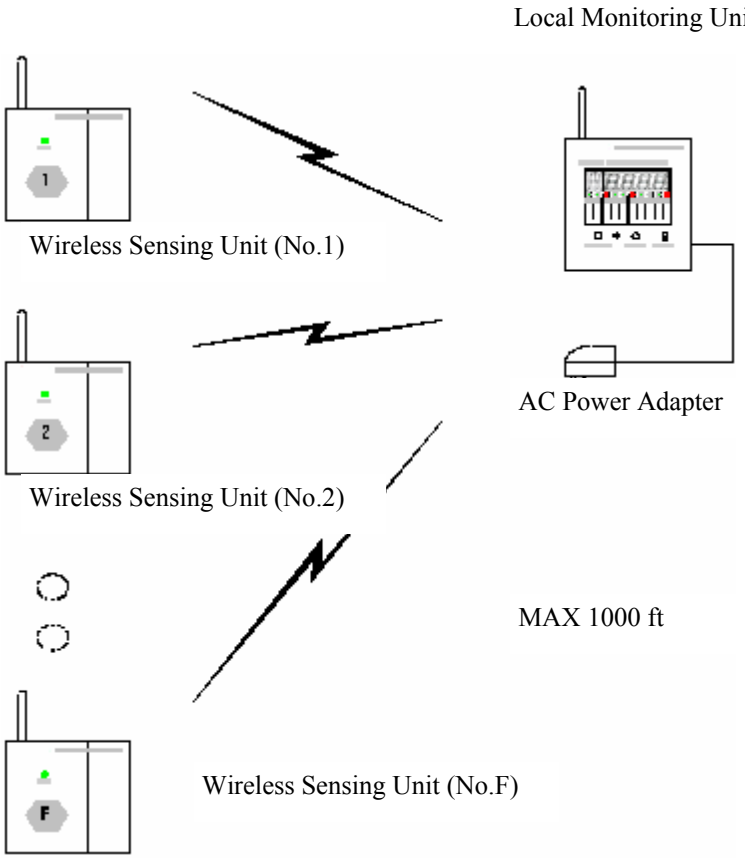
Item #	Description
3542	External T/RH Sensor w/ 6 ft cable
3668WCM	PAR Light Sensor
3667	External Temperature Sensor
3666	Leaf Wetness Sensor
3653	SpecLog Software
3663W	Radiation Shield (Required)

System Configuration

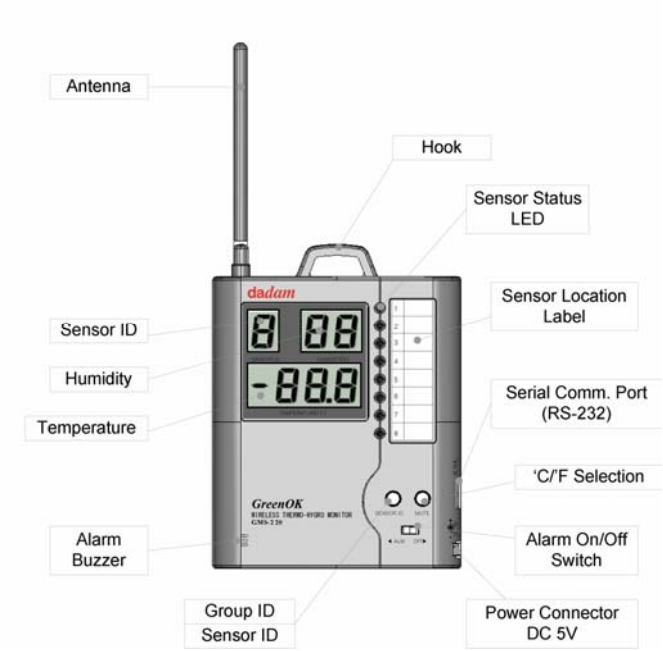
The Watchdog Wireless Crop Monitor has a wireless *sensing* unit (see *figure* 1, p. 11) for monitoring temperature and humidity (optional) and a local *monitoring* unit for receiving and displaying information from the sensing unit. The sensing unit has an operating range of 1000 ft (300m) with line of sight. Interfering objects will reduce transmission range. The sensing unit is battery operated.

A single monitoring unit can read a maximum of 16 sensing units. Of these, only 8 can be set to trigger an alarm. If more than 16 units are to be deployed within 1000 ft of the monitoring unit (or, if more than 8 need to be alarm capable), additional monitoring units will be necessary. In this case the monitoring units must be assigned a group number from 1 to 4. The monitoring units are programmed only to read sensors from their assigned group. The default setting for all sensing and monitoring units is one. (See **Setting the Group** p. 9)

System Configuration



Configuring the Monitoring Unit



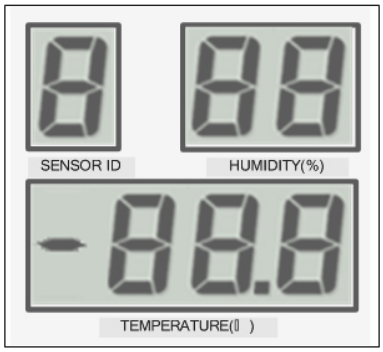
Powering Up the Unit

The monitoring unit turns on as soon as the power adapter is plugged in. While initializing, the sensor ID display will cycle from number 1 to letter G, the sensor status LED's will flash green, then red, then alarms 1 and 2 will sound several times. When initialization is complete, the sensor status LED's shut off and the LED's for sensor ID, temperature and humidity show dashes.

LED Displays

Data

The temperature and relative humidity are shown on the digital displays. The monitoring unit will cycle sequentially through the remote sensing units. Data is displayed for 4 seconds. The sensor ID identifies the remote sensing unit that is currently being read.



Sensor No./Temperature/Humidity LED

Transmitting (TX) Status

The transmitting status of sensing units 1 - 8 is indicated by the column of LED lights on the upper right side of the monitoring unit. A numbered LED will not illuminate until the monitoring unit has received a signal from a sensing unit with that number. It will then give the following information:

Green	Receiving normal transmission.
Red (blinking)	Temperature outside selected limits.
Red (steady)	No transmission received in selected interval.

If either of the alarm conditions exist for more than 2 hours, that LED will turn off.

Note: The transmitting status LED's will not respond to sensing units assigned sensor ID's A - G.

Buttons/switches

[Group]/SENSOR ID - Pressing this button will cause the data display to instantly scroll to the next sensor. The display then returns automatically to the 4-second scrolling cycle. This button can also be used to set the group number (See Below).

[^{o}C/^{o}F]/MUTE - Pressing the MUTE button will stop the audible alarm. If, after 10 minutes, the alarm condition is still met, the alarm will resume. This button can also be used to change the units of temperature (See **Changing Units** p. 10).

ALM ◄ ► OFF - This switch activates and deactivates the audible alarm completely. Even when this switch is set to OFF, the sensor status LED will still function.

Setting the Group

Sensing units with firmware 2.0 and above can be assigned a group number. To determine which firmware your unit has, count the number of times that the unit flashes when powered on. Firmware 2.0 will flash 6 times quickly. Firmware 1.2 will flash 3 times slowly.

Assigning a group number allows you to use multiple sets of 16 sensors in the same 1000 ft radius. To set the group number press and hold the “Group” button after the unit has powered up and the initial beeps have sounded. The number 1 will appear in the sensor ID display. You can press the "C/F" (“Mute”) button to choose a group number from 1 to 4. After choosing a group number power down then power up the unit. The assigned group number will appear in the sensor ID display initially when it powers up. The default group number for the monitoring unit is 1.

Changing Units

Press and hold the "C/F" button (also marked "MUTE"). After one second a "C" will appear in the "SENSOR ID" display. Release the button to set the units to Celsius. If you continue to hold the button, after three seconds an "F" will appear in the "SENSOR ID" display. Release the button to set the units to Fahrenheit. Disconnect and reconnect the power supply to reinitialize the monitor.

Alarms

The monitoring unit has 2 audible alarms. Alarm 1 is activated if one or more sensing units is reading outside the selected temperature range. Alarm 1 beeps on a half second interval. Alarm 2 is activated if the monitoring unit is not getting a transmission from one or more sensing units. alarm 2 beeps on a half second interval. If both alarm 1 and alarm 2 conditions exist, alarm 1 will be heard. The audible alarm can be muted with the MUTE button or disabled completely by moving the ALM switch to OFF.

Note: Alarms will not sound for sensing units with alphabetic sensor ID’s.

Configuring the Wireless Sensing

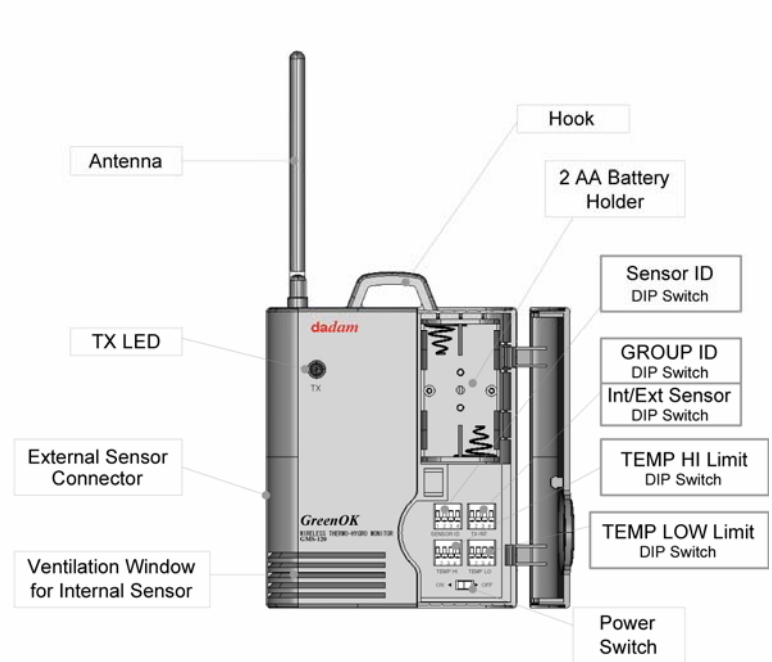


Figure 1: Sensing Unit

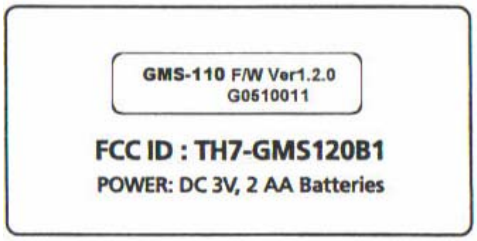
Battery Replacement

The sensing unit is powered by 2 AA alkaline batteries. When the batteries start to run low, the LED will stop blinking. The battery compartment is accessed by pushing the tab on the cover. Take care to install the batteries in the correct orientation. Failure to do so could damage the unit. Fresh batteries will power the unit for 6 months.

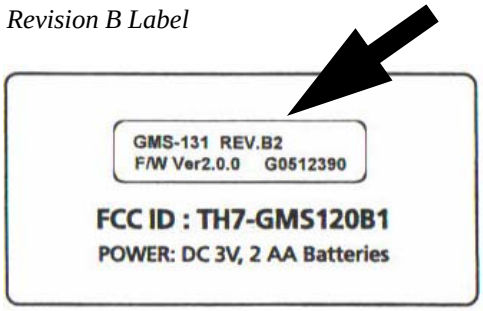
Sensing Unit Revisions

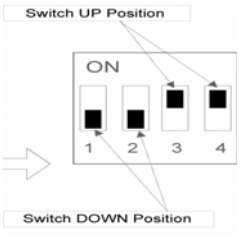
There are two generations of the remote sensing units, revision A and revision B. Each revision type has a different temperature chart.

Revision A Label



Revision B Label





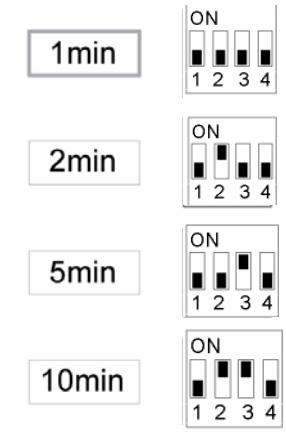
Setting the Sensor ID

The sensing units are identified by their sensor ID. Available sensor ID options are numbers 1-9 and letters A-G. If multiple sensing units are being used with any given monitoring unit, a unique sensor ID should be assigned to each sensing unit. The sensor ID will appear on the monitoring unit (see p. 8) when data from that specific sensing unit is being displayed. Alarms can only be set for sensing units with numerical sensor ID's. The sensor ID is set with upper left dip switch panel beneath the battery compartment (see *Figure* 1, pg 11).

Dip switch configuration for sensor ID

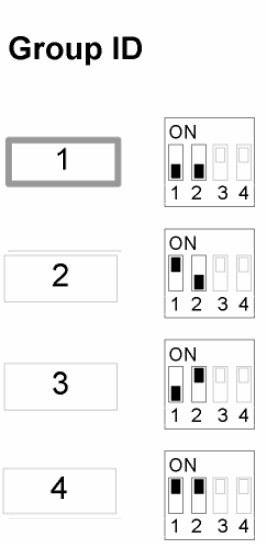
Setting the Transmission Interval– (*revision A only)*

The transmission interval determines the frequency at which the sensing unit sends data to the monitoring unit. The transmission interval is set with upper right dip switch panel beneath the battery compartment (see *Figure* 1, p.11). For revision B units the transmission the transmission is always 1 minute.



Setting the Group– *(revision B only)*

For Rev B units running firmware 2.0 or higher you can assign a group number to the sensing unit. This allows you to have multiple sets of sensing units within the same 1000 ft radius. The two left-hand switches of the TX INT dip switch panel are used for the group. A monitoring unit will only pick up sensing units with the same group number. (See **Setting the Group** p. 9)



Setting the Sensor Type:
(revision B only)

For revision B sensors, the right-hand dip switches are used to configure the sensor type. The sensor type is pre-configured. Use the chart below to set the sensor type.

#3541 GMS 120
(internal temperature/RH)

#3541 GMS 120
(using external temperature/RH)

#3546 GMS 131
(internal temperature/volt)

Sensor Type Dip Switch Configuration

Setting the High Temperature Limits (for Alarms)

The monitoring unit is equipped with an alarm feature that will sound when the temperature rises above the upper temperature limit (see **Alarms**, p. 10). The temperature limits are set with lower dip switch panels beneath the battery compartment (see *Figure* 1 p. 11).

Rev A		Rev B
40 C *(104 °F)*		40 C *(104.0 °F)*
		38 C *(100.4°F)*
38 C *(100.4 °F)*		36 C *(96.8 °F)*
		34 C *(93.2 °F)*
36 C *(96.8 °F)*		32 C *(89.6 °F)*
		30 C *(86.0 °F)*
34 C *(93.2 °F)*		28 C *(82.4 °F)*
		26 C *(78.8 °F)*
32 C *(89.6 °F)*		24 C *(75.2 °F)*
		22 C *(71.6 °F)*
32 C *(82.4 °F)*		20 C *(68.0 °F)*
		18 C *(64.4 °F)*
30 C *(78.8 °F)*		16 C *(60.8 °F)*
		14 C *(57.2 °F)*
28 C *(75.2 °F)*		12 C *(53.6 °F)*
		10 C *(50.0 °F)*

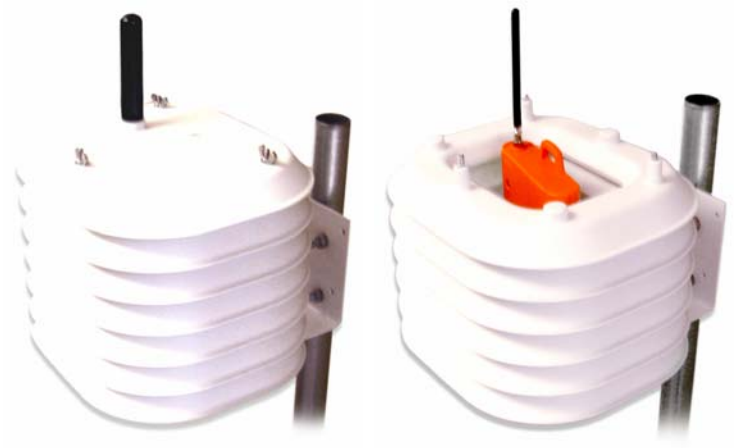
Setting the Low Temperature Limits (for Alarms)

The monitoring unit is equipped with an alarm feature that will sound when the temperature falls below the lower temperature limit (see **Alarms**, p. 10). The temperature limits are set with lower dip switch panels beneath the battery compartment (see *Figure* 1, p. 11).

Rev A		Rev B
7 C *(44.6 °F)*		5 C *(41.0 °F)*
		4 C *(39.2 °F)*
6 C *(42.8 °F)*		3 C *(37.4 °F)*
		2 C *(35.6 °F)*
5 C *(41.0 °F)*		1 C *(33.8 °F)*
		0 C *(32.0 °F)*
4 C *(39.2 °F)*		-1 C *(30.2 °F)*
		-2 C *(28.4 °F)*
3 C *(37.4 °F)*		-3 C *(28.6 °F)*
		-4 C *(24.8 °F)*
2 C *(35.6 °F)*		-5 C *(23.0 °F)*
		-6 C *(21.2 °F)*
1 C *(33.8 °F)*		-7 C *(19.4 °F)*
		-8 C *(17.6 °F)*
0 C *(32.0 °F)*		-9 C *(15.8 °F)*
		-10 C *(14.0 °F)*

Unit Placement

The monitoring and sensing units should be set up so the antenna is extended in a vertical position. The base unit should be placed on a flat, stable surface. In a controlled indoor environment, the sensing unit can be placed on a flat surface or hung from the small loop at the top of unit. For greenhouse and outdoor applications, the sensing unit **must** be housed in a radiation shield. The radiation shield should be white and ventilated to allow air circulation. This ensures accurate temperature readings not influenced by solar radiation. A radiation shield also protects the unit from moisture.



Radiation shield for Wireless Crop Monitor (item 3663WCM). Required

SpecLog Software

SpecLog software allows you to create a strip chart on your computer monitor as well as record temperature and humidity data at a specific interval. After collecting data, you can run reports to help you manage plant growth.

Reports include:

- Temperature/Relative Humidity Hours.
- DIF Temperature
- Degree days
- Daily Summary
- Monthly Summary

See the SpecLog Software manual for further details.

Connecting to a Computer

Data from the monitoring unit can be displayed on your computer monitor and recorded for future analysis. This requires connecting the unit directly to a computer via a 9-pin serial cable (included with SpecLog software) If you do not have a 9-pin serial port you, will have to purchase a USB serial adapter. An adapter is available from Spectrum (Item 3661USB). Not all commercially available USB serial adapters are compatible with SpecLog, so please check with Spectrum Technologies before purchasing one.

SPECIFICATIONS

Wireless Sensing Unit		
	Measuring Range	Internal Temp -4° ~ 158°F External Temp -40° ~ 176°F Humidity 1 ~ 99%
	Resolution	Temperature 0.1°F Humidity 1%
	Accuracy Temperature	+/- 1.8 °F (-40 °F to 14 °F) & (113 °F - 176 °F) +/-1.0 °F (14 °F to 113 °F)
	Radio Frequency	426.075MHz, Unlicensed Low-power Radio Equipment
	RF Transmission Range	Maximum 300 meters (1000 ft.)
	Power Supply	DC 3V, 2 Pcs AA Alkaline Batteries
	Operating Range	- 4°F ~ 158°F, ≤ 80% RH
	Dimension	5.25 in. (H)x4.0 in.(W)x1.0 in.(D)
	Weight	7.0 oz. (including Battery)
	Standard Accessory	Alkaline Battery

Base Monitoring Unit		
	Number of Channel	8 Sensing Unit
	Display Range	Temperature -40° ~ 176°F Humidity 1 ~ 99%
	Display Resolution	Temperature 0.1°F Humidity 1%
	Radio Frequency	426.075MHz, Unlicensed Low-power Radio Equipment
	RF Transmission Range	Maximum 300 meters (1000 ft.)
	Host Computer Interface	RS-232 Serial Port
	Power Supply	AC 110 Power Adapter
	Operating Range	- 4°F ~ 158°F, ≤ 80% RH
	Dimension	5.75 in. (H)x4.33 in.(W)x1.0 in.(D)
	Weight	7.0 oz.
	Standard Accessory	AC Power Adapter

INFORMATION TO THE USER

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one more of the following measures:

-Reorient or relocate the receiving antenna.

-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-Consult the dealer or an experienced radio/TV technician for help.

WARNING

The manufacturer is not responsible for any Radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment."

Warranty

This product is warranted to be free from defects in material or workmanship for 1 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 is void if the Spectrum products have been damaged by customer error or negligence, or if there has been an unauthorized modification.

Returning Products to Spectrum

Before returning a failed unit, you must obtain a Returned Goods Authorization (RGA) number from Spectrum. You must ship the product(s), properly packaged against further damage, back to Spectrum at your expense. Clearly mark the RGA number on the **outside of the package**. Spectrum is not responsible for any package that is returned without a valid RGA number or for the loss of the package by any shipping company.

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