Remote Automatic Weather Station (RAWS) Information Guide

U.S. Fish & Wildlife Service
Region 3

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RAWS located on the Sherburne National Wildlife Refuge Zimmerman, MN

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Table of Contents

How Does RAWS Work? The Narrative!

Upon setting up a RAWS, the stations location is determined and fixed utilizing GPS satellites for latitude/longitude readings.

The station is ready to begin collecting weather data. RAWS sensors collect the following types of data:

Temperature
Relative Humidity
Wind speed
Wind direction
Solar radiation
Precipitation
Fuel moisture

and other weather parameters as necessary.

The collected weather data is transmitted approximately every hour from the weather station by means of the GOES antennae to one of the NOAA (National Oceanic and Atmospheric Administration) Geostationary Operational Environmental Satellites (GOES). From the GOES satellite, the weather data is transmitted to the National Environmental Satellite, Data, and Information Service (NESDIS) Data Acquisition Processing System (DAPS) at Wallops Island, Virginia. Simultaneously, the data is transmitted to a Domestic Communications Satellite (DOMSAT) where it is transmitted to the Automated Sorting, Conversion and Distribution System (ASCADS) computer located at the BLM (Bureau of Land Management) in Boise, Idaho. ASCADS is simply put, the receiving point for all of the GOES data. ASCADS then transfers the weather data into WIMS (Weather Information Management System). ASCADS can also "watchdog" the weather data depending upon how WIMS is set-up in the station catalog. Finally, ASCADS can transfer weather data into other agencies and organization's computer systems as warranted.

Additional background information:

The National Environmental Satellite, Data, and Information Service (NESDIS) is tasked with managing, operating and maintaining the U.S. Geostationary Operational Environmental Satellite (GOES) system. The GOES system's primary mission is to continuously observe and record changing weather phenomena from satellite based sensors stationed approximately 23,000 miles from earth. As a "collateral duty" the GOES system supports our weather data transmission radio relay or Data Collection System (DCS). The DCS is what enables a wide variety of environmental data to be relayed from point sources or Data Collection Platforms (DCP) such as our RAWS stations that are either land, sea or mobile based through GOES and back to earth, where this data is distributed to various system users.

The RAWS data transmitted through GOES is sent to the DCS Automated Processing System (DAPS). DAPS was developed for the National Oceanic and Atmospheric Administration (NOAA) to support the increased volume and complexity of data transmissions. The DAPS is located at the NOAA Command and Data Acquisition facility at Wallops Island, VA.

When the weather date has been transmitted from DAPS to the DOMSAT Satellite, it is then transmitted to ASCADS. From ASCADS it is transmitted into WIMS or to other user sites such as the National Weather Service, Western Region Climate Center, States, etc.

WIMS (Weather Information Management System) is a complex and comprehensive weather management system that allows the user to access and utilize collected weather data. One of the benefits of the WIMS is this wide accessibility to the data by registered users since this data is stored on the IBM mainframe computer at the USDA National Information Technology Center in Kansas City, MO. WIMS data is available 24 hours a day by personal computer and internet access.

WIMS is widely popular amongst many Federal agencies, including the principal land management and wildland fire fighting agencies in the country (USDA-USFS, DOI-BLM, USFWS, BIA, NPS). WIMS also contains the processing software code for the National Fire Danger Rating System (NFDRS). The daily NFDR indices are calculated and made available nationwide.

WIMS also hosts the National Interagency Fire Management Integrated Database (NIFMID). Here weather data is automatically archived into the historic weather database for future retrieval and analysis. WIMS only archives weather data and of importance to the user, only stores this weather data for <u>one year</u>. Afterwards, the data is stored permanently on ASCADS.

One of the principal benefits of using a centralized processing system like WIMS is that the weather information (data) can be stored in one location with access allowed to all users. A user can view their own and other station weather data, records, and outputs without the necessity or need for additional phone or computer connections.

<u>Recent GOES Developments</u>:

As reported by the RAWS Coordination Center, NIFC, Boise, ID.

Development of a faster transmission rate for the GOES satellite has been a work in progress for a number of years. High Data Rate (HDR) as it has become known, has had a couple of “false starts”. However, NOAA/NESDIS engineers believe they have the problems that lead to the initial difficulties resolved.

> **What will HDR do for you?** High Data Rate will allow better transmit times for users (closer to top of the hour) and eventually more frequent transmissions (more frequent than hourly).

This is an excellent development as more frequent and efficient transmit times translate into better weather data reporting and collecting. This is especially critical where near real time weather data is needed!

All of the GOES satellite antennas within R-3 are capable of High Data Rate transmission.

GOES puts the data into the “transmit” buffer 2 minutes before transmittal time.

Interior View of RAWS showing FWS-11 Data Logger. All of the data from the sensors is stored here.

Get Your Station Connected:

Prior to your RAWS station being able to send data and subsequently access this data through WIMS, several key assignments of passwords, usernames, and station identification numbers are necessary. This will properly register you and your RAWS station within the RAWS system and with the National Weather Service (NWS).

1.) Station ID: Contact your local NWS office or NWS Regional Representative to obtain your Station ID. Without this Station ID, your RAWS station will not be listed in WIMS and you will not be able to access your station weather data through WIMS.

2.) Contact the BLM Remote Sensing Fire Weather Support Unit, NIFC, Boise, ID at ph: (208)387-5475 to obtain the (NESSID) number for your GOES satellite.

3.) Contact the WIMS helpdesk at ph: 1-800-253-5559 or (208)387-5290 to obtain your WIMS Username and password. (See the attached message from WIMS regarding the recent changes to the WIMS Username and password log-in procedure.

After obtaining your WIMS username and password you will be able to access your stations weather data through WIMS for data retrieval or monitoring. Using either a desktop or portable personal computer with internet access, log onto the FAMWEB (Fire and Aviation Management Web Applications) website at (http://famweb.nwcg.gov). You will access WIMS from this site.

4.) If you are responsible for your RAWS station maintenance and repair and you perform such tasks as calibration of herbaceous fuel conditions, etc. you will need to obtain an ASCADS username and password. To do this, complete the following:

- Purchase a licensed copy of SecureNetTerm software, ver.5.2 from InterSoft International, Inc. P.O. Box 218794, Houston, TX 77218-8794
  phone: 1-888-823-1541 or 24 hr fax: 1-888-823-1542 Cost is $69.95 per copy.

- Upon receipt of the SecureNetTerm software, contact Buddy Adams, BLM Remote Sensing Fire Weather Support Unit, NIFC, Boise, ID at
  ph: (208)387-5475 to initialize the software and to obtain your new ASCADS username and password.

If you do not perform RAWS station maintenance and repair, access to ASCADS is not necessary. If you want this additional responsibility, contact the Regional RAWS coordinator.

5.) Finally, you need to catalog your RAWS station with the NWS. This is necessary in order to allow the station data to be accessible to the NWS. Contact the local or regional NWS representative nearest you (see attached NWS phone contact list for names/numbers). This person will assist in cataloging your station. **[NOTE: This is not the same as the Station ID, this is a separate process.]**

GOES Satellite Antennae

RG-T Tipping Rain Gauge

Fuel Moisture Stick

Temperature / Relative Humidity Sensor

Important message regarding the "new" WIMS Log-on procedure.

6/6/2003

Status of the WIMS/NIFMID Database Migration

The National Weather Service data gateway system is available to receive and send products as of June 4, 2003. This means that forecasts can be generated and the Weather Service bulletins are available in WIMS.

We have been receiving several calls dealing with the user name and password change in the new database instance. Please remember that the new user name no longer has the "OPS$" prefix. The new user name is your old user name without the "OPS$", i.e. an old user name of "OPS$FS9999" is now "FS9999". The password is based on the personal information stored in WIMS/NIFMID database for the user id. If the user id "OPS$FS9999" was assigned to "Smoky Longlastname" with a phone number of "800-253-5559", the password would be "longlast5559". This is up to 8 characters of the last name and the last 4 digits of the phone number.

WIMS, KCFAST, SIT, and ICS-209 are available.

Your username no longer has the ops$ prefix. Read the system update document for information about your new password.

The US Federal Wildland Fire Management Data for 2002 has been updated.

If you experience any problems please contact the F&AM Helpdesk at 1-800-253-5559.

For support contact the Fire Applications Helpdesk:

email: fire_help@dms.nwcg.gov

The following page contains the "system update document" referenced above.

WIMS and KCFAST are unavailable until June 1, 2003 at 2000 cdt

- **Dates:** May 31 through June 1, 2003. Starting at (new start time) 1800 CDT on May 31 until 2000 CDT June 1 2003, WIMS, KCFAST and FIRESTAT uploads will be unavailable.
- **Purpose:** The WIMS/NIFMID database is being migrated from the SYSTEM D (Mainframe) at NITC, Kansas City, to an IBM AIX server to increase efficiency and reduce system support costs.
- **Problem:** The F&AM systems group has scheduled a migration of the WIMS/NIFMID database from the System D (Mainframe) to an IBM AIX server at NITC, Kansas City. Efficiency and rising costs associated with the Mainframe technology necessitate this migration. Users will no longer incur CPU-use charges for WIMS and KCFAST accounts as a result of this migration. This action will impact WIMS, KCFAST, FIRESTAT, and SIT/209 users.
- **Impacts:** The WIMS and KCFAST applications will be unavailable for a full 25 hours during the actual migration process. Access to SIT/209 may be interrupted for brief periods of time during this update.

  FIRESTAT uploads to the NIFMID database will be unavailable starting 1800 CDT May 31, 2003 until the next release of the FIRESTAT program.

  [The information in the following two paragraphs is very important to WIMS users and explains the new log-on procedure.]

  As part of this migration to a new database server, the username and passwords for WIMS, KCFAST, and SIT/209 will be changed. The current **ops$** prefix on all usernames will be removed to simplify log-on and reduce security risks using the current ops$ prefixed accounts in Oracle. The password will be updated to be the first 8 characters (minimum 2 characters) of the last name and the last 4 digits of the telephone number assigned to the account as listed in the WIMS user table (use LUSER to see the current information). For example, the user **Smokey Bear** with a phone number of **800-253-5559** and a user name of **ops$fs99999** will have a new user name of **fs99999** and a password of **bear5559**. Please remember that the password must start with a character and be a minimum of 6 characters.

  At the start of the migration, the accounts used for SIT/209 will also be updated to drop the **ops$** prefix. The password string will be the same as used for WIMS and KCFAST described above. Password changes can be made through the web page at famweb.nwcg.gov.

  Some users may experience difficulty accessing their accounts after the migration. Please contact the F&AM Helpdesk if you experience a problem logging on.

  If you need assistance please contact the F&AM Helpdesk at 1-800-253-5559 or 1-208-387-5290 or fire_help@dms.nwcg.gov.

Tips for WIMS Users:

Two very helpful sections of the WIMS User Manual are:

- Appendix A. Menus, FASTPATHS, and access levels

  This will give you a complete list of all of the data access functions available to the WIMS user. All of the four and five letter menu codes are included along with descriptive title. Print these four pages (no. 143-146) as a handy desk reference.

- Chapter 7. Working with Observations OBS

  A four page table listing all of the data entry definitions for the daily weather observations that you make. Print pages 86-89 for your desk reference. In order to enter a new observation you must be the station manager or have Access Control List authorization.

To download a WIMS User Manual go to http://www.fs.fed.us/fire/planning/nist/ select the Distribution page to download manuals, scroll down to [WIMS Web User Guide June 5, 2001] and select to download. This will give you the most current WIMS manual.

WIMS users/managers need to remember that three fields in the OBS (Observation) section need to be updated daily. They are:

(W) State of the Weather — enter the appropriate single digit identifier (0-9) to allow for accurate NFDRS indices. *This field **must not** be blank.*

(M L) Morning's Lightening — enter the appropriate single digit identifier (0-6) that describes the current morning's lightening activity level. *This field **must not** be blank.*

(Y L) Yesterday's Lightening — enter the appropriate single digit identifier (0-6) that describes the lightening activity from midnight yesterday to midnight last night. *This field **must not** be blank.*

Eventually, State of the Weather will be calculated internally in WIMS by data collected through use of the Solar Radiation Detector.

Why is it important to enter these three weather observations daily?

The National Fire Danger Rating System (NFDRS) uses these three indices for calculating certain parameters of the Fire danger rating for a specific geographic area. For example; the M L (morning lightening) level is critical to the accurate calculation of the Lightening Activity Level (LAL). Without accurate daily observations, the NFDRS relies

upon calculated averages from geographical area stations that do have these parameters filled in. The trade-off is choosing between accurate daily observations to fill the fields in the NFDRS calculation or relying upon less desirable weighted averages from surrounding area stations.

KBDI - Keetch Byram Drought Index.

An excellent description of the Keetch Byram Drought Index was prepared by the Texas Interagency Coordination Center. It is included following this WIMS section.
Remember! You need Average Annual Precipitation in the station catalog to obtain an accurate KBDI.

FWS-11 and FWS-12S Data Loggers:

How long does a data logger store weather data?

The FWS-11 data logger in a standard fire weather station will store data for 60 days. It will then start deleting data, oldest day of data first, as each new day of weather data is collected.

The FWS-12S data logger can typically store an amazing two years worth of weather data in a standard fire weather station. In a GOES satellite weather station, this storage capacity is reduced to just more than a year due to the "doubling" up of data storage due to the storage and firing system in the FTS system. For example, prior to sending the weather data at the exact specified time every hour, as described earlier on page 6, the data is placed into the transmit buffer, then, minutes later, the exact data is transmitted by the GOES satellite. Thus, doubling up the data storage need.

Later, if you log onto the FTS program, click View/Edit on GOES, the data log will appear as the following example:

10:00 10:10
11:00 11:10
etc. showing the "double" listing of data storage.

Modems:

All 10 of the RAWS in place and in service within Region 3 have a dial-up modem as an alternative to access the stations WIMS data. These stations all utilize the FTS high-speed field modem, the TM 4000 or TM-Ultra.

Keetch-Byram Drought Index

John L. Keetch and George Byram designed a drought index specifically for fire potential assessment. It is a number representing the net effect of evapotranspiration and precipitation in producing cumulative moisture deficiency in deep duff and upper soil layers. It is a continuous index, relating to the flammability of organic material in the ground.

The KBDI attempts to measure the amount of precipitation necessary to return the soil to Full field capacity. It is a closed system ranging from 0 to 80 units and represents a Moisture regime from 0 to 8 inches of water through the soil layer. At 8 inches of water, The KBDI assumes saturation. Zero is the point of no moisture deficiency and 800 is the maximum drought that is possible. At any point along the scale, the index number indicates the amount of net rainfall that is required to reduce the index to zero, or saturation.

The inputs for KBDI are weather station latitude, mean annual precipitation, maximum dry bulb temperature, and the last 24 hours of rainfall. Reduction in drought occurs only when rainfall exceeds 0.20 inches (called net rainfall). The computational steps involve reducing the drought index by the net rain amount and increasing the drought index by a drought factor. KBDI levels and its relationship to expected fire potential are reflected in the following table:

- KBDI = 0 – 200: Soil moisture and large class fuel moistures are high and do not contribute much to fire intensity. Typical of spring dormant season following winter precipitation.
- KBDI = 200 – 400: Typical of late spring, early growing season. Lower litter and duff layers are drying and beginning to contribute to fire intensity.
- KBDI = 400 – 600: Typical of late summer, early fall. Lower litter and duff layers contribute to fire intensity and will burn actively.
- KBDI = 600 – 800: Often associated with more severe drought with increased wildfire occurrence. Intense, deep-burning fires with significant downwind spotting can be expected. Live fuels can also be expected to burn actively at these levels.

A word on our maintenance contract!

How do you maintain a RAWS?
What type of maintenance contract do we have?
What sensors do we replace annually?
Where do I get spare parts and who pays for these parts?

1.) How do you maintain a RAWS?

RAWS stations are very durable given the incredible technological sophistication that they possess. Electronic components are just like any mechanical device, sooner or later they will fail. Typically, a failure occurs when it is least expected and always when it is a major inconvenience.

However, by periodically swapping out key sensors, we can reduce, if not eliminate the majority of faults and failures that may occur.

[RAWS stations require at least, an annual rehabilitation/maintenance site visit.]

This will ensure, as best possible, that our weather stations are providing accurate, up to date information pertaining to fire weather that firefighter safety is dependent upon.

2.) What type of maintenance contract do we have?

All Region 3 RAWS stations are covered under a "Depot Maintenance Contract" with the BLM. Depot level maintenance is a contract through a bench-level rehabilitation and calibration facility (as in the FWS with the BLM's Remote Sensing/Fire Weather Support Unit (RSFWSU BLM/NIFC, 3833 S. Development Ave. Boise, Idaho 83705 ph: (208)387-5475), or a vendor. Station owners are responsible for annual station rehabilitation, emergency repair, and quality assurance. Equipment is removed and shipped to a depot or vendor facility for rehabilitation and calibration as per Depot Sensor Calibration Standards.

3.) What sensors do we replace annually?

There are 2 primary weather sensors that we utilize in a RAWS station that are replaced (swapped) yearly. They are: Air Temperature/Relative humidity sensor and the Fuel Moisture sensor. Additionally, the Rain Gauge Tipping Bucket needs to be field calibrated annually.

Included with this guide are the Annual Rehabilitation Maintenance pages taken from the NWCG, National Fire Danger Rating System, Weather Station Standards, PMS 426-3 (Revised March, 2003).

These pages specifically list the one, two, three, and four year calibration requirements along with "as needed" checks.

4.) Where do I get spare parts and who pays for these parts?

The FWS is covered under the Depot Maintenance Contract and the costs are written into this contract. The individual RAWS station manager does not need to budget annual maintenance parts costs as these are covered under the FWS contract. Just make sure that you **return** the old sensors to the BLM!

How to Order Parts Under the BLM Depot Maintenance Contract

Updated 3/15/02

[Note: All Region 3 RAWS Stations are covered under this contract.]

Before you attempt to use this contract, you must be sure your station is covered. Contact your agency Weather Station Coordinator or the BLM at 208-387-5475.

The following information describes ordering parts for Region 3 RAWS.

FWS

Under the depot maintenance contract, the BLM Remote Sensing Fire Weather Support Unit (RSFWSU) offers two options to help you keep your station healthy.

KEEP YOUR ORIGINAL PARTS:
You may send your sensors to the depot using the RAWS/REMS Repair and Return for Credit Form. (See copy of form immediately following this section.) Once the parts are received in Boise, the RSFWSU folks will calibrate, clean and repair your sensors and return them to you.

SWAP NEW PARTS FOR OLD:
(requires filling out a purchase order (form No. 3-2103 and sending in for tracking purposes, if you don't return parts your station will be billed). Note: Included is a copy of Optional Form 347, the standard form utilized nationwide for purchasing in the FWS, in lieu of 3-2103 which is cited. You may also order freshly calibrated parts prior to visiting your weather station using the complete NFES Catalog Numbers and prices. A mini-catalog of all RAWS related equipment is included to help you complete your orders. Fax the request to 208-387-5573. ***Lack of complete information will result in a delay in processing your order.*** Visit your site, make necessary repairs and return the old parts to the BLM RSFWSU using the RAWS/REMS Repair and Return for Credit Form. Include a copy of the form in EACH box that is shipped to ensure proper credit.

Other Federal and Non-Federal Agencies use the following procedures

USFS

Fill out the Maintenance Form (copy attached) complete with NFES Catalog Numbers and prices. Be sure to and include a valid Job Code and override code or your order will not be processed. Fax the request to 208-387-5573. ***Lack of complete information will result in a delay in processing your order.*** Visit your site, make necessary repairs and return the old parts to the BLM RSFWSU using the RAWS/REMS Repair and Return for Credit Form. Include a copy of the form in EACH box that is shipped to ensure proper credit.

Non Federal Cooperators

Fill out the Maintenance Form complete with NFES Catalog Numbers and prices. ***Lack of complete information will result in a delay in processing your order.*** Fax it to 208-476-8288. Follow-up with a phone call to 208-476-8362 or 208-476-8312 to be sure the fax has been received. Visit your site, make necessary repairs and return old parts to the BLM RSFWSU. Include a copy of the RAWS/REMS Repair and Return for Credit Form with EACH box that is shipped.

Other Federal Agencies - Contact your agency RAWS Coordinator for instructions.

What's different than before, except the forms?
You MUST return your used parts within 30 days after your receive the new parts from the BLM. Failure to do so will result in the value of the parts being charged to the job code and override (USFS) you provide. In the case of States, failure to return parts in a timely manner will result in a bill being sent to your agency to recover funds.

WHY has the process changed?
At the end of the FY 01, the depot was missing over $400,000.00 worth of parts that had been sent out but not returned. Most of us have been great about returning used sensors, but others have not.

IMPORTANT: If you order parts and then discover that you are not going to be able to service your weather station and return the parts within the 30 day timeframe, RETURN THE PARTS TO BOISE IMMEDIATELY. Include a copy of the RAWS/REMS Repair and Return for Credit Form with EACH box that is shipped.

REMS "Repair and Return" or "Return for Credit" Form

Updated 7/31/02

INSTRUCTIONS:

1. Use this form when shipping RAWS/REMS equipment to the BLM Depot for ***any reason*** in order to assure tracking and credit.

2. One copy of this form should be included with EACH package shipped.

3. Please be sure to keep records of UPS or FedEx tracking numbers of your packages until you are sure proper credit has been received.

Date: _____ / _____ / _____

Contact Information: Name: _____

Phone: (_____) _____ - _____ Email: _____ @ _____ . _____

Agency/Region: _____ Unit: _____ Sub-Unit: _____

Account to be Credited *(must be same as account used to order parts):*

Station Name: _____ Federal Job Code: _____ Override: _____

Check One:

_____ Repair & Return to Owner _____ Return for Credit

_____ Other (Please Explain): _____

_____

Contents Description:	**Serial Number:**

Other Information/Notes: _____

SHIP TO: RSFWSU BLM/NIFC - 3833 S. Development Avenue - Boise, ID 83705

REMS/RAWS Mini NFES Catalog

Updated 6/20/2003

PLEASE NOTE:

- This catalog is to be used ONLY for parts swap (user orders part, swaps at station and returns like part to RSFWSU).
- It is **not intended for new purchases** under any circumstances.
- If you require parts for your station that you do not already own, you must procure them from an appropriate vendor.
    - This includes cables!

NFES #	MODEL #	DESCRIPTION	COST
5523		Solar Panel 20W (Unregulated)	$195.00
5528	439C	Fuel Moisture/Fuel Temperature	$410.73
5531		FM/FT Cable (7 ft)	$250.94
5534	013/WSM-30	Wind Speed (FTS) (Ice-Rated)	$274.88
5535	023/WSM-30	Wind Direction (FTS) (Ice-Rated)	$470.29
5536		Tipping Bucket (H540/H555)	$525.36
5551	425A	Wind Speed/Direction (Non-Heated)	$1567.50
5552	425AH	Wind Speed/Direction (Heated)	$1885.75
5560	H55B	DCP H55B (Non-GOES)	$1988.33
5580		GOES Antenna	$330.39
5588		Pyranometer (Sensor Only)	$178.35
5589	438B	Soil Moisture Sensor	$531.43
5591		Aspirated Shield 435C	$222.00
5592	435C	RH/AT Sensor 435C	$1449.00
5597	433F	Soil Temp Sensor	$208.20
5598	453A	Wind Speed/Direction (YM Young)	$744.90
5599	441A	Pyranometer (Complete with HDW)	$430.75
5602	H540	DCP 540	$4483.75
5603		Met Card H540	$408.67
5610	430A	Wind Speed Sensor	$382.59
5611	431A	Wind Direction Sensor	$460.78
5612	439A	Fuel Moisture/Fuel Temp	$831.46
5613	433E	Fuel Temp Sensor	$143.63
5615	435A	RH/AT Sensor	$580.92
5616		Wind Speed/Wind Direction Cable	$389.35
5627	438A	Soil Moisture/Soil Temp	$564.10
5628		Soil Moisture/Soil Temp Cable	$141.26

5629		Modem/Speech Board (H540)	$761.04
5634		4-Tone Speech (H540)	$516.29
5636		Parallel Plate (RH/AT)	$160.76
5638		Micro Board (3-EPROM)	$316.52
5640		Micro Board (1-EPROM)	$316.52
5642	H555B	DCP with GOES Transmitter	$3270.63
5645	541	WWV Receiver	$1133.18
5651		Antenna Cable (GOES)	$61.39
5652		Solar Panel Cable	$107.07
5654		RH/AT Cable (10 ft)	$250.94
5655		Precipitation Cable	$41.22
5656		Solar Panel 9-Watt Unregulated	$332.47
5671		Cable Micro (WS/WD, RH/AT, SP)	$400.00
5673		Cable Micro (RH/AT)	$126.93
5700		GPS Receiver	$427.00
5701		TX.RX Inverter Board	$148.00
5742	FWS-11	Data Logger (FTS)	$2964.00
5743	FWS-12	Data Logger (FTS)	$2597.00
5744	TM4000	Telephone Modem (FTS)	$1601.00
5745	RG-T	Rain Gauge (FTS) -	$770.00
5746	RG-E12-30	Rain Gauge (FTS) (Heated) -	$1985.00
5747	THS-1	RH/AT Sensor (FTS) -	$770.00
5748	FS-11	Fuel Stick (FTS) -	$786.00
5749	SDI-S-PYR	Solar Radiation Sensor (FTS) -	$975.00
5751	014-WSM-20	Wind Speed Sensor (FTS) (Non-Ice)	$200.00
5752	024-WDM-20	Wind Direction Sensor (FTS) (Non-Ice) -	$300.00
5753	WS-11/TRX	Wind Speed Sensor (FTS) (Plastic)	$49.80
5754	WD-11/TRX	Wind Direction Sensor (FTS) (Plastic)	$52.80
5755		Humidity Sensor	$76.50
5781		RM 4000	$1918.00
5782		RM 4000 Base	$1776.00
5786	034/WSD-PB	Wind Speed/Wind Direction (Plastic)	$412.25
5789		Lightning Arrestor (2 Boxes)	$687.00
5790		Telephone Modem (TM-Ultra) -	$1197.00
5791		Battery Pack (FWS11 or FWS12)	$350.00
5792		Data Logger Housing (FWS11/12)	$214.00
5793		Data Logger FWS-12S (Fixed Standard)	$2647.00

5794		Data logger (FTS-12S) (Keyway)	$2647.00
5795		G3/G4 GOES Transmitter for FWS-12S	$3342.00
5796		GOES Antenna (FTS)	$1050.00

Of347.pdf

USFS

Automated Weather Stations Maintenance Order Form

FY 03 #13023000153

→Important: Fax completed form to 208-387-5573←

Ship to:	Forest:		Phone: ( ) -
	Attn:		Fax: ( ) -
	Strt:		Email:
	City:		*Incomplete shipping and contact information will result in a delay of parts delivery*
	State:	Zip:	
Tracking #:	Override Code: Federal Job Code: Station Name:		*These must be filled in completely in order for parts to be shipped.*

NFES #	Description	Price	Quantity	Total
	Order Total:			

Requested Delivery Date: _____

Technical Point of Contact: _____ Phone:( ) -

*Authorized Signature: _____ Date: _____

Print Signature Name: _____

By signing this document, I understand that we must return like parts to the BLM's Remote Sensing Fire Weather Support Unit within 30 days of receipt. I further understand that failure to return like parts within 30 days, will result in funds being charged to our jobcode for the value of the parts plus shipping.

** Authorized signature must have spending authority for the organization.*

Copy of USFS Maintenance Form.

ANNUAL REHABILITATION MAINTENANCE

Field Maintenance Standards

Instructions for returning sensors to Depot for calibration: clearly mark the station they are from prior to sending to the depot facility.

Minimum replacement means swap out of individual component under the terms of the depot contract under which the station is being maintained. This does not mean purchasing a new component or sensor, nor is this the same as life-cycle management.

Tipping Bucket - Disassemble, clean, check all connections. Using the precipitation gauge calibrator, run 399 ml (or the appropriate amount for the model of bucket being used) of water through the collector and ensure that the recording device (either the DCP or the tipping bucket counter) reads 50 counts, plus/minus 2 counts.

MINIMUM FIELD CALIBRATION - 1 Year
MINIMUM DEPOT CALIBRATION/REPLACEMENT - 3 Years

Wind Speed - Check for damage and alignment of cups, ice skirt, free movement of bearings.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Wind Direction - Check for damage of pointer and feather, free movement of bearings. Manually rotate the sensor through each of the four quadrants and scan the data for accuracy.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Relative Humidity/Air Temperature - Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – Yearly

Fuel Temperature - Check for deterioration and cracking of the wood.

MINIMUM CALIBRATION/REPLACEMENT - 3 Years

Fuel Moisture - Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – Yearly

Battery - Perform a voltage test. Replace batteries according to manufacturer recommendations or if you suspect problems. Some manufacturers recommend yearly, others recommend every three years.

MINIMUM CALIBRATION/REPLACEMENT - 3 Years for internal
"D" cell (Supplemental Power) – yearly

WWV Receiver - Perform pass/fail functional check and replace if necessary.

MINIMUM CALIBRATION/REPLACEMENT - As Needed

GOES Antenna - Check for broken, loose, or bent elements, proper alignment, and connectors
for corrosion.

MINIMUM CALIBRATION/REPLACEMENT - As Needed

Cables - Check for cracking, deterioration, corrosion, proper routing, and security. Ensure O- rings are installed on all connectors. Replace as required for corrosion, aging, etc. Treat all connectors with moisture inhibitor.

MINIMUM CALIBRATION/REPLACEMENT - As Needed

Tower - Check for structural damage, proper alignment, and leveling. Be aware of potential risk to safety when dealing with a potentially damaged tower (i.e., tower rust, corrosion, cable frey, etc.).

MINIMUM CALIBRATION/REPLACEMENT - As Needed, if structure is compromised or as per manufacturer's specifications.

DCPs and Data Loggers - Check for security, damage, and ensure that all cables are properly connected. Verify the unit has the most recent version of the software or firmware installed. Change out as needed (defective, evidence of moisture, corrosion, rust, etc.).

MINIMUM CALIBRATION/REPLACEMENT - 4 Years

Solar Radiation - Sensor must be cleaned periodically using only *water* and/or a mild detergent such as dishwashing soap.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Documentation - Documentation of the site visit will be captured in the ASCADS database*. It is the responsibility of every person that visits the site to assure that ASCADS is updated. Owner will maintain a hard copy documentation file for each station. This will include photos, site access instructions, purchase history and other related site information.

*Ultimately, maintenance, station and site information will all be housed online with station metadata. Collaboration is necessary between the ASCADS and WIMS managers to address and resolve metatdata issues with the intent of not duplicating the storage of data and seamless access to the information for the user.

Depot Sensor Calibration Standards

The depot or manufacturer's maintenance facility under contract will rehabilitate and calibrate sensors to the standards listed below and manufacturer's specifications.

Test Equipment - The test equipment and associated tools used during depot sensor calibration routines shall follow a general practice of "traceability protocol" based on standards maintained by the National Bureau of Standards (NBS). This results in claims of calibrations that are "traceable to NBS".

Wind Sensors - Check and record torque readings for all sensors before and after depot calibration.

Wind Speed - Perform torque test, disassemble, change bearings, inspect for corrosion, test for proper operation of reed switch or proper voltage and frequency output for units with hall-effect devices. Ensure that the unit meets or exceeds a maximum starting threshold of .25 MPH. Clean and paint as needed. Torque specifications for wind speed sensors will meet or exceed <.05 inch/lbs.

Wind Direction - Perform torque test, check potentiometer for linearity of all four quadrants and replace as required. Change bearings, check pointer assembly for static balance and check for corrosion. Align and adjust according to manufacturers specifications. Torque readings will meet or exceed <.75 inch/lbs.

Tipping Bucket - Disassemble, clean and inspect for corrosion, mechanical wear and damage. Check and align the contact closure mechanism for proper operation. Assemble and run operational test and check (T&C). Paint as needed.

Relative Humidity/Air Temperature - Calibrate sensors for voltage and current according to manufacturers specifications. Calibrate the RH sensor at the 12% and 76% levels. After calibration the RH sensor will read within plus or minus 3% of the ambient room relative humidity. Test the air temperature by using temperature standards and check the resistance at said levels to plus or minus .5 degree.

Fuel Moisture - Calibrate sensors for voltage and current according to manufacturers specifications.

Fuel Temperature - Check stick for weathering/wear and replace as necessary. Using an ohmmeter, check the thermistor at various temperature settings. The resistance must correspond to the published calibration curve within plus or minus one degree.

WWV Receiver - Each receiver is checked for proper software revision, then tested for operation at 5 MHz, 10 MHz, and 15 MHz using the WWV TEST program.

Cables - Inspect all cables for serviceability, clean and check all connectors for corrosion and O-ring installation and check all connections with a megger. Check armor for correct orientation with respect to sensor end.

Antenna - Clean connections, check and replace elements as necessary. Connect antenna to a DCP/Data Logger and with watt meter in line check for proper power out and at minimum a 10 to 1 ratio on the forward to reflected power readings.

Solar Radiation - LI-200SA specifications: Calibrate against an Epply Precision Spectral Pyranometer (PSP) under natural daylight conditions. Absolute error under these conditions is +/-5% maximum, typically +/-3%. Sensitivity: Typically 80µA per 1000 W m_2.

Global Positioning System (GPS) - Replace faulty GPS receivers and/or antennas when breakdowns occur.

Data Collection Platform/Datalogger - Check unit to make sure it has correct software installed. Adjust all voltages out of the power supply and regulator and align all cards. Adjust the RF power output to manufacturer specifications. Adjust modulation and frequency as necessary. Run and monitor the complete unit for a minimum of 5 days in the environmental test chamber at various temperatures with a full complement of sensors.

Documentation - A maintenance history record shall be kept for each sensor and DCP that is repaired/calibrated by a Depot facility. These records are kept on file by serial number and used by Depot staff for spotting systematic problem areas that may have impact on the program. The documentation also is helpful in working with manufacturers in order to develop better quality products.

RAWS Web Sites

Additional important documentation, updates, user guides, etc. is found on the following web sites. Periodic visits to these sites will help keep you abreast of current changes in the RAWS field. As WIMS users well know, the WIMS web site is mandatory for access to WIMS data.

RAWS **http://www.fs.fed.us/raws**

WIMS **http://famweb.nwcg.gov/**

Fire Applications Support **http://www.fs.fed.us/fire/planning/nist**

U.S. Fish and Wildlife Service
Region 3 Remote Automatic Weather Stations
Hardware / Software Parameters

STATION NAME	STATE	CITY	CONTACT PERSON	LIST of SENSORS	TELEMETRY TYPE	MODULES		LOGGER	SOFTWARE VERSION
						WIMS	NFDRS		
Crab Orchard	IL	Carterville	**Tom Palmer** Forester 618-997-3344 Ext. 319	P, WS, WD, AT, FT, FM RH	TM4000	No	Yes	FWS-11	Fire Weather Plus 2000 ver. 4.09.1
Neal Smith	IA	Prairie City	**Richard Hager** Biol. Tech 515-994-3400	P, WS, WD, AT, FT, FM RH	QD	Yes	Yes	FWS-11	FTS2000
Desoto	IA	Missouri Valley	**Mindy Sheets** Asst. Refuge Mgr. 712-642-4122	P, WS, WD, AT, FT, FM RH	TM4000	No	Yes	FWS-11	Fire Weather Plus 3.51
Seney	MI	Seney	**Gary Lindsay** Prescribed Fire Spec. 906-586-9851	P, WS, WD, FT, FM, RH	TM	No	No	FWS-11	Fire Weather Plus 1.25
Sherburne	MN	Zimmerman	**Richard Johnson** Fire Mgt. Officer 763-389-3323 Ext. 216	P, WS, WD, AT, RH, FM	TM	Yes	Yes	FWS-11	Fire Weather Plus 2000
Agassiz	MN	Middle River	**Larry Anderson** Prescribed Fire Spec. 218-449-4115	P, WS, WD, AT, RH, FM	TM	No	No	FWS-11	Fire Weather Plus 3.53
Necedah	WI	Necedah	**Matt Plagenz** Prescribed Fire Spec. 608-565-4410	P, WS, WD, AT, FT, FM RH	TM	No	Yes	FWS-11	Fire Weather Plus 2000
Horicon	WI	Mayville	**Jon Krapfl** Fire Technician 920-387-2658	P, WS, WD, AT, FT, FM RH	TM	No	Yes	FWS-11	Fire Weather Plus 2000
Detroit Lakes	MN	Detroit Lakes	**Steve Schumacher** Fire Mgt. Officer 218-847-4431	P, WS, WD, AT, FT, FM RH	Telephone TM/ULTRA Modem	Yes	Yes	FWS-12S	Fire Weather Plus 2000 ver. 4.061
Big Oaks	IN	Madison	**Brian Winters** Prescribed Fire Spec. 812-273-0783	P, WS, WD, AT, RH, FM	TM/ULT	No	Yes	FWS-12	Fire Weather Plus 2000

Telemetry

TM means dial telephone using TM4000 at 1200 bps
TM/Cell means dial cellular using TM4000 at 1200 bps
TM/ULT means dial telephone using the TM Ultra modem at up to 14.4 kbps
QD means Quick Deploy station
QD/Cell means QD with cellular communications
QD/RD means QD with radio telemetry communications option

Sensors

P	Precipitation
WS	Wind Speed
WD	Wind Direction
AT	Air Temperature
FT	Fuel Temperature
FM	Fuel Moisture
RH	Relative Humidity

How Does RAWS Work?

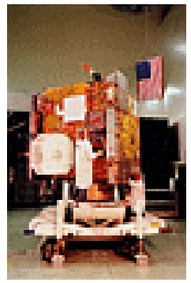
The Remote Automatic Weather Station Schematic

Global Positioning System Satellites

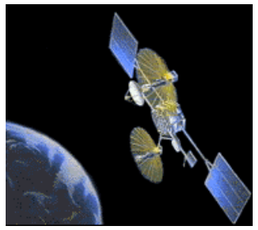
Currently 24 GPS Satellites in orbit. Provide continuous 3-dimensional position, velocity, and time information for users with GPS receivers anywhere on or near the earths surface.

Our RAWS stations utilize the Lat/Long Coordinates and GPS clock timing.

GOES Satellite



DOMSAT Communications Satellite



GOES Transmits weather data hourly

RAWS sensors collect critical weather data including; Temperature, Relative Humidity, wind speed, wind direction, solar radiation, precipitation, etc.

DAPS
Wallops Island, VA

FTS Support

ASCADS Computer ⟷ **SecureNet** ⟷ **Weather Station Owner / Manager**

Internet Link

- **WIMS**
- **National Weather Service**
- **Western Region Climate Center**
- **Other Users / etc.**

Produced by Tim Hepola, Fire Ecologist, R-3, USFWS
Special Thanks to Allan Amott, FTS, Inc. for assistance
Satellite photos courtesy of NASA