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# **AUTOMATED SURFACE OBSERVING SYSTEM (ASOS)**

## **RELEASE NOTE**

**SOFTWARE VERSION - 2.7A**

**Replacement Wind Sensor  
(Vaisala 425 Ice-Free Wind Sensor)**



**May 16, 2002**

U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Weather Service / Office of Operational Systems/Observing Systems Branch  
National Weather Service / Office of Science and Technology/Development Branch

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## 1.0 Introduction

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### 1.1 Background

The ASOS wind sensor (Belfort 2000) uses rotating cups to measure wind speed and a vane to measure wind direction. This type of technology has been used by the National Weather Service (NWS) since the mid-1940s. With the advent of automation, ASOS implemented new processing algorithms that changed the sampling period for the sustained wind speed and direction from 1-minute to 2-minutes. Over a 2-minute period, ASOS will use twenty four 5-second discrete averages to determine the 2-minute average wind speed and direction. Each minute ASOS will store the highest 5-second discrete average speed for the minute, along with its direction, in the 12-hour archive for additional processing. This highest speed value is used to determine if a gust and/or a peak wind remark will be reported.

After gaining experience with the ASOS wind sensor, along with the changes in the wind algorithms, two areas for improving wind measurements were identified. The first area is the sensor's performance under icing conditions. The anemometer's and vane's measurements can be impacted by ice accumulation. Occasionally these conditions may even cause the sensors to become inoperative. The second area is the sampling period for the gust speed. A discrete period of 5-seconds was determined to be too long and causing too much smoothing of the gust speed. With the implementation of ASOS, gust speeds were claimed to be reduced by 10 percent at gusts higher than 35 knots.

To improve the accuracy and reliability of wind measurements under icing conditions, ASOS Product Improvement sought a replacement wind sensor that could operate under adverse winter conditions such as freezing rain, freezing drizzle, and snow. Ice-Free Wind (IFW) sensor testing started in fall of 1995. Today an IFW sonic anemometer (Vaisala 425) is being implemented with ASOS Acquisition Control Unit (ACU) software version 2.7A. This implementation includes a new gust sampling period of a running 3 seconds. It should be noted that the sampling periods used to report both sustained winds (discrete 5-second samples over a 2-minute period) and gusts (running 3-second sample) can be changed through a download of these programmable sampling periods from the ASOS Operations and Monitoring Center (AOMC). Current plans call for the IFW sensor to be installed at all 883 NWS / Federal Aviation Administration sponsored ASOS sites.

### 1.2 Purpose

This ASOS Release Note gives a summary of the changes found in ACU application software version 2.7A, since 2.6A.

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## 2.0 General Information

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The Vaisala 425 sonic anemometer can only interface to ACU software versions beginning with version number 2.7A. This software can only be installed on the new processor board (i.e., Synergy Microsystems, Inc., single board computer). Except for the implementation of the new 3-second gust sampling period, no changes were made to the ASOS wind algorithms (e.g., wind shift, variable wind direction, and peak wind remarks).

### 2.1 Wind Replacement Sensor Interface

The wind replacement sensor is the Vaisala 425 sonic anemometer. The interface in software version 2.7A includes: 1) Operator Interface Device (OID) functions to configure the Vaisala 425 sensor and define it as the wind data source to be used in ASOS products and messages (e.g., METAR/SPECI reports); 2) System Maintenance Log (SYSLOG) messages for the sensor; 3) Maintenance functions to test and trouble shoot the sensor via the OID; 4) Twelve-hour archive of data from the wind sensor not defined as the data source for ASOS products and messages; and 5) The capability to change the sampling period used to determine the 2-minute average sustained winds and gusts.

After the wind sensor is installed, the site will have the capability of defining either the Belfort 2000 (BELFORT ASOS) or the Vaisala 425 as the source of the wind data reported by ASOS. The data from the defined wind data source will be stored as part of the 12-hour archive of sensor data. Data from the undefined wind data source will be stored in a TEST file available via the 12-hour archive OID function. (See Section 3.4.)

At most sites the Vaisala 425 will replace the Belfort 2000. Only sites participating in the Climate Continuity / Bias Study will have both sensors installed and configured.

### 2.2 Verifying Installation of Software Version 2.7A

Starting at the OID's 1-Minute Screen, use the commands REVUE-SITE-VERSN-SW to verify the installation of the 2.7A ACU application software. (See Figure 1 on page 3.) If you are not sure you are looking at the 1-Minute Screen, press the EXIT function from the current page and that will return you to the 1-Minute Screen. If the EXIT function does not exist, but the SIGN function does, then you are looking at the 1-Minute Screen. (See Figure 2.)

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07:33:56 05/10/02 1233Z STERLING #2

UNIT	BOARD	NAME	DEVICE	VERSION	DATE
ACU	CPU A	PSOS OS	EPROM	2.5	04/19/01
	CPU B	PSOS OS	EPROM	2.5	04/19/01
	MEMORY	ACU APPLICATION	EPROM	2.7A	05/02/02
	MEMORY	DCP APPLICATION	EPROM	2.7A	05/02/02
DCP-1	CPU A	BOOT	EPROM	1.90	11/03/97
	CPU B	BOOT	EPROM	1.90	11/03/97
	MEMORY	DCP APPLICATION	RAM	2.7A	05/02/02
DCP-2	CPU A	BOOT	EPROM	1.90	11/03/97
	CPU B	BOOT	EPROM	1.90	11/03/97
	MEMORY	DCP APPLICATION	RAM	2.7A	05/02/02

SOFTWARE VERSIONS

PRINT

EXIT    BACK

**Figure 1: SOFTWARE VERSIONS Page (REVUE-SITE-VERSN-SW) .**

07:33:35 05/10/02 1233Z STERLING #2

```

SKY           = CLR
VISIBILITY   = 10SM           TEMP/DEWPT    = 19.4 /12.2  C  67 /54  F
RVR          = RVRNO         WIND DIR/SPD = 320/08
PRESENT WX   =               ALTIMETER          = 30.15

REMARKS      = RMK AO2

METAR KST0 101156Z AUTO 33006KT 10SM CLR 19/13 A3014 RMK AO2 SLP204 7////
T01940133 10194 20128 53035 $ RTX FIBI
  
```

PRINT

REVUE

SIGN            AUX

**Figure 2: OID 1-Minute Screen**

### 3.0 Specific Changes In Software Version 2.7A

This section will identify changes that are available to operators of the OID and to those accessing ASOS remotely via the Direct Command Mode (DCM). Operators at the OID include the UNSigned user (UNS) and the following password levels: 1) OBServer (OBS); 2) Air Traffic Controller (ATC); 3) Electronics TEChnician (TEC); and 4) SYStem Manager (SYS). The functions to be used to complete a task are provided in each section. All function command strings provided assume the operator begins from the 1-Minute Screen on the OID. The DCM requires only a remote access code and not a password.

### 3.1 Configuring the Vaisala 425 (TEC and SYS)

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After the Vaisala 425 sensor has been installed, only the electronics technician or system manager can configure the sensor on the REVUE-SITE-CONFIG-SENSR page. (See Figure 3.) Using the CHANG function, move the cursor to the correct Serial Input/Output (SIO) port and enter the two-letter code of **WI** for the new wind sensor. Use the EXIT or BACK function for ASOS to accept the change to the sensor configuration page.

It is important to note that only a very limited subset of ASOS sites will have both the Belfort 2000 and Vaisala 425 installed and configured. Generally, the Vaisala 425 will replace the Belfort 2000. The Belfort 2000 uses the two-letter code of **WS** when configured. When the Belfort 2000 is replaced, the **WS** code is to be removed from the sensor configuration page.

Figure 3 is an example of a site where both the Vaisala 425 (**WI**) and the Belfort 2000 (**WS**) are configured.

```
07:34:25 05/10/02 1234Z                                STERLING #2
-----
      SIO #1   SIO #2   SIO #3   SIO #4   SIO #5
PORTS  2  3  4   1  2  3  4   1  3  4   1  2  3  4   1  2
DCP #1 C1 FR PW  TB ** TD V1  V3 C3 DT
DCP #2 C2 TS V2  WI WS ** **
DCP #3
LOCAL SENSORS
** ** **
PRESSURE SENSORS
P1 P2 P3
CONFIGURATION
PRINT
ALGOR CHANG
EXIT BACK
```

Figure 3: **SENSOR CONFIGURATION** Page (REVUE-SITE-CONFIG-SENSR) .

### 3.2 Defining the Source of the Wind Data (TEC and SYS)

After the Vaisala 425 sensor has been installed and configured, only the electronics technician or system manager can define it as the source of the wind data to be used in all ASOS messages and products. Using the REVUE-SITE-CONFIG-DEFIN page, the source of the wind data can be sequenced through two choices (i.e., BELFORT ASOS and VAISALA 425). After pressing the CHANG function, move the cursor to the WIND field and use the SEQN function to sequence between BELFORT ASOS and VAISALA 425. In the page below, the VAISALA 425 will be the source of the wind data used in the ASOS messages and products, and the wind data

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from the BELFORT ASOS will be stored on the TEST page of the 12-hour archive. (See Section 3.4.)

After the source of the wind data has been defined, the report processing for the sensor can be controlled through the sensor STATUS page. Move the cursor to the **WIND 425NWS** (Vaisala 425 defined) field and use the PROC function. (See Figure 5.) There is no report processing control for the wind sensor data stored on the TEST page of the 12-hour archive (i.e., in this case the BELFORT ASOS). These values are stored in brackets ( e.g., [ ] ) on the TEST page. The brackets signify the data are **NOT** used in any ASOS messages or products.

```

07:35:06 05/10/02 1235Z                                     STERLING #2
-----
                DEFINE CONFIGURATION
SENSORS
CEILOMETER          POLLED          ACU MEMORY          1 MEGABYTE
VISIBILITY          BELFORT ASOS    DCP MEMORY          1 MEGABYTE
TEMP                HO83          RS_232 MODEM        UDS
DEWPOINT            DTS1          SYNCH MODEM         UDS
PRESENT WX          LEDWI         ACU/DCP COMM        PHASE II RADIO
WIND                VAISALA 425    RT CLOCK            VIDEO CARD
PRESSURE            SETRA MODEL 470 ACU POWER SUP        ASTEC
FREEZING RAIN       PHASE II      DCP POWER SUP        R.O. ASSOC.
SNOW DEPTH          PHASE II      ACU UPS              SOLA
HAIL                PHASE II      DCP UPS              SOLA
SUNSHINE            PHASE II      GTA RADIO            MOTOROLA VT-200
LIQUID PRECIP       BELFORT ASOS
THUNDERSTORM        LLP TSS 924
                DEFINE CONFIG
                PRINT
                CHANG
                EXIT  BACK
  
```

**Figure 4: DEFINE CONFIGURATION Page** (REVUE-SITE-CONFIG-DEFIN)



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SENSOR	DCP#	SELFTTEST	DATA QUALITY	AUTO/MAN	RPT PROC
CEILOMETER #2	2	P	P	AUTO	ON
CEILOMETER #3	1	P	P	AUTO	ON
TIPPING BUCKET	1	N/A	P	AUTO	ON
<b>WIND 425NWS</b>	2	P	P	AUTO	ON
RVR	N/A	N/A	N/A	AUTO	OFF

STATUS	
PRINT	PAGE
PROC	
EXIT	BACK

Figure 5: SENSOR STATUS Page (REVUE-SENSR-STAT)

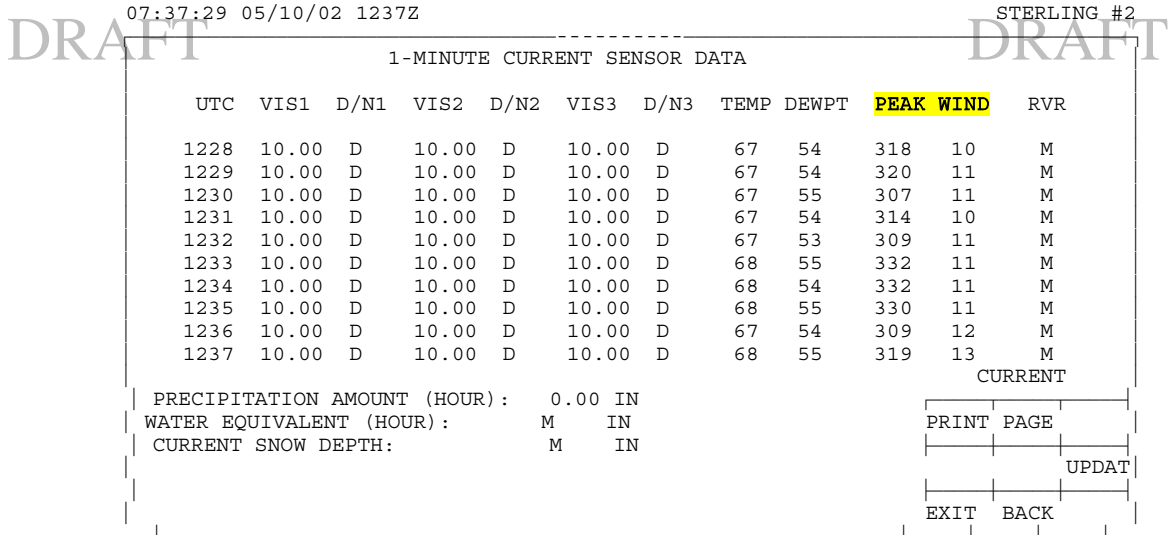
**NOTE:** In Figure 5 the Vaisala 425 is defined as the source of the wind data. If the BELFORT ASOS wind sensor had been defined as the source, then **WIND SPEED/DIR** would appear in the SENSOR column .

### 3.3 Current Sensor Data (UNS, OBS, TEC, SYS)

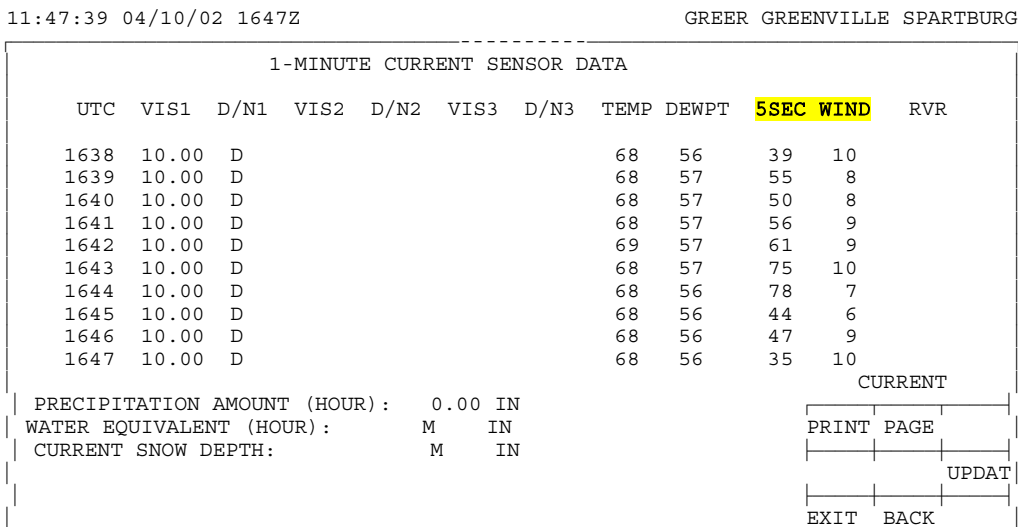
The ATC password level does not have access to these data. The current sensor data being used by the algorithms are stored on the **CURRENT** sensor data pages. These pages have changed slightly with the implementation of software version 2.7A. (See Figures 6 and 6A.) In Figure 6 the column containing the peak wind (direction and speed) sample for the minute is labeled **PEAK WIND**. In software version 2.7A, with the Vaisala 425 sensor defined, the peak wind sampling period is a running 3-second sample. If the BELFORT ASOS were defined, then the peak wind sampling period would be a discrete 5-seconds. In Figure 6A, the highest 5-second discrete sample for the minute is labeled **5SEC WIND**. Prior to software version 2.7A, ASOS only used this discrete sampling period to determine gusts.

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**Figure 6: SOFTWARE 2.7A - CURRENT SENSOR DATA (REVUE-SENSR-DATA)**



**Figure 6A: SOFTWARE 2.6A - CURRENT SENSOR DATA (REVUE-SENSR-DATA)**

The wind samples used by the ASOS algorithms over the last 2 minutes can be viewed on the **WIND SAMPLES** page. (See Figures 7 and 7A.) In software version 2.7A, when the Vaisala 425 is defined as the wind data source, this page will display both the 5-second discrete samples used for computing the 2-minute average sustained wind, as well as the peak 3-second running sample reported every 5 seconds to determine if a gust is to be reported. At the bottom of the page in Figure 7, the sample averaging period is displayed for the sustained wind (AVERAGE WIND TIME) and the peak wind (AVERAGE PEAK TIME). These will be displayed when the Vaisala 425 is the wind data source. It is possible for both of these times to change via an AOMC download to the site. Prior to software version 2.7A, ASOS used the 5-

second discrete samples to compute both the 2-minute average sustained wind and gusts. It is for this reason that only the 5-SECOND AVERAGE WIND samples were displayed on this page in software version 2.6A.

07:38:01 05/10/02 1238Z STERLING #2

WIND SAMPLES											
READINGS	AVERAGE			PEAK		READINGS	AVERAGE			PEAK	
	DIR	SPEED	DIR	SPEED	DIR		SPEED	DIR	SPEED	DIR	SPEED
OLDEST	324	6	311	9	12	303	11	309	11		
23	313	7	310	7	11	304	10	302	11		
22	310	10	312	10	10	309	12	307	13		
21	328	9	317	11	9	301	13	301	14		
20	312	9	316	10	8	311	12	307	14		
19	310	11	309	12	7	319	12	319	12		
18	311	9	316	11	6	315	11	318	12		
17	322	7	309	8	5	319	10	313	11		
16	315	6	321	7	4	332	7	324	9		
15	301	7	299	8	3	321	6	319	7		
14	301	10	301	11	2	317	7	319	8		
13	311	11	305	11	NEWEST	317	7	317	7	CURRENT	

AVERAGE WIND TIME = 5 SEC  
 AVERAGE PEAK TIME = 3 SEC

PRINT PAGE  
 UPDAT  
 EXIT BACK

Figure 7: WIND SAMPLES Page (REVUE-SENSR-DATA-PAGE-PAGE)

(Software Version 2.7A - Vaisala 425 defined as wind data source.)

11:47:48 04/10/02 1647Z GREER GREENVILLE SPARTBURG

5-SECOND AVERAGE WIND									
READINGS	WIND	DIR	WIND	SPD	READINGS	WIND	DIR	WIND	SPD
OLDEST	19		5		12	36		9	
23	30		5		11	27		9	
22	30		6		10	30		8	
21	29		7		9	32		8	
20	28		7		8	31		9	
19	36		8		7	20		8	
18	47		9		6	25		8	
17	30		8		5	25		8	
16	34		8		4	30		9	
15	29		8		3	23		9	
14	34		9		2	21		8	
13	35		10		NEWEST	19		7	

CURRENT  
 PRINT PAGE  
 UPDAT  
 EXIT BACK

Figure 7A: WIND SAMPLES Page (REVUE-SENSR-DATA-PAGE-PAGE)

(Software Version 2.7A with BELFORT ASOS defined as wind data source and Software Version 2.6A.)

### 3.4 Twelve-Hour Archive Data (UNS, OBS, TEC, SYS)

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The ATC password level does not have access the 12-hour archive data. By using the REVUE-SENSR-(12-HR) functions from the 1-Minute Screen, the wind data from the defined sensor (Vaisala 425) will be displayed. (See Figures 8 and 8A.) In software version 2.7A, the column label used to display the peak wind sample for the minute was changed from **5SEC WIND** to **PEAK WIND**. This was necessary since the running sampling period for minute's peak wind is changeable. Prior to software version 2.7A, this sampling period was a discrete 5 second period and was not changeable. (See Section 3.3 to determine the sampling periods used by ASOS.)

Use the **TEST** function on this keypad to access the wind data from the sensor **NOT** defined to provide data for the ASOS products and messages (i.e., in this case the BELFORT ASOS). All data on this page will be stored in brackets (i.e., [ ]) to signify that they are not used to report weather conditions occurring at the site. (See Figure 9.) Since these data are observed by the Belfort 2000 wind sensor, ASOS will be using the discrete 5-second samples to determine both the 2-minute average sustained winds and gusts.

07:36:23 05/10/02 1236Z STERLING #2

UTC	VIS1	D/N1	VIS2	D/N2	VIS3	D/N3	WIND DIR/SPD	PEAK WIND	RVR
1224	0.076	D	0.063	D	0.105	D	322 7	327 11	[ M ]
1225	0.082	D	0.060	D	0.099	D	317 8	319 9	[ M ]
1226	0.075	D	0.059	D	0.107	D	323 7	310 9	[ M ]
1227	0.077	D	0.061	D	0.105	D	326 7	333 9	[ M ]
1228	0.071	D	0.062	D	0.103	D	324 8	318 10	[ M ]
1229	0.073	D	0.056	D	0.100	D	318 9	320 11	[ M ]
1230	0.075	D	0.062	D	0.102	D	316 8	307 11	[ M ]
1231	0.071	D	0.064	D	0.100	D	316 8	314 10	[ M ]
1232	0.065	D	0.064	D	0.098	D	317 8	309 11	[ M ]
1233	0.074	D	0.064	D	0.098	D	324 8	332 11	[ M ]
1234	0.074	D	0.056	D	0.100	D	325 9	332 11	[ M ]
1235	0.075	D	0.056	D	0.101	D	321 9	330 11	[ M ]

12HR ARCHIVE

PRINT	PAGE	PREV
TIME TEST		
EXIT	BACK	EXT

Figure 8: SOFTWARE 2.7A - 12HR ARCHIVE Page (REVUE-SENSR-(12-HR))

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11:48:00 04/10/02 1648Z GREER GREENVILLE SPARTBURG

UTC	VIS1	D/N1	VIS2	D/N2	VIS3	D/N3	WIND	DIR/SPD	5SEC WIND	RVR
1636	0.115	D					56	7	41	10
1637	0.116	D					46	8	35	10
1638	0.117	D					42	9	39	10
1639	0.116	D					46	8	55	8
1640	0.121	D					49	7	50	8
1641	0.119	D					54	7	56	9
1642	0.171	D					61	8	61	9
1643	0.132	D					63	8	75	10
1644	0.128	D					63	7	78	7
1645	0.123	D					59	6	44	6
1646	0.132	D					41	6	47	9
1647	0.126	D					29	7	35	10

12HR ARCHIVE

PRINT	PAGE	PREV
TIME TEST		
EXIT	BACK	NEXT

Figure 8A: SOFTWARE 2.6A - 12HR ARCHIVE Page (REVUE-SENSR- (12-HR) )

07:36:42 05/10/02 1236Z STERLING #2

UTC	DEWPT	WIND DIR	WIND SPEED	WIND DIR @ PEAK SPD	PEAK WIND
1224	[ 25]	[272]	[ 8]	[261]	[ 9]
1225	[ 25]	[267]	[ 8]	[265]	[ 9]
1226	[ 25]	[274]	[ 7]	[288]	[ 9]
1227	[ 25]	[275]	[ 7]	[267]	[ 10]
1228	[ 25]	[272]	[ 9]	[274]	[ 11]
1229	[ 25]	[266]	[ 9]	[259]	[ 11]
1230	[ 25]	[264]	[ 8]	[264]	[ 10]
1231	[ 25]	[267]	[ 9]	[272]	[ 11]
1232	[ 25]	[269]	[ 9]	[282]	[ 11]
1233	[ 25]	[276]	[ 8]	[269]	[ 9]
1234	[ 25]	[275]	[ 9]	[278]	[ 10]
1235	[ 25]	[269]	[ 9]	[274]	[ 11]

12HR TEST SENSOR

PRINT	PREV
TIME TEST	
EXIT	BACK NEXT

Figure 9: 12HR ARCHIVE TEST SENSOR Page (REVUE-SENSR- (12-HR) -TEST)

### 3.5 System Maintenance Log (SYSLOG) Messages (UNS, OBS, TEC, SYS)

The ATC password level can not view messages in the SYSLOG. Press REVUE-SYSLG to enter the system maintenance log. ASOS automatically monitors the wind sensor being used to provide data in the messages and products, as well as the TEST wind sensor. The TEST wind sensor is not monitored as closely as the other sensors, and if a maintenance action is required for this sensor a maintenance indicator sign (\$) is **NOT** appended to the METAR/SPECI reports.

DRAFT In order for ASOS to report on the maintenance status of these sensors, the following SYSLOG messages are used. DRAFT

SYSLOG Messages for the BELFORT 2000:

0352 WIND SENSOR POWER COMMANDED OFF REMAINED ON  
0367 WIND SENSOR POWER COMMANDED ON REMAINED OFF  
0381 WIND SPEED/DIR SENSOR CONFIGURED  
0399 WIND SPEED/DIR SENSOR DECONFIGURED

1550 SENSOR RESPONSE TIMEOUT (CHECK FIBER OPTIC FRU, THEN  
DIRECTION SENSOR FRU, THEN POWER SUPPLY MODULE FRU)  
1551 SIMULATED WIND DIRECTION ERROR (REPLACE DIRECTION  
SENSOR FRU)  
1552 SIMULATED WIND SPEED ERROR (REPLACE DIRECTION SENOR FRU)  
1553 SIMULATED DATA CHECKSUM ERROR (CHECK FIBER OPTIC FRU,  
THEN DIRECTION SENSOR FRU)  
1554 WIND SENSOR STATUS ERROR  
1555 WIND SPEED HEAD ERROR (CHECK SPEED SENSOR FRU, THEN  
DIRECTION SENSOR FRU)  
1556 WIND DIRECTION HEAD ERROR (CHECK DIRECTION SENSOR FRU)  
1557 VOLTAGE OUT OF RANGE (CHECK POWER SUPPLY FRU, THEN  
DIRECTION HEAD FRU)  
1558 WIND SPEED SENSOR HEAD MISSING (CHECK SPEED SENSOR FRU,  
THEN DIRECTION SENSOR FRU)  
1559 WIND SPEED TEMPERATURE ERROR (CHECK SPEED SENSOR FRU,  
THEN DIRECTION SENSOR FRU)  
1560 WIND DIRECTION TEMPERATURE ERROR (CHECK DIRECTION  
SENSOR FRU)  
1561 HALL EFFECT TRANSDUCER ERROR (CHECK SPEED SENSOR FRU)  
1562 FATAL HARDWARE/SOFTWARE ERROR (CHECK DIRECTION SENSOR  
FRU)  
1563 +5 VOLTS FAILURE (CHECK POWER SUPPLY FRU)  
1564 GROUND VOLTAGE FAILURE (CLEAN GROUND CONNECTIONS,  
THEN POWER SUPPLY FRU)  
1565 DIRECTION HEAD TEMPERATURE OUT OF LIMITS  
1566 SPEED HEAD TEMPERATURE OUT OF LIMITS  
1567 RAM CHECK ERROR (REPLACE DIRECTION SENSOR FRU)  
1568 ROM CHECK ERROR (REPLACE DIRECTION SENSOR FRU)  
1569 MAGNET CHECK ERROR (REPLACE DIRECTION SENSOR FRU)  
1570 ENCODER CHECK ERROR (REPLACE DIRECTION SENSOR FRU)  
1571 DIAGNOSTIC DATA CHECKSUM ERROR (CHECK FIBER OPTIC FRU,  
THEN DIRECTION SENSOR FRU)  
1572 WIND SENSOR DATA QUALITY CHECK ERROR

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1573 WIND DIRECTION SENSOR HEAD MISSING (CHECK SPEED SENSOR FRU, THEN DIRECTION SENSOR FRU)

1574 BELFORT ASOS IS THE PRIMARY WIND SENSOR

2455 WIND SENSOR PASSES

2655 REPLACE WIND SENSOR

2727 WIND SENSOR IS INOPERATIONAL

2728 WIND DIRECTION MISSING

2775 WIND SPEED MARKED MISSING: FAILED DATA QUALITY CHECK - FAILED TO VARY MORE THAT 1 KNOT OVER 2 MIN.

2776 WIND DIRECTION MARKED MISSING: FAILED DATA QUALITY CHECK - FAILED TO VARY MORE THAN 1 DEG. OVER 2 MIN.

2778 WIND SPEED MARKED MISSING: FAILED DATA QUALITY CHECK - EXCEEDED CHANGE RATE OF 10 KNOTS

2779 WIND DIRECTION MARKED MISSING: FAILED DATA QUALITY CHECK - EXCEEDED CHANGE RATE OF 130 DEGREES

2780 WIND SPEED MARKED MISSING: SENSOR SPEED DATA MISSING

2780 WIND DIRECTION MARKED MISSING: SENSOR DIRECTION DATA MISSING

2781 WIND SPEED MARKED MISSING: FAILED DATA QUALITY CHECK - EXCEEDED RANGE OF 0 TO 125 KNOTS

2782 WIND DIRECTION MARKED MISSING: FAILED DATA QUALITY CHECK - EXCEEDED RANGE OF 0 TO 359 DEGREES

2783 WIND SENSOR OPERATIONAL

2784 WIND SENSOR DATA AVAILABLE

2785 WIND SPEED AND DIRECTION MARKED MISSING: WIND SENSOR DATA NOT AVAILABLE

2786 WIND SPEED DATA NO LONGER MISSING

2787 WIND DIRECTION DATA NO LONGER MISSING

2788 WIND DIRECTION MARKED MISSING: INSUFFICIENT NUMBER OF VALID WIND DIRECTIONS RECEIVED

2789 WIND SPEED MARKED MISSING: INSUFFICIENT NUMBER OF VALID WIND SPEEDS RECIEVED

SYSLOG Messages for the VAISALA 425 Sonic Anemomter:

0418 WIND 425NWS SENSOR CONFIGURED

0419 WIND 425NWS SENSOR DECONFIGURED

1772 HEATER VOLTAGE FAILURE

1773 ARRAY HEATER RESISTANCE FAILURE

1774 HEATER OFF VOLTAGE FAILURE

1775 INCOMING SUPPLY VOLTAGE FAILURE

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- 1776 +5 VOLT SUPPLY FAILURE
- 1777 +10 VOLT SUPPLY FAILURE
- 1778 PATH 0 SIGNAL QUALITY INDEX ERROR
- 1779 PATH 1 SIGNAL QUALITY INDEX ERROR
- 1780 PATH 2 SIGNAL QUALITY INDEX ERROR
- 1781 PATH 3 SIGNAL QUALITY INDEX ERROR
- 1782 PATH 4 SIGNAL QUALITY INDEX ERROR
- 1783 PATH 5 SIGNAL QUALITY INDEX ERROR
- 1784 WIND 425NWS SENSOR RESPONSE TIMEOUT
- 1785 DATA QUALITY CHECK ERROR
- 1786 WIND 425NWS SENSOR POWER COMMAND OFF REMAINED ON
- 1787 WIND 425NWS SENSOR POWER COMMAND ON REMAINED OFF
- 1788 WIND 425NWS IS THE PRIMARY WIND SENSOR
- 1789 WIND 425NWS SENSOR IS OPERATIONAL
- 1790 WIND 425NWS SENSOR IS INOPERATIONAL
- 1791 WJ COMMAND ISSUED TO WIND 425NWS SENSOR

3.6 Maintenance Page for Vaisala 425 (TEC and SYS)

A maintenance page has been provided to perform maintenance actions on the VAISALA 425. This page is accessed through the MAINT function from the 1-Minute Screen. From the Maintenance Page (Figure 10), use the SEL function to select the appropriate Data Collection Package (DCP) or ACU (Figure 11), and then select **WIND 425NWS** (Figure 12).

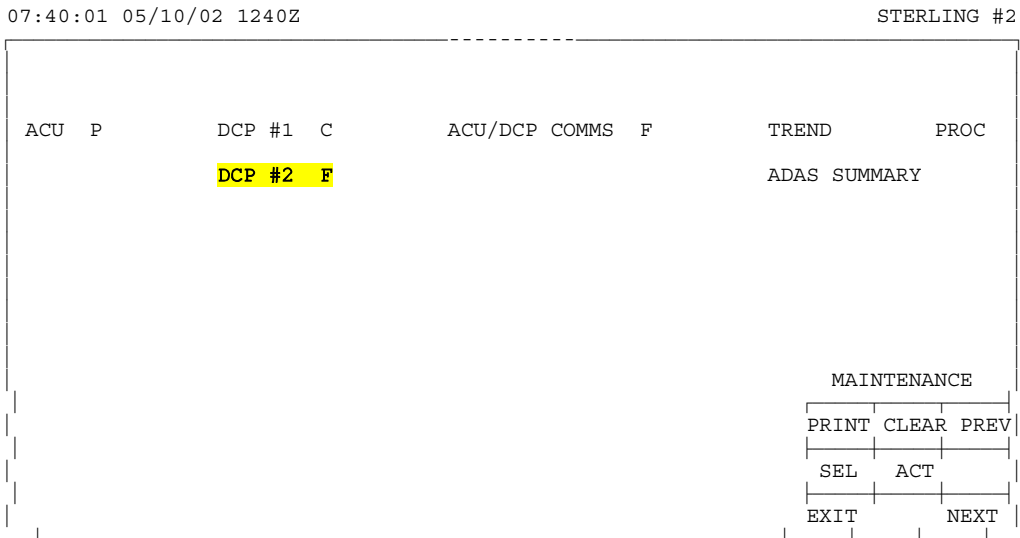


Figure 10: MAINTENANCE Page (MAINT)



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SENSOR GROUP:		HARDWARE:	
CEILOMETER #2	P	VME	P
THUNDERSTORM	P	DCP POWER	P
VISIBILITY #2	P	DCP UPS#1	F
<b>WIND 425NWS</b>	C		

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```

REMOTE DCP#2
PRINT CLEAR PREV
SEL
EXIT BACK NEXT

```

Figure 11: ACU / Remote DCP STATUS Page (MAINT-DCP#2)

07:41:34 05/10/02 1241Z

STERLING #2

HEATER VOLTAGE	23.1	P	1	DATA QUALITY	P	3
ARRAY HEATER RESISTANCE	4.8	P	1	SENSOR RESPONSE	P	2
HEATERS OFF VOLTAGE	0.1	P		REPORT PROCESS	Y	
INCOMING SUPPLY VOLT	11.8	P		POWER STATUS	P	2
5 VOLT SUPPLY	5.09	P		POWER CONTROL	ON	
10 VOLT SUPPLY	10.1	P				
BAD ONE-SECOND READINGS	00000					
PATH 0 SIGNAL QUALITY INDEX	96	P				
PATH 1 SIGNAL QUALITY INDEX	96	P				
PATH 2 SIGNAL QUALITY INDEX	93	P				
PATH 3 SIGNAL QUALITY INDEX	97	P				
PATH 4 SIGNAL QUALITY INDEX	92	P				
PATH 5 SIGNAL QUALITY INDEX	95	P				

```

WIND 425NWS
PRINT CLEAR
TEST POWER
EXIT BACK

```

Figure 12: WIND 425NWS SENSOR MAINTENANCE Page (MAINT-DCP#2-WIND 425NWS)

Please note that a maintenance page is ONLY provided for the wind sensor defined as the data source. In this case ONLY the Vaisala 425 has a maintenance page. IF the BELFORT ASOS is installed and configured, but not defined as the wind data source, then a maintenance page for the BELFORT ASOS will NOT be available.

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### 3.7 Direct Command Mode (Remote Access)

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The wind data displayed in the 12-hour archive, and in the TEST file of the 12-hour archive, can also be downloaded via the Direct Command Mode (DCM). ASOS will store 12 hours of the wind data in both files. (See Figure 13.) The commands to download these data have the following syntax:

**12HR1 hhmm<sub>i</sub> hhmm<sub>f</sub>** - 12-Hour Archive Data Used in Messages / Products

**12TEST hhmm<sub>i</sub> hhmm<sub>f</sub>** - Data Stored in the TEST file of the 12-Hour Archive

Where: **hhmm<sub>i</sub>** - begin time and **hhmm<sub>f</sub>** - end time

NOTE: Placing a “Z” after the time will retrieve data based on Universal Time Coordinated (UTC). If a “Z” is not entered, ASOS assumes Local Standard Time (LST).

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CMD>12HR1 1700Z 1719

\* BRACKETS [ ] INDICATE QUESTIONABLE SENSOR DATA, REPORT PROCESSING OFF \*

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LISTING 12HR PAGE #1 FROM: 05/13/2002 17:00 THRU 05/13/2002 17:19

UTC	VIS1	D/N1	VIS2	D/N2	VIS3	D/N3	WIND	DIR/SPD	PEAK WIND	RVR
1700	0.195	D	0.183	D	0.239	D	229	15	237 23	[ M ]
1701	0.193	D	0.185	D	0.240	D	234	15	236 25	[ M ]
1702	0.188	D	0.186	D	0.246	D	229	14	228 19	[ M ]
1703	0.193	D	0.183	D	0.242	D	225	15	215 22	[ M ]
1704	0.192	D	0.192	D	0.242	D	218	15	218 21	[ M ]
1705	0.193	D	0.183	D	0.242	D	221	15	223 23	[ M ]
1706	0.193	D	0.180	D	0.242	D	229	16	226 20	[ M ]
1707	0.197	D	0.187	D	0.244	D	225	14	233 15	[ M ]
1708	0.195	D	0.186	D	0.247	D	224	12	224 18	[ M ]
1709	0.200	D	0.190	D	0.247	D	220	13	205 18	[ M ]
1710	0.200	D	0.192	D	0.250	D	213	14	206 17	[ M ]
1711	0.198	D	0.187	D	0.248	D	209	14	212 19	[ M ]
1712	0.197	D	0.187	D	0.246	D	206	15	207 21	[ M ]
1713	0.197	D	0.189	D	0.245	D	216	14	231 18	[ M ]
1714	0.198	D	0.188	D	0.250	D	223	14	217 19	[ M ]
1715	0.202	D	0.189	D	0.249	D	213	15	226 21	[ M ]
1716	0.203	D	0.192	D	0.247	D	204	13	188 16	[ M ]
1717	0.200	D	0.196	D	0.248	D	205	12	212 17	[ M ]
1718	0.201	D	0.189	D	0.252	D	208	13	217 16	[ M ]
1719	0.202	D	0.188	D	0.253	D	212	11	214 15	[ M ]

12HR LISTING COMPLETE, 20 ENTRY(S) LISTED.

CMD>12TEST 1700Z 1719

LISTING 12HR TEST PAGE FROM: 05/13/2002 17:00 THRU 05/13/2002 17:19

UTC	DEWPT	WIND DIR	WIND SPEED	WIND DIR @ PEAK SPD	PEAK WIND
1700	[ 67 ]	[175]	[ 16 ]	[182]	[ 24 ]
1701	[ 67 ]	[180]	[ 16 ]	[185]	[ 19 ]
1702	[ 67 ]	[177]	[ 16 ]	[164]	[ 19 ]
1703	[ 67 ]	[173]	[ 16 ]	[167]	[ 18 ]
1704	[ 67 ]	[166]	[ 16 ]	[172]	[ 19 ]
1705	[ 67 ]	[169]	[ 16 ]	[172]	[ 18 ]
1706	[ 67 ]	[176]	[ 16 ]	[173]	[ 20 ]
1707	[ 67 ]	[172]	[ 15 ]	[174]	[ 14 ]
1708	[ 67 ]	[172]	[ 13 ]	[158]	[ 17 ]
1709	[ 67 ]	[169]	[ 14 ]	[160]	[ 17 ]
1710	[ 68 ]	[161]	[ 14 ]	[155]	[ 17 ]
1711	[ 67 ]	[156]	[ 15 ]	[141]	[ 17 ]
1712	[ 67 ]	[154]	[ 15 ]	[154]	[ 19 ]
1713	[ 67 ]	[164]	[ 14 ]	[174]	[ 18 ]
1714	[ 67 ]	[169]	[ 15 ]	[162]	[ 19 ]
1715	[ 67 ]	[160]	[ 16 ]	[175]	[ 20 ]
1716	[ 68 ]	[152]	[ 13 ]	[133]	[ 16 ]
1717	[ 68 ]	[153]	[ 13 ]	[160]	[ 16 ]
1718	[ 68 ]	[155]	[ 14 ]	[159]	[ 15 ]
1719	[ 68 ]	[159]	[ 12 ]	[166]	[ 14 ]

12HR TEST LISTING COMPLETE, 20 ENTRY(S) LISTED.

CMD>

Figure 13: 12-Hour Archive & TEST Wind Data Downloaded via DCM

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## 4.0 Summary

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Implementation of the new IFW Vaisala 425 sonic anemometer is expected to improve the reliability of ASOS wind reporting under icing conditions. The current cup and vane wind sensor (BELFORT 2000) will only remain at sites participating in the Climate Continuity / Bias Study. These will number in the neighborhood of about 20 sites.

With the installation of the Vaisala 425, the sampling period for peak wind data will change from a discrete 5-second sample to a running 3-second sample. It is envisioned that this change will help ASOS replicate gust reporting prior to the implementation of ASOS. This is the only change that was made to the ASOS wind algorithms. ASOS will retain the sustained winds reported from a 2-minute average of twenty four 5-second discrete samples. If future research provides evidence that these sampling periods require changes, then a download from the AOMC will provide these changes to the site's software.

The interface for the ATC password level has not changed. For sites with both wind sensors installed, data from the sensor not being used in the ASOS products and messages will be available from the DCM (12TEST command) or from the OID's 12-hour archive via the TEST function. Implementation of this new sensor function does not alter any procedures required to perform surface observing duties (i.e., editing and augmenting of data, or the controlling of the report processing functions).

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**ACRONYMS**

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ACU - Acquisition Control Unit  
AOMC - ASOS Operations and Monitoring Center  
ASOS - Automated Surface Observing System  
ATC - OID Air Traffic Controller Password Level  
DCM - Direct Command Mode  
DCP - Data Collection Package  
IFW - Ice Free Wind Sensor  
LST - Local Standard Time  
NWS - National Weather Service  
OBS - OID Observer Password Level  
OID - Operator Interface Device  
SIO - Serial Input/Output  
SYS - OID System Manager Password Level  
SYSLOG - System Maintenance Log  
TEC - OID Electronics Technician Password Level  
UNS - OID Unsigned User Level  
UTC - Universal Time Coordinated

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