ASOS MODIFICATION NOTE 34 (for Electronics Technicians)
Engineering Division
W/OSO321:BGM/AJW

SUBJECT	:	Automated Surface Observing System (ASOS) Freezing Rain Sensor
PURPOSE	:	Add a sensor to measure freezing rain on existing ASOS.
EQUIPMENT AFFECTED	:	ASOS Freezing Rain Sensor (AZR)
PARTS REQUIRED	:	Reference parts listed in Appendix A.
MOD PROCUREMENT	:	The above parts will be provided through NLSC by WSH. WSH will issue one freezing rain sensor pole kit, S100-2MT3MP1 for each site listed in appendix D. There are two types of freezing rain sensor circuit breakers. WSH will issue S1002A1A3A3-1 for each site listed in appendix E. WSH will issue one freezing rain sensor, S100-2MT3, for each site listed in appendix F.
SPECIAL TOOLS REQUIRED	:	None
TIME REQUIRED	:	4 hours
EFFECT ON OTHER INSTRUCTIONS	:	ASOS Modification Notes 31, ACU memory firmware version 2.3, and 32, voice processor firmware version 3.0, are to be installed in conjunction with this modification.
AUTHORIZATION	:	This modification is authorized by Engineering Change Proposal E92SM05F030.
VERIFICATION STATEMENT	:	This modification has been tested for operational integrity by the Engineering Design Branch, Sensor Test Section in Sterling, Virginia, and sites listed in appendix C.

GENERAL

This modification note provides a procedure to install the freezing rain sensor. The freezing rain sensing device consists of a small cylindrical probe which, when stimulated, vibrates at 40 kHz, its resonant frequency. When ice freezes to the probe its mass increases and the sensors resonant vibration frequency decreases. The sensor is sensitive enough to measure accumulation rates as low as 0.01 inch per hour. The firmware energizes the heater relay once every 10 hours for a maximum of 50 mSec and measures voltage drop across the series resistor in the heater circuit.

PROCEDURE:

Instructions are provided in appendix B for installation of the freezing rain sensor. Reference installation instructions for EHB-11, Section 3.6, Modification Note 31, ASOS software version 2.3 upgrade. Modification Note 31 and Modification Note 32 must be completed prior to or concurrent with this modification note.

BEFORE INSTALLING FIRMWARE

1. Call the AOMC at 1-800-242-8194. Inform the AOMC at which site you will be installing the freezing rain sensor.

2. For commissioned sites, get approval of the responsible MIC/OIC before starting installation. For non-commissioned sites, coordinate with the MIC/OIC before starting installation. You may install on any day of the month if permission is granted and the restrictions in steps 3 and 4 are complied with.

3. **Commissioned Sites Only**: Do **not** start installation during bad weather, precipitation, instrument flight rule (IFR) conditions, or if any of these conditions are expected within 3 hours. These meteorological conditions will be defined by the responsible MIC/OIC.

4. Do not start installation at a time that will conflict with scheduled synoptic observations at 00, 03, 06, 09, 12, 15, 18, and 21Z. Allow 4.0 hours to complete installation and restart ASOS.

5. Immediately before beginning work at NWS staffed sites, the MIC/OIC observer will inform the tower and any other critical users that ASOS will be under maintenance control while the freezing rain sensor is added (at unstaffed sites, the el tech will inform tower). Alert towers using Controller Video Displays (CVD) and Operator Interface Devices (OID) to log off and shut down display power to avoid confusion.

6. Make the appropriate SYSLOG entries (MAINT-ACT-FMK) Mod
   1. Log on as **TECH**.
   2. Key the **MAINT** screen.
   3. Key the **ACTION** page.
   4. Key **START** - Stop here and preform Mod 34.
      Upon completion of the Mod 34, log onto the system.

7. Continue with appendix A, Instructions for installation of the freezing rain sensor. Once complete with the steps in appendix A, continue with "After Installing Sensor," step 8.

AFTER INSTALLING SENSOR

See page 4 for a description of the time required to reboot ASOS and sensor response time after power is applied.

8. When ASOS is restarted at unstaffed sites, call to inform towers using CVDs and OIDs to turn on their displays. (At staffed sites, the MIC/OIC/observer will call the tower.)

9. If on-site NWS staff provides backup while the installation is underway, no special observation is needed when ASOS is restarted. Proceed to step 12.

   If there is no backup on site and a record observation was missed during the installation, a special observation must be taken when ASOS is restarted. The el tech should take the following steps at the ASOS keyboard after installation:

   a. Press [SIGN].
   b. Type initials and press [ENTER].
   c. Type the observer level password and press [ENTER].
   d. Press [GENOB].
   e. Press [SPECL].
   f. Press [EXIT].
   g. Press [SIGN].
   h. Type his/her initials again and press [RETURN].
   i. Press [Enter] twice. This signs the "observer" off ASOS.
   j. Leave ASOS running.

   Note: The "observer" must sign off before the 5-minute edit time is up.

10. Inform office staff that ASOS is again operational and that because at most 15 minutes remain until the next hourly observation, augmentation of the ceiling might be required. Also, may be necessary to augment several elements or even manually enter an entire

observation. The chart below indicates how long it takes after start up for ASOS to automatically report each observation element.

Times Needed for Elements to be Reported Automatically

	Minimum	Maximum
Pressure	60 seconds	10 minutes
Precipitation Amount	60 seconds	*
Wind direction	2 minutes	7 minutes
Wind speed	2 minutes	7 minutes
Precipitation Type	2 minutes	*
Temperature	5 minutes	10 minutes
Dew Point	5 minutes	10 minutes
Visibility	10 minutes	15 minutes
Obstruction to Visibility	10 minutes	*
Ceiling	30 minutes	35 minutes
Freezing Rain	15 minutes	*

* Maximum time not applicable since phenomena may not be present. Minimum time applies if phenomena are present.

11. Verify that ASOS transmitted an hourly observation. Call the AOMC and tell them:

    a. Your location,
    b. that installation of the freezing rain sensor has been completed, and
    c. that ASOS is operational.

12. Enter in the SYSLOG that maintenance has been completed.
    1. Key the **MAINT** screen.
    2. Key the **ACTION** page.
    3. Key **FMK** - Enter the Field Mod Kit (FMK) number as follows: **Mod 34**.
       On the second line of the screen verify that only Mod 34 is displayed.
    4. Check the **SYSLOG** and verify the **FMK** message. Notify the AOMC via telephone that Mod 34 has been completed.

13. At an expansion site with ATCT, the el tech will contact ATCT and supply information on the following:

    a. ASOS maintenance completed,
    b. ASOS restored to service, and

c. tower CVDs and OIDs need to be turned on, and TRACON asked to turn on their displays.

REPORTING MODIFICATION

Target date for completion of this modification is 30 days after receipt of parts. Report completed modification on WS Form A-26, Engineering Maintenance Reporting System Maintenance Record, according to instructions in EHB-4, part 2 use reporting code **AZR**. Also, record the modification number in block 17(a) as 11 (see appendix G for a completed sample of WS Form A-26). Record the serial number for the freezing rain sensor.

Make appropriate entries in the SYSLOG using the Maintenance Action keys, Field Modification keys, and comment fields. Follow these steps:

1. Log on as **TECH.**
2. Key the **MAINT** screen.
3. Key the **ACTION** page.
4. Key **START** - Stop here and perform the modification.
   After Mod Note number **34** is complete log on system.

Acting Chief, Engineering Division

Attachments
Appendix A - Parts List
Appendix B - Modification Instructions
Appendix C - Test Sites
Appendix D - Sites Requiring Poles and Sensors
Appendix E - Sites Requiring the Upgraded Circuit Breaker
Appendix F - Sites Requiring Freezing Rain Sensor Only
Appendix G - EMRS Sample A-26 Form

W/OSO321:AJWissman:rhz:11/2/95:12/5/96:sol on EHB disk “AMOD34.H11" and on K:\OSO32\321: spellchecked 11/29/95:sol:12/1/95:rz

PARTS LIST

F/N	Qty.	P/N	NOMENCLATURE	
32	4 EA	MS35308-468	Screw, Hex Head	*
33	4 EA	MS51971-7	Nut, Hex	*
34	4 EA	MS35338-145	Washer, Lock	*
35	4 EA	MS15795-820	Washer, Flat	*
39	1 EA	62828-90253-1	Lug	*
40	1 EA	62828-90254-1	Connector, Split Bolt	*
41	1 EA	62828-90115-10	Freezing Rain Sensor	
	1 EA	62828-90324-1	Mounting Pole	*
93	1 EA	62828-40213-1	Liner, Plastic	*
	6 Ft	QQW343S10S1B	Wire, Solid Copper	*
	1 EA	62828-PWR-HAR	AC Power Harness	*
	1 EA	62828-40155-90	Circuit Breaker Module	*
	1 EA	62828-90006-1	Fiber Optic Modem	*
	6 Ft	62828-90096-1	Flexible Conduit	*
	1 EA	62828-42040-30	Fiber Optic Cable	*
	4 EA	62828-90075-1	Screw, Metric	*
	4 EA	MS35338-134	Washer Look	*
	1 EA	DCPA3A7RX	Marker	*
	1 EA	DCPA3A7TX	Marker	*
	1 EA	62828-90256-1	Cable Ties	*
	2 EA	62828-90097-1	Connector, Flex Conduit	*
	2 EA	62828-90293-1	O-Ring Gasket	*
	5 EA	62828-90132-11	Terminal Lug, Spade	*

These (*), may have been installed during the system installation. Extra materials must be returned to the NRC, attention ASOS repair.

MODIFICATION INSTRUCTIONS

This procedure describes the reconfiguration of the DCP to accommodate the freezing rain sensor. The FREEZING RAIN SENSOR requires a separate circuit breaker for heater power and the VISIBILITY SENSOR only requires electronic power. SKIP STEPS 4 THROUGH 14 AND 45 and 46 IF VISIBILITY CIRCUIT BREAKER MODULE IS ALREADY IN SLOT A1A3A8. Those sites listed in Appendix C only require the installation of the freezing rain sensor. FOR FREEZING RAIN SENSOR INSTALLATION ONLY COMPLETE STEPS 1, 2, 29 THROUGH 39, 41 THROUGH 43, AND 47 THROUGH 49. Follow the instructions listed below to make this modification.

1. Open the DCP door, set UPS power switch to 0 (OFF) on CLASS II systems only, and turn **OFF** the UPS POWER CIRCUIT BREAKER A1A3A1.

2. Open the DCP power distribution panel and turn **OFF** the DCP power. This will remove all power to the DCP and the sensors.

3. Is there a VIS circuit breaker module in A1A3A8? If yes, go to next step. If no, skip to step 15.

4. Remove circuit breaker module A1A3A3 VIS and insert into A1A3A8 position.

5. Open the DCP Faraday box (A3) to access the sensor power wiring and the fiber optic modems.

6. Remove the blank cover from A7 position and save the gasket.

7. Install fiber optic modem (62828-90006-1) and the gasket in position A7 using screws (62828-90075-1) and washers (MS35338-134).

8. Locate the SIO connector in the DCP harness marked A3A7J1. Connect this connector to fiber optic modem just installed in position A7 and tighten the screws on the connector.

NOTE: In steps 9, 10, and 11 the changes are made to the power connections on the terminal boards on the inside of the Faraday box (A3) door.

9. Remove the black and red wires from terminal board A17-4 and move them to terminal A17-9.

10. Remove white and yellow wires from A18-4 and move them to A18-9.

11. Remove green wire from A18-4G and move it to A18-9G.

NOTE: As sleeves are removed and replaced check the size of these sleeves to ensure proper fit.

12. Remove the fiber optic cable marked DCPA3A2TX. Remove marker sleeve and replace with marker sleeve DCPA3A7TX.

13. Remove the fiber optic cable marked DCPA3A2RX. Remove marker sleeve and replace with marker sleeve DCPA3A7RX.

14. Connect the fiber optic cable to the fiber optic modem in position A7. Ensure that the RX and TX are properly connected.

15. Install FZR circuit breaker module (62828-40155-90) into slot A3.

NOTE: If VIS circuit breaker module was moved in step 4 skip to step 19.

16. Open the DCP Faraday box (A3) to gain access to the sensor power wiring and the fiber optic modems and remove the blank cover from A2 position and save the gasket.

17. Install fiber optic modem (62828-90006-1) and the gasket in position A2 using screws (62828-90075-1) and washers (MS35338-134).

18. Locate the SIO connector in the DCP harness marked A3A2J1. Connect this connector to fiber optic modem located in position A2 and tighten the screws on the connector.

19. At pedestal No. 3 remove the cover on top of the raceway and the access plug on the side of the raceway.

20. Install connectors P/N 62828-90097-1 on both ends of the 6 foot piece of flex conduit P/N 62828-90096-1. Remove retaining nut from one end of conduit and install 0-ring gasket P/N 62828-90293-1 on connector. Locate pull cord inside of the raceway and bring pull cord out through retaining nut **(retaining nut MUST be installed on inside of raceway)** and side hole of raceway. Secure flex conduit to raceway.

21. Attach fiber optic cable (62828-42040-30) and power wiring harness (16 AWG. black, 16 AWG. white, 16 AWG. red, 16 AWG. yellow and 16 AWG. green wire) to pull cord. Locate other end of pull cord in the DCP Faraday box and pull the fiber optic cables and power wiring through raceway into Faraday box. Allow enough length to connect to the fiber optic modem.

CAUTION

Fiber optic cables are delicate and should be handled with care.

22. Connect fiber optic cable marked DCPA3A2TX and DCPA3A2RX to fiber optic modem installed in position A2. Ensure that the RX and TX are properly connected.

23. Strip 1/4-inch insulation off of black wire and connect to terminal A17-4.

24. Strip 1/4-inch insulation off of white wire and connect to terminal A18-4.

25. Strip 1/4-inch insulation off of red wire and connect to terminal A17-20.

26. Strip 1/4-inch insulation off of yellow wire and connect to terminal A18-20.

27. Strip 1/4-inch insulation off of green wire and connect to terminal A18-4G.

28. At sensor pedestal No. 3 install freezing rain sensor mounting pole (P/N 62828-90324-1) with plastic liner (P/N 62828-40213-1) between pedestal and mounting pole using four hex head screws (P/N MS35308468), four hex nuts (P/N MS51971-7), four lock washers (P/N MS35338-145), and eight flat washers (P/N MS15795-820).

CAUTION -- DO NOT TOUCH SENSOR TIP!

1. The freezing rain sensor's protective cover and tip cover must be removed prior to operation.

2. The sensor tip gets extremely hot and can also be damaged by oils from fingertips.

29. Install freezing rain sensor P/N 62828-90115-10 on mounting pole using hardware supplied with sensor. Refer to installation drawing for proper orientation of sensor.

30. Open door of freezing rain sensor. Remove retaining nut from end of flex conduit and install O-ring gasket P/N 62828-90097-1 on conduit. Route fiber optic cable, power wiring, and flex conduit through entry hole on sensor. Secure flex conduit to sensor using retaining nut that was removed previously in this step.

31. Cut black wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB1-1.

32. Cut white wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-2.

33. Cut green wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-3.

34. Cut red wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-4.

35. Cut yellow wire to length, strip and install terminal lug P/N 62828-90132-11 on wire and connect wire to TB-5.

36. Connect fiber optic cable to fiber optic modem making sure RX and TX are installed properly.

37. Install lug P/N 62828-90253-1 on 6-foot piece of 10 AWG. solid wire P/N QQW343S1OS1B. Connect wire to ground stud on sensor using hardware supplied with sensor. Connect other end of ground wire to system ground wire running along top of raceway using split bolt connector P/N 62828-90254-1.

38. Secure flex conduit and ground wire to sensor pole using Tywrap P/N 62828-90256-1. See installation drawing for approximate location.

39. Close the sensor door and reinstall cover on top of raceway using existing hardware.

40. Close Faraday box and secure using existing hardware.

41. Set the freezing rain sensor circuit breakers (P/N 62828-90155-90) A1A3A2 **ON.** CB1 and CB2 need to be turned **ON**.

42. Turn UPS OUTPUT POWER A1A3A1 **ON.** Set UPS power switch to 1 (ON) CLASS II SYSTEMS ONLY.

43. Turn ON the DCP Power Circuit Breaker in Power Distribution Panel. Close and secure power distribution panel door. Power is now restored to DCP and all sensors. Secure DCP door.

NOTE: The physical installation of the freezing rain sensor is now complete. The freezing rain sensor must now be configured on the system. The setup of sensor is accomplished through the OID.

44. If you moved VISIBILITY from A1A3A3 TO A1A3A8 go to next step. If VISIBILITY circuit breaker was not moved skip to step 46.

45. Sign on OID as a TECHNICIAN and Press REVUE - SITE - CONFG - SENSR CHANG.
Move cursor to SIO #1 Port 3 and type **FR** on keyboard.
Move cursor to SIO #2 Port 4 and type **V1** on keyboard.
Press **BACK** - **ALGOR** to verify visibility configuration.
Press **EXIT**.

46. Press **MAINT** and move cursor to DCP #1.
Press **SEL** and move cursor to FREEZING RAIN.
Press **SEL** and verify sensor response status.
Press **BACK** and move cursor to VISIBILITY #1.
Press **SEL** and verify sensor response status.
Press **EXIT-REVUE-SENSR- 2-HR** Vis EXCO-will be displayed under VIS #l
Press **PAGE**. Frequency of freezing rain probe will be displayed under ZR. Nominal frequency is 40kHZ.
Press **EXIT** After 10 minutes of operation visibility will be displayed on one minute screen.
Press **MAINT** and clear fail counts for freezing rain and visibility sensors. Press EXIT.

47. Sign on OID as a TECHNICIAN and Press **REVUE** - **SITE** - **CONFG** - **SENSR** - **CHANG**.
Move cursor to SIO #1 Port 3 and type "FR" on keyboard.
Press **EXIT**.

48. Press **MAINT** and move cursor to DCP #1
Press **SEL** and move cursor to FREEZING RAIN
Press **SEL** and verify sensor response status
Press **EXIT** - **REVUE** - **SENSR** - **12-HR** - **PAGE**. Frequency of Freezing Rain probe will be displayed under ZR. Nominal Frequency is approximately 40kHZ.
Press **EXIT** ZRNO will not be displayed in the REMARKS segment.
Press **MAINT** and clear Fail Counts for all sensors.
Press **EXIT**.

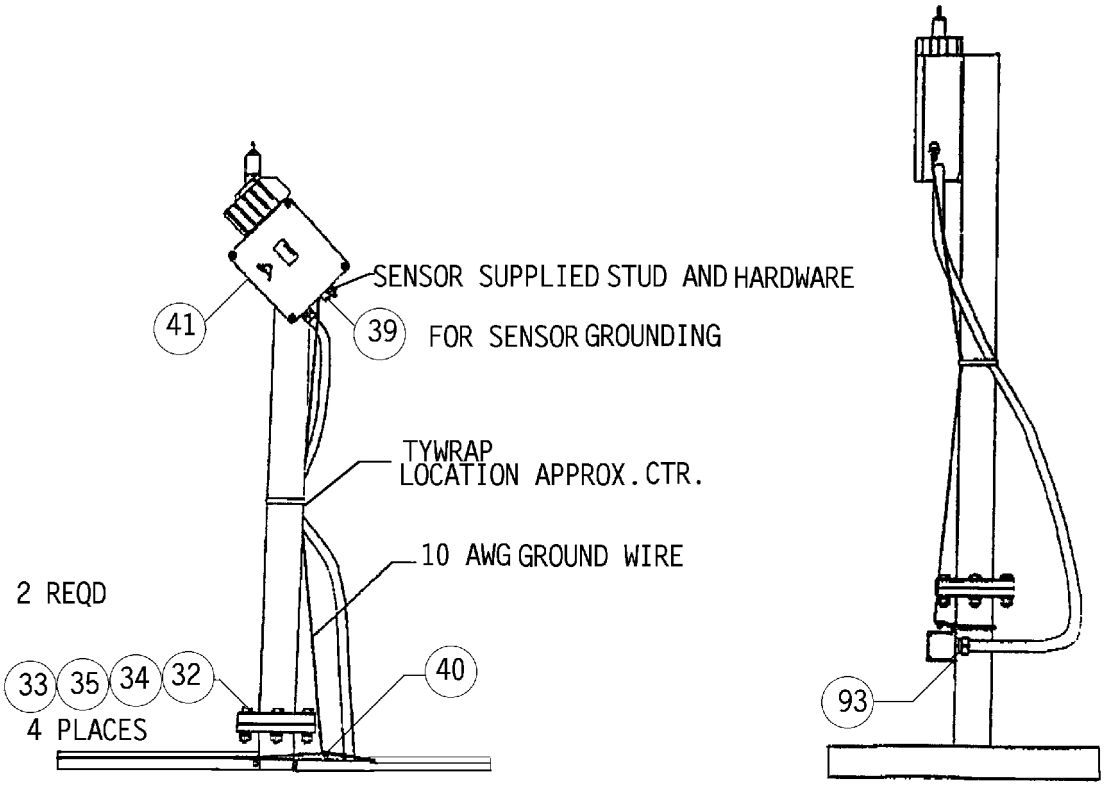
49. ***If the ACU firmware is earlier than version 2.3 or Engineering Modification Note 31 has not been completed, the freezing rain sensor must be deconfigured. Early versions of the ACU firmware incorrectly control the freezing rain heater power and incorrectly calculates freezing rain accumulations***.

This completes installation of freezing rain sensors.

MODIFICATION

WIRING INSTRUCTIONS

FROM	TO	WIRE No.	COLOR
Visibility	DCP		
TB1-1	A17-9	6	BLACK
TB1-2	A18-9	6	WHITE
TB1-3	A18-9G	6	GREEN
TB1-4	A17-9	6	RED
TB1-5	A18-9	6	YELLOW
TX	RX		FIBER OPTIC CABLE
RX	TX		FIBER OPTIC CABLE
Freezing Rain	DCP		
TB1-1	A17-4		BLACK
TB1-2	A18-4	5	WHITE
TB1-3	A18-4G	5	GREEN
TB1-4	A17-20	5	RED
TB1-5	A18-20	5	YELLOW
TX	RX		FIBER OPTIC CABLE
RX	TX		FIBER OPTIC CABLE



INSTALLATION DRAWING

Listed below are eight ASOS freezing rain test sites.

Site ID	
1. 3R5	FAA site
2. AHN	NWS site
3. ANC	NWS site
4. FAR	NWS site
5. SLC	NWS site
6. JST	FAA site
7. BGM	NWS site
8. CLE	MWS site

The following sites require the freezing rain sensor pole kit S100-2MT3MP1 to be installed. Contact Bob McCormick at 301-713-1835 if any ASOS site does not have the mounting pole and signal cable.

The following sites need circuit breakers, S100-2A1A3A3-1.

SID	CITY	STATE	TYPE	NWS_RGN
ALS	Alamosa	CO	N	Central
CNK	Concordia	KS	N	Central
COS	Colorado Springs	CO	N	Central
GRI	Grand Island	NE	N	Central
MCI	Kansas City	MO	N	Central
PUB	Pueblo	CO	N	Central
TOP	Topeka	KS	N	Central
TUL	Tulsa	OK	N	Central

N= National Weather Service

The following sites need freezing rain sensor, S100-2MT3 only. WSH will issue one sensor for each of these sites.

SID	CITY	STATE	TYPE	FR	NWS_RGN
APN	ALPENA	MI	N	Y	Central
BFF	SCOTTSBLUFF	NE	N	Y	Central
COU	COLUMBIA	MO	N	Y	Central
CVG	COVINGTON/CINCINNATI	KY	N	Y	Central
DSM	DES MOINES	IA	N	Y	Central
DTW	DETROIT	MI	N	Y	Central
EVV	EVANSVILLE	IN	N	Y	Central
FAR	FARGO	ND	N	Y	Central
FNT	FLINT	MI	N	Y	Central
FWA	FORT WAYNE	IN	N	Y	Central
HON	HURON	SD	N	Y	Central
HTL	HOUGHTON LAKE	MI	N	Y	Central
IND	INDIANAPOLIS	IN	N	Y	Central
INL	INTERNATIONAL FALLS	MN	N	Y	Central
LAN	LANSING	MI	N	Y	Central
LNK	LINCOLN	NE	N	Y	Central
MKE	MILWAUKEE	WI	N	Y	Central
MKG	MUSKEGON	MI	N	Y	Central
MLI	MOLINE	IL	N	Y	Central
MSN	MADISON	WI	N	Y	Central
ORD	CHICAGO	IL	N	Y	Central
PIA	PEORIA	IL	N	Y	Central
RAP	RAPID CITY	SD	N	Y	Central
RFD	ROCKFORD	IL	N	Y	Central
SBN	SOUTH BEND	IN	N	Y	Central
SDF	LOUISVILLE	KY	N	Y	Central

SID	CITY	STATE	TYPE	FR	NWS_RGN
SPI	SPRINGFIELD	IL	N	Y	Central
STC	ST CLOUD	MN	N	Y	Central
SUX	SIOUX CITY	IA	N	Y	Central
VTN	VALENTINE	NE	N	Y	Central
ABE	ALLENTOWN	PA	N	Y	Eastern
ACY	ATLANTIC CITY	NJ	N	Y	Eastern
AVP	WILKESBARRE-SCRANTON	PA	N	Y	Eastern
BDL	WINDSOR LOCKS	CT	N	Y	Eastern
BDR	BRIDGEPORT	CT	N	Y	Eastern
BKW	BECKLEY	WV	N	Y	Eastern
BOS	BOSTON	MA	N	Y	Eastern
BWI	BALTIMORE	MD	N	Y	Eastern
CAK	AKRON	OH	N	Y	Eastern
CMH	COLUMBUS	OH	N	Y	Eastern
CON	CONCORD	NH	N	Y	Eastern
CRW	CHARLESTON	WV	N	Y	Eastern
DAY	DAYTON	OH	N	Y	Eastern
DCA	WASHINGTON DC	DC	N	Y	Eastern
EKN	ELKINS	WV	N	Y	Eastern
ERI	ERIE	PA	N	Y	Eastern
IAD	WASHINGTON DC	DC	N	Y	Eastern
ILG	WILMINGTON	DE	N	Y	Eastern
IPT	WILLIAMSPORT	PA	N	Y	Eastern
JFK	NEW YORK	NY	N	Y	Eastern
LYH	LYNCHBURG	VA	N	Y	Eastern
MFD	MANSFIELD	OH	N	Y	Eastern
ORF	NORFOLK	VA	N	Y	Eastern
ORH	WORCESTER	MA	N	Y	Eastern
PHL	PHILADELPHIA	PA	N	Y	Eastern
PVD	PROVIDENCE	RI	N	Y	Eastern

SID	CITY	STATE	TYPE	FR	NWS_RGN
PWM	PORTLAND	ME	N	Y	Eastern
RDU	RALEIGH/DURHAM	NC	N	Y	Eastern
RIC	RICHMOND	VA	N	Y	Eastern
ROA	ROANOKE	VA	N	Y	Eastern
TOL	TOLEDO	OH	N	Y	Eastern
YNG	YOUNGSTOWN	OH	N	Y	Eastern
ACT	WACO	TX	N	Y	Southern
AGS	AUGUSTA	GA	N	Y	Southern
AHN	ATHENS	GA	N	Y	Southern
ATL	ATLANTA	GA	N	Y	Southern
AUS	AUSTIN	TX	N	Y	Southern
BNA	NASHVILLE	TN	N	Y	Southern
CHA	CHATTANOOGA	TN	N	Y	Southern
CSG	COLUMBUS	GA	N	Y	Southern
DFW	DALLAS/FORT WORTH	TX	N	Y	Southern
FSM	FORT SMITH	AR	N	Y	Southern
HSV	HUNTSVILLE	AL	N	Y	Southern
IAH	HOUSTON	TX	N	Y	Southern
LBB	LUBBOCK	TX	N	Y	Southern
MCN	MACON	GA	N	Y	Southern
MEI	MERIDIAN	MS	N	Y	Southern
MGM	MONTGOMERY	AL	N	Y	Southern
OKC	OKLAHOMA CITY	OK	N	Y	Southern
SAT	SAN ANTONIO	TX	N	Y	Southern
TRI	BRISTOL/JOHNSON/KINGSPORT	TN	N	Y	Southern
TUP	TUPELO	MS	N	Y	Southern
TYS	KNOXVILLE	TN	N	Y	Southern
AST	ASTORIA	OR	N	Y	Western
BIL	BILLINGS	MT	N	Y	Western
BNO	BURNS	OR	N	Y	Western

SID	CITY	STATE	TYPE	FR	NWS_RGN
ELY	ELY	NV	N	Y	Western
EUG	EUGENE	OR	N	Y	Western
FAT	FRESNO	CA	N	Y	Western
FCA	KALISPELL	MT	N	Y	Western
GEG	SPOKANE	WA	N	Y	Western
HLN	HELENA	MT	N	Y	Western
HVR	HAVRE	MT	N	Y	Western
OLM	OLYMPIA	WA	N	Y	Western
PDX	PORTLAND	OR	N	Y	Western
RDD	REDDING	CA	N	Y	Western
RNO	RENO	NV	N	Y	Western
SCK	STOCKTON	CA	N	Y	Western
SLE	SALEM	OR	N	Y	Western
WMC	WINNEMUCCA	NV	N	Y	Western
ALS	ALAMOSA	CO	N	Y	Central
CNK	CONCORDIA	KS	N	Y	Central
COS	COLORADO SPRINGS	CO	N	Y	Central
GRI	GRAND ISLAND	NE	N	Y	Central
MCI	KANSAS CITY	MO	N	Y	Central
PUB	PUEBLO	CO	N	Y	Central
TOP	TOPEKA	KS	N	Y	Central
TUL	TULSA	OK	N	Y	Central