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Revision F
April 14, 1998

U.S. Department of Transportation

Federal Aviation Administration

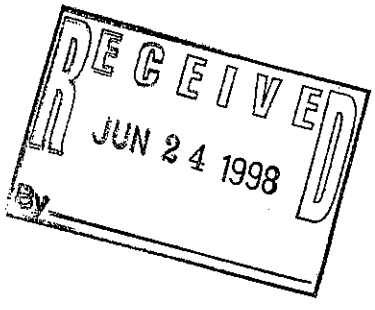
INTERFACE CONTROL DOCUMENT

between

AWOS Data Acquisition System (ADAS)

and

Automated Weather Observing System (AWOS)



INTERFACE CONTROL DOCUMENT

APPROVAL SIGNATURE PAGE

AWOS DATA ACQUISITION SYSTEM
AUTOMATED WEATHER OBSERVING SYSTEM

(ADAS/AWOS)

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
FAA/AUA-430		
NWS/Wx23		

REVISION RECORD

REVISION LETTER	DESCRIPTION	DATE	ENTERED BY
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EFFECTIVITY

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Oberlin, OH	09/15/93
Houston, TX	10/13/93
Longmont, CO	11/10/93
Leesburg, VA	12/07/93
Salt Lake City, UT	01/05/94
Ronknokoma, NY	02/02/94
Olathe, KS	03/02/94
Farmington, MN	03/30/94
Albuquerque, NM	04/27/94
Freemont, CA	05/25/94
Memphis, TN	06/22/94
Palmdale, CA	07/20/94
Miami, FL	08/17/94
Indianapolis, IN	09/14/94
Hilliard, FL	10/12/94
Nashua, NH	11/11/94
Honolulu, HI	12/04/94
Anchorage, AK	01/04/95

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1. SCOPE

1.1 Scope. This Interface Control Document (ICD) provides the design characteristics for and implementation criteria of the logical interface between the Federal Aviation Administration (FAA) Automated Weather Observing System (AWOS) and the FAA AWOS Data Acquisition System (ADAS). The National Weather Service (NWS) Automated Surface Observing System (ASOS), the Department of Defense (DoD) Automated Observing System (AOS), and non-federal AWOS will also interface with the ADAS. Any and all of these systems that interface with an ADAS must comply with the design characteristics and implementation criteria described herein.

In the remainder of this document the term "AWOS", unless explicitly stated otherwise, shall be taken to refer to all of ASOS, AOS, and federal/non-federal AWOS. In addition, the term "Metar" (initial capital only) will always denote the general Aviation Routine Weather Report formatting convention, while the term "METAR" (all capitals) will denote specifically the scheduled Metar message type.

The FAA National Interfacility Communication System (NICS) shall be responsible for installing the physical and/or logical links between each ADAS and its network of reporting AWOS sites.

1.2 Subsystem/Equipment Item Responsibility List. The connectivity between each subsystem equipment item and those responsible for its design are as follows.

Subsystem/ Equipment Item	Operating Group ID No.	Title	Contact
ASOS	NWS Wx23	ASOS Program	Manager
AWOS	FAA ANW-700	Weather Sensors	Manager
ADAS	FAA ANW-700	Weather Sensors	Manager
NICS	FAA ASM-300	Telecommunications Management and Operations Division	Manager

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2. APPLICABLE DOCUMENTS

2.1 Government Documents. The following documents of the issue in effect on the date of this ICD, form a part of this ICD to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of the ICD, the contents of the ICD shall be considered a superseding requirement.

SPECIFICATIONS

Federal Aviation Administration (FAA)

FAA-E-2804	AWOS Data Acquisition System (ADAS) Specification
FAA-G-2100	Electronic Equipment, General Requirements
FAA-AC-150/5220-16	Automated Weather Observing Systems (AWOS) for Non-Federal Applications, FAA Advisory Circular

NAS Verification Plan

NAS-IR-44010001	Transmission Equipment: Digital Interface
NAS-IR-44010002	Transmission Equipment: Analog Interface

Department of Commerce

50-SANW-1-00050	Contract, containing Automated Surface Observing System (ASOS) Specification, U.S. Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)

STANDARDS

Federal

FED-STD-1032	Telecommunications: High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating Equipment
FIPS PUB 59	Representations of Universal Time, Local Time Differentials, and United States Time Zone References for Information Interchange

Federal Aviation Administration

FAA-STD-013	Quality Control Program Requirements

FAA-STD-016	Quality Control System Requirements
FAA-STD-018	Computer Software Quality Program Requirements
FAA-STD-020a	Transient Protection, Grounding, Bonding and Shielding Requirements for Equipment
FAA-STD-025b	Preparation of Interface Documentation, October 1987
FAA-STD-029	Selection and Implementation of Telecommunication Standards, 26 February 1986

OTHER PUBLICATIONS

NAS Change Proposals (NCPs)

NCP 16133	Automated Thunderstorm Detection Requirements for ASOS and ADAS
NCP 17445	FAA'S CONVERSION TO METEOROLOGICAL AVIATION REPORT (METAR) AND TERMINAL AERODROME FORECAST (TAF) WEATHER MESSAGES

National Oceanic and Atmospheric Administration (NOAA)

FMH-1	Federal Meteorological Handbook - Surface Aviation Observations, FCM-H1-1995, Department of Commerce

Federal Communications Commission (FCC)

FCC Rules, Part 15, Subpart J	Code of Federal Telecommunication Regulations

Other

NOS	National Ocean Survey, U.S. Terminal Procedures
AFD	Airport/Facility Directory, National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce (DOC)

2.2 Non-Government Documents. The following documents of the issue in effect on the date of this ICD, form a part of this ICD to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of the ICD, the contents of the ICD shall be considered a superseding requirement.

Electronic Industries Association (EIA)

RS-232-C	Interface between Data Terminal Equipment and Data Circuit-Terminal Equipment Employing Serial Binary Data Interchange

International Standards Organization (ISO)

ISO 3309	Data Communication - High-level Data Link Control Procedures - Frame Structure
ISO 4335	Data Communication - High-level Data Link Control Procedures - Elements of Procedures
ISO 7498	Information Processing Systems - Open Systems Interconnection - Basic Reference Model, ISO, Geneva, Switzerland
ISO 7809	Information Processing Systems - Data Communication - High-level Data Link Control Procedures - Consolidation of Classes of Procedures

2.3 Related ICDs.

NAS-IC-XXXXXXXX	Interface Control Document between Automated Surface Observing System(ASOS) and the Tower Control Computer Complex (TCCC),
XXX-XX-XXXXXXXX	Interface Control Document between Automated Surface Observing System(ASOS) and the Automated Weather Information Processing System (AWIPS).

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3. INTERFACE CHARACTERISTICS

3.1 General Design Characteristics. The ADAS system is required to input weather messages from federal AWOS, non-federal AWOS, National Weather Service (NWS) Automated Surface Observing Systems (ASOS), and Department of Defense (DoD) Automated Observing Systems (AOS) on a 1-minute cycle; to determine and report on weather conditions to the aviation weather community as they occur; and to disseminate the weather messages to the Data Link Processor (DLP), Weather and Radar Processor (WARP), and the Weather Message Switching Center Replacement (WMSCR). In the remainder of this document the term "AWOS", unless explicitly stated otherwise, shall be taken to refer to all of ASOS, AOS, and federal/non-federal AWOS. In addition, ADAS receives Lightning Detection Data (LDD) from the National Lightning Detection Network (NLDN), and disseminates Lightning Activity Data (LAD) to AWOS. An ADAS is located in each of 22 Air Route Traffic Control Centers (ARTCCs), as well as the FAA Technical Center and the FAA Academy. An ADAS can accommodate up to 48 AWOS input/output (I/O) ports, each dedicated to AWOS communications. However, ADAS can communicate with a maximum of 137 AWOS sites. Each AWOS reports to one ADAS.

The FAA National Interfacility Communication System (NICS) is responsible for installing the physical and/or logical links between each ADAS and its network of reporting AWOS sites. In performing that responsibility, the NICS designers may, at their option, utilize leased lines and/or a combination of leased lines interleaved with radio communication links. In addition, NICS designers may, again at their discretion, concentrate information or data (e.g. by multiplexing and demultiplexing).

Figure 3-1 shows the topology of the AWOS and ADAS communication network. As indicated in Figure 3-1, up to 10 AWOS sites can be linked to ADAS through a single I/O port. Concentration of AWOS weather messages is achieved by NICS using a pair of Time Division Multiplexing (TDM) modems and a digital port sharing device (i.e. "hubber") on each port.

3.2 Functional Characteristics. The AWOS/ADAS interface characteristics shall be implemented in accordance with the International Standards Organization (ISO) Open System Interconnection (OSI) Basic Reference Model. This model provides the vehicle for a logical and modular framework of functions and procedures to be incorporated in software design. Figure 3-2 shows the layers required for and the logical interface between AWOS and ADAS. Data transmission rate on this interface shall be 2400 bits per second (bps).

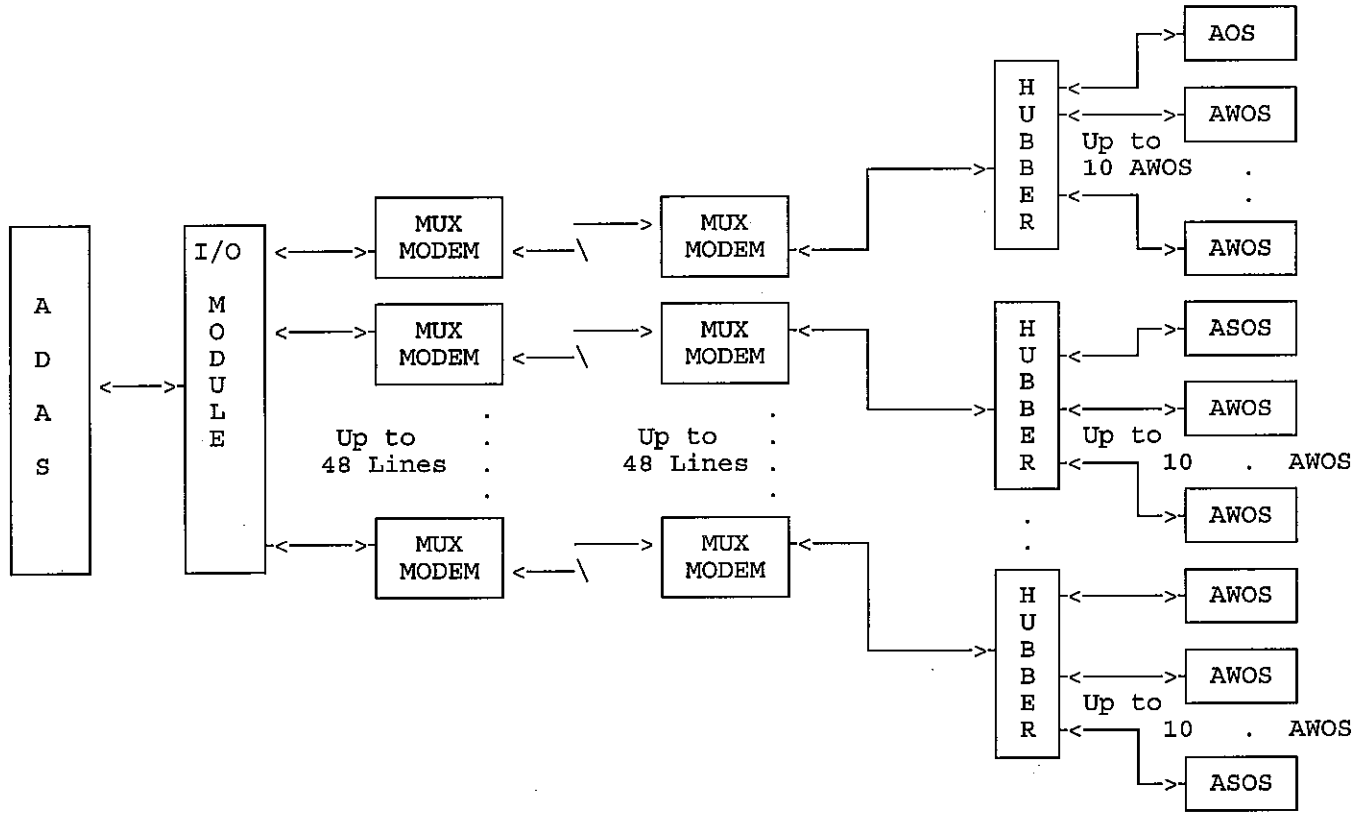
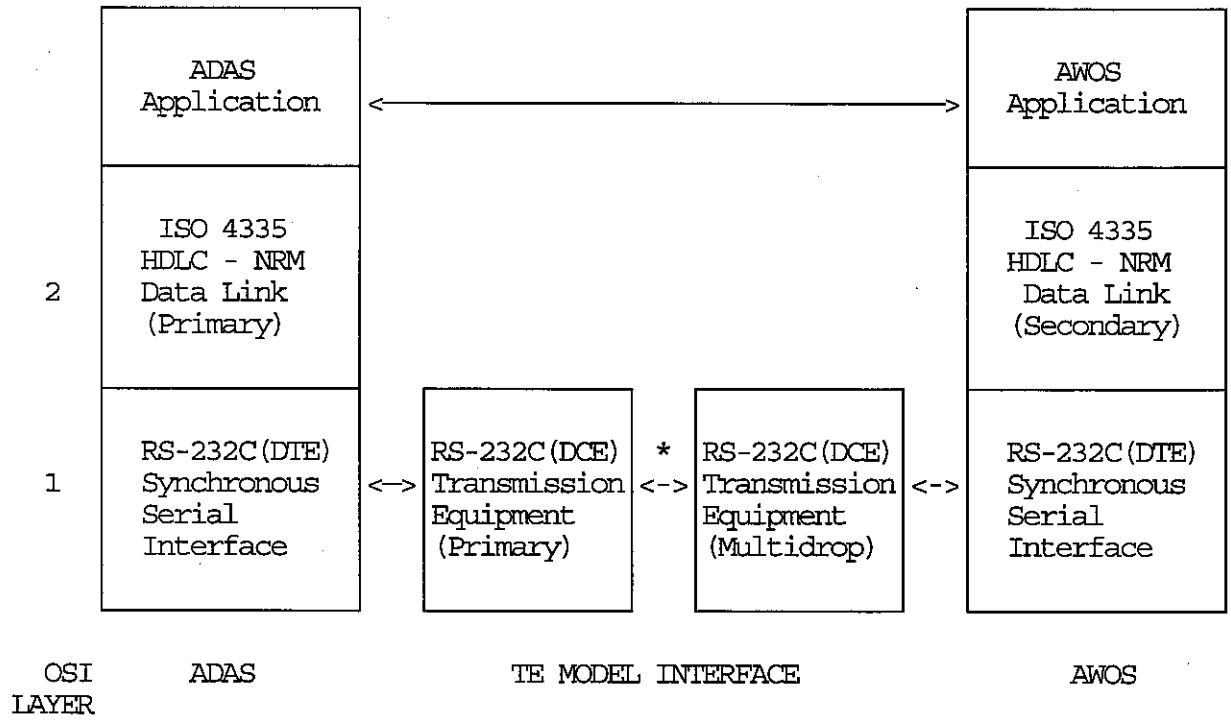


Figure 3-1. AWOS (ASOS)/ADAS Network Topology.



* Specification conforms to NAS-IR-44010001 and NAS-IR-44010002

Figure 3-2. ASOS-AOS-AWOS / ADAS Communication Layer Interface.

3.2.1 Application Process. There is no true OSI application layer defined for the ADAS/AWOS interface. The peer ADAS and AWOS application processes define the services and protocol procedures for the exchange of messages between the AWOS and ADAS. The ADAS and AWOS applications use the services provided by the OSI Link layer to: a) establish communications with the peer application; b) transmit and receive Application Data Units (ADUs); and c) terminate communications.

This paragraph defines the procedures for the exchange of information (e.g. surface meteorological data) between the ADAS and AWOS application processes using ADUs. Detailed descriptions of the parameters, content, and format of the specific messages is provided in the Appendices I through IV. The definitions of several terms used frequently in the ensuing subsections are provided in 6.2.

3.2.1.1 Application Data Units (ADUs). All data exchange between the AWOS and ADAS applications shall take place using ADUs that have the following general characteristics:

(a) ADUs shall be made up of either an ADU header plus an ADU information field, or an ADU header alone.

(b) Only one ADU information field shall be permitted per ADU.

(c) No ADU information field shall exceed 255 octets.

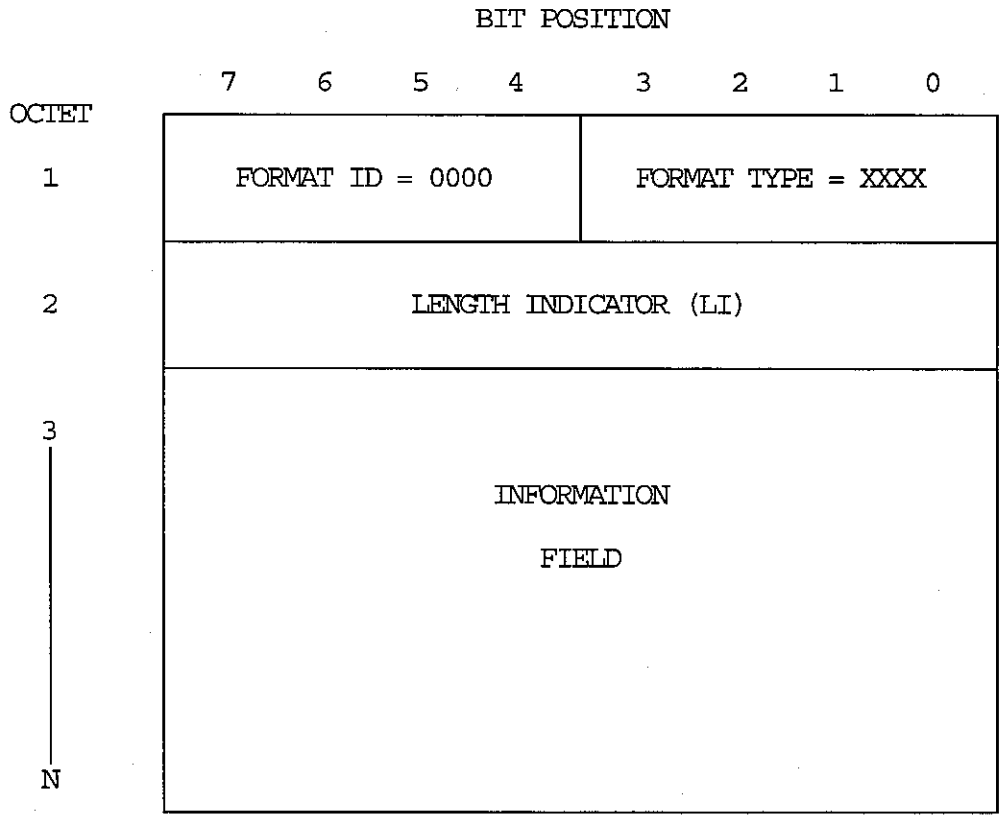
(d) ADU information fields greater than or equal to 255 octets shall be partitioned into two (or more) ADUs. When an ADU information field is exactly 255 octets long, an additional ADU with a null information field shall be generated.

(e) Only one ADU shall be permitted per High-Level Data Link Control (HDLC) frame (see Appendix V).

(f) Each ADU shall be an integral number of octets.

(g) If within the ADU, a binary value is encoded using more than one octet, the most significant octet shall be transmitted first.

A schematic of an ADU used in AWOS/ADAS communications is delineated in Figure 3-3. As indicated, the ADU Header shall comprise 2 octets. Bits 4-7 of Octet 1 shall contain the Format ID. The Format ID relates the general purpose of the ADU being transmitted, e.g. data transfer or data request. Bits 0-3 of Octet 1 shall contain Format Type. The Format Type relates the specific character of the attached information, e.g. an AWOS Format Weather Message. Figure 3-3 represents an ADU stored in computer memory during processing by an application program.



N = LI + 2, where LImax = 255
Nmax = 257

Figure 3-3. Schematic of the Application Data Unit (ADU) Used on the AWOS/ADAS Interface.

In addition, the octet and bit sequences shown indicate the order in which these data are passed to the data link protocol software for insertion into the information field of the HDLC frame, and subsequent transmission on the AWOS/ADAS link. Octet 2, the Length Indicator (LI), shall provide the length (in octets) of the following ADU information field.

Individual parameters contained in the ADU Header are outlined in Table 3-1. There shall be four primary categories of ADUs: data transfer, data request, error condition, and data extension. Within these four primary categories several sub-categories are identified. Two columns on the right side of Table 3-1 define the binary values of the Format ID and Format Type (Octet 1 of the ADU Header) associated with a specific message category (or sub-category). Each of the items included in Table 3-1 is briefly described below and detailed in the appendices.

3.2.1.1.1 Data Transfer. Data transfer is the first general classification of ADU. There are 11 specific types of data transfers currently defined. They are summarized in a matrix shown in Figure 3-4 and described below:

(a) AWOS Format Weather Message, without Alerts. Depending upon the current observed weather conditions and/or message content, the Format Type shall indicate the character and structure of the encapsulated weather message.

1) No Alerts, no Auto Remarks, no Supplements

a) No weather alerts were detected during the current observation cycle (see 10.3.4).

b) Weather data is provided only in the fixed length segment of the AWOS Weather Format Message (see 10).

c) LI shows that the AWOS Format Weather Message is 68 octets long.

2) No Alerts, but includes Auto Remarks and/or Supplements

a) No weather alerts were detected during the current observation cycle (see 10.3.4).

b) Automated remarks were generated and/or an authorized AWOS operator has entered a supplement.

c) LI shows that the total number of octets included in the subsequent ADU information field is > 68 and ≤ 228.

Table 3-1. ADU Header Definition.

MESSAGE DESCRIPTION	FORMAT ID	FORMAT TYPE
I. Data Transfer		
A. AWOS to ADAS of "AWOS Format Weather Message"		
1. No Alerts, no Auto Remarks, no Supplements	0000	0001
2. No Alerts, includes Auto Remarks and/or Supplements	0000	0010
B. AWOS to ADAS of "AWOS Format Weather Message"		
1. Includes Alert(s), no Auto Remarks, no Supplements	0000	0011
2. Includes Alert(s), Auto Remarks and/or Supplements	0000	0100
C. ASOS/AOS only, to ADAS, of "Surface Aviation Observation (SAO) Format Weather Message" and SAO Test Messages		
1. Record Observation (SA; TA)	0000	0101
2. Special Observation (SP, USP, RS; TP, UTP, TS)	0000	0110
NOTE: SAO Format shall be discontinued as of an effective date to be determined.		
D. ADAS to AWOS of Lightning Activity Data	0000	0111
E. AWOS or ADAS Test Message	0000	1000
F. AWOS or ADAS Date/Time Message	0000	1001
G. ASOS/AOS only, to ADAS, of "Standard Hydrometeorological Exchange Format (SHEF) Weather Message" and SHEF Test Messages		
1. SHEF Hourly Routine Precipitation Message	0000	1010
2. SHEF 15-Minute Precipitation Criteria Message	0000	1011
H. ASOS/AOS only, to ADAS, of Daily (DSM) and Monthly (MSM) Summary Messages		
1. Primary Daily Summary Message (DS; DT)	0000	1100
2. Intermediate Daily Summary Message (DS; DT)	0000	1101
3. Monthly Summary Message (MS; MT)	0000	1110
I. ASOS/AOS only, to ADAS, of "Aviation Routine Weather Report (Metar) Format Weather Message"		
1. Aviation Routine Weather Report (METAR; TESTM)	0000	0101
2. Aviation Selected Special Weather Report (SPECI; TESTS)	0000	0110
NOTE: To become effective as of a date to be determined.		
II. Data Request		
A. ADAS of AWOS for Current Weather only	0001	0001
B. Test Message Request	0001	0010
C. Date/Time Message Request	0001	0011

Table 3-1 (continued). ADU Header Definition.

MESSAGE DESCRIPTION	FORMAT ID	FORMAT TYPE
III. Error Condition		
A. From AWOS to ADAS		
1. No Current Weather Message available	0010	0000
B. From ADAS to AWOS		
1. Weather message format error	0010	0010
C. From AWOS or ADAS as Receiving Station		
1. ADU Header error	0010	0011
2. Date Exception	0010	0100
3. Time Exception	0010	0101
IV. Data Extension (ADAS and AWOS)		
A. ADUs ≥ 255 octets	0011	0000

(b) AWOS Format Weather Message, with Alerts. Depending upon the current observed weather conditions and/or message content, the Format Type shall indicate the character and structure of the encapsulated weather message.

1) Alert(s), no Auto Remarks, no Supplements

a) Critical weather conditions were detected during the observation cycle (see 10.3.4).

b) Weather data is provided only in the fixed length segment of the AWOS Format Weather Message.

c) LI shows that the AWOS Format Weather Message is 68 octets long.

2) Alert(s), with Auto Remarks and/or Supplements

a) Critical weather conditions were detected during the observation cycle (see 10.3.4).

b) Automated remarks were generated and/or an authorized AWOS operator has entered a supplement.

c) LI shows that the total number of octets included in the subsequent ADU information field is > 68 and ≤ 228.

(c) SAO Format Weather Message. Surface Aviation Observation (SAO) Format Weather Messages are prepared only by ASOS/AOS for transmittal to ADAS. SAO Format Weather Messages shall be discontinued as of a date to be determined.

(d) Lightning Activity Data (LAD). The LAD ADU shall consist of a 2-octet header plus a variable length data field ranging from 6 to N octets, where N - 6 shall constitute the length of the (optional) variable length Automated Lightning Remark (see Appendix III).

(e) Test Messages. Both AWOS (optionally) and ADAS shall transmit a special Test Message in response to a request from its link counterpart (see 3.2.1.1.2.b). The Test Messages are provided to confirm the identification and software configuration of the system generating the message (see Appendix IV).

(f) Date/Time. Both AWOS (optionally) and ADAS shall transmit the current date/time in response to a request from its link counterpart (see 3.2.1.1.2.c). In addition, the ADAS may transmit an unsolicited date/time message to the AWOS. This ADU shall be 13

octets long and consist of an AWOS Site ID and configuration number, the date, the time (resolution to the second), and the respondent system's time offset (in hours) from Coordinated Universal Time (UTC) (see Appendix IV).

(g) SHEF Weather Message. Standard Hydrometeorological Exchange Format (SHEF) Weather Messages shall be prepared only by ASOS/AOS for transmittal to ADAS. The SHEF ADU shall consist of a two octet ADU header and a SHEF Weather Message. The SHEF ADU header shall indicate that the ADU information field contains an Hourly message, or a 15-Minute message (see Table 3-1 and Appendix VII).

1) SHEF Hourly RoutIne Precipitation Message

a) A routine Hourly SHEF message is produced by ASOS/AOS.

b) For a complete description of the Hourly SHEF message, see the current issue of the ASOS Specification.

2) SHEF 15-Minute Precipitation Criteria Message

a) A 15-Minute SHEF message is generated by ASOS/AOS.

b) For a complete description of the 15-Minute SHEF message, see the current issue of the ASOS Specification.

(h) Daily and Monthly Summary Messages. The Daily Summary Message (DSM) and Monthly Summary Message (MSM) shall be prepared only by ASOS/AOS for transmittal to ADAS. The DSM and MSM ADU shall consist of a two octet ADU header and a variable length summary message. The DSMs and MSMs shall not exceed 245 and 260 bytes/octets in length, respectively. The ADU header shall indicate that the ADU information field contains a real or test Primary DSM, a real or test Intermediate DSM, or a real or test MSM (see Table 3-1 and Appendix VIII).

1) Primary Daily Summary Message (DS or DT)

a) The Primary DSM shall be generated once a day by ASOS/AOS.

2) Intermediate Daily Summary Message (DS or DT)

a) The Intermediate DSM shall be generated up to three times a day by ASOS/AOS.

3) Monthly Summary Message (MS or MT)

a) The MSM shall be generated once a month by ASOS/AOS.

(i) Metar Format Weather Message. Aviation Routine Weather Report (Metar) Format Weather Messages shall become effective as of a date to be determined. Metar Format Weather Messages are prepared by ASOS/AOS (not AWOS) for transmittal to ADAS (with respect to federal/nonfederal AWOS, the ADAS itself prepares Metar Format Weather Messages from data provided by AWOS Format Weather Messages, see Appendix IX). The ASOS/AOS Metar ADU shall consist of a two octet ADU header and a Metar Format Weather Message. The Metar ADU header shall indicate that the ADU information field contains a real or test Aviation Routine Weather Report (METAR or TESTM), or else a real or test Aviation Selected Special Weather Report (SPECI or TESTS). Metar messages shall not exceed 240 bytes/octets in length, including the ASOS/AOS "Maintenance Indicator" (see current issue of the ASOS Specification), but excluding any carriage returns, line feeds or space characters inserted by ASOS/AOS for printing control.

1) Aviation Routine Weather Report (METAR or TESTM)

a) A METAR report is a scheduled message produced periodically (e.g. hourly) by ASOS/AOS.

b) Automated remarks may be generated to highlight the detection of pre-specified weather conditions, or to record certain routine meteorological parameters (e.g. synoptic temperature, 24-hour precipitation). For a complete description, see the current issue of the ASOS Specification.

2) Aviation Selected Special Weather Report (SPECI or TESTS)

a) A SPECI report is generated by ASOS/AOS when standard pre-specified conditions have been met, or when a locally adaptable threshold condition has been met (see the current issue of the ASOS Specification for details).

b) Automated remarks may be generated to indicate and record those critical conditions.

3.2.1.1.2 Data Request. Data request is the second general classification of ADU. All data request ADUs shall be two octets long. ADAS shall initiate all AWOS/ADAS communication transactions (see Appendix V); however, either ADAS or AWOS may make data requests after communications have been established. Data request ADUs currently defined are:

(a) Current Weather, ADAS of AWOS and ASOS/AOS.

1) ASOS/AOS will transmit an AWOS Format Weather Message (always), a SHEF Weather Message (when conditions warrant), Daily and Monthly Summary Messages at specified times, and a Metar Format Weather Message (when conditions warrant) upon receiving this request ADU. The response messages transmitted by ASOS/AOS shall be contained in individual ADUs and HDLC frames.

2) Federal and non-federal AWOS shall transmit only an AWOS Format Weather Message in response to this data request.

(b) Test Message Request. Data request initiated by a technician at the ADAS and (optionally) AWOS. The system receiving the request shall transmit the pre-specified AWOS or ADAS Test Message (see 3.2.1.1.1.(e)).

(c) Date/Time Request. A Date/Time request is initiated by a technician at the ADAS and (optionally) AWOS. The system receiving the request shall transmit the pre-specified AWOS or ADAS Date/Time Message (see 3.2.1.1.1.(f)).

3.2.1.1.3 Error Condition. There shall be at least five error condition ADUs defined. Implementation of the error condition ADUs by the ADAS shall be mandatory. Implementation of the error condition ADUs by the AWOS shall be optional. The error condition ADU shall consist of a two octet header, and the Error message. All Error Messages except the "No Current Weather Message Available" shall have 12 record keeping octets exclusive of the ADU header (e.g. AWOS identification and configuration, current date and time, error position indicator: see Appendix IV, Figure 40-6) followed by the message received that was in error. The "No Current Weather Message Available" message shall be of fixed length with 11 record keeping octets only, omitting the "Error Position Indicator" octet (see 40.3.3.4). The error condition ADUs shall be:

(a) From AWOS to ADAS

1) No Current Weather Message Available (LI = 11)

(b) From ADAS to AWOS

1) Weather Message format error

(c) From AWOS or ADAS as Receiving Station

1) ADU error

2) Date exception

3) Time exception

3.2.1.1.4 Data Extension. Data extension ADUs are provided to accommodate data streams ≥ 255 octets that must be partitioned into two or more ADUs. As indicated in Figure 3-3, the maximum length permitted for a single ADU information field is 255 octets. When an ADU information field is exactly 255 octets long, an additional extension ADU with a null information field must be generated. Any message greater than or equal to 255 octets shall be encoded (in two or more ADUs) as follows:

(a) First ADU

1) LI is set to 255. (The station receiving this ADU expects a "data extension" ADU to follow, see below).

2) The first 255 octets of the message are encoded in the subsequent information field.

(b) Second ADU

1) LI is set to indicate the remaining number of octets in the message, or to 255 if the message is ≥ 2 x 255 (510) octets.

2) The encoded information field equals the number of remaining octets in the message, or the next 255 octets in sequence.

(c) nth ADU (general case)

1) LI is set to indicate the remaining number of octets in the message, or to 255 if the message is ≥ n x 255 octets.

2) The encoded information field equals the number of remaining octets in the message, or the next 255 octets in sequence.

(d) Last ADU

1) LI is set to indicate the remaining number of octets in the message.

2) The encoded information field equals the number of remaining octets in the message.

For example, a 255 octet message requires the generation of two ADUs. The first ADU is 257 octets long (i.e. a two octet header plus the 255 octet message). The second ADU is only two octets long (an ADU header only), with LI set 0 (zero).

3.2.1.2 Weather Message Formats. Five classes of weather messages, each with a distinct specified format, are transmitted over the AWOS/ADAS Interface. The first of these classes, the AWOS Format Weather Message, is transmitted to ADAS, and provides information on surface meteorological observations made at AWOS sites. Federal and non-federal AWOS, when operating in the manual mode, may contain a manually-entered Metar Format message in the AWOS Format Weather Message operator supplement field. The second, the Metar Format Weather Message, is transmitted to ADAS by ASOS/AOS only, and provides information on surface meteorological observations made at ASOS/AOS sites. The third, the Lightning Activity (LAD) Message, is transmitted from ADAS to AWOS, and provides lightning flash information monitored within critical distances of the recipient AWOS. The fourth, the SHEF Weather Message, is transmitted to ADAS by ASOS/AOS only, and provides information on precipitation accumulation observations made at ASOS/AOS sites. The fifth, the Daily and Monthly Summary Messages, is transmitted to ADAS by ASOS/AOS only, and supports both data archive and the generation of NWS public service products.

3.2.1.2.1 AWOS Format Weather Message. A complete description of the AWOS Format Weather Message is provided in Appendix I.

3.2.1.2.2 SAO Format Weather Message. The SAO Format Weather Message shall cease to be generated and transmitted by all parties as of a date to be determined.

3.2.1.2.3 Lightning Activity Data (LAD) Message. A complete description of the Lightning Activity Data Message is provided in Appendix III.

3.2.1.2.4 SHEF Weather Message. The SHEF Weather Message generated by ASOS/AOS is briefly discussed in Appendix VII. For a complete description, see the current issue of the ASOS Specification.

3.2.1.2.5 Daily and Monthly Summary Message. The Daily and Monthly Summary Message generated by ASOS/AOS is described in Appendix VIII.

3.2.1.2.6 Metar Format Weather Message. The Metar Format Weather Message created by the ASOS and AOS is briefly referenced in Appendix IX, which otherwise gives complete details only of the Metar Format Weather Message to be generated by the ADAS from data provided by AWOS Format Weather Messages received from federal/non-federal AWOS only. A complete description of the ASOS/AOS Metar message is provided in the current issue of the ASOS Specification. Generation and transmission of Metar Format Weather Messages by all parties shall commence on a date to be determined.

Transfer Type	Weather Alert(s) Yes/No	Automated Remark(s) Yes/No	Operator Supplement Yes/No	Data Content	Length Indicator Octets
(A.1) AWOS Format Weather Message	No	No	No	Fixed Length Segment (FLS)	68
(A.2) AWOS Format Weather Message	No	Yes	Yes	FLS + Auto Rem + Oper. Suppl. Maximum	68 80 (Max) 80 (Max) 228 Total
(B.1) AWOS Format Weather Message	Yes	No	No	Same as (A.1)	Same as (A.1)
(B.2) AWOS Format Weather Message	Yes	Yes	Yes	Same as (A.2)	Same as (A.2)

Figure 3-4. Matrix Summarizing ADAS/AWOS Data Transfer ADUs

Transfer Type	Weather Alert(s) Yes/No	Automated Remark(s) Yes/No	Operator Supplement Yes/No	Data Content	Length Indicator Octets
(D) Lightning Activity Data (LAD) Message	Yes Alert Trigger for SPECI Generation	Yes Function of Current Lightning Activity	NA	AWOS Site ID L Information L Remark	4 2 K, where K => 0 — K+6 Total
(E) AWOS or ADAS Test Message	NA	NA	NA	Site/System ID Software Configuration AWOS ADAS	 62 Total 30 Total
(F) Date/Time Message	NA	NA	NA	Site/System ID &Configuration Date/Time	6 7 — 13 Total
(G.1) SHEF Hourly Routine Precip Message	No	No	No	Precipitation Accumulation Maximum	 See ASOS Specification

Figure 3-4. Matrix Summarizing ADAS/AWOS Data Transfer ADUs (Continued)

Transfer Type	Weather Alert(s) Yes/No	Automated Remark(s) Yes/No	Operator Supplement Yes/No	Data Content	Length Indicator Octets
(G.2) SHEF 15-Minute Precip Criteria Message	Yes	No	No	Precipitation Accumulation Maximum	See ASOS Specification
(H.1) Primary Daily Summary Message	No	No	Optional	See Appendix VIII	245 Maximum
(H.2) Intermediate Daily Summary Message	No	No	Optional	See Appendix VIII	245 Maximum
(H.3) Monthly Summary Message	No	No	Optional	See Appendix VIII	245 Maximum
(I.1) Metar Format Weather Message Routine Report	No	Function of Weather Conditions and Time	Optional	See ASOS Specification	240 Maximum
(I.2) Metar Format Weather Message Special Report	Yes Standard and Locally Adaptable "Specials" Criteria	Function of Weather Conditions and Time	Optional	See ASOS Specification	240 Maximum

Figure 3-4. Matrix Summarizing ADAS/AWOS Data Transfer ADUs (Continued)

3.2.1.3 Non-Weather Message Formats. Non-weather messages transmitted between ADAS and AWOS are:

(a) Test Message

(b) Error Message

(c) Date/Time Message

A description of each is provided in Appendix IV.

3.2.2 Presentation Layer. N/A.

3.2.3 Session Layer. N/A.

3.2.4 Transport Layer. N/A.

3.2.5 Network Layer. N/A.

3.2.6 Data Link Layer. The data link layer shall be implemented in accordance with ISO 3309 (Frame Structure), ISO 4335 (Elements of Procedure), and ISO 7809 (Data Link Operation). Specific characteristics are described in Appendix V.

3.2.6.1 Classes of Procedure and Options. The AWOS/ADAS interface shall implement class UN (unbalanced normal) with option 13 in accordance with ISO 7809. The AWOS/ADAS interface shall operate in the normal response mode configuration. The primary station shall be ADAS, and the secondary stations shall be the AWOS forming the multipoint circuit. Two way, alternate transmission shall be provided. The primary station shall continually poll each secondary station in turn during normal response mode operation.

3.2.6.2 Addressing. Primary and Secondary station addressing shall be assigned at the time of circuit implementation.

3.2.7 Physical Layer. This layer provides the definition of interface requirements and characteristics between ADAS, AWOS, and intermediate transmission equipment (e.g., multiplexors and modems). The circuit shall be full duplex, multipoint, and dedicated (leased) carrier operation for secondary station transmission.

3.2.7.1 Functional Pin Assignment. Pin assignments for interface functions shall be in accordance with RS-232-C, configured for send and receive operation.

3.2.7.2 Electrical. Data Terminal Equipment (DTE) (AWOS or ADAS) and Data Communication Equipment (DCE) (Transmission Equipment) shall have electrical characteristics in accordance with RS-232-C

3.2.7.3 Signaling and Timing. The transmission channel implemented in accordance with this ICD shall provide full duplex, synchronous, bit serial transmission at a data rate of 2400 bps. The transmission channel shall be implemented using equipment in accordance with NAS-IR-44010001 and NAS-IR-44010002. DTE to DCE transmitter synchronization shall be provided by the internally generated DCE clock.

3.2.7.4 Distance. Maximum signalling distance shall be 465 feet or less.

3.2.7.5 Cable. Cable connecting the DTE with the DCE shall be supplied by the DTE. Cable shall be low-impedance shielded twisted pair per RS-232-C recommendation. Further, the cable shielding shall be attached to pin one (1) of the cable connector.

3.2.7.6 Connectors. The DTE chassis connector and the DCE chassis connector shall have 25 female contacts with a male shell. Cable shall have a 25-pin connector with a female shell.

3.2.7.7 Interface Protection. The RS-232-C interface shall be protected from electrical damage by the accidental connection of an EIA-530 device.

3.3 Physical Characteristics.

3.3.1 Mechanical Characteristics. The cabling used for the interface shall meet the electrical current capacity and mechanical requirements specified in FAA-G-2100. The cabling shall be wired for all mandatory functions specified in FED-STD-1032.

3.3.1.1 Installation. The DTE shall meet the requirements of the DCE at the physical location of the DCE/DTE interface. The project associated with the DTE (AWOS or ADAS) shall be expected to provide and install all required interface cable.

3.3.1.1.1 Interchangeability. Interface equipment components which perform similar or identical functions shall be interchangeable, and shall be of the same model and revision number.

3.3.1.1.2 Surface Finish. Surface finish shall be as specified in FAA-G-2100.

3.3.1.1.3 Location and Orientation. The location of the interface shall be oriented to allow unobstructed access for servicing.

3.3.1.1.4 Holes. Not Applicable.

3.3.1.1.5 Fasteners. Cable-end connectors shall be secured to chassis connectors in the mated condition using captive jackscrew hardware of size #4-40. All fastener hardware shall be in accordance with FAA-G-2100.

3.3.1.1.6 Bonding. Bonding shall be in accordance with FAA-STD-020.

3.3.1.1.7 Weight and Center of Gravity. Not applicable.

3.3.1.1.8 Materials. Materials shall be in accordance with FAA-G-2100.

3.3.1.1.9 Markings. Markings for terminal strips and blocks shall be in accordance with FAA-G-2100. The DTE and DCE equipment shall be labelled in accordance with 3.9, FAA-G-2100 to indicate the presence of a RS-232-C interface.

3.3.1.2 Connectors. The DTE chassis connector and the DCE chassis connector shall have female contacts with a male shell. Cable connectors shall have male contacts with female shell.

3.3.1.3 Fluids (Gases and Liquids). Not applicable.

3.3.1.4 Transportation and Handling. Not applicable.

3.3.2 Electrical/Electronic Characteristics. Electrical/electronic requirements are stated in 3.2.7.

3.3.2.1 Electrical/Electronic Block Diagrams. Electrical/electronic block diagrams are not used to impose requirements of this ICD.

3.3.2.2 System Description. System description is not used to impose requirements in this ICD.

3.3.2.3 Schematics. Schematics are not used to impose requirements in this ICD.

3.3.2.4 Interface Wiring Diagrams. Interface wiring diagrams are not used to impose requirements in this ICD.

3.3.2.5 Power Capacity. Not applicable.

3.3.3 Environmental Characteristics. All the equipment at the location of the interface shall comply with the following environmental requirements.

3.3.3.1 Thermal. This interface shall perform in accordance with the requirements specified herein throughout a temperature range of 0 to 50 degrees Celsius. This requirement is also applicable to the connectors and

the interconnection cable between the DTE (AWOS or ADAS) and the DCE as supplied by the DTE.

3.3.3.1.1 Passive Heat Transfer. Not applicable.

3.3.3.1.2 Cooling. No cooling requirements are imposed by this ICD.

3.3.3.2 Electromagnetic. Electromagnetic requirements shall be as specified in 3.3 of FAA-G-2100 and FCC Rules, Part 15, Subpart J.

3.3.3.3 Dynamic. Not applicable.

3.3.4 Envelope Characteristics. Not applicable.

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4. QUALITY ASSURANCE PROVISIONS

4.1 General. This section defines the verification requirements for Section 3 of this ICD. The NAS Verification Plan verification philosophy, verification requirements, responsibilities, and documentation requirements, are described in the NAS Verification Plan.

The NAS Verification Plan philosophy requires the evaluation of all specified functional, performance, and interface requirements. Verification of subsystem performance shall take place primarily during factory-level testing as part of Development Test and Evaluation (DT&E) and Production Acceptance Test and Evaluation (PAT&E). NAS system compatibility shall be verified during installation and integration testing at the FAA Technical Center (FAATC) or site of first installation as part of Operational Test and Evaluation (OT&E). This will include operational demonstrations to evaluate the man-machine interface and the quality of the logistics, maintenance, and training programs.

DT&E is that testing performed for design assistance, technical risk assessment, and specification performance verification. DT&E provides an early look at how well the system is performing in terms of performance and design. Fabrication defects and marginal components will be detected early in the test program.

The principal objective of OT&E is to explore and resolve critical operational and technical issues. System evaluation is an integral part of OT&E and is based on a comparison of operational test measurements to explicit pre-established quantitative and qualitative criteria that describe the operational requirements.

PAT&E is testing performed to ascertain that a production system has been fabricated properly and satisfies the specification to which it was built.

Interfaces are considered to be part of the system for operational testing and are exercised with the system. OT&E emphasizes operational realism in the test environment.

4.2 Responsibility for verification. This paragraph establishes the overall NAS program verification responsibilities. Specific verification responsibilities shall be specified in the quality assurance sections of the subsystem procurement specifications in accordance with this subsection and the NAS Verification Plan.

4.2.1 Government. FAA is responsible for directing all NAS program verification activities. The program office responsible for each end of the interface will be responsible for verification testing of the interface at the time of acceptance from the contractor. Operational testing and integration

of the interface will be the responsibility of the network side of the interface in all cases.

4.2.2 Contractor testing. The contractor shall be responsible for developmental testing and for supporting system integration testing and site acceptance testing. Except as otherwise specified, the vendor may utilize his own facilities or any other qualified laboratory. The FAA and/or FAA designated representative have the right to witness, separately perform, and otherwise ensure all verification activities.

4.2.3 Contractor Quality Assurance requirements. The contractor shall establish and maintain a Quality Control/Quality Assurance system in accordance with FAA-STD-013 and FAA-STD-016, beginning with subsystem development and continuing through contractor site acceptance activities. For subsystems using software/firmware, the contractor shall establish and maintain a Quality Control/Quality Assurance program in accordance with FAA-STD-018.

4.3 Special Test Support Requirements. N/A.

4.4 Verification Methods and Rationale. This paragraph describes the verification method(s) to be used in verifying each Section 3 requirement and the rationale for its selection.

4.4.1 Inspection (I).

4.4.1.1 Hardware. Inspection (I) of hardware is defined as a method of verification of physical characteristics that determine compliance without the use of special laboratory equipment, procedures, items, or services. Inspection is used to verify construction features, document and drawing compliance, workmanship, and physical condition. The success criterion for inspection shall be pass/fail.

4.4.1.2 Software. Software examination is an element of inspection (I) consisting of investigation, without the use of special laboratory appliances or procedures, to determine compliance with requirements. This nondestructive examination includes review of directory listings that contain source and object files to verify inclusion of all required software components. In addition, review of software source code is made to verify compliance with software documentation, requirements, and coding standards as well as verification of the implementation of required mathematical equations. The success criterion for inspections shall be pass/fail.

4.4.1.3 Technical Data and Documentation (TD&D). Verification by inspection will be the primary method of verifying technical data and documentation (TD&D). The inspection task will consist of comparing the TD&D with the appropriate compliance and reference documents. Variations will be identified