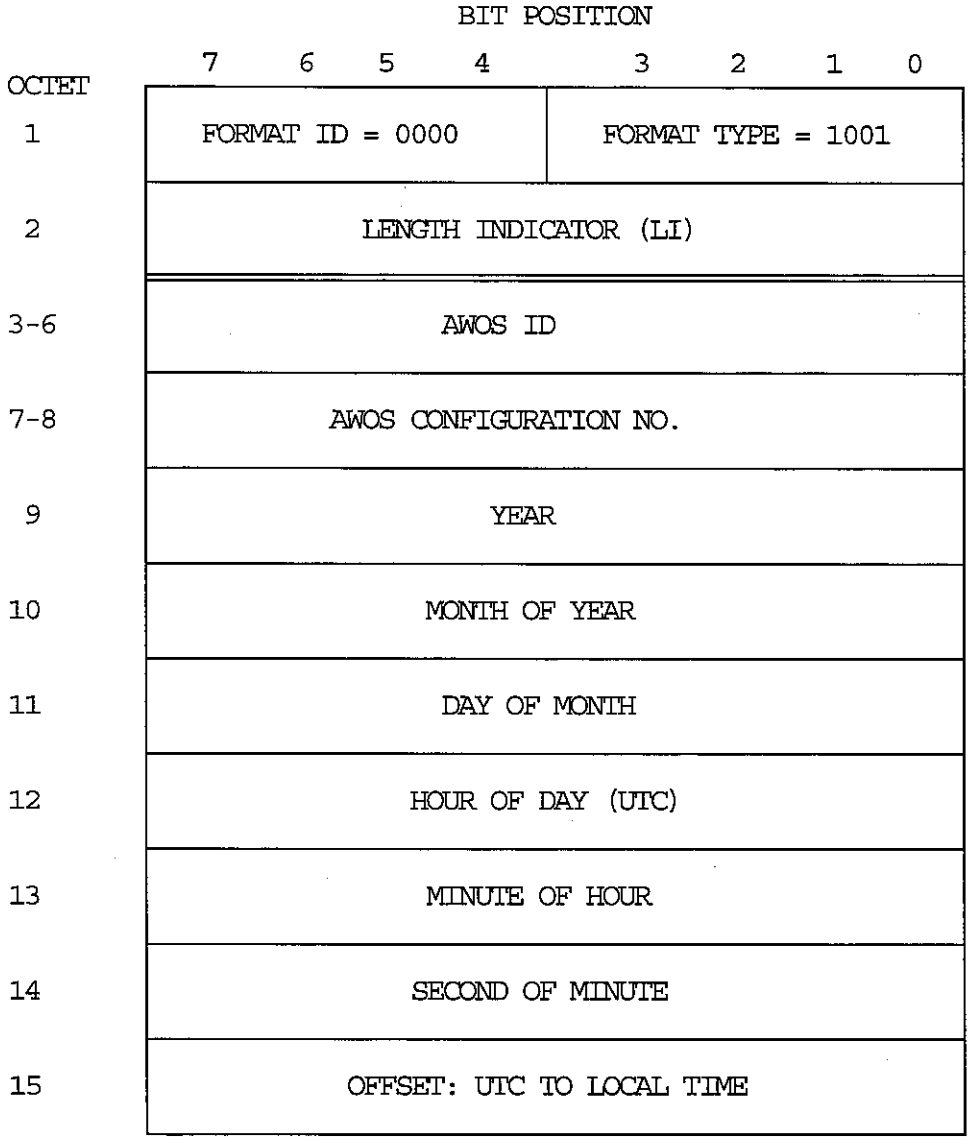


N = LI + 2, where LI = 13
N = 15

Figure 40-5. Date/Time Message ADU.

40.3.1.2 ADAS Test Message. The ADAS Test Message ADU is transmitted to the AWOS station technician to confirm the ADAS ID and software configuration in response to a Test Message Request ADU. The ADAS Test Message shall be fixed length. The structure and contents of the ADAS Test Message are provided in Table 40-2.

40.3.1.2.1 Site ID (Table 40-2, Field 1). Each ADAS site shall have a Site ID assigned by the FAA. The Site ID shall be four ASCII characters.

40.3.1.2.2 Date and Time (Table 40-2, Field 2). Date and time shall be recorded as ASCII characters in the ADAS Test Message. Each element of the date time field shall comprise two ASCII characters. Leading zeros shall be encoded where necessary.

40.3.1.2.3 ADAS Software Version (Table 40-2, Field 3). The last field of information in the ADAS Test Message shall provide ADAS software version number. The version number is given in the form "XX.xx" (5 characters). Leading zeros shall be used where necessary.

40.3.1.2.4 Reserved (Table 40-2, Fields 4 to N). Eleven octets shall be reserved at the end of the ADAS Test Message. Reserved octets shall be encoded as spaces (ASCII 32D) until actual parameters are specified.

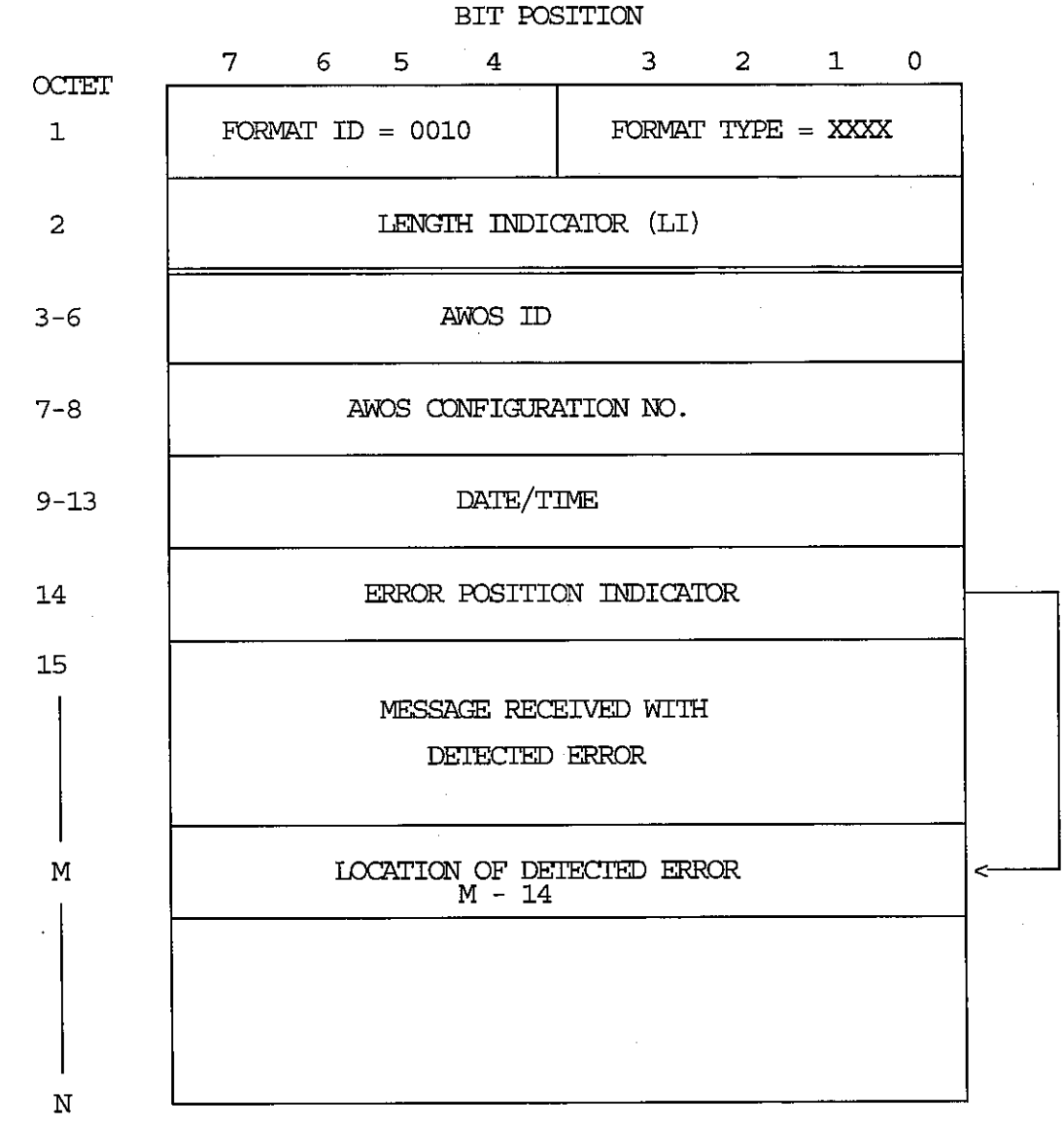
40.3.2 Date/Time Message. Figures 40-4 through 40-5 show, respectively, schematics of the Date/Time Message request ADU (a two-octet Header), and the Date/Time Message ADU. The Date/Time Message consists of 4 fields and 13 octets. The structure and contents of the Date/Time Message are provided in Table 40-3.

40.3.2.1 Site ID (Table 40-3, Field 1). The Site ID shall be of the AWOS participating in the message exchange. The Site ID shall be four ASCII characters long.

40.3.2.2 Site Configuration Number (Table 40-3, Field 2). The AWOS Site Configuration Number shall be encoded in this field of Date/Time Message ADU (see 10.3.2). In the Date/Time Message, the Site Configuration Number shall be two octets long and encoded in binary.

40.3.2.3 Date and Time (Table 40-3, Field 3). Date and time shall be encoded in binary. This is the only message transmitted on the AWOS/ADAS link in which second of the minute is encoded (range of values: 0-59). In the Date/Time Message, each element of the date and time field shall comprise a single octet.

40.3.2.4 Offset: UTC to Local Standard Time (LST) (Table 40-3, Field 4). The absolute value of the time offset from UTC to LST for that site originating the Date/Time Message ADU shall be provided in this field.



N = LI + 2, where LI = 255 (Max.)
Nmax = 257

Figure 40-6. Error Message ADU.

40.3.3 Error Message. Figure 40-6 is a schematic of the Error Message ADU. The Error Message ADU shall consist of 5 fields, where the first four are fixed length, and the fifth may have a variable number of octets. The structure and contents of the Error Message are provided in Table 40-4.

40.3.3.1 Site ID (Table 40-4, Field 1). The Site ID shall be of the AWOS receiving or transmitting the Error Message ADU. The Site ID shall be four ASCII characters long.

40.3.3.2 Site Configuration Number (Table 40-4, Field 2). The Site Configuration Number shall be for the AWOS receiving or transmitting the Error Message ADU (see 10.3.2). In the Error Message, the Site Configuration Number shall be two octets long and encoded in binary.

40.3.3.3 Date and Time (Table 40-4, Field 3). Date and time shall be encoded in binary. In the Error Message, each element (year, month, day, hour - UTC, minute) of the date and time field shall comprise a single octet.

40.3.3.4 Error Position Indicator (Table 40-4, Field 4). The error position indicator shall contain an offset value to the octet detected in error in the subsequent data stream. For example, if an AWOS Format Weather Message transmitted to ADAS had the day of the month (i.e. the ninth octet of the AWOS message) in error, the error position indicator would be 9. The maximum value that the error position indicator may assume is 230 (i.e. for an AWOS Format Weather Message 228 octets, plus a two octet ADU header).

The error position indicator shall be encoded in binary.

40.3.3.5 Data Stream In Error (Table 40-5, Field 5). Field 5 of the Error Message is the data stream in which the error was detected as received from the original transmitting site. In the previous example, the data stream in error would be the AWOS Format Weather Message containing the incorrect day of the month.

This final portion of the Error Message ADU may be variable in length depending upon the data stream detected in error.

Table 40-1. Content of the AWOS Test Message.

FIELD	OCTET	TYPE	CONTENT
1	1	ASCII	Site ID
	2	"	|
	3	"	|
	4	"	|
2	5	"	Site Configuration # (XX)
	6	"	|
3	7	"	System ID
	8	"	|
	9	"	|
	10	"	|
4	11	"	Year (0-99)
	12	"	|
	13	"	Month (1-12)
	14	"	|
	15	"	Day (1-31)
	16	"	|
	17	"	Hour, UTC (0-23)
	18	"	|
	19	"	Minute (0-59)
	20	"	|
5	21	"	Latitude (XXxxN)
	22	"	|
	23	"	|
	24	"	|
	25	"	|
	26	"	Longitude (XXXxxW)
	27	"	|
	28	"	|
	29	"	|
	30	"	|
	31	"	|

Table 40-1. Content of the AWOS Test Message (Continued).

FIELD	OCTET	TYPE	CONTENT
6	32	ASCII	Magnetic Variation (XXY)
	33	"	|
	34	"	|
7	35	"	Field Elevation, ft (XXXXX)
	36	"	|
	37	"	|
	38	"	|
	39	"	|
	40	"	Station Elevation, ft (XXXXX)
	41	"	|
	42	"	|
	43	"	|
	44	"	|
8	45	"	AWOS Software Version (XX.xx)
	46	"	|
	47	"	|
	48	"	|
	49	"	|
9	50	"	Reserved
|	51	"	|
|	52	"	|
|	53	"	|
|	54	"	|
|	55	"	|
|	56	"	|
|	57	"	|
|	58	"	|
|	59	"	|
|	60	"	|
|	61	"	|
N	62	"	|

Table 40-2. Content of the ADAS Test Message.

FIELD	OCTET	TYPE	CONTENT
1	1	ASCII	ADAS ID
	2	"	|
	3	"	|
	4	"	|
2	5	"	Year (0-99)
	6	"	|
	7	"	Month (01-12)
	8	"	|
	9	"	Day (01-31)
	10	"	|
	11	"	Hour, UTC (00-23)
	12	"	|
	13	"	Minute (00-59)
	14	"	|
3	15	"	ADAS Software Version (XX.xx)
	16	"	|
	17	"	|
	18	"	|
	19	"	|
4	20	"	Reserved
	21	"	|
	22	"	|
	23	"	|
	24	"	|
	25	"	|
	26	"	|
	27	"	|
	28	"	|
	29	"	|
N	30	"	|

Table 40-3. Content of the Date/Time Message.

FIELD	OCTET	TYPE	CONTENT
1	1	ASCII	Site ID*
	2	"	|
	3	"	|
	4	"	|
2	5	Binary	Site Configuration #*
	6	"	|
3	7	Binary	Year (0-99)
	8	"	Month of year (1-12)
	9	"	Day of month (1-31)
	10	"	Hour of day, UTC (0-23)
	11	"	Minute of hour (0-59)
	12	"	Second of minute (0-59)
4	13	"	Offset: UTC to Local Standard Time+

---

* Of AWOS transmitting or receiving the Date/Time Message.

\+ Of system (AWOS or ADAS) transmitting the Date/Time Message.

Table 40-4. Content of the Error Message.

FIELD	OCTET	TYPE	CONTENT
1	1	ASCII	Site ID
	2	"	|
	3	"	|
	4	"	|
2	5	Binary	Site Configuration #
	6	"	|
3	7	Binary	Year (0-99)
	8	"	Month (1-12)
	9	"	Day (1-31)
	10	"	Hour, UTC (0-23)
	11	"	Minute (0-59)
4	12	"	Error Position Indicator*
5	13	"	Data Stream in Error
	|	"	|
	|	"	|
	|	"	|
	LI	"	|

---

* Error position indicator and the accompanying erroneous data stream are not encoded for a "no current weather message available" error

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APPENDIX V

50. DATA LINK LAYER

50.1 Purpose. The Data Link Layer establishes procedures for the exchange of frames of data over a physical link. The Data Link Layer addresses such issues as defining the beginning and end of the transmission, detecting errors in that transmission, recovery from transmission errors, addressing conventions when several Data Terminal Equipments (DTE) share a single circuit, and the conventions for command and response.

50.1.1 Applicability. It shall be mandatory for all interfacing AWOS and ADAS to implement the data link specifications and procedures set forth in this appendix.

50.2 General Conventions and Criteria.

50.2.1 Protocol. The High-level Data Link Control Procedures (HDLC), ISO 3309, ISO 4335, ISO 7809, shall be the protocol used at the data link layer for AWOS/ADAS communications. Each system shall implement Class UN (unbalanced normal) with option 13 in accordance with ISO 7809. Specific characteristics are described in the following paragraphs.

50.2.2 Station Type. On each ADAS/AWOS link, ADAS shall be only a primary station. Each AWOS shall be only a secondary station.

50.2.3 Link Configuration. The ADAS/AWOS interface shall use a UN link configuration that is characterized by one primary station (ADAS) linked to one or more secondary stations (AWOS).

50.2.4 Operating Mode. The ADAS/AWOS link shall operate in the normal response mode (NRM) configuration. Two way, alternate (TWA) transmission shall be provided. Only ADAS shall be permitted to establish the link and each AWOS may only initiate a transmission after receiving explicit permission (poll) from ADAS to proceed.

50.2.5 Frame Structure. The transmission unit defined at the data link level is the "frame". The order of transmission shall be as presented in the next subparagraph. A description of HDLC frame components or fields then follows.

50.2.5.1 Order of Transmission. Figure 50-1 delineates a HDLC frame. As indicated, the frame consists of a starting flag, an address field, a control field, an information field, a frame check sequence (FCS), and an end flag. The sequence of field transmissions is from the left to the right. The low-order bits are transmitted first in the address and control fields. On

the other hand, with respect to the FCS, HDLC convention provides that the high-order bit is transmitted first (see Figure 50-1). Finally, the order of bit transmission in the information field depends upon the particular application. Thus, with respect to operational weather data, the order is defined in 3.2.1.1 of this document (i.e. Application Data Unit (ADU) Header, as shown in Figure 3-3, followed by the AWOS Format Weather Message as shown in Figure 10-2). All fields comprising the HDLC frame are described below.

50.2.5.2 Flag Field. Two flag fields encompass the HDLC frame. Each flag field is one octet long; the LSB and MSB are 0 bits and the six internal bits are 1 bits (i.e. 01111110). HDLC permits a single flag sequence to represent the end flag for one frame and the start flag for the next frame. HDLC convention permits the 15-bit sequence of 011111101111110 to be understood as a two-flag sequence by a receiving station.

50.2.5.3 Address Field. In communications over the AWOS/ADAS link, the AWOS address (i.e. the secondary station) shall be inserted into the address field whether or not ADAS or AWOS is building the frame for transmission. The basic (single octet) addressing format shall be used. Only odd value AWOS link addresses shall be assigned to keep the compatibility with extended (multi-octet) addressing convention; i.e. the LSB will always be set to indicate the address octet as being the 'final address octet'. Figure 50-2 shows this address format. Please note that the bit numbers are labelled 1 (LSB, on the left) to 8 (MSB, on the right).

AWOS link address number shall be a function of ADAS port assignment. FAA shall assign data link addresses to each AWOS site.

50.2.5.4 Control Field. A single octet control field shall be used on the ADAS/AWOS link. HDLC frames are categorized as Information (I), Supervisory (S), and Unnumbered (U). Each of these frame types are identifiable by the contents of the control field. Figure 50-3 depicts the contents of the control field as taken from Paragraph 3.1 of ISO 4335. The general contents of the three frame types identified above and in Figure 50-3 are described in the following three subsections. Details on the repertoire of specific HDLC commands and responses are provided in 50.2.6.

50.2.5.4.1 Information (I) Frames. Information (I) frames are used to perform an information transfer. An I frame is signified by the LSB of the control field being set to 0. N(S) (see Figure 50-3) is the sequence number of the information frame being transmitted. A maximum of seven information frames can be outstanding between a station pair (e.g. AWOS/ADAS) before confirmation.

N(R) is the receive sequence number set by the receiving station. The value of N(R) represents the next expected frame, and thus confirms all I frames up to and including N(R)-1.

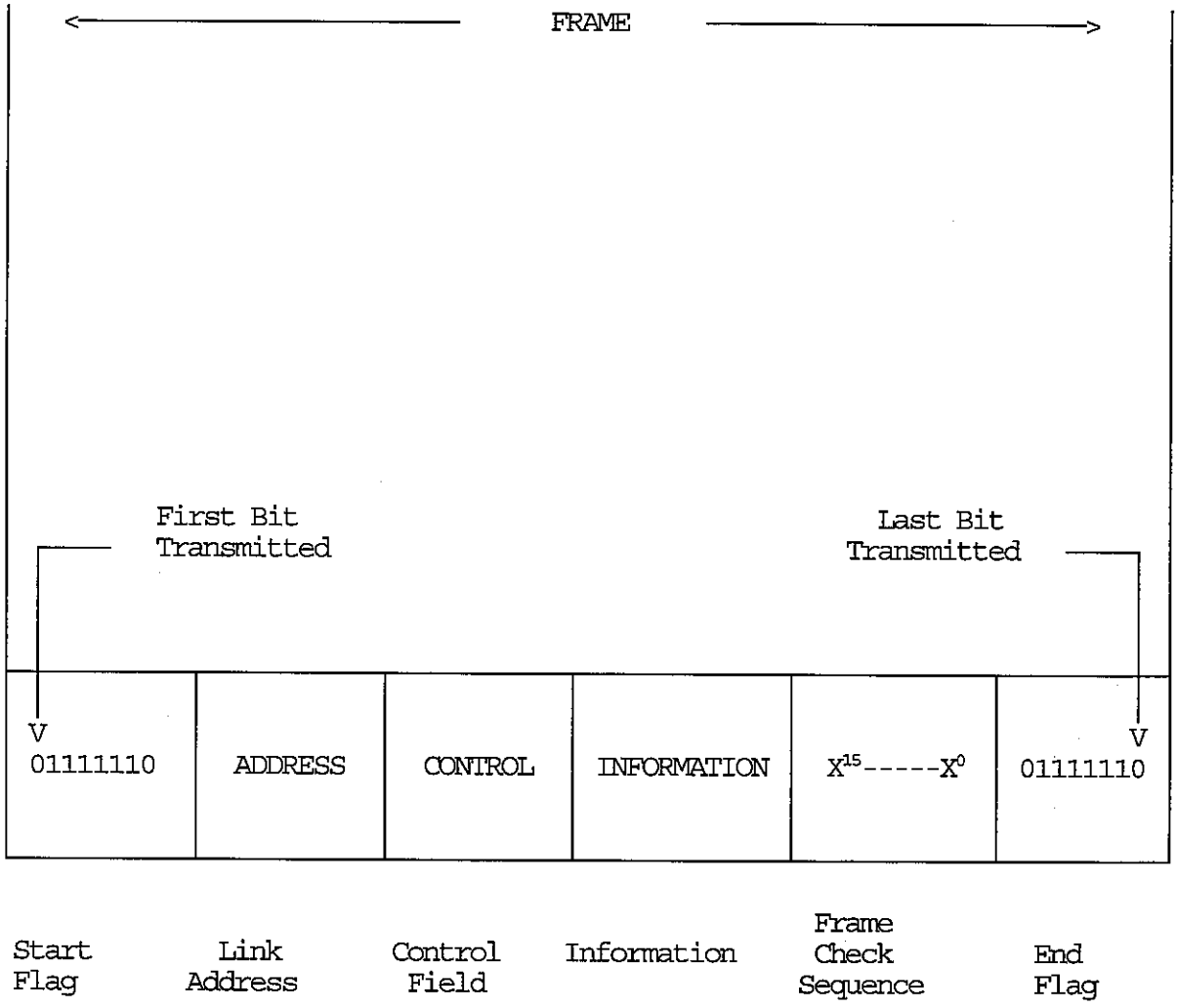

Figure 50-1. Structural Relationship of the Defined Fields in the HDLC Frame.

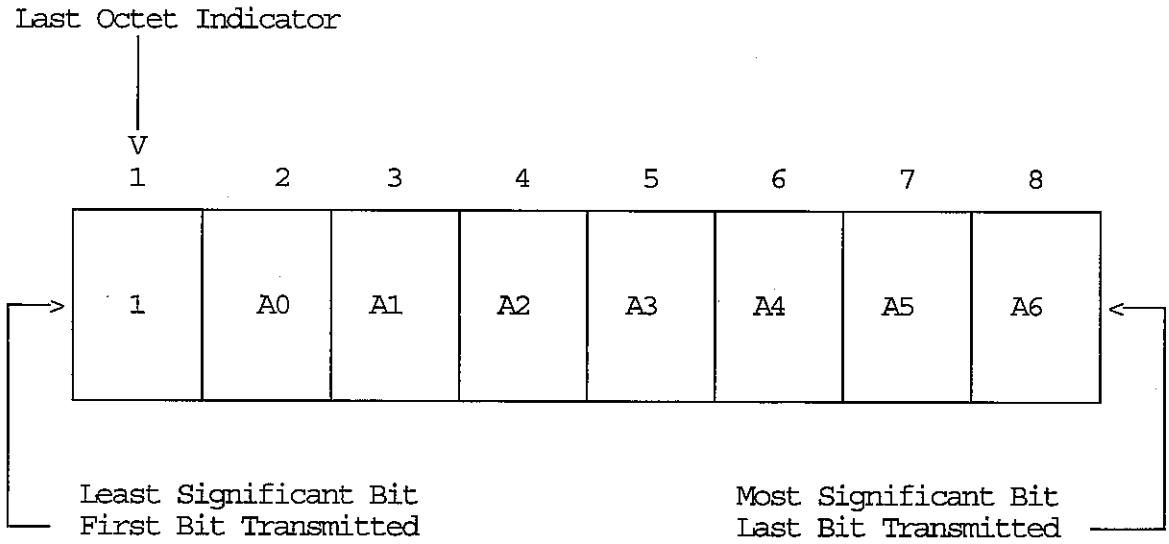

Figure 50-2. AWOS Link Address Format.

First Bit Transmitted

Control Field Bits	1	2	3	4	5	6	7	8
Information Transfer Format	0	N(S)			P/F	N(R)		
Supervisory Format	1	0	S	S	P/F	N(R)		
Unnumbered Format	1	1	M	M	P/F	M	M	M

Where: N(S) = Transmitting station send sequence number (Bit 2 is the low-order bit)
N(R) = Transmitting station receive sequence number (Bit 6 is the low order bit)
S = Supervisory function bits
M = Modifier function bits
P/F = Poll bit, ADAS command frames
= Final Bit, AWOS response frames
= Set P/F to "1" to indicate Poll/Final frame

Figure 50-3. Contents of the HDLC Control Field.

50.2.5.4.2 Supervisory (S) Frames. Supervisory (S) frames begin with 10 in the first two low-order bits of the control field sequence. Each SS-bit pattern (see Figure 50-3) represents a unique HDLC command and/or response.

50.2.5.4.3 Unnumbered (U) Frames. Unnumbered (U) frames start with 11 in the first two low-order bits of the control field. The five M bits shown in Figure 50-3 permit the definition of up to 32 unnumbered commands (and/or response) functions.

50.2.5.5 Information Field. The information field of the HDLC frame is unrestricted with respect to content or bit groupings. The information field of an I frame may be of zero length. On the AWOS/ADAS link each information field shall be an integral number of octets.

The maximum length of the information field permitted for the ADAS/AWOS interface shall be 257 octets. This total shall exclude the 0 bits inserted for code transparency (see 50.2.7).

50.2.5.6 Frame Check Sequence (FCS). All HDLC frames shall use the 16-bit FCS. The FCS is positioned immediately prior to the closing flag. The contents of the address, control, and information fields are used to determine the FCS; however, the 0 bits inserted to retain code transparency are excluded from the calculation.

50.2.6 Commands and Responses. Table 50-1 lists the commands and responses that shall be used on the ADAS/AWOS link. The first column of Table 50-1 identifies the command or response by acronym. The second column indicates whether the command or response is part of the basic (B) repertoire of HDLC commands/responses for unbalanced configurations using Normal Response Mode, or whether it is the HDLC option number being added to the basic repertoire. Column 3 indicates the function of each command and/or response. Column 4 indicates the type of frame (I, S, or U). Column 5 contains a definition of the command/response acronym with a brief descriptive phrase as warranted. The aggregate of remaining columns contain the required bit patterns of the control field. The ensuing subsections describe each of the commands or responses shown in Table 50-1.

50.2.6.1 Information Transfer (I). The I frame format shall be used to download information from ADAS to AWOS, or to poll AWOS for information (e.g. the current AWOS Format Weather Messages) to ADAS, or to poll ASOS/AOS for information (e.g. the current AWOS Format, SHEF Format, Daily/Monthly Summary Format, and Metar Format Weather Messages) to ADAS.

50.2.6.2 Receive Ready (RR). The RR command (ADAS) or response (AWOS) shall be used to indicate that the transmitting site is ready to receive I frames, and/or to acknowledge the receipt of I frames through N(R)-1.

The P-bit shall be used in the RR command following the I frame that polls AWOS to indicate that AWOS is expected to begin transmission to an ADAS (ADAS shall set the P-bit to 1).

When the AWOS has finished a response transmission, the AWOS shall set the F-bit to 1 of the RR command that follows the last I frame of a response transmission.

50.2.6.3 Receive Not Ready (RNR). The RNR command (ADAS) or response (AWOS) shall be used to indicate a "link busy" condition, i.e. a temporary inability to receive additional I frames because, for example, an input buffer is saturated.

50.2.6.4 Set Normal Response Mode (SNRM). The SNRM command shall be used by ADAS to place the addressed AWOS into Normal Response Mode. Once established, the AWOS NRM shall remain in effect until AWOS is disconnected either logically (via a DISC command) or physically from ADAS.

50.2.6.5 Disconnect (DISC). The DISC command shall be used by ADAS to logically suspend operations with the addressed AWOS. The AWOS shall be logically reconnected to ADAS when ADAS issues an SNRM command.

50.2.6.6 Unnumbered Acknowledgement (UA). The UA response shall be issued by an AWOS to acknowledge the receipt of either a SNRM or DISC command from ADAS.

50.2.6.7 Disconnect Mode (DM). The DM response shall be used by AWOS to indicate that it is in Normal Disconnect Mode (NDM) and (1) it is requesting that ADAS issue an SNRM command, or (2) informing ADAS that it (AWOS) is in NDM and cannot alter its status.

50.2.6.8 Frame Reject (FRMR). The FRMR response (AWOS) shall be used to report a communication error that is nonrecoverable by retransmission of the same frame because, for example:

(a) the control field received is invalid

(b) the HDLC frame exceeds its permitted length

(c) AWOS transmitted an illegal receive variable, N(R), which identifies a frame already acknowledged.

50.2.6.9 Request Disconnect (RD). The RD response shall be used by AWOS to indicate to ADAS that it wishes to be placed into a logically disconnected state by ADAS transmitting a DISC command.

Table 50-1. HDLC Commands and Responses for the AWOS/ADAS Interface

COMMAND/ RESPONSE ID	1 OPT	2 FNC	3 FRM	DESCRIPTION	CONTROL FIELD BIT ASSIGNMENTS LSB 1	2	3	4	5	6	7	MSB 8
I	B	C/R	I	Information Transfer	0	N(S)			0	N(R)		
RR	B	C/R	S	Receive Ready	1	0	0	0	P/F	N(R)		
RNR	B	C/R	S	Receive Not Ready	1	0	1	0	P/F	N(R)		
SNRM	B	C	U	Set Normal Response Mode	1	1	0	0	P	0	0	1
DISC	B	C	U	Disconnect	1	1	0	0	P	0	1	0
UA	B	R	U	Unnumbered Acknowledgement	1	1	0	0	F	1	1	0
DM	B	R	U	Disconnect Mode	1	1	1	1	F	0	0	0
FRMR	B	R	U	Frame Reject: without retransmission request	1	1	1	0	F	0	0	1
RD	13	R	U	Request Disconnect	1	1	0	0	F	0	1	0

1. Option: B= Basic Repertoire; or, Number= HDLC Option

2. Function: Command (C), Response (R), Command or Response (C/R)

3. Frame: Information (I), Supervisory (S), Unnumbered (U)

50.2.7 Code Transparency. On the AWOS/ADAS link, the inclusion of a flag sequence in the middle of an HDLC frame shall be prevented by using a technique termed "zero bit insertion." Following this procedure, after the start flag, the transmitting site shall insert a zero bit following any sequence of five contiguous 1 bits that occur prior to the end flag. The receiving site shall continuously monitor for sequences of five 1 bits. If the next bit is a 0, the five 1 bits shall be passed as "data" and the zero bit is deleted. Otherwise, if the next bit is a 1, the sequence shall be interpreted as a flag sequence.

50.2.8 Command and Response. This section describes the procedures for establishing and carrying out communication transactions between ADAS and AWOS. The ADAS shall be designated as the primary station for the data link and shall initiate all communication transactions. ADAS shall poll (request data from each AWOS on the link) and shall have the capability to transfer information, such as Lightning Detection Data, to each AWOS.

50.2.8.1 Start-up Procedure. ADAS shall initiate a start-up procedure using a SNRM command with the poll bit set to 1. AWOS shall respond with a UA frame with the final bit set to 1. Since there is only one mode of operation used on the ADAS link, start-ups shall not be required unless there has been a logical or physical disconnect.

50.2.8.2 ADAS Poll and AWOS Response. When ADAS initiates a data request, it shall transmit an I-Frame addressed to an AWOS, containing a DataRequest ADU as described in paragraph 3.2.1.1.2. The addressed AWOS shall respond with one or more I-frames, containing Current Weather ADUs, upon completion of the HDLC link-level poll by receipt of an addressed frame with 'P/F' bit set to signify link-level 'poll'. The RR response that follows the last of the I-frames in the AWOS response shall be transmitted with 'F' bit set to signify 'final' frame in the polling sequence.

50.2.8.3 ADAS Information Transfer to AWOS. ADAS shall send information frames containing the data that it is downloading, e.g. an AWOS test message. A particular transfer shall be comprised of one to seven I frames (see Table 50-2). Only the last in the series of frames issued by ADAS shall have its P-Bit set to 1. The RR command following the last in the series of I frames issued by ADAS shall have its P/F bit set to 1.

50.2.9 Link Parameters. Timers are used to indicate when a data link benchmark is expected to occur. Counters are used in recovery procedures to indicate the number of attempts to resolve a failed situation. Table 50-2 provides a summary of each of the timers and counters identified below. A recommended range of values, nominal increments, and default values pertaining to the routine collection of AWOS Weather Messages are provided in the table. Timer values at the primary station may be different from those in secondary stations.

APPENDIX VII

70. STANDARD HYDROMETEOROLOGICAL EXCHANGE FORMAT (SHEF) MESSAGE

70.1 Purpose. The SHEF message shall be transmitted to ADAS by ASOS and AOS to indicate short term cumulative precipitation when precipitation information is otherwise included only in the remarks section of the ASOS/AOS Metar Format message.

Measurements for precipitation shall emanate from the precipitation sensor attached to the ASOS and AOS. ADAS shall receive and retransmit the SHEF message to the WMSCR without modification.

There shall be two types of SHEF messages which ASOS/AOS generate and transmit:

(a) A Routine Hourly SHEF message shall be sent once every hour at an ASOS/AOS site specific time. Transmission of the Routine Hourly SHEF message shall not coincide with the hourly transmission of Metar Format messages by the ASOS/AOS.

(b) A Fifteen (15) Minute SHEF Alert message shall occur when the precipitation amount equals or exceeds a specified amount within a 15-minute period.

70.2 General Conventions and Criteria.

70.2.1 Source Data and Systems. ASOS and AOS shall generate SHEF Weather Messages.

70.2.2 Application Data Unit. The ADU containing the SHEF Weather Message shall consist of a two-octet header and the variable length message. Values for the Format ID and Format Type are given in Table 3-1.

70.3 Content and Format. The Hourly SHEF Message and the Fifteen Minute SHEF Alert are fully described in the current issue of the ASOS Specification.

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APPENDIX VIII

80. ASOS/AOS DAILY AND MONTHLY SUMMARY MESSAGES

80.1 Purpose. The Daily Summary Messages (DSMs) and Monthly Summary Messages (MSMs) shall support both data archive and the generation of NWS public service products.

80.2 General Conventions and Criteria.

80.2.1 Source Data and Systems. NWS, and selected FAA and DoD ASOS/AOS sites shall generate and transmit the ASOS/AOS Daily and Monthly Summary messages. ASOS/AOS shall transmit one (1) primary DSM and up to three (3) intermediate DSMs each day. ASOS/AOS shall transmit the MSM for the previous month on the first day of the following month. All transmission times shall be entered by the System Manager user level, on a site-by-site basis.

80.2.2 Application Data Unit. The ADU containing the Daily and Monthly Summary Messages shall consist of a two-octet header and the variable length message (see Figure 3-1). Values for the Format ID and Format Type are given in Table 3-2.

80.2.3 ASOS/AOS Summary Message Types. There shall be two types of Daily Summary Messages, a primary and an intermediate, and one type of Monthly Summary Message.

80.2.4 Operator Input. The operator may augment and/or edit the Daily Summary Product and Monthly Summary Product. The augmented/edited entries will be automatically encoded into the DSM and MSM, respectively. The operator will not interface directly with the DSM and MSM.

ASOS/AOS shall have the capability to produce corrected primary DSMs and MSMs. The operator shall have a period of four (4) days to make any corrections. At the end of the fourth day, at 00:30 LST, any corrected primary DSMs and MSMs shall be transmitted.

80.2.5 Storage Requirements. The primary DSM and the MSM shall be retained on-site in ASOS's short term storage for a period of 10 days from the time it was last transmitted (including corrected summary messages). Only the most current intermediate DSM shall be retained in ASOS's memory.

80.2.6 Missing Data. Missing data shall be indicated by an "M", data beyond the capability of ASOS/AOS shall be designated by a "N", and data not yet observed or computed for the day will be indicated by a dash "-" (intermediate messages only).

80.3 Content and Format.

80.3.1 Daily Summary Message. This section contains descriptions of the primary and intermediate daily summary messages. Both messages shall use the same general message format described in the following sections. The primary daily summary shall accommodate all the necessary data to be transmitted to complete the Preliminary Local Climatological Data (PLCD) for the day. Data is also provided for the national forecast verification program for disseminated Model Output Statistics (MOS) guidance. The intermediate message(s) shall be used to help produce the local climatological products prior to the end of the day, as well as other routine public service products.

80.3.1.1 Primary Daily Summary Message. The Primary Daily Summary Message shall be constructed and transmitted according to the following format:

YYYY DS (COR) DaDa/MoMo SnTxTxTx**time**/SnTnTnTn**time**//SnMMM/SnNNN//
SLPmm**time**/PPPP/P_1PPP/P_2PPP/P_3PPP/P_4PPP/P_5PPP/P_6PPP/P_7PPP/P_8PPP/P_9PPP/
P_{10}PPP/P_{11}PPP/P_{12}PPP/P_{13}PPP/P_{14}PPP/P_{15}PPP/P_{16}PPP/P_{17}PPP/P_{18}PPP/P_{19}PPP/
P_{20}PPP/P_{21}PPP/P_{22}PPP/P_{23}PPP/P_{24}PPP/FaFaFa/ddfffttttt/DDFFFITTT/WWWW/
SSSSpSpSp/SwSwSw/DDD/CsCsCmCm/(Remarks)

Explanation of Daily Summary Message Text:

NOTE: Some of the field lengths shown in this explanation are maximum values. Please refer to section 80.4 for further clarification and for any exceptions to the values listed in this explanation.

YYYY: Three or four character alphanumeric station identifier.

DS: ASCII "DS" indicating Daily Summary code.

(COR): ASCII "COR" indicating Correction. The parentheses indicate that this field is not routinely transmitted.

DaDa: Day of the month (01-31).

MoMo: Month of the year (01-12).

Sn: Indicates whether the value is negative (-) or positive (blank).

TxTxTx: Calendar day's (midnight to midnight, LST) maximum temperature reported in whole degrees Fahrenheit.

Table 50-2. ADAS/AWOS Link Parameters*

PARAMETER	LOWER LIMIT	UPPER LIMIT	INCREMENT	CURRENT AWOS WEATHER MESSAGE DEFAULT
Time, seconds:				
No Response, T1	1.0	3	0.1	1.0
Busy, T3	0.1	3	0.1	0.1
Count:				
No Response Retry, K1	1	5	1	2
Outstanding Frames, K3	1	7	1	7

* Link parameters are adaptable for different frame requirements

50.2.9.1 Timers. Timers shall be adaptable. The following timers shall be used on the ADAS/AWOS link:

(a) No Response, T1. ADAS, as the primary station, shall maintain a no response timer to protect against a no response situation. The timer shall be initiated after the transmission of a frame containing a P/F bit set to 1. For the operational communication of AWOS Weather Messages, the no response timer shall be 1 second.

(b) Busy Response, T3. A busy response timer shall be used by ADAS, the primary station, to gauge the delay period after an RNR condition is received. Following the timeout of the busy timer, the RR or I frame shall be retransmitted. The AWOS message default value for this timer is 0.1 second.

50.2.9.2 Counters. Counters shall be adaptable. The following counters shall be used on the ADAS/AWOS link:

(a) No Response Retry, K1. This counter shall be used by ADAS when it is sending information to AWOS. It is used to detect when the maximum number of transmission attempts permitted has been reached. With respect to the retrieval of a Current AWOS Weather Message, no more than 2 retries are permitted before forcing a recovery by mode setting commands and responses.

(b) Outstanding Frames, K3. This counter shall be used to track the maximum number of frames that can be outstanding on the ADAS/AWOS link.

50.2.10 Exception Condition Reporting and Recovery. Exception conditions can occur as a result of transmission errors, station malfunction, and/or operational conflicts. The general types of exception conditions and the recovery procedures associated with each are provided in HDLC. This section briefly describes them in the context of the AWOS/ADAS link.

50.2.10.1 No Response. When ADAS detects a no response (timeout) to an outstanding frame, it shall cause the no response counter to be incremented and the requesting frame to be retransmitted. If the counter reaches the maximum permitted number (2 for no response), the AWOS shall be considered nonresponsive. Therefore, ADAS shall transmit a SNRM command to re-initialize the secondary station that did not respond.

50.2.10.2 Busy Condition. A busy condition occurs when an ADAS (or AWOS) cannot receive or continue to receive I frames due to processor constraints, e.g., input buffer saturation or the receiver being occupied in an uninterruptable process. An RNR supervisory frame shall be issued to make the I frame transmitter aware of the exception condition.

When an AWOS receives an RNR, it shall stop sending I frames and shall not resume until the ADAS issues a command (e.g., an I RR) with the P-bit set to 1.

If ADAS receives an RNR, it shall routinely issue a command, usually RR or I, with the P-bit set to 1. The secondary station (AWOS) shall continue to report the busy condition with an RNR response until that condition has cleared.

50.2.10.3 FRMR Condition. If the received frame's control field is uninterpretable and the FCS is good, the secondary station (AWOS) shall issue a FRMR response having an I-field as defined in Paragraph 7.3.2.2 of ISO 4335.

50.2.10.4 N(S) Sequence Errors. An N(S) error occurs at a receiving station when an I frame is received containing an unexpected sequence number N(S). The receiving station shall then issue a RR frame with N(R) set to the lowest frame number of the sequence that is required to be retransmitted.

50.2.11 Link Constraints. See Appendix VI, Section 60.

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APPENDIX VI

60. LINK CONSTRAINTS

60.1 Objective. The objective of this appendix is to demonstrate that the NICS transmission equipment designed to serve the AWOS/ADAS link can handle the expected communications load.

60.2 Method. A worst case analysis is used to demonstrate that normal load conditions will not saturate the transmission media.

60.3 Characteristics and Assumptions. Communication link characteristics are described in the main body and prior appendices of this ICD. A summary of link characteristics and analysis assumptions is provided in Table 60-1. Column 1 provides a characteristic or assumption parameter. Column 2 lists, where appropriate, the engineering units used. Column 3 provides the corresponding value (or description).

As indicated in the table, a maximum of 10 AWOS may be linked on a single multidrop line. It is assumed that all sites connected on a particular link are manned observing locations. NICS has established that the data transmission rate on the AWOS/ADAS link is 2400 bps. The routine polling of each AWOS for the retrieval of current weather data is performed by ADAS on a one minute cycle.

A worst case minute is assumed during which all AWOS sites have severe weather and generate maximum size messages. Lightning flashes are occurring within 30 miles of each site; therefore, ADAS transmits an LAD message to each AWOS. ADAS, to meet its performance requirements, must process critical data received from AWOS within 5 seconds; thus a 55-sec window is available for communications. Data transmittal and retrieval over a 55-second interval permits a minimum aggregate time of 5.5 seconds per AWOS/ADAS transaction.

A range in the number of octets for each of an AWOS Format, a Metar Format, and an LAD Message (including ADU headers) is shown in Table 60-1. The number of octets for an ADAS polling ADU (header only) is also provided in the table.

With respect to the maximum case, there is an aggregate of 493 octets. There are 6 octets of additional overhead, per ADU, because the following data link fields are included in every HDLC I-frame:

Start Flag	1
Address	1
Control Field	1
FCS	2
End Flag	1
Total	6

By convention, it takes one HDLC I-frame to encapsulate one ADU. Therefore, with four ADUs, the aggregate number of octets required to transmit all weather data, ADU overhead, and HDLC I-frame overhead between AWOS and ADAS is 517 (or 4136 bits).

It is assumed that 5% of the 4136 bit data stream contains 5 or more "1-bits" positioned in sequence which causes the data link protocol to use zero bit insertion for code transparency. This action adds ≈5 octets of zeros to the aggregate data stream. The total data stream load would thus be ≈525 octets (or ≈4200 bits) and require 1.75 seconds for transmission. However, a "delay factor" of 2% is assumed, to account for increases in elapsed time of a transmission sequence resulting from factors such as additional link protocol overhead (e.g., an RR or another supervisory frame used to confirm the receipt of data), and link idle time. Thus, the 1.75 second transmission time is increased to 1.79 seconds.

60.4 Results. Because ADAS can dedicate a maximum of 5.5 seconds per AWOS in this worst case scenario, and a maximum of 1.79 seconds are needed for a single transmission sequence, a maximum of 3 sequences per polling cycle is permitted. That is, either 3 failed transactions or two failures plus a success, would require an aggregate transmission time of 5.36 seconds, or about 98% of the communication window (5.5 seconds) allocated to a single AWOS site.

60.5 Conclusions. It is known that more than one-half of the AWOS will be non-towered sites and no operator supplement can be incorporated. Thus, the maximum message length at non-towered sites is reduced by 80 octets. Moreover, NICS has indicated that 8 AWOS is a more realistic maximum number of sites, and more typically, only 3-4 AWOS will be connected per multidrop line. Consequently, the 2400 bps synchronous communication link should readily handle AWOS/ADAS data volume and communications load.

Table 60-1. Summary of Link Characteristics and Input Assumptions

PARAMETER	UNITS	VALUE
	(a) Characteristics	
Link Configuration	-	Simulated Multidrop
Transmission rate	bps	2400
Polling Cycle	per min	1
Application Layer (ADUs)		
ADAS Poll of AWOS	octets	2
AWOS Format Message	"	70-230
Metar Format Message	"	20-246
LAD Message	"	8- 18
SHEF Message	"	
DSM or MSM Message	"	
Sum (6 ADUs)	"	112-493
HDLC "I" Frames (4)	"	24
Data Stream Total		136-517
	(b) Assumptions	
AWOS Configuration	-	Manned Observing Locations
Number of AWOS	-	10
Communications window,		
All sites	sec	55
Per site	"	5.5
Zero bit insertion	%	5
Communications overhead	%	2

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time: Time of occurrence of indicated maximum temperature, minimum temperature, and minimum sea-level pressure. Time shall be reported in hours and minutes, Local Standard Time (LST), using a 24-hour clock.

TnTnTn: Calendar day's (midnight to midnight, LST) minimum temperature reported in whole degrees Fahrenheit.

MMM: Yesterday's observed daytime maximum temperature, from 07:00 LST yesterday to 19:00 LST yesterday. The temperature shall be reported in whole degrees Fahrenheit and used for MOS Forecast Verification.

NNN: Yesterday's observed nighttime minimum temperature, from 19:00 LST day before yesterday to 08:00 LST yesterday. The temperature shall be reported in whole degrees Fahrenheit and used for MOS Forecast Verification.

SLPmm: Minimum sea-level pressure for the day (midnight to midnight, LST) reported to the nearest 0.01 inches of Hg.

PPPP: Total water equivalent precipitation for the day (midnight to midnight, LST). Value shall be reported in hundredths of an inch.

P_nPPP: Hourly precipitation amounts for each of the 24 hours of the observing day. The value of n ranges from 1 to 24, where P_1PPP equals the hourly precipitation amount for 00:00 to 01:00 LST. The precipitation values shall be reported in hundredths of a inch.

FaFaFa: Average 2-minute wind speed reported in tenths of miles per hour.

dd: Direction of the 2-minute fastest wind speed reported in tens of degrees.

fff: Speed of the 2-minute fastest wind speed reported in miles per hour.

tttt: Time of the 2-minute fastest wind speed reported in hours and minutes (LST) using a 24-hour clock.

DD: Direction of the day's peak wind reported in tens od degrees.

FFF: Speed of the day's peak wind reported in miles per hour.

TTTT: Time of the day's peak wind occurrence reported in hours and minutes (LST) using a 24-hour clock.

WWWW: Weather Occurrence Symbols (1, 2, and 8 are currently available through automation. Other weather occurrences may be reported through augmentation or when sensors are developed and become operational). A total of five (5) weather codes may be entered in this field.

SSS: Minutes of sunshine reported in whole minutes. (when available or augmented)

SpSpSp: Percentage of sunshine observed reported to the nearest whole percent. (when available or augmented)

SwSwSw: Total amount of unmelted solid precipitation (snowfall and ice pellets) that fell in the 24 hour period ending at midnight LST, reported in tenths of an inch. (when available or augmented)

DDD: Depth of snow, ice pellets, or ice on the ground at a designated observation time reported in whole inches. (when available or augmented)

CsCs: Average daily sky cover from sunrise to sunset reported in tenths of sky cover. (when available or augmented)

CmCm: Average daily sky cover from midnight to midnight LST, reported in tenths of sky cover. (when available or augmented)

(Remarks): See Table 80-1 for remarks used to indicate estimated data. Parentheses indicate that this field is transmitted only when estimated data is contained in the summary message.

Remark	Definition
ET	Estimated Temperature Data
EPr	Estimated Pressure Data
EP	Estimated Precipitation Data
EW	Estimated Wind Data
ES	Estimated Sunshine Data
ESw	Estimated Snowfall Data
ESd	Estimated Snow Depth Data
EC	Estimated Sky Cover Data

Table 80-1. Remarks Indicating Estimated Data in the Daily Summary Message

80.3.1.1.1 Reporting Criteria. ASOS/AOS shall transmit the primary DSM for the previous day, on the following day at the scheduled time entered by the ASOS/AOS System Manager. If the first transmission is not successful, then ASOS/AOS shall retransmit the DSM one hour later, and if necessary, a third attempt shall be made two hours later. ASOS/AOS shall also transmit corrected primary DSMs at 00:30 LST at the end of the fourth day (see paragraph 80.2.4).

80.3.1.2 Intermediate Daily Summary Message. The content and format of the intermediate DSM is essentially the same as the primary DSM. The only differences are the addition of the message valid time (ZZZZ), the removal of "COR" for corrected reports, removal of the percentage of sunshine possible (SpSpSp), and the removal of the average daily sky cover information (CsCsCmCm). Since ASOS/AOS updates the daily summary product every hour, on the hour, the message valid time (ZZZZ) will always be a whole hour value (e,g., 0600, 0700, etc.). The format of the intermediate DSM shall be as follows:

YYYY DS ZZZZ DaDa/MoMo SnTxTxTx**time**/SnTnTnTn**time**//SnMMM/SnNNN//
SLPmm**time**/PPPP/P_1PPP/P_2PPP/P_3PPP/P_4PPP/P_5PPP/P_6PPP/P_7PPP/P_8PPP/P_9PPP/
P_{10}PPP/P_{11}PPP/P_{12}PPP/P_{13}PPP/P_{14}PPP/P_{15}PPP/P_{16}PPP/P_{17}PPP/P_{18}PPP/P_{19}PPP/
P_{20}PPP/P_{21}PPP/P_{22}PPP/P_{23}PPP/P_{24}PPP/FaFaFa/ddfffttttt/DDFFFTTTT/WWWWW/
SSS/SwSwSw/DDD/(Remarks)

80.3.1.2.1 Reporting Criteria. ASOS/AOS shall transmit the intermediate DSM up to three times during the day. At these intermediate times, the DSM, as updated so far for the day, shall be transmitted. The three optional intermediate transmission times shall be programmable by the ASOS/AOS site's system manager.

80.3.2 Monthly Summary Message. This section contains a description of the Monthly Summary Message. The monthly summary shall accommodate all the necessary data to be transmitted to complete the Preliminary Local Climatological Data (PLCD) for the month. The Monthly Summary Message shall be constructed and transmitted according to the following format:

YYYY MS (COR) MoMo SnTxTxTx-DxDxDxDxDxDx/SnTnTnTn-DnDnDnDnDnDn/
SnTxTxTx/SnTnTnTn/SnTTT/$Dx_{32}Dx_{32}Dx_{90}Dx_{90}Dn_{32}Dn_{32}Dn_{00}Dn_{00}$/HHHH/
CCCC/XXXXX/SLP/SLPmmDmDm**time**(+)/SLPnnDnDn**time**(+)/MpMpMpMpMp/
$Pd_{01}Pd_{01}Pd_{10}Pd_{10}Pd_{50}Pd_{50}Pd_{100}Pd_{100}$/PmPmPmPmDpDpDpDp(+)/$P_5$PPDDTTTT/
P_{10}PPPDDTTTT/P_{15}PPPDDTTTT/P_{20}PPPDDTTTT/P_{30}PPPDDTTTT/P_{45}PPPDDTTTT/
P_{60}PPPDDTTTT/P_{80}PPPDDTTTT/P_{100}PPPDDTTTT/P_{120}PPPDDTTTT/P_{150}PPPDDTTTT/
P_{180}PPPDDTTTT/SSSSSpSpSp/SmSmSmDsDsDsDs(+)/SgSgSgSgDmDm(+)/
McMcMpcMpcMcdMcd/(Remarks)

Explanation of Monthly Summary Message Text:

NOTE: Some of the field lengths shown in this explanation are maximum values. Please refer to section 80.4 for further clarification and for any exceptions to the values listed in this explanation.

YYYY: Three or four character alphanumeric station identifier.

MS: ASCII "MS" indicating Monthly Summary code.

(COR): ASCII "COR" indicating Correction. The parentheses indicate that this field is not routinely transmitted.

MoMo: Month of the year (01-12).

Sn: Indicates whether the value is negative (-) or positive (blank).

TxTxTx: Maximum temperature observed during the month reported in whole degrees Fahrenheit.

- : Indicator that date information follows and up to three dates may be encoded.

DxDx: Date(s) of occurrence of TxTxTx (01-31).

TnTnTn: Minimum temperature observed during the month reported in whole degrees Fahrenheit.

DnDn: Date(s) of occurrence of TnTnTn (01-31).

$\overline{\text{TxTxTx}}$: Average daily maximum temperature reported to the nearest 0.1 of a degree Fahrenheit.

$\overline{\text{TnTnTn}}$: Average daily minimum temperature reported to the nearest 0.1 of a degree Fahrenheit.

$\overline{\text{TTT}}$: Average monthly temperature reported to the nearest 0.1 of a degree Fahrenheit.

$Dx_{32}Dx_{32}$: Number of days with a maximum temperature less than or equal to 32 degrees Fahrenheit (encoded as two digits).

$Dx_{90}Dx_{90}$: Number of days with a maximum temperature greater than or equal to 90 degrees Fahrenheit (use 70F in NWS Alaska Region). Value shall be encoded as two digits.

$Dn_{32}Dn_{32}$: Number of days with a minimum temperature less than or equal to 32 degrees Fahrenheit (encoded as two digits).

$Dn_{00}Dn_{00}$: Number of days with a minimum temperature less than or equal to 0 degrees Fahrenheit (encoded as two digits).

HHHH: Monthly total of heating degree days.

CCCC: Monthly total of cooling degree days.

$\overline{\text{XXXXX}}$: Monthly mean station pressure reported to the nearest 0.005 inch of Hg.

$\overline{\text{SLP}}$: Monthly mean sea-level pressure reported to the nearest 0.01 inch of Hg.

SLPmm: Monthly maximum sea-level pressure reported to the nearest 0.01 inch of Hg.

DmDm: Date of occurrence of SLPmm (01-31).

time: Time of occurrence of SLPmm and SLPnn reported in hours and minutes (LST) using a 24-hour clock.

(+) : "+" indicates last of several occurrences. The parentheses indicate that this field is not routinely transmitted.

SLPnn: Monthly minimum sea-level pressure reported to the nearest 0.01 inch of Hg.

DnDn: Date of occurrence of SLPnn (01-31).

MpMpMpMpMp: Monthly total precipitation (water equivalent) reported to the nearest 0.01 of an inch.

$Pd_{01}Pd_{01}$: Number of days with the precipitation greater than or equal to 0.01 of an inch.

$Pd_{10}Pd_{10}$: Number of days with the precipitation greater than or equal to 0.10 of an inch.

$Pd_{50}Pd_{50}$: Number of days with the precipitation greater than or equal to 0.50 of an inch.

$Pd_{100}Pd_{100}$: Number of days with the precipitation greater than or equal to one inch.

PmPmPmPm: Greatest precipitation in 24 hours (water equivalent) reported to the nearest 0.01 of an inch.

DpDpDpDp: Date(s) of occurrence of PmPmPmPm (01-31).

P_5PP: Short duration precipitation (5 minute maximum) reported to the nearest 0.01 of an inch.

DD: Date on which the short duration precipitation period ended (01-31).

TTTT: Time that identifies the ending of the specific short duration precipitation period. Time shall be reported in hours and minutes (LST) using a 24-hour clock.

$P_{10}PPP$: Short duration precipitation (10 minute maximum) reported to the nearest 0.01 of an inch.

$P_{15}PPP$: Short duration precipitation (15 minute maximum) reported to the nearest 0.01 of an inch.

$P_{20}PPP$: Short duration precipitation (20 minute maximum) reported to the nearest 0.01 of an inch.

$P_{30}PPP$: Short duration precipitation (30 minute maximum) reported to the nearest 0.01 of an inch.

$P_{45}PPP$: Short duration precipitation (45 minute maximum) reported to the nearest 0.01 of an inch.

$P_{60}PPP$: Short duration precipitation (60 minute maximum) reported to the nearest 0.01 of an inch.

$P_{80}PPP$: Short duration precipitation (80 minute maximum) reported to the nearest 0.01 of an inch.

$P_{100}PPP$: Short duration precipitation (100 minute maximum) reported to the nearest 0.01 of an inch.

$P_{120}PPP$: Short duration precipitation (120 minute maximum) reported to the nearest 0.01 of an inch.

$P_{150}PPP$: Short duration precipitation (150 minute maximum) reported to the nearest 0.01 of an inch.

$P_{180}PPP$: Short duration precipitation (180 minute maximum) reported to the nearest 0.01 of an inch.

SSSS: Hours of sunshine reported to the nearest 0.1 of an hour.

SpSpSp: Percentage of sunshine observed reported the nearest whole percent.

SmSmSm: Greatest snowfall in 24 hours reported to the nearest 0.1 of an inch.

DsDsDsDs: Date(s) of occurrence of SmSmSm (01-31).

SgSgSgSg: Greatest snow depth during the month reported to the nearest whole inch.

DmDm: Date of occurrence of SgSgSgSg (01-31).

McMc: Number of clear days (00-31).

MpcMpc: Number of partly cloudy days (00-31).

McdMcd: Number of cloudy days (00-31).

(Remarks): See Table 80-2 for remarks used to indicate estimated data. Parentheses indicate that this field is transmitted only when estimated data is contained in the summary message.

Remark	Definition
ET	Estimated Temperature Data
EPr	Estimated Pressure Data
EP	Estimated Precipitation Data
ES	Estimated Sunshine Data
ESw	Estimated Snowfall Data
ESd	Estimated Snow Depth Data
EC	Estimated Sky Cover Data

Table 80-2. Remarks Indicating Estimated Data in the Monthly Summary Message

80.3.2.1 Reporting Criteria. ASOS/AOS shall transmit the MSM for the previous month on the first day of the following month at the scheduled time entered by the ASOS/AOS System Manager. If the first transmission is not successful, then ASOS/AOS shall retransmit the MSM one hour later, and if necessary, a third attempt shall be made two hours later. ASOS/AOS shall also transmit corrected MSMs at 00:30 LST at the end of the fourth day (see paragraph 80.2.4).

80.4 Encoding Convention. The following encoding rules shall be applied to all Daily and Monthly Summary Messages.

- Individual octets shall be encoded in ASCII characters.
- ASOS/AOS shall encode the messages to the fullest extent for which data exist. After the last data field for which data exist is encoded, the remainder of the summary message is truncated, followed by the appropriate remarks.
- Temperature data shall be encoded in at least two digits, excluding the Sn character (e.g., -2F = -02, 0F = 00, 99F = 99, and 105F = 105).
- Minimum sea-level pressure shall always have three digits encoded (e.g., 29.99 = 999).
- Precipitation amounts shall be encoded as; "0" (non-occurrence), "T" (trace), or the observed amount (e.g., 0.01 of an inch = 01, 1.11 inches = 111, 23.11 inches = 2311).
- Wind speeds shall be encoded in at least two digits.
- Wind direction shall always be encoded in two digits.
- Times of occurrence shall be entered in four digits and based on a 24-hour clock (e.g., 00:23 LST = 0023, 20:45 LST = 2045).
- Days and months shall always be encoded as two digits (e.g., 01, 12, 31).
- Minutes of sunshine shall have at least one digit encoded (e.g., no minutes of sunshine = 0, 9 minutes = 9, 54 minutes = 54, 245 minutes = 245).
- Percentage of sunshine shall be encoded in at least two digits (e.g., no sunshine = 00, 09% = 09, 90% = 90, 100% = 100).
- The DSMs and MSMs shall not exceed 245 and 260 bytes/octets in length, respectively.

APPENDIX IX

90. AVIATION ROUTINE WEATHER REPORT (Metar) FORMAT WEATHER MESSAGES

90.1 Purpose. On a date to be announced, the United States intends to convert to the use of Aviation Routine Weather Report (Metar) Format Weather Messages. Metar Messages shall be prepared by National Weather Service (NWS) Automated Surface Observing Systems (ASOS), Department of Defense (DoD) Automated Observing Systems (AOS), and FAA's AWOS Data Acquisition System (ADAS) for dissemination to and utilization by the National Airspace System (NAS), NWS, and their end users. At the time of conversion all weather information systems will be required to recognize, process, and distribute this new format.

The Metar Format Weather Message is to be a replacement for the Surface Aviation Observation (SAO) Format Weather Message. For details of the latter message type, as generated by ADAS for dissemination to WMSCR, see Appendix II of Revision C of this ICD.

To enhance display and printout readability of Metar Format messages generated by ADAS and ASOS/AOS, ADAS and ASOS/AOS shall break Metar Format messages into new lines. Any characters inserted in the Metar message as a result of this new line processing shall not count toward the maximum Metar Format message length total of 240 characters. The ADAS and ASOS/AOS shall divide the message into printable and displayable lines by the insertion of ASCII control characters as follows:

(a) No separate line shall exceed sixty-nine (69) printable characters, including ASCII space characters.

(b) Each line shall be separated from the next successive line by the insertion of a seven (7) character group consisting of: two (2) ASCII Carriage Returns (CR, 13 decimal); one (1) ASCII Line Feed (LF, 10 decimal); and four (4) ASCII spaces (_, 32 decimal).

(c) The last line of the message shall be terminated by the insertion of the three (3) character group consisting of two (2) ASCII CR's and one (1) ASCII LF.

(d) Each line, except the last, shall be broken only following a Metar Format message field separation ASCII space character.

(e) No message characters shall be deleted from the message except as necessary to truncate to 240 message data characters.

90.1.1 Applicability to ASOS and AOS. ASOS and AOS compute sensor readings and manual inputs obtained at their sites directly into reportable data products for inclusion in Metar Format Weather Messages. The remainder of this appendix shall not apply to ASOS/AOS. For details of the ASOS/AOS implementation of the Metar Format Weather Message, see the current issue of the ASOS Specification.

90.1.2 Applicability to ADAS. ADAS shall compute the Metar Format Weather Messages from the contents of the AWOS Format Weather Message (see Appendix I), received from federal and non-federal AWOS, in accordance with the requirements in this appendix. These requirements are derived from algorithm specifications given in NAS Change Proposal (NCP) 17445.

90.2 General Conventions and Criteria.

90.2.1 Source Data and Constraints.

(a) ADAS shall process Metar Format Weather Messages using weather data contained in AWOS Format Weather Messages retrieved from federal and non-federal AWOS.

(b) This appendix describes only the processing of valid, automated-mode, non-test-mode AWOS Format Weather Messages into Metar Format Weather Messages. For details of the detection and disposition of invalid, manual mode, and test mode AWOS Format Weather Messages, see the current issue of the ADAS Specification.

(c) ADAS shall not modify any data originally contained in an AWOS Format Weather Message with the specific intent of editing incorrect or suspect information.

90.2.1.1 ADU Headers. The ADAS shall process for Metar Format conversion the AWOS format messages defined in Table 3-1 as message types I.A.1, I.A.2, I.B.1, and I.B.2, as uniquely identified by their Format ID and Format Type ADU header bytes. In addition, the second ADU header byte, Length Indicator (LI), shall be exactly equal to 68 for messages I.A.1 and I.B.1, and shall be greater than 68, but less than or equal to 228, for messages I.A.2 and I.B.2.

90.2.1.2 AWOS Modes. The AWOS Format Weather Message, Field 18, Site Status, Octet 59, Bits 1, 2, and 3, shall convey AWOS mode information to the ADAS (see 10.3.16 and Table 10-10).

90.2.1.3 AWOS Alert Data. The presence of data (at least one bit set) in the Alert Data field of the AWOS Format Weather Message (see Table 10-2) shall be conveyed to the ADAS only by the appropriate values of the ADU header Format Code field (see Table 3-1, Message types I.B.1 and I.B.2).

90.2.2 Encoding Convention. The Metar Format Weather Message shall be encoded using the standard ASCII character set. Weather symbology used in this document shall follow NCP 14850 unless stated otherwise.

90.2.3 Message Types. There shall be two types of Metar Format Weather Messages: a periodic (scheduled) Aviation Routine Weather Report ("METAR") and a conditional Aviation Selected Special Weather Report ("SPECI").

90.2.3.1 Aviation Routine Weather Report (METAR). A METAR report shall be generated by the ADAS an adaptable number of times per hour (1, 2, 3, 4, 6, and 12 times per hour) per reporting site relative to a single ADAS adaptable hourly routine reporting minute-offset-to-the-hour. The ADAS shall compare these adaptation data to the ADAS UTC time standard to determine the presence of the base hourly routine reporting time for all AWOS, and the presence of any adapted METAR reporting times for individual AWOS within the routine hour. The case when the ADAS current adaptive METAR generation frequency is once per hour (a periodicity of 60 minutes) for a given AWOS shall be hereafter termed "METAR Option 1". The case when the ADAS current adaptive METAR generation frequency is other than once per hour for a given AWOS shall be hereafter termed "METAR Option 2". When METAR Option 2 is in effect for a given AWOS, the special reports described in 90.2.3.2 and 90.2.3.3 shall not be generated.

90.2.3.2 Aviation Selected Special Weather Report (SPECI). Only when METAR Option 1 is in effect, a SPECI report shall be generated whenever predefined atmospheric conditions are met, with the exception that when a routine (METAR) report is in preparation and special conditions are detected, then the REPORT TYPE shall be METAR (see 90.3.2.1). Criteria described in 90.2.3.2.1 through 90.2.3.2.9 shall be used to determine the generation of a Metar Format SPECI special report. With the exception of the Urgent Weather condition (90.2.3.2.9), the ADAS shall not use the contents of the AWOS Format Weather Message Alert Data Field 4 (see 10.3.4 and Table 10-2) for the purpose of detecting these conditions.

90.2.3.2.1 Ceiling. A ceiling SPECI report shall be generated if a ceiling forms or dissipates below, decreases to less than, or if below, increases to equal or exceed one of the following:

(a) 3000 feet.

(b) 1500 feet.

(c) 1000 feet.

(d) 500 feet.

(e) The lowest standard local landing minimum published nationally in the National Ocean Survey (NOS) U. S. Terminal Procedures (see

90.2.3.3.1, special reports based on local thresholds) if available, or, if not available, 200 feet.

See 90.3.2.9.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.2 Sky Condition. A sky condition SPECI report shall be generated if a layer of clouds or obscuring phenomena aloft is present below 1000 feet and neither clouds nor obscuring phenomena aloft below 1000 feet were reported in the preceding METAR or SPECI report. The same criterion applies equally to the highest instrument landing minimum applicable to the airport (see 90.2.3.3.2, special reports based on local thresholds). See 90.3.2.9.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.3 Visibility. A visibility SPECI report shall be generated if the reported AWOS visibility decreases to less than, or if below, increases to or exceeds one of the following thresholds:

(a) 3 miles.

(b) 2 miles.

(c) 1 mile.

(d) The lowest standard local landing minimum published nationally in the NOS U. S. Terminal Procedures (see 90.2.3.3.3, special reports based on local thresholds) if available, or, if not available, 0.5 miles.

See 90.3.2.6.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.4 (deleted).

90.2.3.2.5 Wind Shift. A wind shift SPECI report shall be generated if the absolute value of the difference between the current AWOS true wind direction and the wind direction valid 15 minutes ago is 45 degrees or more, and the absolute value of the difference between the current wind direction and the wind shift direction associated with the previous wind shift SPECI report (if it exists) is 45 degrees or more, and all AWOS average wind speeds from the current to 15 minutes ago inclusive equal or exceed 10 knots. See 90.3.2.12.1.2.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.6 Lightning Activity. A lightning activity SPECI report shall be generated if the value of the bit defined as Subfield S of the Lightning Activity Field (Octet 57, Bit 0) of the AWOS Format Weather Message is set to the value 1 (see 10.3.15.1). However, note that if all 16 bits of this field are set to one, lightning data is not available, Subfield S is undefined, and no special shall be generated. This bit is set by the ADAS in the LAD message when any of the following conditions are detected: (1) Lightning first appears

at a distance of less than or equal to 10-miles from the Airport Location Point (ALP), and Lightning ceases to be reported in this area. In each case the specific ALP for a given AWOS site shall be that stated in the Airport/Facility Directory (AFD).

90.2.3.2.7 Precipitation. A precipitation SPECI report shall be generated if precipitation of the following types begins/ends, or (except for hail) changes in intensity:

(a) Hail.

(b) Freezing precipitation.

(c) Ice pellets.

See 90.3.2.8.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.8 Runway Visual Range (RVR). When RVR data is available, an RVR special report shall be generated when either of the following conditions obtain: (1) at least 10 consecutive minutes of RVR values at or above 2400 feet are followed by a value below 2400 feet, or (2) at least 10 consecutive minutes of RVR values below 2400 feet are followed by a value at or above 2400 feet. See 90.3.2.7.2 for AWOS Format Weather Message source data requirements.

90.2.3.2.9 Urgent Weather). An urgent weather selected special report shall be generated when Tornado, Funnel Cloud, and/or Waterspout are detected, and when they end or disappear from sight. See 90.3.2.12.1.1.2 for AWOS Format Weather Message source data requirements.

90.2.3.3 Special Reports Based on Local Thresholds. Only when METAR Option 1 is in effect, special reports (SPECI) shall be generated to indicate that a locally adaptable threshold (e.g. a local visibility minimum) has been reached. The ADAS shall maintain all local threshold values, up to the maximum numbers indicated below, for all interfacing federal and non-federal AWOS.

90.2.3.3.1 Ceiling. A ceiling forms or dissipates below, decreases to less than, or if below, increases to equal or exceed nationally published landing minima for an airport (up to six threshold values).

90.2.3.3.2 Sky Condition. A layer of clouds or obscuring phenomena aloft is present at or below the highest instrument landing minimum applicable to the airport, and neither clouds nor obscuring phenomena aloft were reported below this height in the previous METAR or SPECI report (ADAS need maintain only this highest minimum).

90.2.3.3.3 Visibility. Reported visibility decreases to less than, or if below, increases to or exceeds any nationally published minima applicable to the airport (up to six threshold values).

90.2.4 REMARKS. The conditions identified in the following paragraphs shall cause REMARKS to be encoded into the Metar Format Weather Message. Multiple REMARKS shall be encoded in the order that the associated conditions are presented in the following paragraphs.

90.2.4.1 Automated REMARKS. The detection of prespecified atmospheric conditions shall cause the encoding of automated REMARKS.

90.2.4.1.1 Urgent Weather. When the criteria for generating the urgent weather SPECI report are met (see 90.2.3.2.9), the urgent weather REMARK shall be encoded in the report.

90.2.4.1.1.A Station Type. The station type REMARK shall be encoded in every Metar format weather message.

90.2.4.1.2 Wind Shift. When the criteria for generating the wind shift SPECI report are met (see 90.2.3.2.5), the wind shift REMARK shall be encoded in the report.

90.2.4.1.3 Variable Visibility. If the Automated Remarks Field 22 of the AWOS Format Weather Message contains the Variable Visibility remark (see 10.3.20.1), then the Variable Visibility REMARK shall be encoded into the Metar Format Weather Message.

90.2.4.1.4 Automated Lightning. The Automated Lightning REMARK shall be reported in every Metar message when there is an automated lightning remark present in the AWOS Format Weather Message (see 10.3.19 and 10.3.20.1).

90.2.4.1.5 Present Weather Begin/End. If available, each start and stop of any monitored present weather type shall be encoded in only those METAR messages occurring at exactly the minute-offset-to-the-hour. However, each start and stop of thunderstorm activity and tornadic activity shall also be encoded in all Metar messages.

90.2.4.1.6 Pressure Falling/Rising. Pressure data shall be evaluated for the following conditions and encoded into all special and hourly routine reports. PRESSURE FALLING/RISING RAPIDLY shall be reported when a pressure

change of more than 0.025 inches (inHg) occurs between the current AWOS time and 20 minutes previous.

90.2.4.1.7 Sea-Level Pressure. A sea-level pressure REMARK shall be encoded in every Metar format weather message for which there is engineering data.

90.2.4.2 Plain Language REMARKS. An operator at federal and non-federal AWOS may optionally enter manual remarks in Field 23 of the AWOS Format Weather Message (10.3.21). When the AWOS is operating in the automated mode, any such current remarks shall be incorporated by the ADAS without editing into the plain language REMARK of all Metar Format messages.

90.2.4.3 Additive Data REMARKS. Additive data shall comprise several meteorological and/or climatological parameters, as well as specific missing data indications for weather and RVR. Individual additive data parameters shall be incorporated into the routine report(s) indicated below.

90.2.4.3.1 1-Hour Precipitation. 1-hour precipitation accumulation shall be reported in each routine report (METAR) generated on the hourly minute.

90.2.4.3.2 3- and 6-Hour Precipitation. 3- and 6-hour precipitation accumulation shall be reported on a 3-hour cycle beginning at 00 UTC in only the routine report (METAR) generated on the hourly minute. 6-hour precipitation accumulation shall be reported only at 00, 06, 12, and 18 UTC. 3-hour precipitation accumulation shall be reported only at 03, 09, 15, and 21 UTC.

90.2.4.3.3 24-hour Precipitation. 24-hour precipitation accumulation shall be reported at 12 UTC in only the routine report (METAR) generated on the hourly minute.

90.2.4.3.4 6-hour Maximum Temperature. 6-hour maximum temperature shall be reported at 00, 06, 12, and 18 UTC in only the routine report (METAR) generated on the hourly minute.

90.2.4.3.5 6-hour Minimum Temperature. 6-hour minimum temperature shall be reported at 00, 06, 12, and 18 UTC in only the routine report (METAR) generated on the hourly minute.

90.2.4.3.6 24-hour Maximum/Minimum Temperature. For a given AWOS, maximum and minimum temperatures for the previous 24 hours of AWOS local standard time shall be reported once daily at 00 hours, AWOS local standard time, in only the routine report (METAR) generated on the hourly minute.

90.2.4.3.7 3-hour Pressure Tendency. 3-hour pressure tendency shall be reported on a 3-hour cycle starting at 00 UTC in only the routine report (METAR) generated on the hourly minute.

90.2.4.3.8 Precipitation Identifier Information Not Available. "PWINO" shall be reported in all Metar Format Weather messages when the condition is detected, except from AWOS stations of STATION TYPE A01.

90.2.4.3.8.A Precipitation Accumulator Information Not Available. "PNO" shall be reported in all Metar Format Weather messages when the condition is detected.

90.2.4.3.9 Freezing Rain Information Not Available. "FZRANO" shall be reported in all Metar Format Weather messages when the condition is detected, except from AWOS stations of STATION TYPE A01.

90.2.4.3.10 Thunderstorm Information Not Available. "TSNO" shall be reported in all Metar Format Weather messages when the condition is detected.

90.2.4.3.11 RVR Information Not Available. "RVRNO" shall be reported in all Metar Format Weather messages when the condition is detected, except from AWOS stations of STATION TYPE A01.

90.2.5 Missing Weather Data. Information for Metar Fields 1-4 shall be encoded as described in the related paragraphs 90.3.2.1 through 90.3.2.4. For the remaining engineering data and REMARK fields, there are two cases which ADAS can detect in the AWOS Format Weather Message which lead to the condition of data missing for a Metar Format field: first, an AWOS sensor has not been installed; second, an AWOS sensor is installed but not operating (for example, it is down for maintenance). Procedures for ADAS detecting these missing conditions in the AWOS Format Weather Message vary depending on the nature of the field and are described in detail under 90.3.2 for each separate Metar field in the paragraphs titled "Source Data". When REMARK fields which rely on a weather product history maintained for a specified period of time by the ADAS do not have the complete required history, the Metar field shall be treated as missing by the ADAS. When the Metar field is missing, and no other direction for indicating a missing condition is given in the associated field descriptor paragraph titled "Encoding Convention", then ADAS shall encode no missing indicator of any sort and no additional field separator for the field.

90.3 Content and Format. The following paragraphs describe the content and format of Metar Format Weather Messages. Paragraph 90.3.1 delineates the general structure of the message, whereas Paragraph 90.3.2 specifies message components.

90.3.1 General Structure. Figure 90-1 delineates the general structure of a Metar Format Weather Message.

90.3.1.1 Message Fields. Table 90-1 details the contents of the Metar Format Weather Message. There are 9 columns of information provided in the table. Columns 1 ("Field") and 2 ("CONTENT") identify a field and its