content, respectively. Column 3 ("FRM") indicates field format, i.e. whether the number of bytes in the field is variable (Var) or fixed (Fix). At a minimum, if a field is not required in every automated Metar message, "Var" is specified. The number of elements or characters comprising a particular variable length field depends on the observed meteorological conditions.

Columns 4 and 5 indicate the number of bytes comprising a field under different conditions. Column 4 ("MIN") represents a minimum Metar field, where exclusion of the field (i.e. 0 bytes) may be encoded as conditions warrant. Column 5 ("MAX") gives the maximum number of characters that shall be encoded in each field of a Metar Message. Column 6 ("COM") is blank or contains a lower case letter that footnotes a comment at the end of the table. Where applicable, Columns 7-8 ("ENG. UNITS" and "RESOLUTION") give engineering data units and resolution, respectively. Column 9 ("EXAMPLE(s)") provides examples.

Because the convention used in building Metar Format Weather Messages dictates the inclusion of a space (ASCII 32D, where "D" indicates decimal or Base 10 numbering) or a solidus or slant ("/", ASCII 47D) to enhance legibility, each is identified, where appropriate, as a distinct element of a single field.

90.3.1.2 Message Length. Each row of Table 90-1 describes a particular field, field component, or byte subtotal for a field. The last several rows summarize Metar Format Weather Message length projections for the different cases (MIN, MAX) considered. The length of a Metar Format Weather Message can vary depending on the hour of day (at 12 UTC more information is generated than at 13 UTC), the number of sensors installed or parameters monitored at an AWOS, the extent of operator remarks, the current weather conditions, or some combination of these variables. While the maximum length of the Metar Format Weather Message as a whole shall be 240 bytes (characters), it will be noticed that this number is less than the sum of the maximum lengths specified in the table for each field. If more than 240 bytes could be encoded in a given Metar Format message, then the message fields shall be encoded in the order given in the table until exactly 240 bytes have been encoded, whereupon processing shall be simply broken off (in mid-field if necessary). No special indication of the occurrence of message truncation shall be incorporated.

90.3.2 Field Components. This paragraph describes the individual fields comprising the automated Metar Format Weather Message. Examples are provided for each field. Metar Format Weather Message examples are completed only up through the current field of interest; however, the separation character (if any), which separates the current field from what would be the next successive field, is always shown as if that next field were present.

For each field, the paragraph entitled "Reporting Criteria" specifies the conditions warranting the encoding of the field, the paragraph entitled "Source Data" specifies the data to be computed into the field value as well

as other data necessary to detect the missing condition, and the paragraph entitled "Encoding Convention" specifies the formatting of the field value into the ASCII character string constituting the literal field.
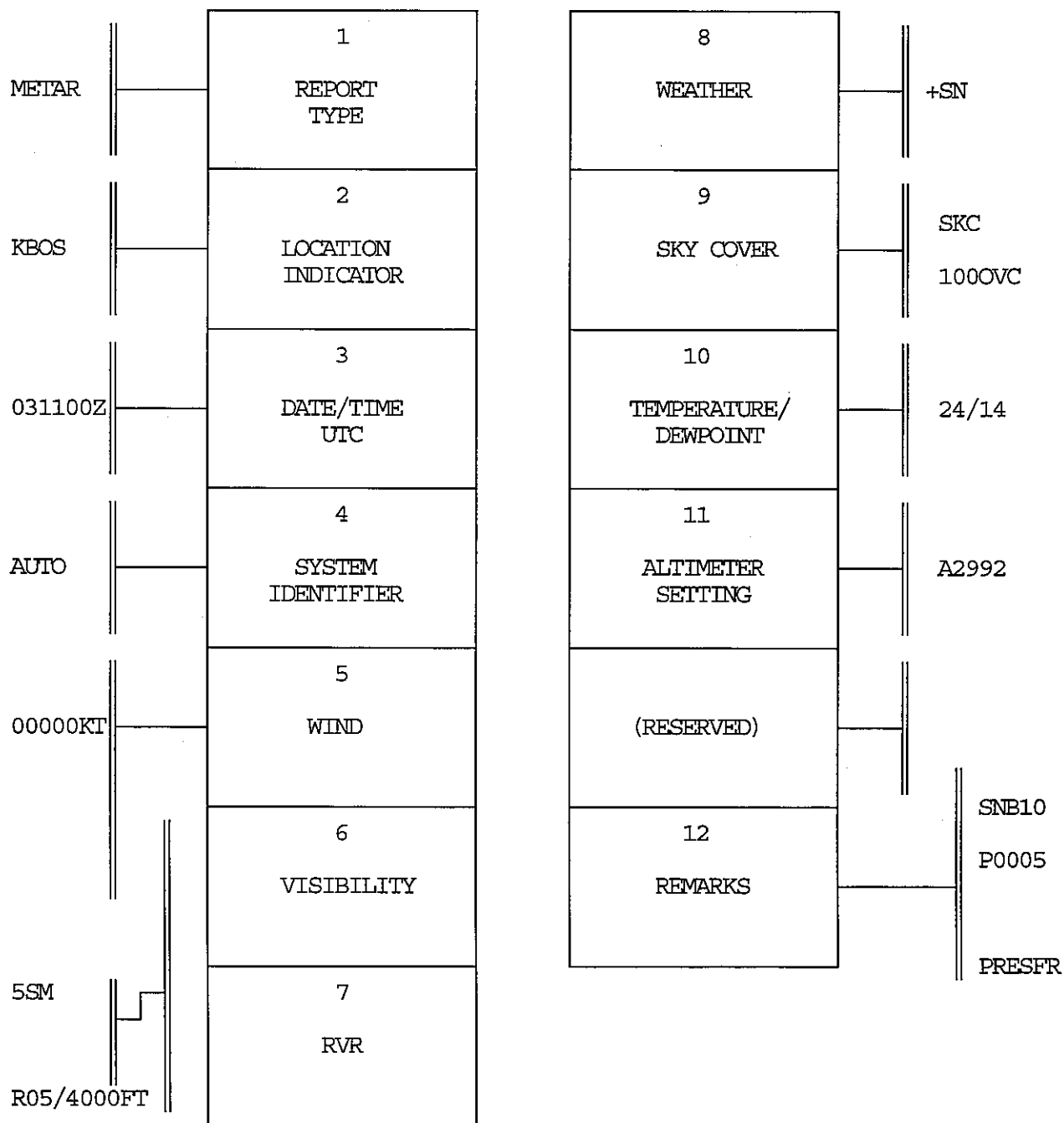
METAR	**1** REPORT TYPE
KBOS	**2** LOCATION INDICATOR
031100Z	**3** DATE/TIME UTC
AUTO	**4** SYSTEM IDENTIFIER
00000KT	**5** WIND
	6 VISIBILITY
5SM	**7** RVR
R05/4000FT	

8 WEATHER	+SN
9 SKY COVER	SKC 100OVC
10 TEMPERATURE/ DEWPOINT	24/14
11 ALTIMETER SETTING	A2992
(RESERVED)	
12 REMARKS	SNB10 P0005 PRESFR

Figure 90-1.   Block Diagram of a Metar Format Weather Message

Table 90-1. Format and Content of the ADAS Automated Metar Format Weather Message

Field	CONTENT	FRM	CHARACTERS MIN	MAX	C O M	ENG. UNITS	RESO- LUTION	EXAMPLE(s)
1	MESSAGE TYPE	Fix	5	5	-		-	METAR, SPECI
1a	Trailing space	Fix	1	1	-		-	_ ("Underscore" character represents blank space)
2	LOCATION INDICATOR	Fix	4	4	-		-	KBOS
2a	Trailing space	Fix	1	1	-		-	_
3	DATE/TIME	Fix	7	7		UTC day,hr,min	date range 01-31;	UTC time range 0000-2359: 031801Z
3a	Trailing space	Fix	1	1	-		-	_
4	SYSTEM IDENTIFIER	Var	0	4	-		-	AUTO (not encoded when manual override or operator remarks detected)
4a	Trailing space	Var	0	1	-		-	_
5	WIND, Subtotal	Var	0	20				050111G150KT_010V110
5.1	DIRECTION	Var	0	3		Deg	Units	Range 000-360: 150
5.2	SPEED	Var	0	3		KT	Units	04; 50; 110
5.3	CHARACTER	Var	0	4		KT	Units	G20; G125
5.3a	DESIGNATOR	Var	0	2	-		-	"KT"
5.3b	SEPARATOR SPACE	Var	0	1	-		-	_
5.4	VARIATION	Var	0	7		Deg;KT	Units	010V080; VRB03KT
5a	Trailing space	Var	0	1	-		-	_
6	VISIBILITY	Var	0	7	a	St.mi	-	1_3/4SM
6a	Trailing space	Var	0	1	-		-	_
7	RVR, Subtotal	Var	0	18	-		-	R22/3500V4000FT; R04R/P6000FT
7.1	Runway ID	Var	0	3		Deg	10s	R24
7.2	Designator	Var	0	1	-		-	L (left), C (center), R (Right)
7.2a	Solidus	Var	0	1	-		-	"/"
7.3	Visual Range	Var	0	13		feet	Units	M1000FT; 1400V2400FT
7a	Trailing space	Var	0	1	-		-	_
8	WEATHER GROUP	Var	0	23	b	-	-	-SN
8a	Trailing space	Var	0	1	-		-	_
9	SKY COVER	Var	0	44		feet	100s	SCT010_BKN014_OVC024
9a	Trailing space	Var	0	1	-		-	_
10	TEMPERATURE/DEWPOINT	Var	0	7		Deg C	Units	15/10; M05/M07; 02/M03
10a	Trailing space	Var	0	1	-		-	_
11	ALTIMETER SETTING	Var	0	5		inHg	100ths	30.02 encoded as A3002
11a	Trailing space	Var	0	1	-		-	_
SUBTOTAL: Fields 1-11			19	154				

Table 90-1. General Format and Content of the Automated Metar Format Weather Message (Continued)

Field	CONTENT	FRM	CHARACTERS MIN	MAX	C O M	ENG. UNITS	RESO-LUTION	EXAMPLE(s)
12	REMARKS, Subtotal	Var	13	306	b			
12a	Indicator	Fix	4	4	-	-		RMK_
12.1	AUTOMATED REMARKS, Subtotal		3	151	b			
12.1.1	Urgent Weather	Var	0	12	-	-		TORNADO; FUNNEL CLOUD; WATERSPOUT
12.1a	Trailing space	Var	0	1	-	-		_
12.1.1.A	Station Type	Fix	3	3	-	-		AO1; AO2
12.1aa	Trailing space	Fix	1	1	-	-		_
12.1.2	Wind Shift	Var	0	8		mins	units	WSHFT_59
12.1b	Trailing space	Var	0	1	-	-		_
12.1.3	Variable Visibility	Var	0	15		St.mi		VIS_1_1/4V1_1/2
12.1c	Trailing space	Var	0	1	-	-		_
12.1.4	Automated Lightning	Var	0	38	-	-		LTG_DSNT_NE; LTG_DATA_MISG
12.1d	Trailing space	Var	0	1	-	-		_
12.1.5	Begin/End	Var	0	59	b			RAB10; GRB05E20B30E45RAB12E25B33E50
12.1e	Trailing space	Var	0	1	-	-		_
12.1.6	Pressure Fall/Rise	Var	0	6	-	-		PRESRR; PRESFR
12.1f	Trailing space	Var	0	1	-	-		_
12.1.7	SEA-LEVEL PRESSURE	Var	0	6		mb	10ths	SLP003
12.1g	Trailing space	Var	0	1	-	-		_
12.2	PLAIN LANGUAGE REMARK	Var	0	80	e	-	-	ACSL_W-NW
12.2a	Trailing space	Var	0	1	-	-		_
12.3	ADDITIVE DATA, Subtotal		0	73	-	-		
12.3.1	1-Hour Precipitation	Var	0	9		inches	100ths	P0020
12.3a	Trailing space	Var	0	1	-	-		_
12.3.2	3/6-Hour Precipitation	Var	0	5		inches	100ths	60001
12.3b	Trailing space	Var	0	1	-	-		_
12.3.3	24-Hour Precipitation	Var	0	5		inches	100ths	71383
12.3c	Trailing space	Var	0	1	-	-		_
12.3.4	6-Hour Max Temperature	Var	0	5		.1 Deg C	units	1P180
12.3d	Trailing space	Var	0	1	-	-		_

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Table 90-1.   General Format and Content of the Automated Metar Format Weather Message (Continued)

Field	CONTENT	FRM	CHARACTERS MIN	MAX	C O M	ENG. UNITS	RESO- LUTION	EXAMPLE(s)
12.3.5	6-Hour Min Temperature	Var	0	5		.1 Deg C	units	2M140
12.3e	Trailing space	Var	0	1		-	-	_
12.3.6	24-Hour Max/Min Temp	Var	0	9		.1 Deg C	units	400001160
12.3f	Trailing space	Var	0	1		-	-	_
12.3.7	3-Hour Pressure Tendncy	Var	0	5		mb	10ths	52130
12.3g	Trailing space	Var	0	1		-	-	_
12.3.8	PWINO	Var	0	5		-	-	PWINO
12.3h	Trailing space	Var	0	1		-	-	_
12.3.8.A	PNO	Var	0	3		-	-	PNO
12.3ha	Trailing space	Var	0	1		-	-	_
12.3.9	FZRANO	Var	0	6		-	-	FZRANO
12.3i	Trailing space	Var	0	1		-	-	_
12.3.10	TSNO	Var	0	4		-	-	TSNO
12.3j	Trailing space	Var	0	1		-	-	_
12.3.11	RVRNO	Var	0	5		-	-	RVRNO

SUBTOTALS: Field(s)

		MIN	MAX	
1-11	(Core Message)	19	154	
12	(REMARKS)	7	310	b
12.1	(Automated REMARKS)	3	151	b
12.2	(Plain Language)	0	81	
12.3	(Additive Data)	0	73	
TOTAL: 1-12	Metar Format Message	26	240	f

a: Resolution is a function of distance
b: Maximum value represents a reasonable upper limit. Where an indicated maximum represents a cumulative value, its magnitude may be less than the sum of its component parts.
c: Maximum number of characters function of 15-minute detection/reporting algorithm
d: Maximum number of characters function of 10-minute detection/reporting algorithm
e: Operator permitted up to 80 characters of input
f: Maximum number of bytes permitted in a Metar Format Weather Message

90.3.2.1 <u>REPORT TYPE (Table 90-1, Field 1)</u>.

90.3.2.1.1 <u>Reporting Criteria</u>. REPORT TYPE shall be encoded into every Metar Format Weather Message.

90.3.2.1.2 <u>Source Data</u>. REPORT TYPE shall be determined in accordance with the requirements stated under paragraph 90.2.3 of this document.

90.3.2.1.3 <u>Encoding Convention</u>. REPORT TYPE, Field 1 of the Metar Format Weather Message, shall be of fixed length, 5 ASCII characters comprising either of the literal character strings "METAR" and "SPECI" in accordance with 90.2.3. When METAR Option 1 is in effect, and a Metar Routine Report is scheduled for generation, the REPORT TYPE encoded shall be "METAR" regardless of whether any of the defined special conditions is detected. A trailing space, ASCII 32D (symbolized in the example by an underscore character "_"), shall be appended to this field to separate it from the contents of Field 2, LOCATION INDICATOR. For example,

SPECI_

90.3.2.2 <u>LOCATION INDICATOR (Table 90-1, Field 2)</u>.

90.3.2.2.1 <u>Reporting Criteria</u>. LOCATION INDICATOR shall be encoded in every automated Metar Format Weather Message.

90.3.2.2.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar data product as follows: Field 1, Site ID, Octets 1 through 4, shall be the engineering data utilized (see 10.3.1).

90.3.2.2.3 <u>Encoding Convention</u>. LOCATION INDICATOR shall be a fixed length field consisting of the exact four ASCII characters extracted from the AWOS Format Weather Message. A trailing space shall be appended to this field to separate it from the contents of Field 3, DATE/TIME. For example,

SPECI_KBOS_

90.3.2.3 <u>DATE/TIME (Table 90-1, Field 3)</u>.

90.3.2.3.1 <u>Reporting Criteria</u>. DATE/TIME (i.e. day of the month and UTC Time) shall be encoded in every Metar Format Weather Message.

90.3.2.3.2 <u>Source Data</u>. The current ADAS day of the month and UTC time of day (hour and minute) shall be computed into this Metar data product.

90.3.2.3.3 <u>Encoding Convention</u>. The DATE/TIME field is symbolically represented as:

YYHHmmZ_

where YY shall be a fixed length 2-character subfield with a leading "0" character as necessary encoding the ADAS day of the month, as adjusted for UTC time, HH shall be a fixed length 2-character subfield with leading "0" characters as necessary encoding the UTC hour of the day on a 24 hour clock basis, mm shall be a fixed length 2-character subfield with leading "0" characters as necessary encoding the minute of the hour, and "Z" shall be the literal ASCII character (90D). A trailing space, ASCII 32D, shall be appended to this field to separate it from the next successive field. For example,

SPECI_KBOS_030705Z_

90.3.2.4   SYSTEM IDENTIFIER (Table 90-1, Field 4).

90.3.2.4.1   Reporting Criteria.   SYSTEM IDENTIFIER shall be encoded into every Metar Format Weather Message, except those derived from an AWOS Format Weather Message where an operator has indicated on-duty (logged-on) status, or where an operator has entered manual override data for Sky Condition, Visibility, and/or Precipitation, or where an operator has entered operator manual remarks.

90.3.2.4.2   Source Data.   The setting of Bit 0, Octet 59, Site Status Field, of the AWOS Format Weather Message, shall be the engineering data utilized to determine that an operator is on duty (logged on) at the AWOS.   The value 15D occurring in Octet 62 Bits 4-7, Octet 63 Bits 0-3, Octet 63 Bits 4-7, Octet 64 Bits 0-3, and/or Octet 65 Bits 0-3 of the AWOS Format Weather Message shall be the engineering data utilized to determine the manual override condition.   The existence of at least 1 character of remarks in the Operator Remarks, Field 23 (see 10.3.21) shall be the engineering data utilized to determine the operator manual remarks condition.   A positive indication at any of these locations shall be sufficient to determine the exclusion of the SYSTEM IDENTIFIER field.

90.3.2.4.3   Encoding Convention.   SYSTEM IDENTIFIER shall be fixed length and comprise 4 bytes.   Metar messages derived from AWOS Format Weather Messages shall encode the fixed ASCII string "AUTO" into the SYSTEM IDENTIFIER field, with the exception that when the logged on operator condition and/or the manual override condition and/or the operator manual remarks condition is detected, the SYSTEM IDENTIFIER field shall not be encoded.   When the SYSTEM IDENTIFIER field is encoded, a trailing space, ASCII 32D, shall be appended to this field to separate it from the contents of Field 5, WIND.   For example,

SPECI_KBOS_030705Z_AUTO_

As information only, and not a requirement for the ADAS, note that the fixed ASCII string "COR_" can be inserted in this field by ASOS/AOS operators to denote a "correction" Metar message sent to correct a problem with a previous message.   An AWOS operator can also insert this field value into a manually-entered Metar message embedded in the operator remarks field of a manual-mode AWOS Format Weather Message.

90.3.2.5 WIND (Table 90-1, Field 5).

90.3.2.5.1 Reporting Criteria. WIND shall be encoded in all automated Metar reports when both WIND DIRECTION and WIND SPEED are not missing. When detected, WIND CHARACTER (gust) shall be reported together with WIND DIRECTION and WIND SPEED. When detected, VARIABLE WIND DIRECTION shall be reported together with WIND DIRECTION, WIND SPEED, and WIND CHARACTER (if present). Field 5 shall consist of up to 4 components: WIND DIRECTION (Field 5.1), WIND SPEED (Field 5.2), WIND CHARACTER (Field 5.3), and VARIABLE WIND DIRECTION (Field 5.4).

VARIABLE WIND DIRECTION detection shall be constituted by the appearance of the automated variable wind remark in the AWOS Format Weather Message.

90.3.2.5.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 10, Wind Direction: True, Octet 34, and Field 11, Wind Speed and Gust, Octets 36 and 37, shall be the engineering data utilized for Metar Fields 5.1, 5.2, and 5.3 (see 10.3.10 and 10.3.11).

For Metar Field 5.4, Field 22, Automated Remarks (Variable Wind), Octets 69+, and Field 21, Automated Remarks Status, Octet 68, Bit 1 shall be the engineering data utilized (see 10.3.19.d and 10.3.20.3). Field 21, bit 1 set, and a valid variable wind remark in Field 22 shall constitute the variable wind condition.

(b) The sensor-not-installed condition for WIND DIRECTION shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 60, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or by the value 254D (FEh) in Octet 34 (see 10.2.7.1). The sensor-not-installed condition for WIND SPEED shall be determined from the value 2 in Field 19, Octet 60, bits 4-7, or by the value 254D (FEh) in Octet 36. For each of WIND DIRECTION and WIND SPEED, both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c) Other indications of a data missing condition for WIND DIRECTION shall be determined from the appropriate values in Field 19 where indicated, or by the value 255D (FFh) in Octet 34 (see 10.2.7.2.b); and for WIND SPEED from the appropriate values in Field 19 where indicated, or by the value 255D (FFh) in Octet 36. For each of WIND DIRECTION and WIND SPEED, both places shall be tested, and an indication in either place shall be sufficient to constitute the condition. Field 21, bit 1 value 0 shall indicate the absence of the variable wind condition.

90.3.2.5.3 Encoding Convention. WIND DIRECTION shall be with respect to true north. WIND DIRECTION shall be a 3-character fixed length field with a

leading "0" character as necessary. Values shall be recorded in Field 5.1 in units of degrees in increments of 10 degrees by appending an ASCII "0" character to the value obtained from the source data. Valid field values shall be from "000" to "360", where "000" represents calm conditions, and "010" to "360" represent winds from 10 degrees to 360 degrees, respectively.

WIND SPEED shall be recorded in whole knots in Field 5.2. It shall be a variable length field comprised of three or two characters. The hundreds digit shall be used only if the WIND SPEED is 100 knots or more. A single leading "0" shall be used with speeds less than 10 knots. Calm conditions are represented by encoding "00" in WIND SPEED. For example, a wind blowing from 30 degrees at 115 knots shall be encoded as:

METAR_KBOS_031400Z_AUTO_030115KT_

Calm conditions shall be encoded as:

METAR_KBOS_031400Z_AUTO_00000KT_

Wind gust shall be the WIND CHARACTER reported by ADAS. WIND CHARACTER shall be a variable length field when present of 3 or 4 characters, encoded in Field 5.3 only when a gust is detected. The value of the detected gust shall be recorded in whole knots and preceded by an upper case "G", ASCII 71D. The hundreds digit shall be used only if the gust is 100 knots or more (e.g. "G105").

The ASCII literal "KT", without a preceding space, shall be appended to Field 5.3 if present, or to Field 5.2 if Field 5.3 is not present. For example, a gust to 30 knots shall be encoded as:

METAR_KBOS_031400Z_AUTO_03015G30KT_

Field 5.4, variable wind, when encoded as follows in the AWOS Format Weather Message, Field 22:

WND aaVbb

shall be represented in Metar Field 5.4 as:

aaaVbbb

i.e. ADAS shall drop the literal "WND_", and shall add trailing "0" characters to both the aa and bb fields, in order to represent direction in whole degrees rather than tens of degrees. A single ASCII space character shall separate "KT" from Field 5.4. For example, wind direction varying between 10 and 80 degrees shall be encoded as:

METAR_KBOS_031400Z_AUTO_03015G30KT_010V080_

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When the AWOS Format Weather Message, Field 22, Automated Variable Wind Remark is encoded as:

VRBkkKT

this Remark shall be literally transferred to constitute the entire contents of Metar field 5. For example, when wind direction varies between 10 and 80 degrees over 2 minutes while the 2-minute average wind speed is 3 KT, wind shall be encoded as:

METAR_KBOS_031400Z_AUTO_VRB03KT_

If WIND DIRECTION or WIND SPEED or both are missing, the entire Metar WIND field, including variable wind, shall be considered missing and shall not be encoded.

An ASCII space character (32D) shall be appended to this Field, when encoded, to separate it from the contents of Field 6, VISIBILITY.

90.3.2.6 <u>VISIBILITY (Table 90-1, Field 6)</u>.

90.3.2.6.1 <u>Reporting Criteria</u>. VISIBILITY shall be encoded in all automated Metar reports when VISIBILITY is not missing.

90.3.2.6.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 6, Visibility, Octets 22 and 23 shall be the engineering data utilized (see 10.3.6 and Table 10-5). Data manually entered by an operator, as indicated by the value 15 in Field 19, Sensor and Sensor Data Status, Octet 64, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), shall be processed no differently than automated data.

(b) The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 64, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 65534D (FFFEh) in Octets 22/23 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 65535D (FFFFh) in Octets 22/23 (see 10.2.7.2.b). Beyond these checks, if the encoded Visibility value in Octets 22 and 23 is not one of the values given in the fourth column, ENCODED VALUE, of Table 10-5, then the Visibility data shall be missing. All places shall be tested, and an indication of any of the foregoing types shall be sufficient to constitute the condition.

90.3.2.6.3 <u>Encoding Convention</u>. The encoding convention for horizontal visibility shall be as shown in Table 90-2, where (note that the first column of this table, labeled AWOS RESOLUTION, is identical to the third column, INDICATED VISIBILITY, of Table 10-5). VISIBILITY shall be reported in statute miles. The literal string "SM" (meaning statute miles) shall be appended to all visibility values. The encoding of VISIBILITY may use from 3 to 7 characters (note that a space, ASCII 32D, shall be inserted between the integral and fractional portions of the detected visibility distance, e.g. 1_1/2, when reported).

For example,

METAR_KBOS_031400Z_AUTO_03015KT_1_3/4SM_

An ASCII space character (32D) shall be appended to this Field to separate it from the contents of Field 7, RVR.

Table 90-2. Encoding Convention for Visibility.

AWOS RESOLUTION Statute Miles	ADAS Metar CONVENTION
0.0	0SM
0.0625	1/16SM
0.125	1/8SM
0.1875	3/16SM
0.25 <	M1/4SM
0.25	1/4SM
0.3125	5/16SM
0.375	3/8SM
0.50	1/2SM
0.625	5/8SM
0.75	3/4SM
0.875	7/8SM
1.00	1SM
1.125	1_1/8SM
1.25	1_1/4SM
1.375	1_3/8SM
1.50	1_1/2SM
1.625	1_5/8SM
1.75	1_3/4SM
1.875	1_7/8SM
2.0	2SM
2.25	2_1/4SM
2.5	2_1/2SM
2.75	2_3/4SM
3.0	3SM
3.5	3_1/2SM
4.0	4SM
5.0	5SM
6.0	6SM
7.0	7SM
8.0	8SM
9.0	9SM
10.0	10SM
11.0	11SM
12.0	12SM
13.0	13SM
14.0	14SM
15.0	15SM
20.0	20SM
25.0	25SM
30.0	30SM
35.0	35SM
40.0	40SM
45.0	45SM
50.0	50SM
55.0	55SM
60.0	60SM
65.0	65SM
70.0	70SM
75.0	75SM
80.0	80SM
85.0	85SM
90.0 +	90SM

*   Underscore represents ASCII space character (32D)

90.3.2.7 <u>RVR (Table 90-1, Field 7)</u>.

90.3.2.7.1 <u>Reporting Criteria</u>. RVR data, when available, shall be included in all SPECI reports, and in only those METAR reports occurring exactly at the adaptable minute-offset-to-the-hour, when the current RVR is 6000 ft or less, and/or visibility, if available, is 1 mile or less.

90.3.2.7.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 13, RVR, Octets 43 through 45, and Field 6, Visibility, Octets 22 and 23, shall be the engineering data utilized (see 10.3.13).

(b) The sensor-not-installed condition for RVR shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 65, bits 4-7 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 44 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c) Other indications of a data missing condition for RVR shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 44 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

(d) The sensor-not-installed condition for Visibility is given in 90.3.2.6.2(b).

(e) Other indications of a data missing condition for Visibility are given in 90.3.2.6.2(c).

90.3.2.7.3 <u>Encoding Convention</u>. The general format of the RVR remark incorporated into each Metar Format Weather Message shall be:

$$RD_RD_R/(V_s)V_RV_RV_RV_RFT \quad or \quad RD_RD_R/(V_s)V_NV_NV_NV_NV(V_s)V_XV_XV_XV_XFT$$

where the symbols above shall be defined as follows:

R: Literal, indicator that runway designator follows.

D_RD_R: Runway designator, 2 or 3 characters with leading 0 as necessary, including L/R/C indication if needed (e.g. "04", "32L")

/: Literal, indicator that visual range data follow.

$V_RV_RV_RV_R$: Constant reportable value in feet of visual range for the past ten minutes.

V_s: Symbol "P" or "M", encoded only when the condition is present, to indicate, respectively, that the following value is either the highest or the lowest reportable value criteria used by the FAA RVR System.

$V_N V_N V_N V_N$: Lowest reportable value in feet of visual range for the past ten minutes.

V: Indicator separating lowest from highest values.

$V_X V_X V_X V_X$: Highest reportable value in feet of visual range for the past ten minutes.

Visual range shall be encoded in units of feet ("VVVV"). If the RVR distance is the lowest reportable value, as determined by the appropriate value in AWOS Message Octet 45, Bits 4-7, the $V_R V_R V_R V_R$ and $V_N V_N V_N V_N$ groups shall be preceded by an "M" character. If the RVR distance is the highest reportable value, as determined by the appropriate value in AWOS Message Octet 45, Bits 4-7, the $V_R V_R V_R V_R$ and $V_X V_X V_X V_X$ groups shall be preceded by a "P" character. The first format shown above shall be encoded only when the visual range is "constant" (i.e. the 10 minutes preceding the report has not varied by at least one hundred feet feet). The second format shown shall be encoded when the 10 minutes preceding the report shows variation of at least one hundred feet.

For example, the following Metar Format Weather Message indicates that Runway 04R currently has a constant visual range greater than 6000 feet.

METAR_KBOS_031400Z_AUTO_03015KT_1_3/4SM_R04R/P6000FT_

Runway 22 currently has a visual range varying between 3500 and 4000 feet.

METAR_KBOS_031400Z_AUTO_03015KT_1_3/4SM_R22/3500V4000FT_

Runway 33L currently has a visual range varying from less than 1000 to greater than 6000 feet.

METAR_KBOS_031400Z_AUTO_03015KT_1_3/4SM_R33L/M1000VP6000FT_

An ASCII space character (32D) shall be appended to this Field to separate it from the contents of Field 8, WEATHER GROUP.

90.3.2.8 <u>WEATHER GROUP (Table 90-1, Field 8)</u>.

90.3.2.8.1 <u>Reporting Criteria</u>. WEATHER GROUP phenomena, when detected, shall be reported in every Metar format weather message.

90.3.2.8.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a)   Field 6, Obscurations, Octets 24 and 25, shall be the engineering data utilized for obscurations (see 10.3.6 and Table 10-6). Field 7, Precipitation Type and Intensity, Octets 28 through 31, shall be the engineering data utilized for liquid, freezing, and frozen precipitation (see 10.3.7 and Tables 10-7 and 10-8). Data manually entered by an operator into Field 7, as indicated by the value 15 in Field 19, Sensor and Sensor Data Status, Octet 63, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), shall be processed no differently than automated data. Field 17, Lightning Activity, Octet 57, Bits 6 and 7, shall be the engineering data utilized for the indication of present thunderstorm (see 10.3.15 and Table 10-9). Field 4, Alert Data, Octet 14 (see 10.3.4 and Table 10-2), shall be the engineering data utilized for detection of tornado (Bit 3), funnel cloud (Bit 4), and waterspout (Bit 5)..

(b)   The sensor-not-installed condition for obscurations shall be determined by the value 65534D (FFFEh) in Octets 24/25 (see 10.2.7.2.a). The sensor-not-installed condition for liquid and frozen precipitation types shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 63, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 14D (Eh) in any of the liquid or frozen precipitation type 4-bit fields within Octets 28-31 (see 10.2.7.2.a). The sensor-not-installed condition for freezing precipitation shall be determined from the value 2 in Field 19, Octet 65, bits 0-3, or from the value 14D (Eh) in any of the freezing precipitation type 4-bit fields within Octets 28-31 (see 10.2.7.2.a). For each of the latter 3 data categories, both places indicated shall be tested, and an indication in either place shall be sufficient to constitute the condition for that category.

(c)   There is no data missing condition defined for tornado, waterspout, and funnel cloud. The data missing condition for obscurations shall be determined from the value 65535D (FFFFh) in Octets 24/25 (see 10.2.7.2.b). Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, and (for thunderstorm) from the value 65535D (FFFFh) in Octets 57/58 (see 10.2.7.2.b), and from the value 15D (Fh) in any of the liquid, freezing, or frozen precipitation type 4-bit fields within Octets 28-31 (see 10.2.7.2.a), and (for individual obscurations, except volcanic ash, and precipitation types) bits not set in Field 20, Parameter Activation Status, Octets 66 and 67 (see 10.3.18 and Table 10-13). All places shall be tested as appropriate for individual parameters or data categories, and an indication in any place shall be sufficient to constitute the condition for that category.

90.3.2.8.3 Encoding Convention. There are a maximum of three types or subgroups of present weather phenomena that shall be reported in the WEATHER GROUP in the following order (when more than one type/subgroup is present): Tornadic Activity, Precipitation, and Obscurations. Note that blowing and drifting precipitation types are treated as members of the Obscuration subgroup, rather than of the Precipitation subgroup. Each type or subgroup, when present, shall be separated from any other type or subgroup by an ASCII space character. Whenever the Weather Group field is present, a space, ASCII 32D, shall be appended to the field to separate it from the contents of Field 9, SKY COVER.

Tornadic and Precipitation phenomena and symbology that shall be used are shown in Table 90-3. With respect to the values given in Field 7 of the AWOS Format Weather Message for the various precipitation types, the "+" intensity character prefix shall be associated with the value 4 (Heavy), no intensity prefix shall be associated with the value 3 (Moderate), and the "-" intensity character prefix shall be associated with the values 2 (Light) and 1 (Trace Occurrence). The "+" intensity prefix followed by the Showers prefix (viz. "+SH") shall be associated with the value 7 (Heavy Showers of the indicated precipitation type), the showers prefix with no intensity prefix shall be associated with the value 6 (Moderate Showers), and the "-" intensity prefix followed by the Showers prefix (viz. "-SH") shall be associated with the value 5 (Light Showers). The Vicinity prefix followed by the Showers prefix, without any intensity prefix, (viz. "VCSH") shall be associated with the value 8. The Low Drifting prefix, without any intensity prefix, (viz. "DR") shall be associated with the value 9. The Blowing prefix, without any intensity prefix, (viz. "BL") shall be associated with the value 10. The Vicinity prefix followed by the Blowing prefix, without any intensity prefix, (viz. "VCBL") shall be associated with the value 11. Note that there are no prefix qualifiers for Hail, Ice Crystals, Small Hail/Snow Pellets, and Undetermined type precipitation. When thunderstorm data is not missing, Octet 57, Bit 6, of the AWOS Format Weather Message shall be tested. If Bit 6 is set, signifying lightning at or within 5 miles of the airport, "TS" shall be encoded, and Bit 7 of Octet 57 shall not be tested. If Bit 6 is not set, then Bit 7 shall be tested. If Bit 7 is set, signifying lightning more than 5 miles from the airport and at or within 10 miles of the airport, "VCTS" shall be encoded. If neither Bit 6 nor Bit 7 is set, no thunderstorm indication shall be encoded.

When present, Thunderstorm and up to 3 additional kinds of precipitation shall be reported in the Precipitation subgroup. Multiple precipitation phenomena shall be encoded in the order of most-intense to least-intense (i.e. in the order of prefixing "+", "" (no prefix), "-", "+SH", "SH", "-SH", and "VCSH": "BL", "DR", and "VCBL" are treated as obscurations), and, when of equal intensity, in the order given in Table 90-3. Thunderstorm shall always be encoded first in the precipitation subgroup; however, when thunderstorm is immediately followed by a precipitation type with an intensity qualifier, then the intensity qualifier shall immediately precede the thunderstorm indication:
SPECI_KBOS_031347Z_AUTO_03015KT_1_3/4SM_R04R/1000FT_+TSVCRA_

Obscuration phenomena and symbology are presented in Table 90-4. Observed conditions of light rain, mist shall be encoded as,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_

Table 90-3. Present Weather Types and Symbology

PRESENT WEATHER TYPE	SYMBOL
Tornado/Waterspout	+FC
Funnel Cloud	FC
Thunderstorm (at the airport)	TS
Thunderstorm (in the vicinity)	VCTS
Freezing Rain	FZRA
Freezing Drizzle	FZDZ
Hail	GR
Small Hail	GS
Ice Pellets	PL
Ice Crystals	IC
Snow	SN
Snow Grains	SG
Rain	RA
Drizzle	DZ
Precipitation (Undetermined type)	UP

Table 90-4.   Obscuration Types and Symbology.

OBSCURATIONS	SYMBOL
Fog*	FG
Ground/Shallow Fog**	MIFG
Partial Fog**	PRFG
Patchy Fog**	BCFG
Freezing Fog**	FZFG
Fog Vicinity**	VCFG
Haze*	HZ
Mist**	BR
Smoke**	FU
Blowing Snow**	BLSN ·
Blowing Dust**	BLDU
Blowing Sand**	BLSA
Blowing Snow Vicinity**	VCBLSN
Blowing Dust Vicinity**	VCBLDU
Blowing Sand Vicinity**	VCBLSA
Blowing Spray**	BLPY
Volcanic Ash**	VA
Drifting Snow**	DRSN
Drifting Dust**	DRDU
Drifting Sand**	DRSA
Sandstorm**	SS
Heavy Sandstorm**	+SS
Sandstorm Vicinity**	VCSS
Duststorm**	DS
Heavy Dustsorm**	+DS
Duststorm Vicinity**	VCDS
Squall**	SQ
Sand/Dust Whirls**	PO
Sand/Dust Whirls Vicinity**	VCPO

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*   Automated entries

**   Manual entries

90.3.2.9 SKY COVER (Table 90-1, Field 9).

90.3.2.9.1 Reporting Criteria. SKY COVER, when not missing, shall be
reported in every Metar Format Weather Message.

90.3.2.9.2 Source Data. Source data from the AWOS Format Weather Message
shall be computed into this Metar weather product as follows:

(a) Field 5, Cloud Layer and Amount, Octets 16 through 21, shall be the
engineering data utilized (see 10.3.5 and Tables 10-3 and 10-4a
through 10-4d). Data manually entered by an operator, as indicated
by the value 15 in Field 19, Sensor and Sensor Data Status, Octet 62,
bits 4-7 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), shall
be processed no differently than automated data.

(b) The sensor-not-installed condition shall be determined from the value
2 in Field 19, Sensor and Sensor Data Status, Octet 62, bits 4-7 (see
10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value
254D (FEh) in Octet 16 (see 10.2.7.2.a). Both places shall be
tested, and an indication in either place shall be sufficient to
constitute the condition.

(c) Other indications of a data missing condition shall be determined
from the appropriate values occurring in Field 19 where indicated, or
from the value 255D (FFh) in Octet 16 (see 10.2.7.2.b). Both places
shall be tested, and an indication in either place shall be
sufficient to constitute the condition.

90.3.2.9.3 Encoding Convention. The sky cover literal phrases that shall be
used for encoding are shown in Table 90-5. "CLR" shall indicate that there
are no clouds within the design limits of the ceilometer. A trailing space,
ASCII 32D, shall be appended to this field to separate its contents from Field
10, TEMPERATURE/DEWPOINT. For example,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_CLR_

The cloud cover contractions "FEW", "SCT", "BKN", and "OVC" shall be followed
immediately by the detected cloud base height as a fixed-length, 3-character
subfield with leading zero(s) as needed (in 100s of feet AGL) and a space
character (ASCII 32D). For example:

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_SCT100_

A maximum of 3 cloud layers shall be encoded in the SKY COVER field. For
example,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-
RA_BR_SCT020_BKN030_OVC050_

indicates that 3 distinct cloud layers were detected, a scattered layer based
at 2000 ft, a broken ceiling based at 3000 ft, and an overcast layer based at
5000 ft.

The contraction "VV" shall indicate the vertical visibility in the presence of
an indefinite ceiling. Four possible height indications can be received from
the AWOS and shall be encoded as follows: "VV000" (see Table 10-4, case 3.a),
"VV002" (see Table 10-4, case 3.b), "VV005" (see Table 10-4, case 3.c), and
"VV007" (see Table 10-4, case 3.d). A message containing the vertical
visibility designator (VV) which signifies the limit of vertical visibility to
200 feet above ground shall be as follows,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_

As information only, and not a requirement for the ADAS, note that AWOS will
voice over VOR the string, for example, "INDEFINITE CEILING TWO HUNDRED", when
the AWOS Format Weather Message contains an indication that ADAS will process
into the Metar message, for example, as "VV002".

Table 90-5.   Sky Cover Symbols Used in the ADAS Metar
Format Weather Message.

SYMBOL	DESCRIPTION
CLR	Clear
FEW	Few clouds
SCT	Scattered clouds
BKN	Broken clouds
OVC	Overcast
VV	Vertical Visibility

90.3.2.10 TEMPERATURE/DEWPOINT (Table 90-1, Field 10).

90.3.2.10.1 Reporting Criteria. TEMPERATURE/DEWPOINT, when TEMPERATURE is not missing, shall be encoded in all automated Metar reports.

90.3.2.10.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 8, Ambient Temperature, Octet 32 and Field 9, Dew Point Temperature, Octet 33 shall be the engineering data utilized (see 10.3.8), where the engineering units for both shall be either whole degrees Fahrenheit plus 100 or whole degrees Celsius plus 100. Field 2, Site Configuration Number, Octet 5, Bit 1 shall indicate the engineering units as follows: 0 = degrees Fahrenheit, 1 = degrees Celsius.

(b) The sensor-not-installed condition for Ambient Temperature shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 61, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 32 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

The sensor-not-installed condition for Dewpoint Temperature shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 61, bits 4-7 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 33 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c) Other indications of a data missing condition for Ambient Temperature shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 32 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 33 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.10.3 Encoding Convention. When temperature and dewpoint are available, ADAS shall first subtract the value 100 decimal from the values found in the source fields. Then, if the source data is in units of degrees Fahrenheit, ADAS shall convert the Fahrenheit values to whole degrees Celsius,

with rounding off to the nearest whole degree Celsius, prior to performing Metar Format encoding.   TEMPERATURE/DEWPOINT shall be encoded as follows:

MTT/MDD_

where "M" is a literal indicating that the TEMPERATURE value is negative (and is encoded only when this condition obtains), TT is a fixed length, 2-character field with leading zero as necessary encoding the TEMPERATURE portion in degrees Celsius, "/" is a literal solidus (slant), ASCII 47D, always separating the TEMPERATURE and DEWPOINT portions, "M" is a literal indicating that the DEWPOINT value is negative (and is encoded only when this condition obtains), and DD is a fixed length, 2-character field with leading zero as necessary encoding the DEWPOINT portion in degrees Celsius.   An ASCII space character, 32D, shall be appended to this field to separate it from the contents of Field 11, ALTIMETER SETTING.   For example,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_

A TEMPERATURE of -6 C and a DEWPOINT of -10 C shall be reported as,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_M06/M10_

When DEWPOINT is missing, only TEMPERATURE shall be encoded, such as,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_M06/_

When TEMPERATURE is missing, the entire TEMPERATURE/DEWPOINT field shall not be encoded.

90.3.2.11   ALTIMETER SETTING (Table 90-1, Field 11).

90.3.2.11.1   Reporting Criteria.   ALTIMETER SETTING, when not missing, shall be encoded in all automated Metar reports.

90.3.2.11.2   Source Data.   Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

   (a) Field 12, Altimeter, Octets 38 and 39 shall be the engineering data utilized (see 10.3.12).

   (b) The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 62, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 65534D (FFFEh) in Octets 38/39 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

   (c) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 65535D (FFFFh) in Octets 38/39 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.11.3   Encoding Convention.   When engineering data is available, ALTIMETER SETTING shall be encoded as follows:

   APPPP_

where "A" is a literal indicating that the altimeter setting is given in units of hundredths of inches of Mercury (inHg), and PPPP is a 4 character, fixed length field, recorded in 100ths of inches of Mercury (e.g. 30.04 shall be encoded as "A3004"). A trailing space, ASCII 32D, shall be appended to this field to separate it from the contents of Field 12, REMARKS, only when Field 12 contains data (as assumed in the following example). For example, 29.46 inHg results in:

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946_

90.3.2.12 REMARKS (Table 90-1, Field 12). REMARKS shall be incorporated
into Field 12 of the automated Metar Format Weather Message. The REMARKS
field shall be subdivided into 3 distinct segments:

  (a) Automated REMARKS

  (b) Plain Language REMARKS

  (c) Additive Data REMARKS

The literal "RMK_" shall be appended to the Metar Format Weather Message prior
to the first REMARK. For example,

METAR_KBOS_031400Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_

90.3.2.12.1 Automated REMARKS (Table 90-1, Field 12.1). Automated REMARKS
shall consist of the following parameters that are reported in the following
order when conditions warrant:

  (a)   Urgent Weather: Tornado, Funnel Cloud, Waterspout

  (b)   Station Type: AO1 or AO2

  (c)   Wind: Wind Shift

  (d)   Visibility: Variable Visibility

  (e)   Present Weather: Automated Lightning and Weather Begin/End

  (f)   Pressure: Pressure Falling/Rising Rapidly and Sea Level Pressure

When relevant criteria for any of these REMARK subgroups are not met, or
engineering data is missing due to sensor or system malfunction, no REMARK
shall be reported for the subgroup unless specifically indicated in the REMARK
description below.

90.3.2.12.1.1 Urgent Weather (Table 90-1, Field 12.1.1).

90.3.2.12.1.1.1 Reporting Criteria. Urgent weather when detected shall be reported in all Metar messages.

90.3.2.12.1.1.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 4, Alert Data, Octet 14 (see 10.3.4 and Table 10-2), shall be the engineering data utilized for detection of tornado (Bit 3), funnel cloud (Bit 4), and waterspout (Bit 5).

(b) There is no data missing condition defined for the urgent weather conditions.

90.3.2.12.1.1.3 Encoding Convention. The urgent weather conditions shall be encoded as:

TORNADO_

FUNNEL_CLOUD_

WATERSPOUT_

For example,

SPECI_KBOS_031403Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_TORNADO_

A space character shall be appended to this REMARK.

90.3.2.12.1.1.A Station Type (Table 90-1, Field 12.1.1.A).

90.3.2.12.1.1.A.1 Reporting Criteria. Station type shall be reported in all Metar messages.

90.3.2.12.1.1.A.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 19, Sensor and Sensor Data Status, Octet 63, Bits 0-3 (see 10.3.17 and Tables 10-11 and 10-12), shall be the engineering data utilized for detection of the precipitation identifier not-installed condition.

(b) There is no data missing condition defined for station type.

90.3.2.12.1.1.A.3 Encoding Convention. The station type shall be encoded as:

AO1_

AO2_

When the AWOS Format Weather Message, Octet 63, Bits 0-3 have the numeric value 2 (sensor not installed), the literal ASCII text "AO1" shall be encoded. For any other value, the literal ASCII test "AO2" shall be encoded.

For example,

SPECI_KBOS_031403Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_TORNADO_AO2_

When there are subsequent REMARKS a space character shall be appended to this REMARK.

90.3.2.12.1.2 Wind Shift (Table 90-1, Field 12.1.2).

90.3.2.12.1.2.1 Reporting Criteria. Wind shift detection shall proceed in accordance with paragraph 90.2.3.2.5. Wind shift shall be reported in all Metar messages after it has been detected through the next hourly routine report.

90.3.2.12.1.2.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 10, Wind Direction: True, Octet 34, and Field 11, Wind Speed: Average, Octet 36 shall be the engineering data utilized (see 10.3.10 and 10.3.11).

(b) The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 60, bits 0-3 (wind direction) and Octet 60, bits 4-7 (wind speed) (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 34 (wind direction) or in Octet 36 (wind speed) (see 10.2.7.2.a). All places shall be tested, and an indication in any place shall be sufficient to constitute the condition for the wind shift REMARK.

(c) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 34 or Octet 36 (see 10.2.7.2.b). All places shall be tested, and an indication in any place shall be sufficient to constitute the condition for the wind shift REMARK.

90.3.2.12.1.2.3 Encoding Convention. Wind shift shall be encoded as:

WSHFT_tt_

where "WSHFT_" is the prefix indicator, and tt is the ADAS UTC time in minutes past the hour, 15 minutes before the wind shift detection event. When there are subsequent REMARKS a space character shall be appended to this REMARK. An example of a reported wind shift follows (note that in this example and all examples that follow, no attempt has been made to follow the exact requirement for line breaks specified in 90.1, and second and successive lines are indented for clarity: examples illustrate content and sequence only):

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_

The "10" following the WSHFT indicates that the shift began at 10 minutes past the hour.

90.3.2.12.1.3 Variable Visibility (Table 90-1, Field 12.1.3).

90.3.2.12.1.3.1 Reporting Criteria. A Variable Visibility REMARK shall be encoded in all those METAR and SPECI messages generated concurrently with its detection. Variable Visibility detection shall be constituted by the appearance of the automated variable visibility remark in the AWOS Format Weather Message.

90.3.2.12.1.3.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 22, Automated Remarks (Variable Visibility), Octets 69+, and Field 21, Automated Remarks Status, Octet 68, Bit 0 shall be the engineering data utilized (see 10.3.19.c and 10.3.20.2). Field 21, bit 0 set, and a valid variable visibility remark in Field 22 shall constitute the variable visibility condition. ADAS shall convert the decimal encoding of the AWOS remark to mixed number format for the Metar REMARK.

90.3.2.12.1.3.3 Encoding Convention. Variable visibility shall be encoded using a mixed number format (i.e. integer value plus a fraction) as follows:

VIS_minVmax_

where "VIS_" is a literal prefix which ADAS shall substitute for the prefix "VSBY_" encoded in the AWOS Format Weather Message Field 22, "V" is a literal delimiter signifying variability, and min and max are variable length fields of from 1 to 5 characters each, representing respectively the minimum and maximum horizontal visibilities in statute miles. A space character shall separate an integer part from a fractional part of a value. When there are subsequent REMARKS an ASCII space character (32D) shall be appended to the REMARK being encoded. For example:

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_

This message indicates an average visibility of 2.5 miles varying between 1.75 and 3 miles.

90.3.2.12.1.4 <u>Automated Lightning (Table 90-1, Field 12.1.4)</u>.

90.3.2.12.1.4.1 <u>Reporting Criteria</u>. An Automated Lightning REMARK shall be encoded in all those METAR and SPECI messages generated concurrently with its detection. Automated Lightning detection shall be constituted by the appearance of the automated lightning remark in the AWOS Format Weather Message.

90.3.2.12.1.4.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 22, Automated Remarks (Automated Lightning), Octets 69+, and Field 21, Automated Remarks Status, Octet 68, Bit 3 shall be the engineering data utilized (see 10.3.19.b and 10.3.20.1). Field 21, bit 3 set, and a valid automated lightning remark in Field 22 shall constitute the presence of the automated lightning condition (note that the literal remark may be an indication of missing data: "LTG_DATA_MISG").

90.3.2.12.1.4.3 <u>Encoding Convention</u>. If Field 22 of the AWOS Format Weather Message contains "LTG_DATA_MISG", an automated lightning remark shall not be encoded, else automated Lightning shall be encoded into this field by repeating the exact, unedited ASCII character sequence of the automated lightning remark from the source Field 22 of the AWOS Format Weather Message, such as:

LTG_DSNT_SW_

where the phraseology is in accordance with Appendix III of this ICD. When there are subsequent REMARKS an ASCII space character (32D) shall be appended to the REMARK being encoded. For example, as in the case of distant lightning southwest of the airport:

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_

When Field 22 of the AWOS Format Weather Message contains "LTG_DATA_MISG", indications will exist to encode the Thunderstorm Information Not Available remark (see 90.3.2.12.3.10).

90.3.2.12.1.5 Present Weather: Begin/End (Table 90-1, Field 12.1.5).

90.3.2.12.1.5.1 Reporting Criteria. The begin/end of thunderstorm activity
and tornadic activity shall be included in all Metar Format Weather Messages.
All other forms of present weather begin/end for the current hour shall be
included in no SPECI, and in only those METAR occurring exactly at the
adaptable minute-offset-to-the-hour (see 90.2.4.1.5).

90.3.2.12.1.5.2 Source Data. Source data from the AWOS Format Weather
Message shall be computed into this Metar weather product as follows:

   (a) Field 7, Precipitation Type and Intensity, Octets 28 through 31,
        shall be the engineering data utilized for liquid, freezing, and
        frozen precipitation (see 10.3.7 and Tables 10-7 and 10-8). Field
        17, Lightning Activity, Octet 57, Bits 6 and 7, shall be the
        engineering data utilized for the indication of thunderstorm-
        present-or-not for each minute (see 10.3.15 and Table 10-9). Field
        4, Alert Data, Octet 14 (see 10.3.4 and Table 10-2), shall be the
        engineering data utilized for detection of tornado (Bit 3), funnel
        cloud (Bit 4), and waterspout (Bit 5). The ADAS shall not otherwise
        use the contents of the Alert Data field (Field 4 of the AWOS Format
        Weather Message) for the purpose of processing the Present Weather
        Begin/End REMARK.

   (b) The sensor-not-installed condition for liquid and frozen
        precipitation types shall be determined from the value 2 in Field
        19, Sensor and Sensor Data Status, Octet 63, bits 0-3 (see 10.2.7.1,
        10.3.17, and Tables 10-11 and 10-12), or from the value 14D (Eh) in
        any of the liquid or frozen precipitation type 4-bit fields within
        Octets 28-31 (see 10.2.7.2.a). The sensor-not-installed condition
        for freezing precipitation shall be determined from the value 2 in
        Field 19, Octet 65, bits 0-3, or from the value 14D (Eh) in any of
        the freezing precipitation type 4-bit fields within Octets 28-31
        (see 10.2.7.2.a). For each of these data categories, both places
        indicated shall be tested, and an indication in either place shall
        be sufficient to constitute the condition for that category.

   (c) Other indications of a data missing condition shall be determined
        from the appropriate values occurring in Field 19 where indicated,
        and (for Thunderstorm) from the value 65535D (FFFFh) in Octets 57/58
        (see 10.2.7.2.b), and from the value 15D (Fh) in any of the liquid,
        freezing, and frozen precipitation type 4-bit fields within Octets
        28-31 (see 10.2.7.2.a), and (for individual precipitation types)
        bits not set in Field 20, Parameter Activation Status, Octet 67 (see
        10.3.18 and Table 10-13). All places shall be tested as appropriate
        for individual parameters or data categories, and an indication in

any place shall be sufficient to constitute the condition for that category.

90.3.2.12.1.5.3 <u>Encoding Convention</u>. The begin (B) and/or end (E) of these events, and the time of record shall be encoded as follows:

        Begin: Bmm or Bhhmm
        End: Emm or Ehhmm

where the literal ASCII "B" indicates "begin", the literal ASCII "E" indicates "end", hh is the UTC hour included <u>only</u> when the hour of reporting is different from the hour of the event (this may occur only when the value of the adaptive hourly minute is different from 0), and "mm" represents the time, in minutes past the hour, when the present weather condition began or ended.

Present Weather remarks shall be encoded in the following order:

    (a) Tornado, Waterspout, or Funnel Cloud

    (b) Thunderstorm

    (c) Liquid precipitation

    (d) Freezing precipitation

    (e) Frozen precipitation.

Table 90-6 presents the symbology which shall be used to depict various present weather conditions, and examples of Metar encoding convention denoting the begin/end of each of these events. As shown, a given weather symbol shall be used only once in this REMARK, preceding the first indication pertaining to it. The order for encoding specific precipitation types shall be as shown in this table. Table 90-6 also indicates when special reports (SPECI) are generated because the begin/end of these conditions are considered critical weather events. When there are subsequent remarks, an ASCII space character (32D) shall be appended to the REMARK being encoded.

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_TSB05E27B33E57RAB01_

When a weather event has begun, and then a data missing condition for that specific weather type is present at message generation time, the event shall be deleted from all current and subsequent messages. For example, if for the second "TS" event in the example above, data was missing from minute 40 on,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_TSB05E27RAB01_TSNO

If a weather event has begun, and then a data missing condition for that specific weather type is detected for fewer than 15 consecutive minutes, and then the data missing condition is no longer detected, the event shall be treated as if the event has continued during the data-missing time. For example, if for the second lightning event in the first example above, data was missing from minute 40 to minute 50, and then in minute 51 there was no longer a "TS" indication, the end of the event would be declared as of minute 51.

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_TSB05E27B33E51RAB01_

Table 90-6. Symbology Used for Indicating the Begin/End of Present Weather
Conditions.

PRESENT WEATHER SYMBOL	CONDITION	EXAMPLE	EXPLANATION
X	*	XB05	"X" began at 5 minutes past the hour.
X	*	XE20	"X" ended at 20 minutes past the hour.
X	*	XB1345E07	"X" began at 45 minutes past the preceding hour (13), and ended at 7 minutes past the current hour.
X	*	XB10E20 B40E55	"X" began at 10 minutes past the hour, and ended at 20 minutes past the hour; "X" began again at 40 minutes past the hour, and ended at 55 minutes past the hour.

Where,

SYMBOL	*CONDITION
X = FC	Tornado, Waterspout, or Funnel Cloud**
TS	Thunderstorm**
RA	Rain
DZ	Drizzle
UP	Precipitation (non-specific)
FZRA	Freezing Rain**
FZDZ	Freezing Drizzle**
PE	Ice Pellets**
SN	Snow
GR	Hail**

**   Critical weather event that will cause the generation of a special
(SPECI) report.

90.3.2.12.1.6 <u>Pressure Falling Rapidly, Rising Rapidly (Table 90-1, Field 12.1.6)</u>. Pressure REMARKS reported in Metar Format Weather Messages include:

(a) Pressure rising rapidly.

(b) Pressure falling rapidly.

90.3.2.12.1.6.1 <u>Reporting Criteria</u>. The detection of pressure rising rapidly or pressure falling rapidly shall be encoded, when the criteria in 90.2.4.1.6 have been met, in all applicable Metar Format Weather Messages (all SPECI, and only those METAR occurring exactly at the adaptable minute-offset-to-the-hour) following detection up to and including the next hourly routine report. Only one of these two pressure REMARKS shall be encoded in a single message when appropriate (i.e. any given REMARK shall continue to be encoded in messages through the next routine report unless it is superseded by a newer pressure REMARK of any of the two types defined here).

90.3.2.12.1.6.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Field 12, Altimeter, Octets 38 and 39, shall be the direct engineering data utilized (see 10.3.12).

(b) The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 62, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 65534D (FFFEh) in the engineering data field (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 in the place cited, or from the value 65535D (FFFFh) in the engineering data field (see 10.2.7.2.b). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

90.3.2.12.1.6.3 <u>Encoding Convention</u>. Pressure falling/rising rapidly shall be encoded respectively in the REMARKS Field of a Metar Message as follows:

(a) PRESFR_

(b) PRESRR_

When there are subsequent REMARKS and this REMARK is encoded, a space character (ASCII 32D) shall be appended to this REMARK.

An example of a Metar Format Weather Message encoded to indicate pressure falling rapidly is as follows:

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_PRESFR_

90.3.2.12.1.7 Sea-Level Pressure (SLP) (Table 90-1, Field 12.1.7).

90.3.2.12.1.7.1 Reporting Criteria. The SEA-LEVEL PRESSURE field shall be encoded in every Metar Format Weather Message for which there is engineering data.

90.3.2.12.1.7.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

   (a) Field 12, Sea Level Pressure, Octets 41 and 42 shall be the engineering data utilized (see 10.3.12).

   (b) The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 62, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 65534D (FFFEh) in Octets 41/42 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

   (c) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 65535D (FFFFh) in Octets 41/42 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.1.7.3 Encoding Convention. When engineering data are available, SEA-LEVEL PRESSURE shall be encoded as follows:

   SLPppp_

where "SLP" is the sea-level pressure indicator, and ppp is a fixed length field composed of 3 characters, a 10s value, a units value, and a 10ths value, with leading "0" characters as necessary, in units of tenths of millibars, mb. A pressure of 1013.2 mb shall be encoded as 132, 1000.0 as 000, and 997.7 mb as 977. When this field is encoded, a trailing space, ASCII 32D, shall be appended to separate it from any subsequent REMARKS. For example,

METAR_KBOS_031400Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP999_

90.3.2.12.2 Plain Language REMARK (Table 90-1, Field 12.2).

90.3.2.12.2.1 Reporting Criteria. An AWOS operator/observer may insert comments to augment an AWOS Format Weather Message. Such comments shall be incorporated by ADAS in all Metar messages from the next message generated through the next hourly routine report.

90.3.2.12.2.2 Source Data. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows: Field 23, Operator Remarks, as specified in 10.3.21, shall be the data utilized for the Metar Plain Language REMARK.

90.3.2.12.2.3 Encoding Convention. The Plain Language REMARK consists of an ASCII text stream composed of contractions and abbreviations commonly used by observers. The text stream may be up to 80 characters long in total. When this REMARK is present, it shall always be presented on a separate line.

METAR_KBOS_031400Z_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
   RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
   ACSL_W-NW

90.3.2.12.3 <u>Additive Data REMARKS (Table 90-1, Field 12.3)</u>. Additive data shall consist of the following parameters and indicators, and shall be reported in the following order:

(a) 1-Hour Precipitation.

(b) 3- and 6-Hour Precipitation.

(c) 24-Hour Precipitation.

(d) 6-Hour Maximum Temperature.

(e) 6-Hour Minimum Temperature.

(f) 24-Hour Maximum/Minimum Temperature.

(g) 3-Hour Pressure Tendency.

(h) Precipitation Identifier Information Not Available.

(i) Precipitation Accumulator Information Not Available.

(j) Freezing Rain Information Not Available.

(k) Thunderstorm Information Not Available.

(l) RVR Information Not Available.

When METAR Option 2 is in effect, with the exception of 1-Hour Precipitation (see 90.3.2.12.3.1.1), the Precipitation, Temperature, and Pressure additive data shall be encoded in only those METAR occurring exactly at the adaptable minute-offset-to-the-hour.

90.3.2.12.3.1 <u>1-Hour Precipitation (Table 90-1, Field 12.3.1)</u>.

90.3.2.12.3.1.1 <u>Reporting Criteria</u>. One-hour precipitation accumulation
(liquid or liquid equivalent) shall be reported in every METAR routine report,
except when no precipitation has been recorded. When METAR Option 2 is in
effect, this field shall record the current accumulation of precipitation
during the hour for each METAR routine report issued.

90.3.2.12.3.1.2 <u>Source Data</u>. Source data from the AWOS Format Weather
Message shall be computed into this Metar weather product as follows:

(a) Field 7, Precipitation, Octets 26 through 31 shall be the
     engineering data utilized (see 10.3.7 and Tables 10-7 and 10-8).
     ADAS shall be capable of detecting both automatic rollover and any
     interim reset of the precipitation accumulator subfield, Octets 26
     and 27 (see 10.3.7.b).

(b) The sensor-not-installed condition shall be determined from the
     value 2 in Field 19, Sensor and Sensor Data Status, Octet 63, bits
     4-7 (precipitation accumulation) (see 10.2.7.1, 10.3.17, and Tables
     10-11 and 10-12).

(c) Other indications of a data missing condition shall be determined
     from the appropriate values occurring in Field 19 where indicated.

90.3.2.12.3.1.3 <u>Encoding Convention</u>. One-hour precipitation is symbolically
represented as follows:

        PRRRR_

where "P" is the prefix indicator for 1-hour accumulated precipitation, and
RRRR is a 4-character fixed length field with leading "0" characters as
necessary representing the melted equivalent precipitation in 100ths of
inches. When P is encoded and there are subsequent REMARKS an ASCII space
character (32D) shall be appended to the REMARK being encoded. For example, a
0.20 inch accumulation of melted precipitation shall be encoded as follows:

METAR_KBOS_031400Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1 3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    P0020_

90.3.2.12.3.2   3- and 6-Hour Precipitation (Table 90-1, Field 12.3.2).   3- and 6-hour precipitation amount shall be the next additive data component encoded.

90.3.2.12.3.2.1   Reporting Criteria.   3- and 6-hour cumulative precipitation shall be encoded every 3 hours according to the schedule provided in 90.2.4.3.2.   6-hour precipitation shall not be encoded if precipitation has not been detected during the previous 6 hours, or if any of the 1-hour precipitation accumulation values required to compute the 6-hour value are missing.   3-hour precipitation shall not be encoded if precipitation has not been detected during the previous 3 hours, or if any of the 1-hour precipitation accumulation values required to compute the 3-hour value are missing.

90.3.2.12.3.2.2   Source Data.   Source data from the AWOS Format Weather Message shall be computed into this Metar Format weather product as follows:

(a)   The 3- and 6-hour precipitation accumulations shall be derived from the 1-hour accumulation values computed for Metar field 12.3.1 (see 90.3.2.12.3.1).

(b)   The sensor-not-installed condition and other data missing indications shall be derived from those computed for Metar field 12.3.1 (see 90.3.2.12.3.1).

90.3.2.12.3.2.3   Encoding Convention.   The encoding convention for 3- and 6-hour Precipitation Amount (liquid or liquid equivalent) is symbolically shown by:

6RRRR_

where "6" is the prefix indicator, and RRRR is a 4-character fixed length field with leading "0" characters as necessary providing the precipitation value in 100ths of inches.   When there are subsequent REMARKS a space character (ASCII 32D) shall be inserted after the REMARK being encoded.   For example,

METAR_KBOS_031200Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1 3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    P0001_60006_

indicates that .06 inches of accumulated precipitation (melted) has been observed in the past 6 hours.

90.3.2.12.3.3 24-Hour Precipitation (Table 90-1, Field 12.3.3).

90.3.2.12.3.3.1 Reporting Criteria. 24-hour precipitation shall be encoded
once per day as specified in 90.2.4.3.3. This additive data component shall
not be encoded if less than .01 inch precipitation has been detected during
the previous 24 hours, or if any of the 1-hour precipitation accumulation
values required to compute the 24-hour value are missing.

90.3.2.12.3.3.2 Source Data. Source data from the AWOS Format Weather
Message shall be computed into this Metar Format weather product as follows:

(a) The 24-hour precipitation accumulation shall be derived from the 1-
     hour accumulation values computed for Metar field 12.3.1 (see
     90.3.2.12.3.1).

(b) The sensor-not-installed condition and other data missing
     indications shall be derived from those computed for Metar field
     12.3.1 (see 90.3.2.12.3.1).

90.3.2.12.3.3.3 Encoding Convention. 24-hour accumulated precipitation is
symbolically represented by:

    7RRRR

where "7" is the 24-hour precipitation indicator, and RRRR is a 4-character
fixed length field with leading "0" characters as necessary representing the
precipitation amount in 100ths of an inch. When there are subsequent REMARKS
a space character shall be appended to the REMARK being encoded. For example,

METAR_KBOS_031200Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1 3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    P0020_60135_71158

indicates that 0.20 inches of liquid-equivalent precipitation accumulated
during the past hour, 1.35 inches of precipitation accumulated during the past
6 hours, and 11.58 inches of precipitation has been observed during the past
24 hours.

90.3.2.12.3.4   6-Hour Maximum Temperature (Table 90-1, Field 12.3.4).

90.3.2.12.3.4.1   Reporting Criteria.   6-hour maximum temperature shall be reported as specified in 90.2.4.3.4.   6-hour maximum temperature shall not be encoded if any of the temperature values required to compute the 6-hour maximum value are missing.

90.3.2.12.3.4.2   Source Data.   Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a)   Field 8, Ambient Temperature, Octet 32 shall be the engineering data utilized (see 10.3.8), where the engineering units shall be either whole degrees Fahrenheit or whole degrees Celsius.   Field 2, Site Configuration Number, Octet 5, Bit 1 shall indicate the engineering units as follows: 0 = degrees Fahrenheit, 1 = degrees Celsius.

(b)   The sensor-not-installed condition for Ambient Temperature shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 61, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 32 (see 10.2.7.2.a).   Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c)   Other indications of a data missing condition for Ambient Temperature shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 32 (see 10.2.7.2.b).   Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.3.4.3   Encoding Convention.   6-hour Maximum Temperature shall be encoded in tenths of degrees Celsius, converted if necessary from degrees Fahrenheit, as follows:

1sTTT_

where "1" is the prefix indicator for maximum temperature, s is the sign character taking on the values of "0" for 0 or positive temperature values and "1" for negative values, and TTT is a 3-character fixed length field with leading "0" characters as necessary in units of tenths of degrees Celsius, representing the 6-hour maximum temperature value.   When there are subsequent REMARKS and this REMARK is encoded, a space character shall be appended to this REMARK.   For example, at 0000 UTC, an observed maximum temperature of 18° C for the past 6 hours shall be recorded as follows:

METAR_KBOS_030000Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    P0020_60135_10180_

90.3.2.12.3.5 <u>6-Hour Minimum Temperature (Table 90-1, Field 12.3.5)</u>.

90.3.2.12.3.5.1 <u>Reporting Criteria</u>. 6-hour Minimum Temperature shall be reported as specified in 90.2.4.3.5. 6-hour Minimum Temperature shall not be encoded if any of the temperature values required to compute the 6-hour minimum value are missing.

90.3.2.12.3.5.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a)   Field 8, Ambient Temperature, Octet 32 shall be the engineering data utilized (see 10.3.8), where the engineering units shall be either whole degrees Fahrenheit or whole degrees Celsius. Field 2, Site Configuration Number, Octet 5, Bit 1 shall indicate the engineering units as follows: 0 = degrees Fahrenheit, 1 = degrees Celsius.

(b)   The sensor-not-installed condition for Ambient Temperature shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 61, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 32 (see 10.2.7.2.a). Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c)   Other indications of a data missing condition for Ambient Temperature shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 32 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.3.5.3 <u>Encoding Convention</u>. 6-hour Minimum Temperature shall be encoded in degrees Celsius, converted if necessary from degrees Fahrenheit, as follows:

2sTTT

where "2" is the prefix indicator for minimum temperature, s is the sign character taking on the values of "0" for 0 or positive temperature values and "1" for negative values, and TTT is a 3-character fixed length field with leading "0" characters as necessary in units of tenths of degrees Celsius, representing the 6-hour minimum temperature value. When there are subsequent REMARKS and this REMARK is encoded, a space character shall be appended to this REMARK. For example, at 0000 UTC, an observed minimum temperature of -11° C for the past 6 hours shall be recorded as follows:

METAR_KBOS_030000Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    P0020_60135_10180_21110

90.3.2.12.3.6   24-Hour Maximum/Minimum Temperature (Table 90-1, Field 12.3.6).

90.3.2.12.3.6.1   Reporting Criteria.   24-Hour Max/Min Temperature shall be reported once per day as specified in 90.2.4.3.6.   24-hour Max/Min Temperature shall not be encoded if any of the temperature values required to compute the 24-hour maximum/minimum values are missing.

90.3.2.12.3.6.2   Source Data.   Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a)   Field 8, Ambient Temperature, Octet 32 shall be the engineering data utilized (see 10.3.8), where the engineering units shall be either whole degrees Fahrenheit or whole degrees Celsius.   Field 2, Site Configuration Number, Octet 5, Bit 1 shall indicate the engineering units as follows: 0 = degrees Fahrenheit, 1 = degrees Celsius.

(b)   The sensor-not-installed condition for Ambient Temperature shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 61, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 254D (FEh) in Octet 32 (see 10.2.7.2.a).   Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

(c)   Other indications of a data missing condition for Ambient Temperature shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 255D (FFh) in Octet 32 (see 10.2.7.2.b).   Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.3.6.3   Encoding Convention.   24-Hour Max/Min Temperature shall be encoded in degrees Celsius, converted if necessary from degrees Fahrenheit, as follows:

$$4sT_xT_xT_xsT_nT_nT_n\_$$

where "4" is the prefix indicator for the maximum/minimum temperature field, s is the sign character for the maximum value taking on the values of "0" for 0 or positive temperature values and "1" for negative values, $T_xT_xT_x$ is a 3-character fixed length field with leading "0" characters as necessary in units of tenths of degrees Celsius, representing the maximum temperature value, s is the sign character as before for the minimum value, and $T_nT_nT_n$ is a 3-character fixed length field with leading "0" characters as necessary in units of tenths of degrees Celsius, representing the minimum temperature value.   When there are subsequent REMARKS and this REMARK is encoded, a space character shall be appended to this REMARK.   For example an observed maximum temperature of 36° C and an observed minimum temperature of -22° C for the past 24 hours shall be

recorded as follows (note in the example that local standard midnight at
Boston corresponds to 05 UTC, and that therefore certain temperature and
precipitation additive data elements are not being encoded):

METAR_KBOS_030500Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
P0020_403601220_

90.3.2.12.3.8 <u>Precipitation Identifier Information Not Available (Table 90-1, Field 12.3.8)</u>.

90.3.2.12.3.8.1 <u>Reporting Criteria</u>. PWINO shall be reported in every Metar Format Weather Message, except from AWOS stations of STATION TYPE "A01", only when any of the missing data conditions specified in 90.3.2.12.3.8.2 are detected.

90.3.2.12.3.8.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Indications of a data missing condition shall be determined from the appropriate values occurring in Field 19, Sensor and Sensor Data Status, Octet 63, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 15D (Fh) in any of the liquid or frozen precipitation type 4-bit fields within Octets 28-31 (see 10.2.7.2.a). All places shall be tested, and an indication in any place shall be sufficient to constitute the condition.

90.3.2.12.3.8.3 <u>Encoding Convention</u>. Precipitation Identifier Information Not Available shall be encoded as the following literal character string:

PWINO_

When there are subsequent REMARKS and this REMARK is encoded, a space character (ASCII 32D) shall be inserted after this REMARK.

METAR_KBOS_030100Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946 RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021 P0020_PWINO_

90.3.2.12.3.8.A <u>Precipitation Accumulator Information Not Available (Table 90-1, Field 12.3.8.A)</u>.

90.3.2.12.3.8.A.1 <u>Reporting Criteria</u>. PNO shall be reported in every Metar Format Weather Message only when any of the missing data conditions specified in 90.3.2.12.3.8.A.2 are detected.

90.3.2.12.3.8.A.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) The sensor-not-installed condition for the precipitation accumulator shall be determined from the value 2 in Field 19, Octet 63, bits 4-7.

(b) Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated.

90.3.2.12.3.8.A.3 <u>Encoding Convention</u>. Precipitation Accumulator Information Not Available shall be encoded as the following literal character string:

PNO_

When there are subsequent REMARKS and this REMARK is encoded, a space character (ASCII 32D) shall be inserted after this REMARK.

METAR_KBOS_030100Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
    PNO_

90.3.2.12.3.7   3-Hour Pressure Tendency (Table 90-1, Field 12.3.7).

90.3.2.12.3.7.1   Reporting Criteria.   3-Hour Pressure Tendency shall be reported as indicated in 90.2.4.3.7.   3-Hour Pressure Tendency shall not be encoded if either of the pressure values required to compute the 3-hour value are missing.

90.3.2.12.3.7.2   Source Data.   Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

   (a)   Field 12, Altimeter, Octets 38 and 39 shall be the engineering data utilized (see 10.3.12).   At the reporting time, the current data shall be compared to the data saved from the previous reporting time to derive the tendency (i.e. for the purposes of computation of this field, the ADAS need keep only the data required to compare 3-hour values).

   (b)   The sensor-not-installed condition shall be determined from the value 2 in Field 19, Sensor and Sensor Data Status, Octet 62, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 65534D (FFFEh) in Octets 38/39 (see 10.2.7.2.a).   Both places shall be tested, and an indication in either place shall be sufficient to constitute the condition.

   (c)   Other indications of a data missing condition shall be determined from the appropriate values occurring in Field 19 where indicated, or from the value 65535D (FFFFh) in Octets 38/39 (see 10.2.7.2.b).   Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.3.7.3   Encoding Convention.   The encoding convention for 3-hour pressure tendency is symbolically indicated by:

         5appp_

where "5" is the prefix indicator, a is the tendency characteristic as explained below, and ppp is a 3-character fixed length field with leading "0" characters as necessary providing the pressure change in 10ths of mb.   The tendency characteristic represents the pressure tendency over the past 3 hours.   The tendency values to be encoded are respectively:

   (a)   Pressure has increased from 3 hours ago: a = "2"

   (b)   Pressure is unchanged from 3 hours ago: a = "4"

   (c)   Pressure has decreased from 3 hours ago: a = "7"

Prior to encoding, ADAS shall first subtract the source altimeter data from 3
hours ago from the current source data, and derive the tendency characteristic
from the sign of the difference. ADAS shall then convert the absolute value
of the difference (in units of inHg) to pressure (in units of mb, also known
as hectopascals). For this conversion, ADAS shall use the equation:

(delta pressure (mb)) = 33.864 * (delta altimeter (inHg))

and shall round the result to the nearest 0.1 mb.

When there are subsequent REMARKS and this REMARK is encoded, a space
character (ASCII 32D) shall be inserted after this REMARK.

An example of a Metar Format Weather Message including pressure tendency is
given as follows:

METAR_KBOS_030300Z_AUTO_03015KT_2_1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
RMK_AO2_WSHFT_10_VIS_1_3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021
P0020_60135_57025_

This message indicates that the pressure over the past 3 hours has fallen 2.5
mb.

90.3.2.12.3.9 <u>Freezing Rain Information Not Available (Table 90-1, Field 12.3.9)</u>.

90.3.2.12.3.9.1 <u>Reporting Criteria</u>. FZRANO shall be reported in every Metar Format Weather Message, except from AWOS stations of STATION TYPE "AO1", only when any of the missing data conditions specified in 90.3.2.12.3.9.2 are detected.

90.3.2.12.3.9.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a) Indications of a data missing condition shall be determined from the appropriate values occurring in Field 19, Sensor and Sensor Data Status, Octet 65, bits 0-3 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 15D (Fh) in the freezing precipitation type 4-bit field within Octets 28-31 (see 10.2.7.2.a). All places shall be tested as appropriate and an indication in any place shall be sufficient to constitute the condition.

90.3.2.12.3.9.3 <u>Encoding Convention</u>. Freezing Rain Information Not Available shall be encoded as the following literal character string:

FZRANO

When there are subsequent REMARKS and this REMARK is encoded, a space character (ASCII 32D) shall be inserted after this REMARK.

METAR_KBOS_030000Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946 RMK_AO2_WSHFT_10_VIS_1 3/4V3_LTG_DSNT_SW_TSB05E27RAB01_SLP021 P0020_60135_10180_21110_57025_FZRANO

90.3.2.12.3.10 <u>Thunderstorm Information Not Available (Table 90-1, Field 12.3.10)</u>.

90.3.2.12.3.10.1 <u>Reporting Criteria</u>. TSNO shall be reported in every Metar Format Weather Message only when the missing data condition specified in 90.3.2.12.3.10.2 is detected.

90.3.2.12.3.10.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

   (a)   The thunderstorm data missing condition shall be determined from the value 65535D (FFFFh) in Octets 57/58 (see 10.2.7.2.b).

90.3.2.12.3.10.3 <u>Encoding Convention</u>. Thunderstorm Information Not Available shall be encoded as the following literal character string:

        TSNO_

When there are subsequent REMARKS and this REMARK is encoded, a space character (ASCII 32D) shall be inserted after this REMARK.

METAR_KBOS_030100Z_AUTO_03015KT_2 1/2SM_R04R/P6000FT_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1 3/4V3_TSB05E27RAB01_SLP021
    P0020_TSNO_

90.3.2.12.3.11 <u>RVR Information Not Available (Table 90-1, Field 12.3.11)</u>.

90.3.2.12.3.11.1 <u>Reporting Criteria</u>. RVRNO shall be reported in every Metar Format Weather Message, except from AWOS stations of STATION TYPE "AO1", only when any of the missing data conditions specified in 90.3.2.12.3.11.2 are detected.

90.3.2.12.3.11.2 <u>Source Data</u>. Source data from the AWOS Format Weather Message shall be computed into this Metar weather product as follows:

(a)   Indications of a data missing condition for RVR shall be determined from the appropriate values occurring in Field 19, Sensor and Sensor Data Status, Octet 65, bits 4-7 (see 10.2.7.1, 10.3.17, and Tables 10-11 and 10-12), or from the value 255D (FFh) in Octet 44 (see 10.2.7.2.b). Both places shall be tested, and an indication at either place shall be sufficient to constitute the condition.

90.3.2.12.3.11.3 <u>Encoding Convention</u>. RVR Information Not Available shall be encoded as the following literal character string:

        RVRNO

There shall be no space character (ASCII 32D) inserted after this REMARK.

METAR_KBOS_0301000Z_AUTO_03015KT_2_1/2SM_-RA_BR_VV002_25/20_A2946
    RMK_AO2_WSHFT_10_VIS_1_3/4V3_TSB05E27RAB01_SLP021
    P0020_TSNO_RVRNO