24.4.3 METAR/SPECI Format

A U.S. METAR/SPECI has two major sections: the body (consisting of a maximum of 11 groups) and the remarks (consisting of 2 categories). When an element does not occur, or cannot be observed, the corresponding group is omitted from that particular report. See Figure 24-1 for the format.

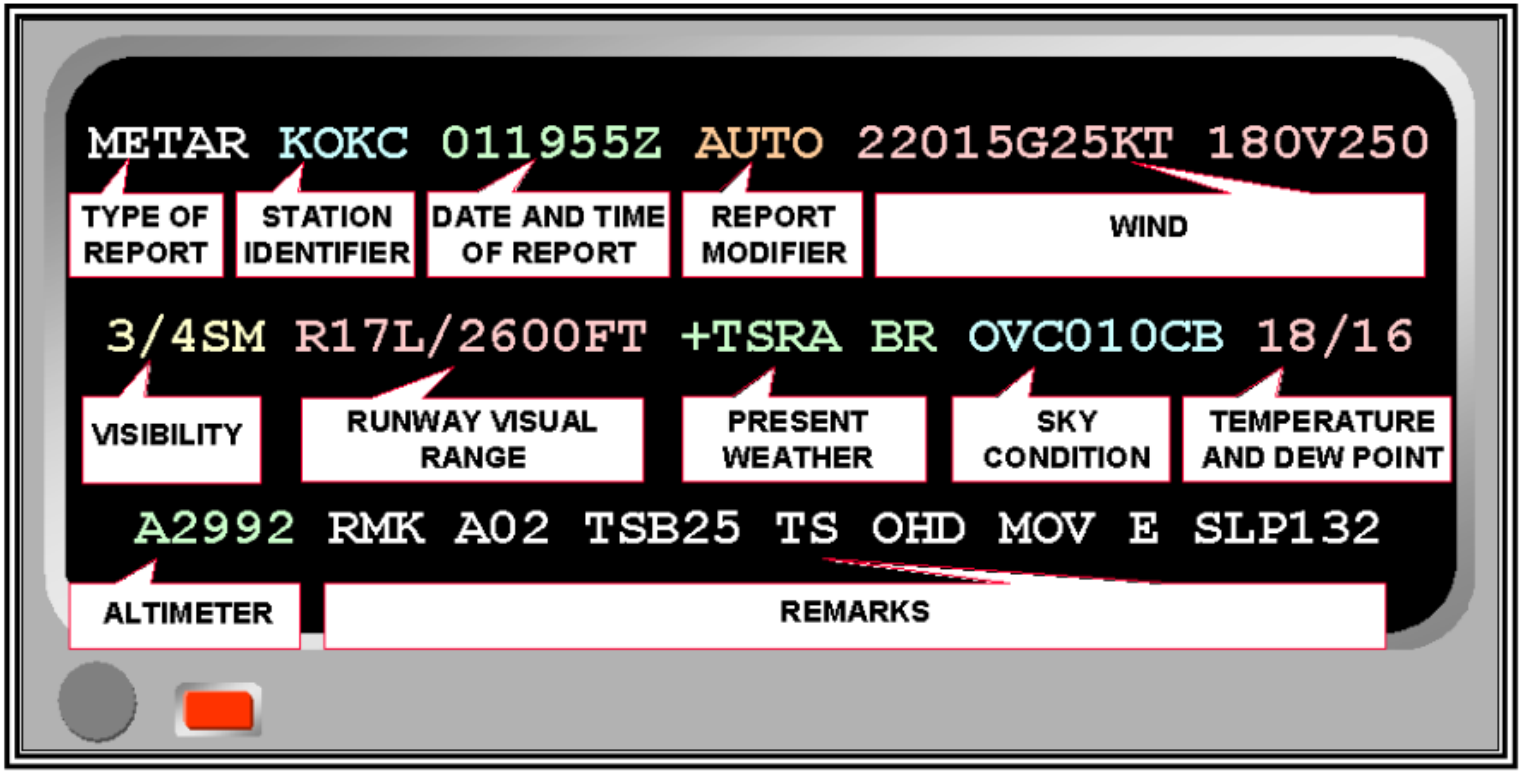


Figure 24-1. METAR/SPECI Coding Format

24.4.3.3 Date and Time of Report

METAR KOKC **011955Z** AUTO 22015G25KT 180V250 3/4SM R17L/2600FT +TSRA BR OVC010CB 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

The date and time are coded in all reports as follows: the day of the month is the first two digits (**01**), followed by the hour (**19**), and the minutes (**55**).

The coded time of observations is the actual time of the report or when the criteria for a SPECI is met or noted.

If the report is a correction to a previously disseminated report, the time of the corrected report is the same time used in the report being corrected.

The date and time group always ends with a **Z**, indicating Zulu time (or Coordinated Universal Time (UTC)).

For example, **METAR KOKC 011955Z** would be disseminated as the 2,000-hour routine report for station KOKC, taken on the 1st of the month at 1955 UTC.

24.4.3.5 Wind Group

METAR KOKC 011955Z AUTO **22015G25KT 180V250** 3/4SM R17L/2600FT +TSRA BR OVC010CB 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

Wind is the horizontal motion of air past a given point. It is measured in terms of velocity, which is a vector that includes direction and speed. It indicates the direction the wind is coming from.

In the wind group, the wind direction is coded as the first three digits (**220**) and is determined by averaging the recorded wind direction over a 2-minute period. It is coded in tens of degrees relative to true north using three figures. Directions less than 100° are preceded with a 0. For example, a wind direction of 90° is coded as **090**. A wind from the north is coded as **360**.

Immediately following the wind direction is the wind speed coded in two or three digits (**15**). Wind speed is determined by averaging the speed over a 2-minute period and is coded in whole knots using the units, tens digits, and, when appropriate, the hundreds digit. When wind speeds are less than 10 kt, a leading 0 is used to maintain at least a two-digit wind code. For example, a wind speed of 8 kt will be coded **08KT**. The wind group is always coded with a **KT** to indicate wind speeds are reported in knots. Other countries may use km/h or meters per second (m/s) instead of knots.

Examples:

05008KT	Wind 50° at 8 kt
15014KT	Wind 150° at 14 kt
340112KT	Wind 340° at 112 kt

24.4.3.5.1 Wind Gust

Wind speed data for the most recent 10 minutes is examined to evaluate the occurrence of gusts. Gusts are defined as rapid fluctuations in wind speed with a variation of 10 kt or more between peaks and lulls. The coded speed of the gust is the maximum instantaneous wind speed.

Wind gusts are coded in two or three digits immediately following the wind speed. Wind gusts are coded in whole knots using the units, tens, and, when appropriate, the hundreds digit. For example, a wind out of the west at 20 kt with gusts to 35 kt would be coded **27020G35KT**.

24.4.3.5.2 Variable Wind Direction (speed 6 kt or less)

Wind direction may be considered variable when, during the previous 2-minute evaluation period, the wind speed was 6 kt or less. In this case, the wind may be coded as **VRB** in place of the three-digit wind direction. For example, if the wind speed was recorded as 3 kt, it would be coded **VRB03KT**.

24.4.3.5.3 Variable Wind Direction (speed greater than 6 kt)

Wind direction may also be considered variable when, during the 2-minute evaluation period, it varies by 60° or more and the speed is greater than 6 kt. In this case, a variable wind direction group immediately follows the wind group. The directional variability is coded in a clockwise direction and consists of the extremes of the wind directions separated by a **V**. For example, if the wind is variable from 180 to 240° at 10 kt, it would be coded **21010KT 180V240**.

24.4.3.5.4 Calm Wind

When no motion of air is detected, the wind is reported as calm. A calm wind is coded as **00000KT**.

24.4.3.6 Visibility Group

METAR KOKC 011955Z AUTO 22015G25KT 180V250 **3/4SM** R17L/2600FT +TSRA BR OVC010CB 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

Visibility is a measure of the opacity of the atmosphere. It is defined as the greatest horizontal distance at which selected objects can be seen and identified, or its equivalent derived from instrumental measurements.

Prevailing visibility is the reported visibility considered representative of recorded visibility conditions at the manual station during the time of observation. It is the greatest distance that can be seen throughout at least half of the horizon circle, not necessarily continuous.

Surface visibility is the prevailing visibility from the surface at manual stations or the visibility derived from sensors at automated stations.

The visibility group is coded as the surface visibility in statute miles. A space is coded between whole numbers and fractions of reportable visibility values. The visibility group ends with **SM** to indicate that the visibility is in statute miles. For example, a visibility of 1½ sm is coded **1 1/2SM**. Most other countries use meters.

U.S. automated stations use an **M** to indicate "less than." For example, **M1/4SM** means a visibility of less than ¼ sm.

24.4.3.7 Runway Visual Range (RVR) Group

METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM **R17L/2600FT** +TSRA BR OVC010CB 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

The RVR is an instrument-derived value representing the horizontal distance a pilot may see down the runway.

RVR is reported whenever the station has RVR equipment and prevailing visibility is 1 sm or less, and/or the RVR for the designated instrument runway is 6,000 ft or less. Otherwise, the RVR group is omitted.

RVR is coded in the following format: The initial **R** is code for runway and is followed by the runway number. When more than one runway is defined with the same runway number, a directional letter is coded on the end of the runway number. Next is a solidus (/) followed by the visual range in feet, and then **FT** completes the RVR report. For example, an RVR value for Runway 01L of 800 ft would be coded **R01L/0800FT**. Most other countries use meters.

In the United States, RVR values are coded in increments of 100 ft up to 1,000 ft, increments of 200 ft from 1,000 to 3,000 ft, and increments of 500 ft from 3,000 to 6,000 ft. Manual RVR is not reported below 600 ft.

For U.S. airports only, the touchdown zone's (TDZ) RVR is reported. For U.S. airports with multiple runways, the operating runway with the lowest touchdown RVR is reported. RVR may be reported for up to four designated runways in other countries.

When the RVR varies by more than one reportable value, the lowest and highest values will be shown with **V** between them, indicating variable conditions. For example, the 10-minute RVR for Runway 01L varying between 600 and 1,000 ft would be coded **R01L/0600V1000FT**.

If RVR is less than its lowest reportable value, the visual range group is preceded by **M**. For example, an RVR for Runway 01L of less than 600 ft is coded **R01L/M0600FT**.

If RVR is greater than its highest reportable value, the visual range group is preceded by a **P**. For example, an RVR for Runway 27 of greater than 6,000 ft will be coded **R27/P6000FT**.

24.4.3.8 Present Weather Group

METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM R17L/2600FT **+TSRA BR** OVC010CB 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

Present weather includes precipitation, obscurations, and other weather phenomena. The appropriate notations found in Table 24-3 are used to code present weather.

Table 24-3. METAR/SPECI Notations for Reporting Present Weather[1]

Qualifier		Weather Phenomena		
Intensity or Proximity	**Descriptor**	**Precipitation**	**Obscuration**	**Other**
1	**2**	**3**	**4**	**5**
- Light	**MI** Shallow	**DZ** Drizzle	**BR** Mist	**PO** Dust/Sand Whirls
Moderate[2]	**PR** Partial	**RA** Rain	**FG** Fog	**SQ** Squalls
+ Heavy	**BC** Patches	**SN** Snow	**FU** Smoke	**FC** Funnel Cloud, Tornado, or Waterspout[4]
VC In the Vicinity[3]	**DR** Low Drifting	**SG** Snow Grains	**VA** Volcanic Ash	**SS** Sandstorm
	BL Blowing	**IC** Ice Crystals (Diamond Dust)	**DU** Widespread Dust	**DS** Dust Storm
	SH Shower(s)	**PL** Ice Pellets	**SA** Sand	
	TS Thunderstorms	**GR** Hail	**HZ** Haze	
	FZ Freezing	**GS** Snow Pellets	**PY** Spray	
		UP Unknown Precipitation		

1. *The weather groups are constructed by considering columns 1 through 5 in Table 24-3 in sequence (i.e., intensity followed by description, followed by weather phenomena). For example, heavy rain shower(s) is coded as +SHRA.*
2. *To denote moderate intensity, no entry or symbol is used.*
3. *See text for vicinity definitions.*
4. *Tornadoes and waterspouts are coded as +FC.*

Separate groups are used for each type of present weather. Each group is separated from the other by a space. METARs/SPECIs contain no more than three present weather groups.

When more than one type of present weather is reported at the same time, present weather is reported in the following order:

- Tornadic activity (tornado, funnel cloud, or waterspout).
- Thunderstorm(s) (with and without associated precipitation).
- Present weather in order of decreasing dominance (i.e., the most dominant type reported first).
- Left to right in Table 24-3 (columns 1 through 5).

Qualifiers may be used in various combinations to describe weather phenomena. Present weather qualifiers fall into two categories:

- Intensity or proximity, and
- Descriptors.

24.4.3.8.1 Intensity Qualifier

The intensity qualifiers are light, moderate, and heavy. They are coded with precipitation types, except ice crystals (**IC**) and hail (**GR**), including those associated with a thunderstorm (**TS**) and those of a showery nature (**SH**). Tornadoes and waterspouts are coded as heavy (**+FC**). No intensity is ascribed to the obscurations of blowing dust (**BLDU**), blowing sand (**BLSA**), and blowing snow (**BLSN**). Only moderate or heavy intensity is ascribed to sandstorm (**SS**) and dust storm (**DS**).

When more than one form of precipitation is occurring at a time, or precipitation is occurring with an obscuration, the reported intensities are not cumulative. The reported intensity will not be greater than the intensity for each form of precipitation. For example, **-FZRAPL** is light freezing rain and light ice pellets, *not* light freezing rain and moderate ice pellets.

24.4.3.8.2 Proximity Qualifier

Weather phenomena occurring beyond the point of observation (between 5 and 10 sm) are coded as in the vicinity (**VC**). **VC** can be coded in combination with thunderstorm (**TS**), fog (**FG**), shower(s) (**SH**), well-developed dust/sand whirls (**PO**), blowing dust (**BLDU**), blowing sand (**BLSA**), blowing snow (**BLSN**), sandstorm (**SS**), and dust storm (**DS**). Intensity qualifiers are not coded in conjunction with **VC**.

For example, **VCFG** can be decoded as meaning some form of fog is between 5 and 10 sm of the point of observation. If **VCSH** is coded, showers are occurring between 5 and 10 sm of the point of observation.

Weather phenomena occurring at the point of observation (at the station) or in the vicinity of the point of observation are coded in the body of the report. Weather phenomena observed beyond 10 sm from the point of observation (at the station) is not coded in the body but may be coded in the remarks section.

24.4.3.8.3 Descriptor Qualifier

Descriptors are qualifiers that further amplify weather phenomena and are used in conjunction with some types of precipitation and obscurations. The descriptor qualifiers are shallow (**MI**), partial (**PR**), patches (**BC**), low drifting (**DR**), blowing (**BL**), shower(s) (**SH**), thunderstorm (**TS**), and freezing (**FZ**).

Only one descriptor is coded for each weather phenomena group (e.g., **FZDZ**).

The descriptors shallow (**MI**), partial (**PR**), and patches (**BC**) are only coded with fog (**FG**) (e.g., **MIFG**). Mist (**BR**) is not coded with any descriptor.

The descriptors low drifting (**DR**) and blowing (**BL**) will only be coded with dust (**DU**), sand (**SA**), and snow (**SN**) (e.g., **BLSN** or **DRSN**). **DR** is coded with **DU**, **SA**, or **SN** for raised particles drifting less than 6 ft above the ground.

When blowing snow is observed with snow falling from clouds, both phenomena are reported (e.g., **SN BLSN**). If blowing snow is occurring and the observer cannot determine whether or not snow is also falling, then **BLSN** is reported. Spray (**PY**) is coded only with blowing (**BL**).

The descriptor for showery-type precipitation (**SH**) is coded only with one or more of the precipitation qualifiers for rain (**RA**), snow (**SN**), ice pellets (**PL**), or hail (**GR**). When any type of precipitation is coded with **VC**, the intensity and type of precipitation is not coded.

The descriptor for thunderstorm (**TS**) may be coded by itself when the thunderstorm is without associated precipitation. A thunderstorm may also be coded with the precipitation types of rain (**RA**), snow (**SN**), ice pellets (**PL**), snow pellets (**GS**), or hail (**GR**). **TS** is not coded with **SH**.

The descriptor freezing (**FZ**) is only coded in combination with fog (**FG**), drizzle (**DZ**), or rain (**RA**) (e.g., **FZRA**). **FZ** is not coded with **SH**.

24.4.3.8.4 Precipitation

Precipitation is any form of water particle, whether liquid or solid, that falls from the atmosphere and reaches the ground. The precipitation types are drizzle (**DZ**), rain (**RA**), snow (**SN**), snow grains (**SG**), ice crystals (**IC**), ice pellets (**PL**), hail (**GR**), snow pellets (**GS**), and unknown precipitation (**UP**). **UP** is reported if an automated station detects the occurrence of precipitation, but the precipitation sensor cannot recognize the type.

Up to three types of precipitation may be coded in a single present weather group. They are coded in order of decreasing dominance based on intensity.

24.4.3.8.5 Obscuration

Obscurations are any phenomenon in the atmosphere, other than precipitation, that reduces the horizontal visibility in the atmosphere. The obscuration types are mist (**BR**), fog (**FG**), smoke (**FU**), volcanic ash (**VC**), widespread dust (**DU**), sand (**SA**), haze (**HZ**), and spray (**PY**). Spray (**PY**) is coded only as **BLPY**.

With the exception of volcanic ash, low drifting dust, low drifting sand, low drifting snow, shallow fog, partial fog, and patches (of) fog, an obscuration is coded in the body of the report if the surface visibility is less than 7 mi or if the obscuration is considered operationally significant. Volcanic ash is always reported when observed.

24.4.3.8.6 Other Weather Phenomena

Other weather phenomenon types include well-developed dust/sand whirls (**PO**), sandstorms (**SS**), dust storms (**DS**), squalls (**SQ**), funnel clouds (**FC**), and tornados and waterspouts (**+FC**).

Examples:

`-DZ`	Light drizzle.
`-RASN`	Light rain and (light) snow.
`SN BR`	(Moderate) snow, mist.
`-FZRA FG`	Light freezing rain, fog.
`SHRA`	(Moderate) rain shower.
`VCBLSA`	Blowing sand in the vicinity.
`-RASN FG HZ`	Light rain and (light) snow, fog, haze.
`TS`	Thunderstorm (without precipitation).

+TSRA	Thunderstorm, heavy rain.
+FC TSRAGR BR	Tornado, thunderstorm, (moderate) rain, hail, mist.

24.4.3.9 Sky Condition Group

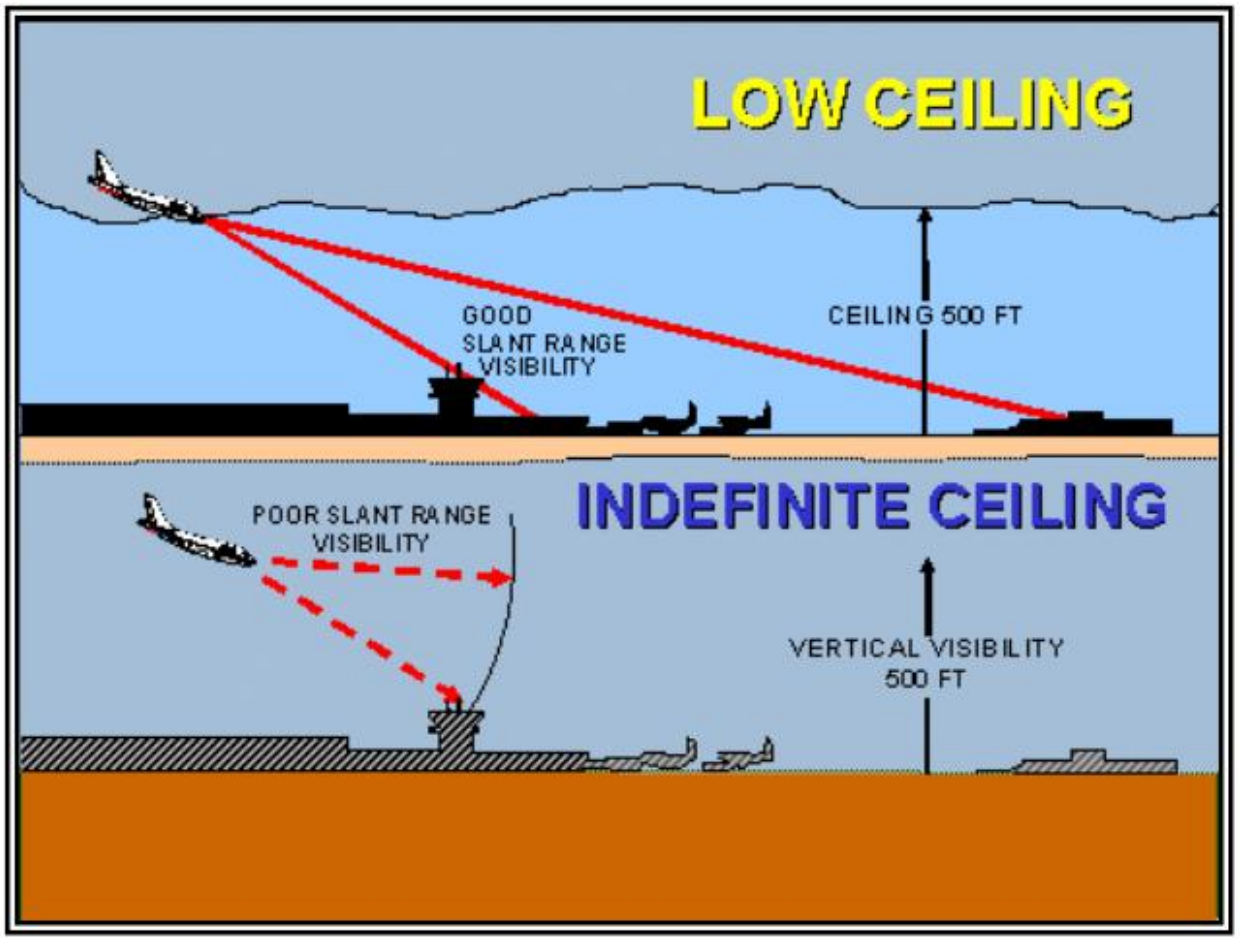
METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM R17L/2600FT +TSRA BR **OVC010CB** 18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132

Sky condition is a description of the appearance of the sky. It includes cloud cover, vertical visibility, or clear skies.

The sky condition group is based on the amount of cloud cover (the first three letters) followed by the height of the base of the cloud cover (final three digits). No space is between the amount of cloud cover and the height of the layer. The height of the layer is recorded in feet AGL.

Sky condition is coded in ascending order and ends at the first overcast layer. At mountain stations, if the layer is below station level, the height of the layer will be coded with three solidi (///).

Vertical visibility is coded as **VV**, followed by the vertical visibility into the indefinite ceiling. An "indefinite ceiling" is a ceiling classification applied when the reported ceiling value represents the vertical visibility upward into surface-based obscuration. No space is between the group identifier and the vertical visibility. Figure 24-3 illustrates the effect of an obscuration on the vision from a descending aircraft.



The ceiling is 500 ft in both examples, but the indefinite ceiling example (bottom) produces a more adverse impact to landing aircraft. This is because an obscuration (e.g., fog, blowing dust, snow) limits runway acquisition due to reduced slant range visibility. This pilot would be able to see the ground but not the runway. If the pilot was at approach minimums, the approach could not be continued, and a missed approach would need to be executed.

Figure 24-3. Obscuration Effects on Slant Range Visibility

Clear skies are coded in the format **SKC** or **CLR**. When **SKC** is used, an observer indicates no layers are present; **CLR** is used by automated stations to indicate no layers are detected at or below 12,000 ft.

Each coded layer is separated from the others by a space. Each layer reported is coded by using the appropriate reportable contraction seen in Table 24-4. A report of clear skies (**SKC** or **CLR**) is a complete layer report within itself. The abbreviations **FEW**, **SCT**, **BKN**, and **OVC** will be followed (without a space) by the height of the layer.

Table 24-4. METAR/SPECI Contractions for Sky Cover

Reportable Contraction	Meaning	Summation Amount of Layer
VV	Vertical Visibility	8/8
SKC or **CLR**[1]	Clear	0
FEW[2]	Few	1/8 – 2/8
SCT	Scattered	3/8 – 4/8
BKN	Broken	5/8 – 7/8
OVC	Overcast	8/8

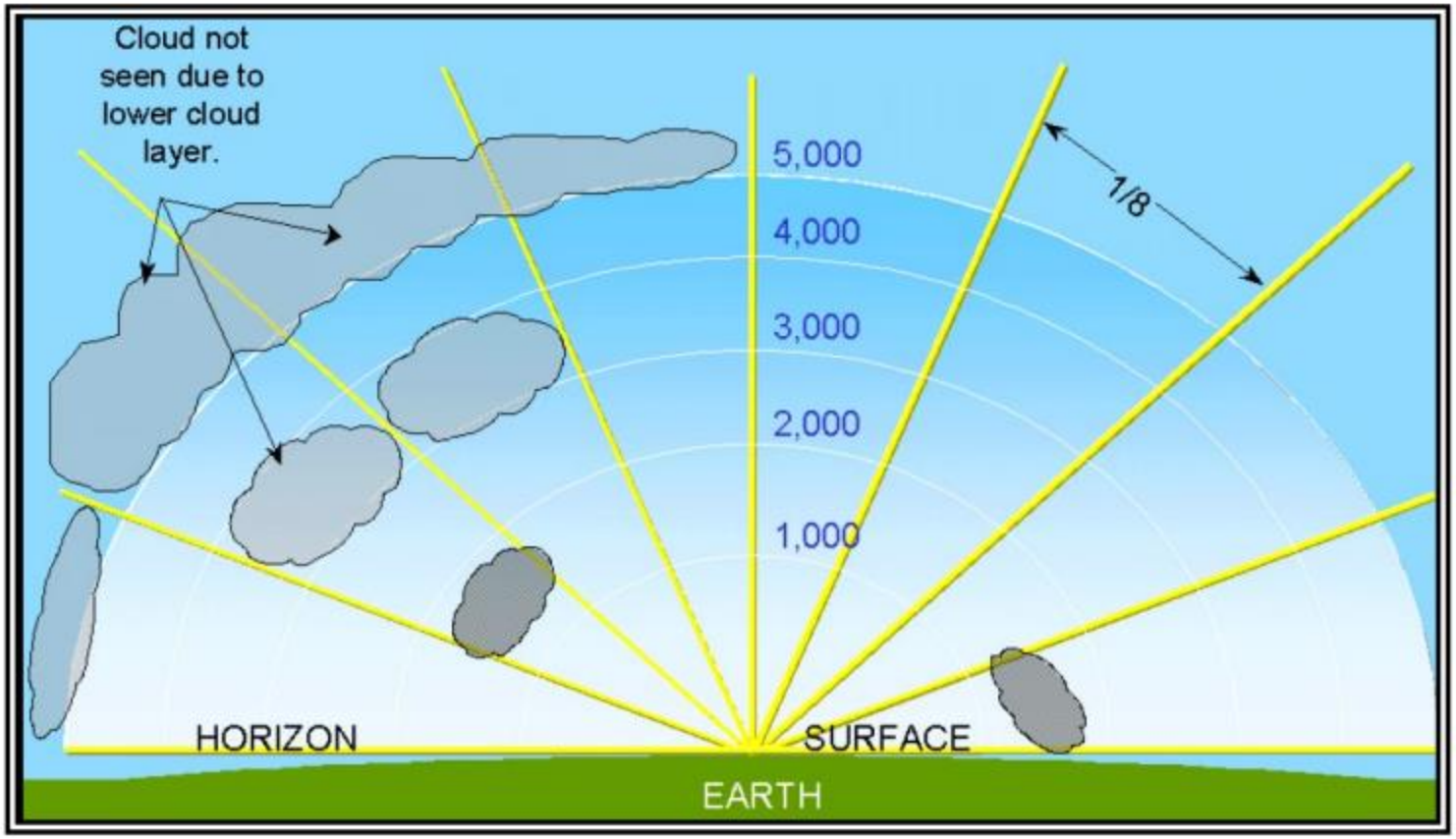
1. *The abbreviation **CLR** will be used at automated stations when no layers at or below 12,000 ft are reported; the abbreviation **SKC** will be used at manual stations when no layers are reported.*
2. *Any layer amount less than 1/8 is reported as **FEW**.*

The height is coded in hundreds of feet above the surface using three digits in accordance with Table 24-5.

Table 24-5. METAR/SPECI Increments of Reportable Values of Sky Cover Height

Range of Height Values (ft)	Reportable Increment (ft)
Less than or equal to 5,000	To nearest 100
5,001 to 10,000	To nearest 500
Greater than 10,000	To nearest 1,000

The ceiling is the lowest layer aloft reported as broken or overcast. If the sky is totally obscured with ground-based clouds, the vertical visibility is the ceiling.



Clouds at 1,200 ft obscure 2/8 of the sky (FEW). Higher clouds at 3,000 ft obscure an additional 1/8 of the sky, and because the observer cannot see above the 1,200-ft layer, they are to assume that the higher 3,000-ft layer also exists above the lower layer (SCT). The highest clouds at 5,000 ft obscure 2/8 of the sky, and, again, since the observer cannot see past the 1,200 and 3,000-ft layers, they are to assume the higher 5,000-ft layer also exists above the lower layers (BKN). The sky condition group would be coded as: FEW012 SCT030 BKN050.

igure 24-4. METAR/SPECI Sky Condition Coding

Figure 24-4. METAR/SPECI Sky Condition Coding

At manual stations, cumulonimbus (**CB**) or towering cumulus (**TCU**) is appended to the associated layer. For example, a scattered layer of towering cumulus at 1,500 ft would be coded **SCT015TCU** and would be followed by a space if there were additional higher layers to code.

Examples:

`SKC`	No layers are present.
`CLR`	No layers are detected at or below 12,000 ft AGL.
`FEW004`	Few at 400 ft AGL.
`SCT023TCU`	Scattered layer of towering cumulus at 2,300 ft AGL.
`BKN100`	Broken layer (ceiling) at 10,000 ft AGL.
`OVC250`	Overcast layer (ceiling) at 25,000 ft AGL.
`VV001`	Indefinite ceiling with a vertical visibility of 100 ft AGL.
`FEW012 SCT046`	Few clouds at 1,200 ft, scattered layer at 4,600 ft AGL.
`SCT033 BKN085`	Scattered layer at 3,300 ft, broken layer (ceiling) at 8,500 ft AGL.

`SCT018 OVC032CB`	Scattered layer at 1,800 ft AGL, overcast layer (ceiling) of cumulonimbus at 3,200 ft AGL.
`SCT009 SCT024 BKN048`	Scattered layer at 900 ft AGL, scattered layer at 2,400 ft AGL, broken layer (ceiling) at 4,800 ft AGL.

24.4.3.10 Temperature/Dewpoint Group

`METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM R17L/2600FT +TSRA BR OVC010CB`
`18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132`

Temperature is the degree of hotness or coldness of the ambient air, as measured by a suitable instrument. Dewpoint is the temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content for the air to become fully saturated.

Temperature and dewpoint are coded as two digits rounded to the nearest whole degree Celsius. For example, a temperature of 0.3 °C would be coded at **00**. Sub-zero temperatures and dewpoints are prefixed with an **M**. For example, a temperature of 4 °C with a dewpoint of -2 °C would be coded as **04/M02**; a temperature of -2 °C would be coded as **M02**.

If temperature is not available, the entire temperature/dewpoint group is not coded. If dewpoint is not available, temperature is coded followed by a solidus (/) and no entry is made for dewpoint. For example, a temperature of 1.5 °C and a missing dewpoint would be coded as **02/**.

24.4.3.11 Altimeter Group

`METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM R17L/2600FT +TSRA BR OVC010CB`
`18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132`

The altimeter setting group codes the current pressure at elevation. This setting is then used by aircraft altimeters to determine the true altitude above a fixed plane of MSL.

The altimeter group always starts with an **A** and is followed by the four-digit group representing the pressure in tens, units, tenths, and hundredths of inches of mercury. The decimal point is not coded. For example, an altimeter setting of 29.92 inHg would be coded as **A2992**.

24.4.3.12 Remarks (RMK)

```
METAR KOKC 011955Z AUTO 22015G25KT 180V250 3/4SM R17L/2600FT +TSRA BR OVC010CB
18/16 A2992 RMK AO2 TSB25 TS OHD MOV E SLP132
```

Remarks are included in METAR and SPECI, when appropriate.

Remarks are separated from the body of the report by the contraction **RMK**. When no remarks are necessary, the contraction **RMK** is not used.

METAR/SPECI remarks fall into two categories (see Table 24-6):

- Automated, Manual, and Plain Language; and
- Additive and Automated Maintenance Data.

Table 24-6. METAR/SPECI Order of Remarks

Automated, Manual, and Plain Language				Additive and Automated Maintenance Data	
1.	Volcanic Eruptions	14.	Hailstone Size	27.	Precipitation Amount Within a Specified Time Period*
2.	Funnel Cloud	15.	Virga	28.	Cloud Types*
3.	Type of Automated Station	16.	Variable Ceiling Height	29.	Duration of Sunshine*
4.	Peak Wind	17.	Obscurations	30.	Hourly Temperature and Dewpoint
5.	Wind Shift	18.	Variable Sky Condition	31.	6-Hourly Maximum Temperature*
6.	Tower or Surface Visibility	19.	Significant Cloud Types	32.	6-Hourly Minimum Temperature*
7.	Variable Prevailing Visibility	20.	Ceiling Height at Second Location	33.	24-Hour Maximum and Minimum Temperature*
8.	Sector Visibility	21.	Pressure Rising or Falling Rapidly	34.	3-Hourly Pressure Tendency*
9.	Visibility at Second Location	22.	Sea Level Pressure	35.	Sensor Status Indicators
10.	Lightning	23.	Aircraft Mishap	36.	Maintenance Indicator
11.	Beginning and Ending of Precipitation	24.	No SPECI Reports Taken	Note: Additive data is primarily used by the NWS for climatological purposes. *These groups should have no direct impact on the aviation community and will not be discussed in this document.	
12.	Beginning and Ending of Thunderstorms	25.	Snow Increasing Rapidly		
13.	Thunderstorm Location	26.	Other Significant Information		

Remarks are made in accordance with the following:

- Time entries are made in minutes past the hour if the time reported occurs during the same hour the observation is taken. Hours and minutes are used if the hour is different.
- Present weather coded in the body of the report as **VC** may be further described (e.g., direction from the station, if known). Weather phenomena beyond 10 sm of the point(s) of observation are coded as distant (**DSNT**) followed by the direction from the station. For example, precipitation of unknown intensity within 10 sm east of the station would be coded as **VCSH E**; lightning 25 sm west of the station would be coded as **LTG DSNT W**.
- Distance remarks are in statute miles, except for automated lightning remarks, which are in nautical miles.
- Movement of clouds or weather, when known, is coded with respect to the direction toward which the phenomena are moving. For example, a thunderstorm moving toward the northeast would be coded as **TS MOV NE**.

- Directions use the eight points of the compass coded in a clockwise order.
- Insofar as possible, remarks are entered in the order they are presented in the following sections (and Table 24-6).

24.4.3.13 Automated, Manual, and Plain Language Remarks

These remarks generally elaborate on parameters reported in the body of the report. An automated station or observer may generate automated and manual remarks. Only an observer can provide plain language remarks.

24.4.3.13.1 Volcanic Eruptions

Volcanic eruptions are coded in plain language and contain the following, when known:

- **Name** of volcano;
- **Latitude and longitude**, or the direction and approximate distance from the station;
- **Date/time** (UTC) of the eruption;
- Size **description**, approximate height, and direction of movement **of the ash cloud**; and
- Any **other pertinent data** about the eruption.

For example, a remark on a volcanic eruption would look like the following:

```
RMK MT. AUGUSTINE VOLCANO 70 MILES SW ERUPTED AT 231505 LARGE ASH CLOUD EXTENDING
TO APRX 30000 FEET MOVING NE.
```

Pre-eruption volcanic activity is not coded. Pre-eruption refers to unusual and/or increasing volcanic activity that could presage a volcanic eruption.

24.4.3.13.2 Funnel Cloud

At manual or augmented stations, when a certified weather observer is on duty, tornadoes, funnel clouds, and waterspouts are coded in the following format: tornadic activity; followed by **TORNADO**, **FUNNEL CLOUD**, **WATERSPOUT**, or **DUST/SAND WHIRL (DUST DEVIL)**; followed by the beginning and/or ending time; followed by the location and/or direction of the phenomena from the station, and/or movement, when known. For example, **TORNADO B13 6 NE** would indicate that a tornado began at 13 minutes past the hour and was 6 sm northeast of the station.

24.4.3.13.3 Type of Automated Station

AO1 or **AO2** is coded in all METARs/SPECIs from automated stations. Automated stations without a precipitation discriminator are identified as **AO1**; automated stations with a precipitation discriminator are identified as **AO2**.

24.4.3.13.4 Peak Wind

Peak wind is coded in the following format: the remark identifier **PK WND**, followed by the direction of the wind (first three digits), peak wind speed (next two or three digits) since the last METAR, and the time of occurrence. A space is between the two elements of the remark identifier and the wind direction/speed group; a solidus (/), without spaces, separates the wind direction/speed group and the time. For example, a peak wind of 45 kt from 280° that occurred at 15 minutes past the hour is coded **PK WND 28045/15**.

24.4.3.13.5 Wind Shift

Wind shift is coded in the following format: the remark identifier **WSHFT**, followed by the time the wind shift began. The contraction **FROPA** is entered following the time if there is reasonable data to consider the wind shift was the result of a frontal passage. A space is between the remark identifier and the time and, if applicable, between the time and the frontal passage contraction. For example, a remark reporting a wind shift accompanied by a frontal passage that began at 30 minutes past the hour would be coded **WSHFT 30 FROPA**.

24.4.3.13.6 Tower or Surface Visibility

Tower or surface visibility is coded in the following format: tower (**TWR VIS**) or surface (**SFC**), followed by the observed tower/surface visibility value. A space is coded between each of the remark elements. For example, the control tower visibility of 1½ sm would be coded **TWR VIS 1 1/2**.

24.4.3.13.7 Variable Prevailing Visibility

Variable prevailing visibility is coded in the following format: the remark identifier **VIS**, followed by the lowest and highest visibilities evaluated, separated by the letter **V**. A space follows the remark identifier, and no spaces are between the letter **V** and the lowest/highest values. For example, a visibility that was varying between ½ and 2 sm would be coded **VIS 1/2V2**.

24.4.3.13.8 Sector Visibility

Sector visibility is coded at manual stations in the following format: the remark identifier **VIS**, followed by the sector referenced to eight points of the compass, and the sector visibility in statute miles. For example, a visibility of 2½ sm in the northeastern octant is coded **VIS NE 2 1/2**.

24.4.3.13.9 Visibility at Second Location

At designated automated stations, the visibility at a second location is coded in the following format: the remark identifier **VIS**, followed by the measured visibility value and the specific location of the visibility sensor(s) at the station. This remark will only be generated when the condition is lower than that contained in the body of the report. For example, a visibility of 2½ sm measured by a second sensor located at Runway 11 is coded **VIS 2 1/2 RWY11**.

24.4.3.13.10 Lightning

When lightning is observed at a manual station, the frequency, type of lightning, and location are reported. The contractions for the type and frequency of lightning are based on Table 24-7 (e.g., **OCNL LTGICCG NW**, **FRQ LTG VC**, or **LTG DSNT W**).

When lightning is detected by an automated system:

- Within 5 NM of the Airport Location Point (ALP), it is reported as **TS** in the body of the report with no remark.
- Between 5 and 10 NM of the ALP, it is reported as **VCTS** in the body of the report with no remark.
- Beyond 10 but less than 30 NM of the ALP, it is reported in remarks only as **LTG DSNT**, followed by the direction from the ALP.

24.4.3.13.10 Lightning

When lightning is observed at a manual station, the frequency, type of lightning, and location are reported. The contractions for the type and frequency of lightning are based on Table 24-7 (e.g., **OCNL LTGICCG NW**, **FRQ LTG VC**, or **LTG DSNT W**).

When lightning is detected by an automated system:

- Within 5 NM of the Airport Location Point (ALP), it is reported as **TS** in the body of the report with no remark.
- Between 5 and 10 NM of the ALP, it is reported as **VCTS** in the body of the report with no remark.
- Beyond 10 but less than 30 NM of the ALP, it is reported in remarks only as **LTG DSNT**, followed by the direction from the ALP.

Table 24-7. METAR/SPECI Type and Frequency of Lightning

Type of Lightning		
Type	**Contraction**	**Definition**
Cloud-Ground	CG	Lightning occurring between cloud and ground.
In-Cloud	IC	Lightning that takes place within the cloud.
Cloud-Cloud	CC	Streaks of lightning reaching from one cloud to another.
Cloud-Air	CA	Streaks of lightning that pass from a cloud to the air but do not strike the ground.
Frequency of Lightning		
Frequency	**Contraction**	**Definition**
Occasional	OCNL	Less than 1 flash/minute.
Frequent	FRQ	About 1 to 6 flashes/minute.
Continuous	CONS	More than 6 flashes/minute.

24.4.3.13.11 Beginning and Ending of Precipitation

At designated stations, the beginning and ending times of precipitation are coded in the following format: the type of precipitation, followed by either a **B** for beginning or an **E** for ending, and the time of occurrence. No spaces are coded between the elements. The coded times of the precipitation start and stop times are found in the remarks section of the next METAR. The times are not required to be in the SPECI. The intensity qualifiers are coded. For example, if rain began at 0005 and ended at 0030, and then snow began at 0020 and ended at 0055, the remark would be coded **RAB05E30SNB20E55**. If the precipitation was showery, the remark is coded **SHRAB05E30SHSNB20E55**. If rain ended and snow began at 0042, the remark would be coded as **RAESNB42**.

24.4.3.13.12 Beginning and Ending of Thunderstorms

The beginning and ending times of thunderstorms are coded in the following format: the thunderstorm identifier **TS**, followed by either a **B** for beginning or an **E** for ending, and the time of occurrence. No spaces are between the elements. For example, if a thunderstorm began at 0159 and ended at 0230, the remark is coded **TSB0159E30**.

24.4.3.13.13 Thunderstorm Location

Thunderstorm locations are coded in the following format: the thunderstorm identifier **TS**, followed by the location of the thunderstorm(s) from the station, and the direction of movement, when known. For example, a thunderstorm southeast of the station and moving toward the northeast is coded **TS SE MOV NE**.

24.4.3.13.14 Hailstone Size

At designated stations, the hailstone size is coded in the following format: the hail identifier **GR**, followed by the size of the largest hailstone. The hailstone size is coded in ¼ in increments. For example, **GR 1 3/4** would indicate that the largest hailstones were 1¾ in in diameter. When small hail with a size less than ¼ in is occurring, the hailstone size is reported in the remarks as **GR LESS THAN 1/4 in**.

24.4.3.13.15 Virga

At designated stations, virga is coded in the following format: the identifier **VIRGA**, followed by the direction from the station. The direction of the phenomena from the station is optional (e.g., **VIRGA** or **VIRGA SW**).

24.4.3.13.16 Variable Ceiling Height

The variable ceiling height is coded in the following format: the identifier **CIG**, followed by the lowest ceiling height recorded, **V** denoting variability between two values, and ending with the highest ceiling height. A single space follows the identifier with no other spaces between the letter **V** and the lowest/highest ceiling values. For example, **CIG 005V010** would indicate a ceiling is variable between 500 and 1,000 ft.

24.4.3.13.17 Obscurations

Obscurations, surface-based or aloft, are coded in the following format: the weather identifier causing the obscuration at the surface or aloft, followed by the sky cover of the obscuration aloft (**FEW**, **SCT**, **BKN**, **OVC**) or at the surface (**FEW**, **SCT**, **BKN**), and the height. Surface-based obscurations have a height of 000. A space separates the weather causing the obscuration and the sky cover; no space is between the sky cover and the height. For example, fog hiding 3/8 to 4/8 of the sky is coded **FG SCT000**; a broken layer at 2,000 ft composed of smoke is coded **FU BKN020**.

24.4.3.13.18 Variable Sky Condition

Variable sky condition remarks are coded in the following format: the two operationally significant sky conditions (**FEW**, **SCT**, **BKN**, and **OVC**), separated by spaces, and **V** denoting the variability between the two ranges. If several layers have the same condition amount, the layer height of the variable layer is coded. For example, a cloud layer at 1,400 ft varying between broken and overcast is coded **BKN014 V OVC**.

24.4.3.13.19 Significant Cloud Types

At manual stations, significant cloud type remarks are coded in all reports.

24.4.3.13.19.1 Cumulonimbus

Cumulonimbus not associated with thunderstorms is coded as **CB**, followed by the direction from the station, and the direction of movement, when known. The location, direction, and direction of movement entries are separated from each other by a space. For example, a cumulonimbus up to 10 sm west of the station moving toward the east would be coded **CB W MOV E**. If the cumulonimbus was more than 10 sm to the west, the remark is coded **CB DSNT W**.

24.4.3.13.19.2 Towering Cumulus

Towering cumulus clouds are coded in the following format: the identifier **TCU,** followed by the direction from the station. The cloud type and direction entries are separated by a space. For example, a towering cumulus cloud up to 10 sm west of the station is coded **TCU W**.

24.4.3.13.19.3 Standing Lenticular or Rotor Clouds

Stratocumulus (**SCSL**), altocumulus (**ACSL**), cirrocumulus (**CCSL**), or rotor clouds are coded in the following format: the cloud type, followed by the direction from the station. The cloud type and direction entries are separated by a space. For example, Altocumulus Standing Lenticular clouds observed southwest through west of the station are coded **ACSL SW-W**.

24.4.3.13.20 Ceiling Height at Second Location

At designated stations, the ceiling height at a second location is coded in the following format: the identifier **CIG**, followed by the measured height of the ceiling and the specific location of the ceilometer(s) at the station. This remark is only generated when the ceiling is lower than that contained in the body of the report. For example, if the ceiling measured by a second sensor located at Runway 11 is broken at 200 ft, the remark would be coded **CIG 002 RWY11**.

24.4.3.13.21 Pressure Rising or Falling Rapidly

At designated stations, the reported pressure is evaluated to determine if a pressure change is occurring. If the pressure is rising or falling at a rate of at least 0.06 in per hour and the pressure change totals 0.02 in or more at the time of the observation, a pressure change remark is reported. When the pressure is rising or falling rapidly at the time of observation, the remark pressure rising rapidly (**PRESRR**) or pressure falling rapidly (**PRESFR**) is included in the remarks.

24.4.3.13.22 Sea Level Pressure

At designated stations, the sea level pressure is coded in the following format: the identifier **SLP**, immediately followed by the sea level pressure in millibars. The hundreds and thousands units are not coded and must be inferred. For example, a sea level pressure of 998.2 mb is coded **SLP982**. A sea level pressure of 1,013.2 mb would be coded **SLP132**. For a METAR, if sea level pressure is not available, it is coded **SLPNO**.

24.4.3.13.23 Aircraft Mishap

If a SPECI is taken to document weather conditions when notified of an aircraft mishap, the remark **ACFT MSHP** is coded in the report, but the SPECI is not transmitted.

24.4.3.13.24 No SPECI Reports Taken

At manual stations where SPECIs are not taken, the remark **NOSPECI** is coded to indicate that no changes in weather conditions will be reported until the next METAR.

24.4.3.13.25 Snow Increasing Rapidly

At designated stations, the snow increasing rapidly remark is reported in the next METAR whenever the snow depth increases by 1 in or more in the past hour. The remark is coded in the following format: the remark indicator **SNINCR**, the depth increase in the past hour, and the total depth of snow on the ground at the time of the report. The depth of snow increase in the past hour and the total depth on the ground are separated from each other by a solidus (/). For example, a snow depth increase of 2 in in the past hour with a total depth on the ground of 10 in is coded **SNINCR 2/10**.

24.4.3.13.26 Other Significant Information

Agencies may add to a report other information significant to their operations, such as information on fog dispersal operations, runway conditions, **FIRST** or **LAST** reports from station, etc.

24.4.3.14 Additive and Automated Maintenance Data

Additive data groups (see Table 24-6) are only reported at designated stations and are primarily used by the NWS for climatological purposes. Most have no direct impact on the aviation community but a few are discussed below.

24.4.3.14.1 Hourly Temperature and Dewpoint

At designated stations, the hourly temperature and dewpoint group are further coded to the tenth of a degree Celsius. For example, a recorded temperature of +2.6 °C and dewpoint of -1.5 °C would be coded **T00261015**.

The format for the coding is as follows:

`T`	Group indicator.
`0`	Indicates the following number is positive; a 1 would be used if the temperature was reported as negative at the time of observation.
`026`	Temperature disseminated to the nearest tenth and read as 02.6.
`1`	Indicates the following number is negative; a 0 would be used if the number was reported as positive at the time of observation.
`015`	Dewpoint disseminated to the nearest tenth and read as 01.5.

No spaces are between the entries. For example, a temperature of 2.6 °C and dewpoint of -1.5 °C is reported in the body of the report as **03/M01** and the hourly temperature and dewpoint group as **T00261015**. If the dewpoint is missing, only the temperature is reported; if the temperature is missing, the hourly temperature and dewpoint group are not reported.

24.4.3.14.2 Maintenance Data Groups

The following maintenance data groups, sensor status indicators and the maintenance indicator, are only reported from automated stations.

24.4.3.14.2.1 Sensor Status Indicators

Sensor status indicators are reported as indicated below:

- If the RVR is missing and would normally be reported, **RVRNO** is coded.
- When automated stations are equipped with a present weather identifier and the sensor is not operating, the remark **PWINO** is coded.
- When automated stations are equipped with a tipping bucket rain gauge and the sensor is not operating, **PNO** is coded.
- When automated stations are equipped with a freezing rain sensor and the sensor is not operating, the remark **FZRANO** is coded.
- When automated stations are equipped with a lightning detection system and the sensor is not operating, the remark **TSNO** is coded.

- When automated stations are equipped with a secondary ceiling height indicator and the sensor is not operating, the remark **CHINO LOC** is coded.

24.4.3.14.2.2 Maintenance Indicator

A maintenance indicator (**$**) is coded when an automated system detects that maintenance is needed on the system.

24.5 Aircraft Observations and Reports

There are three kinds of aircraft observations: Pilot Weather Reports (PIREP), Aircraft Reports (AIREP), and Volcanic Activity Reports (VAR). Both PIREPs and AIREPS have two types:

- Routine PIREPs and Urgent PIREPs.
- Routine AIREPs and Special AIREPs.

PIREPs are reported by the pilot (or aircrew), while AIREPs can either be reported by the pilot or generated from sensors onboard the aircraft (automated AIREPs). PIREPs and AIREPs are coded differently. The PIREP format is a U.S.-only format. The AIREP format is used worldwide. Automated AIREPs are common over the United States.

The VAR is a report for aircraft encounters with volcanic ash and/or sulfur dioxide (SO_2).