

AirNow QC Criteria

Air quality data are sent to the AirNow Data Management Center (DMC) each hour from more than 150 local, state, federal, and tribal agencies for more than 2,500 monitoring sites. When an observation file is received from an agency, each hourly measurement is compared against a set of QC criteria. These criteria help identify potentially erroneous measurements. Data flagged suspect (QC code 5) or invalid (QC code 9) by the automatic QC checks are then manually reviewed by air quality meteorologists at the AirNow DMC. Suspect or invalid observations may become valid or remain invalid after manual review that considers local meteorological conditions and/or current air quality events (e.g., wildfires, dust storms, etc.), as well as the site's history, location, and observations from nearby monitors. Invalid observations are not used to calculate the AQI, nor are they used to produce AirNow maps or other AirNow products. The following QC metrics are used in AirNow, and can be customized in AirNow-Tech by agency staff for their network of monitoring sites and parameters:

Check	Description
Maximum Range	
Summary of approach	Maximum value checks for suspect and invalid observations by site.
Method	If concentration $\geq$ maximum threshold, then value is flagged as invalid. If concentration $\geq$ maximum suspect, then value is flagged as suspect.
Minimum Drift	
Summary of approach	Account for monitor drift by setting threshold equal to zero or a negative value. Data with drift less than X (typically -5) will be flagged as invalid.
Method	If concentration $\leq$ X, then value is flagged as invalid.
Rate of change	
Summary of approach	Compares the rate of change in concentrations from one hour to the next; when the difference (or change) exceeds criteria set for each hour and for each site, the data are flagged as invalid.
Method	If $ABS(Value_{t-1} - Value_t) \geq$ criteria, then value is flagged as bad.
Sticking	
Summary of approach	Check to determine whether concentrations remain unchanged. Values below a selected concentration (X) threshold may often remain at a fixed value and thus will not be checked.
Method	If concentration $< X$, then sticking check will not be applied. If concentration $> X$, and Y continuous hours pass with no change in value, then the value is flagged as invalid.

QC Criteria Details and Examples

Maximum Severe

- Data values greater than or equal to the selected Maximum Severe value will be flagged invalid (QC code 9) and withheld from all AirNow products.
- Example: It may be unusual for ozone to exceed 150 ppb at a given monitor. Thus, if the Maximum Severe value is set to 150 ppb, ozone concentrations reported ≥ 150 ppb would be flagged invalid.

Maximum Suspect

- Data values greater than or equal to the selected Maximum Suspect value (but less than the Maximum Severe value) will still be included in AirNow data products but will be flagged suspect (QC code 5).
- Usually, the Maximum Suspect value is set near and below the Maximum Severe criteria.

Minimum Drift

- Data values less than or equal to the selected Minimum Drift value will be flagged invalid (QC Code 9) and withheld from all AirNow products.
- Some amount of instrument drift is expected. Therefore, default Minimum Drift thresholds are often set below 0.

Rate of Change

- This check compares a given hour's value to the previous hour's value. If the difference is greater than or equal to the selected Rate of Change, the given hour is invalidated (QC code 9) and withheld from all AirNow products.

Sticking Check (Hours and Value)

- These checks look for data values that are "stuck" at the same value for a specified number of hours. These criteria exist because some air quality parameters (e.g., CO, overnight ozone, etc.) legitimately stick at low values for several hours. Importantly, data must both exceed the Sticking Value AND be sticking for the set Number of Sticking Hours before data are invalidated and withheld from AirNow products.
- The Number of Sticking Hours criteria sets the maximum number of consecutive hours for which data can be reported at the same value. A larger number of sticking hours should be used for pollutants that are likely to stick at the same value for many hours.
- The Sticking Value sets the minimum value for which data will be checked for sticking. Observations above this value are subject to the Number of Sticking Hours QC check. Observations below this value are not checked against the Number of Sticking Hours QC check.
- Example: Ozone may stick for several hours overnight, usually at concentrations below 40 ppb. Thus, if the Sticking Value is set to 40 ppb, ozone concentrations < 40 ppb would not be flagged invalid due to sticking.

Absolute Sticking Check (Hours)

- These checks look for data values that are “stuck” at the same value for a specified number of hours. Importantly, data must ONLY be sticking for the set Number of Sticking Hours before data are invalidated and withheld from AirNow products. By default, the number of hours required for the Absolute Sticking Check to trigger is more than the regular Sticking Check.
- The Number of Sticking Hours criteria sets the maximum number of consecutive hours for which data can be reported at the same value. A larger number of sticking hours should be used for pollutants that are likely to stick at the same value for many hours.
- Example: Ozone may stick for several hours overnight, usually at concentrations below 40 ppb. This is allowed by the regular Sticking Check which considers the concentration value. However, if ozone continues to stick under 40 ppb for a much longer period, it is caught by the Absolute Sticking Check.

AirNow Default QC Thresholds

Certain parameters have default QC thresholds in the system. When a new parameter occurrence code (POC) is created for a site, default QC thresholds are applied. Note that parameters can have different QC thresholds for different hours of the day. A given default threshold applies to all hours unless otherwise specified (see ozone below). These thresholds can be edited at any time by your agency in AirNow-Tech (see page 4). QC thresholds for criteria pollutants are automatically specified as:

Ozone

Max suspect:

Hours	Value (ppb)
0-6	65
7-12	80
13-15	100
16-18	90
19-20	75
21-22	70
23	65

Max severe (invalid):

Hours	Value (ppb)
0-6	80
7-12	100
13-15	120
16-18	110
19-20	90
21-22	85
23	80

Rate of change:

Hours	Value (ppb)
0-6	24
7-12	26
13-15	20
16-18	27
19-20	26
21-22	23
23	23

- Min drift: -4.99 ppb
- Sticking check at 8 hrs for values ≥ 10 ppb
- Sticking check at 16 hrs for all values

PM_{2.5}

- Max suspect: 125.5 $\mu\text{g}/\text{m}^3$
- Max severe (invalid): 325 $\mu\text{g}/\text{m}^3$
- Min drift: -4.99 $\mu\text{g}/\text{m}^3$
- Rate of change: 50 $\mu\text{g}/\text{m}^3$
- Sticking check at 4 hours for values ≥ 10 $\mu\text{g}/\text{m}^3$
- Sticking check at 12 hours for all values

PM₁₀

- Max suspect: 355 $\mu\text{g}/\text{m}^3$
- Max severe (invalid): 984 $\mu\text{g}/\text{m}^3$
- Min drift: -4.99 $\mu\text{g}/\text{m}^3$
- Rate of change: 250 $\mu\text{g}/\text{m}^3$
- Sticking check at 4 hours for values ≥ 10 $\mu\text{g}/\text{m}^3$
- Sticking check at 12 hours for all values

Negative Default Thresholds

The default minimum drift/range QC check thresholds are negative because AirNow accounts for instrument drift/noise resulting in valid pollutant readings that could be reported as negative concentrations. For example, some instruments may register in a negative range for a particular hour in clean atmospheric conditions due to instrument drift over time. If all negative concentrations were automatically invalidated or set to zero, daily or other long-term averages would be biased higher than the "true" average. AirNow stores negative concentrations, typically greater than -5 $\mu\text{g}/\text{m}^3$ or ppb, for use in daily averages and NowCast averages for this reason.

Editing QC Thresholds

1. From AirNow-Tech, click on the Site Name for a site of interest from your agency's site list. From the site's **Edit Sites** page, select "Enable Editing" and then the "View QC Criteria" button.
2. Select your parameter of interest from the "Parameter" dropdown list.
3. Edit the QC threshold value for a QC metric for each hour to which it applies. If desired, you can input a different threshold for different hours of the day. For example, you may choose to raise the max severe threshold for ozone during mid-day and afternoon hours. Alternatively, you can also input the same value across all hours for one or more QC metrics using the Set All menu, then selecting "Set All Hourly Values."

For easy access to descriptions of each QC metric, select "QC Descriptions" from the Quality Control Criteria section.

4. When finished, select "Save QC Criteria", then "Disable Editing."

Parameter:

Quality Control Criteria

[QC Descriptions](#)

Hour (LST)	Max Suspect	Max Severe	Rate of Change	# of Sticking Hours	Sticking Value	Absolute # of Sticking Hours	Minimum Drift
0000	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0100	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0200	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0300	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0400	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0500	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0600	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0700	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0800	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
0900	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1000	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1100	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1200	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1300	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1400	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1500	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1600	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1700	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1800	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
1900	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
2000	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
2100	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
2200	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000
2300	355.00000	984.00000	250.00000	4	10.00000	12	-4.90000