Remote Weather Observations

a tutorial:

understanding automated weather stations and interpreting the data

SNOW KNOWLEDGE INC.

What is Remote Weather Data?

- A reading taken from data provided by an automated remote instrumentation that is viewed on a computer.
- Typically called “telemetry”
- Useful in monitoring conditions remotely, either nearby in your operation area or a location

Station types and their consideration

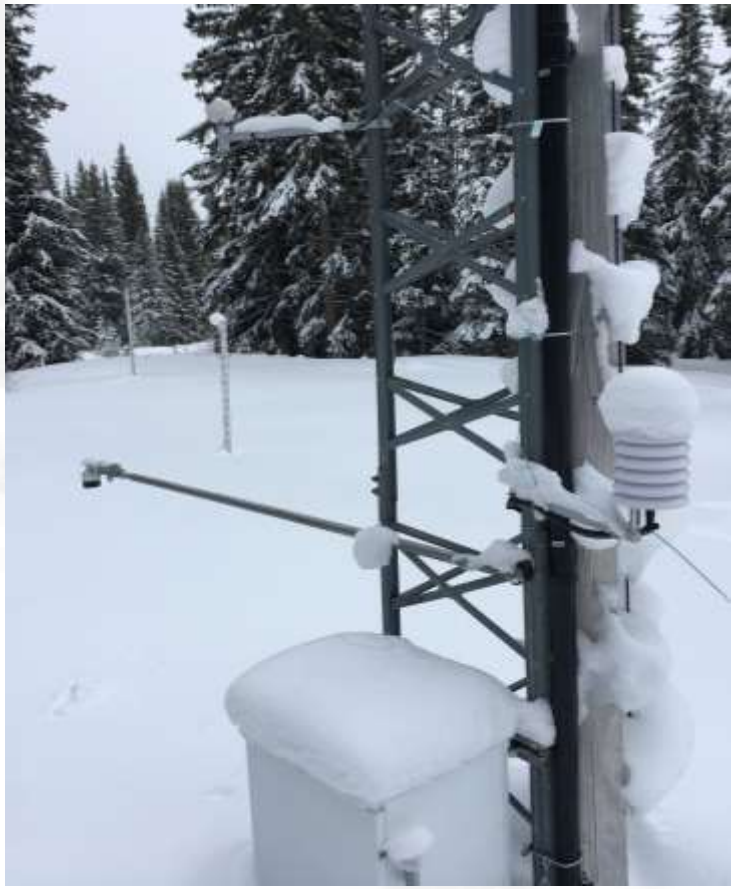
Instrumentation and measurement parameters are chosen to meet the specific needs of the owning organization.

Examples:

- Highway roadside locations help in managing snow removal typically at the location furthest from the office and with the worst conditions.
- Snow pillow sites help in forecasting river flows during run-off so they are typically represent key drainages, are at specific elevations and are accurate on a monthly time scale.
- Avalanche weather locations are chosen to represent a primary contributory measurement specific to the operator's typical avalanche problem such as snow fall, air temperature, winds, or solar input. They are often relied on for near real time observations or standard daily observations.
- Climate monitoring and airport stations may provide useful data depending on location.

Typical weather stations for avalanche forecasting

Wind Site



Snowfall Site

Photo Credit: Chad Hemphill / RMR

Snow Water Equivalent Site

Automated stations for avalanche forecasting

- Typically a wind or a snowfall site.
  - Wind sensors at a snowfall site give an indication of local drifting or wind effect on snowfall measurements.
  - A wind site may have a snow depth sensor located 100 m away in a protected area.
- Automated sites can be stand alone or part of a weather plot where manual observations are also taken.
- Snow pillow sites are useful if one understands the nuances and limitations of the sensors.

Typical sensors / measurements taken at an automated weather station for avalanche forecasting

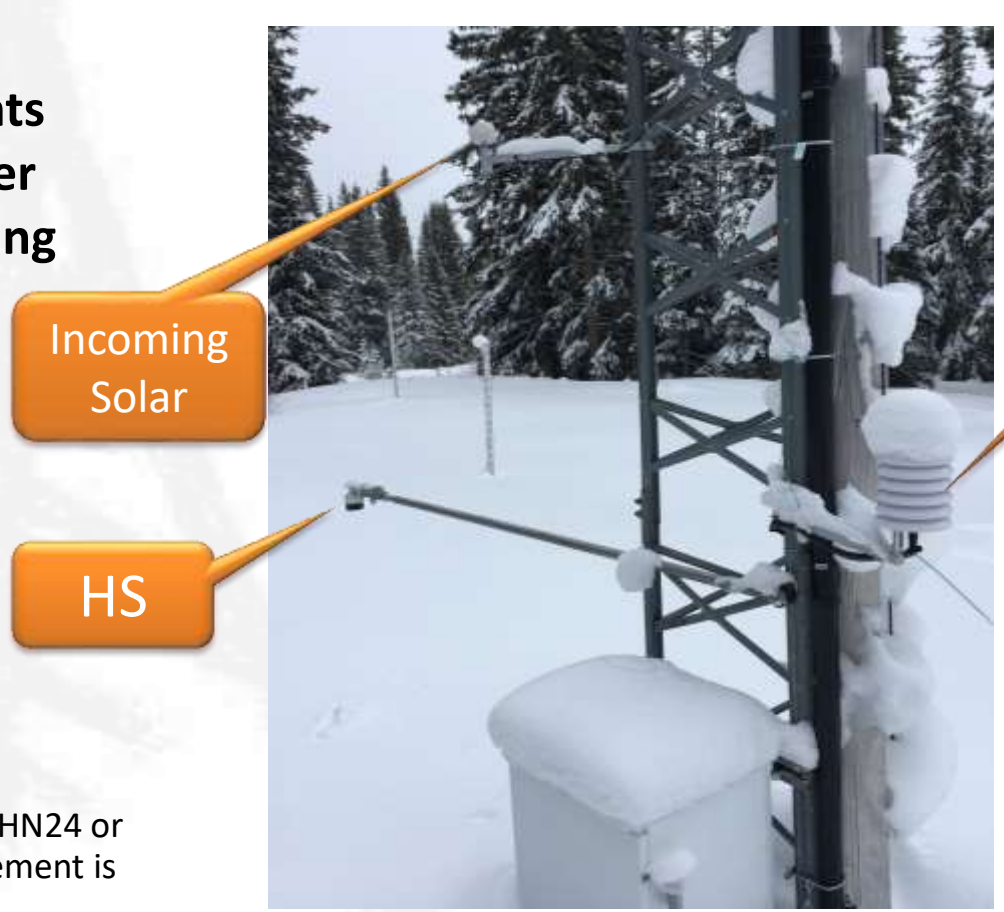
Ta	Temperature Air
RH	Relative Humidity
Dew Point	Calculated based on Ta and RH

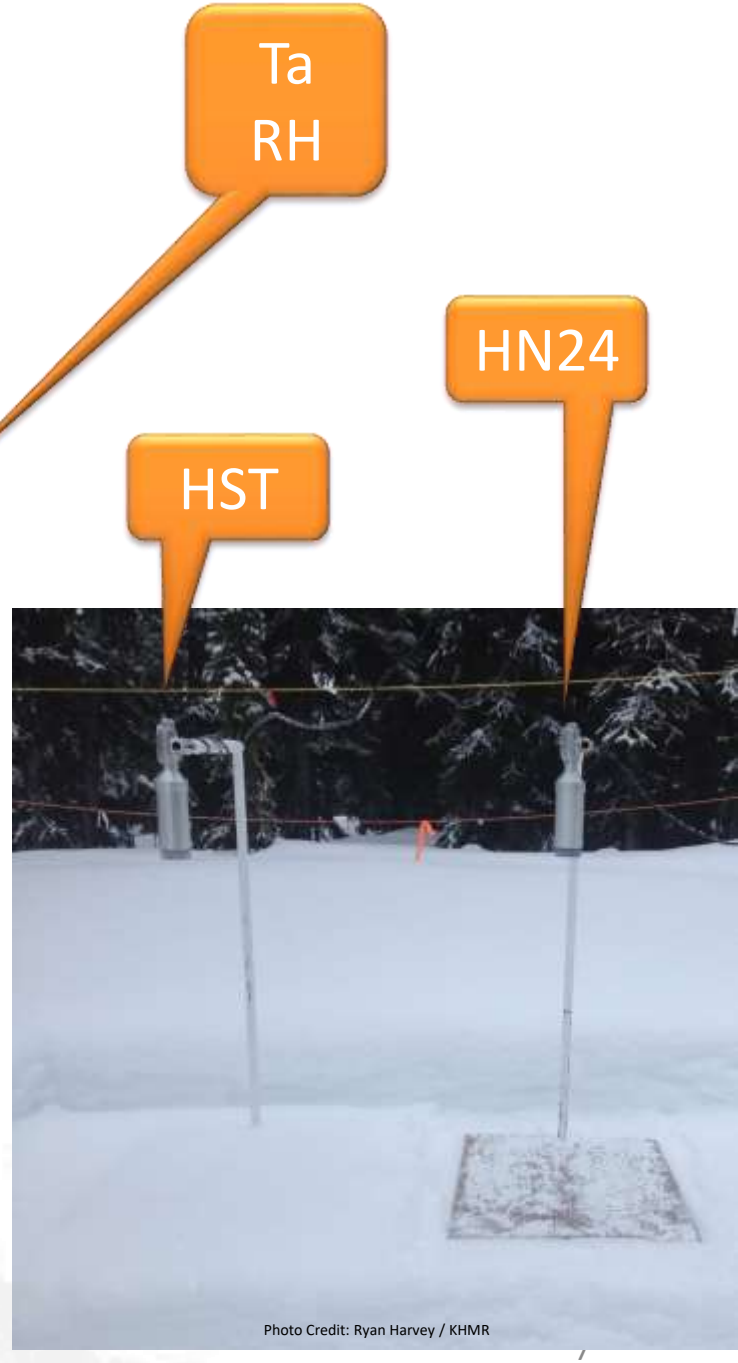
Typical sensors / measurements taken at an automated weather station for avalanche forecasting

Ta	Temperature Air
RH	Relative Humidity
Dew Point	Calculated based on Ta and RH
HS	Total Height of Snow

- Additional snow depth sensors provide HN24 or HST measurements or a virtual measurement is calculated based on changes in the HS.

W/m^2	Incoming solar radiation in watts per square meter
Precip Int	The water equivalent of precipitation that has fallen into the precipitation gauge since the last observation.





Water Equivalent

The Holy Grail of measurements

- Snow pillow – measures weight of snow over it, susceptible to bridging and missing measurement until slab warms. Doesn't capture rain load if there is no snow on the ground.
- Heated tipping bucket – a precipitation gauge with a heater that melts snow accumulating in opening. Low density, low snow fall rate may evaporate. Sometimes a lag between accumulation and measurement.
- Stand pipe – filled with anti-freeze to melt snow, change in weight is reported as mm of water. Prone to being capped by snow mushroom or freezing up if solution is too diluted.
- Radar – measures the change in signal based on water content. Not widely deployed but very promising.

Snow Pillow

Heated Tipping Bucket

Photo Credit: Chad Hemphill / RMR

Stand Pipe

Other key considerations

- Power
  - Enough solar input to charge battery (low angle sun, typical cloud cover).
  - Enough battery size to operate all systems for a few days without charging.
- Communication
  - Low power consumption.
  - Designed for required distance, radio path, obstacles, and polling interval.
  - Cost effective.
- Environment
  - Riming
  - Snow accumulation
  - Regular maintenance

Understanding the source

- Knowing how the station works and how the conditions affect the measurements helps your interpretation and recognition of the data.
- Remote sites collect data that is transmitted via radio, telecom, and internet.
- Outages and delays may occur at any stage during their collection and display.
- Sensors at times may provide incorrect readings.

Weather effects on instrumentation

- Is a zero wind speed reading calm or is the anemometer rimed up?
- Low density snow is typically under reported by water equivalent sensors.
- Low density snow is problematic for snow depth sensors.

Wind Speed kph	Wind Dir	Wind Dir deg	Vel 3 sec Gust	Dir 3 sec Gust
0	NNE	17	2	NNE
0	NNE	26	0	NNE
0	NNE	26	0	NNE
0	NNE	26	0	NNE
0	NNE	26	0	NNE
0	NNE	26	0	NNE
0	NNE	26	0	NNE
0	NNE	26	1	NNE
0	NNE	25	2	NNE
0	NNE	25	1	NNE
0	NNE	25	1	NNE
0	NNE	25	0	NNE
0	NNE	25	1	NNE

0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
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0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW
0	SSW	198	0	SW

Maintenance (or lack of) effects

- Mushroom capped rain gauge

Instrumentation effects

- No value or unchanged value in one field may indicate faulty sensor.
- Sensors do wear out and require regular maintenance to perform as designed.
- The data logger at the station often makes calculations based on sensor measurements.
- Snow depths are notoriously problematic:
  - Jumps to large values typically means sensor is not getting a good signal reflection from snow surface and reporting the height of the sensor off the ground (see next page for why)
  - Hourly calculations of new snow based on change in total depth can be very off.

TIMESTAMP	Ta	RH	HS
"2019-07-14 00:00:00"	6.9	100	10.4
"2019-07-14 01:00:00"	6.7	97	8.9
"2019-07-14 02:00:00"	6.8	91	6.9
"2019-07-14 03:00:00"	6.5	85	15.4
"2019-07-14 04:00:00"	6.3	89	7.9
"2019-07-14 05:00:00"	6.1	92	8.7
"2019-07-14 06:00:00"	6.2	96	0.0
"2019-07-14 07:00:00"	6.3	99	568.0
"2019-07-14 08:00:00"	7.3	96	14.7
"2019-07-14 09:00:00"	6.9	94	10.1
"2019-07-14 10:00:00"	7.8	82	20.1
"2019-07-14 11:00:00"	9.6	79	568.0
"2019-07-14 12:00:00"	10.1	65	230.9
"2019-07-14 13:00:00"	10.8	61	568.0
"2019-07-14 14:00:00"	9.0	77	568.0
"2019-07-14 15:00:00"	8.3	93	0.0
"2019-07-14 16:00:00"	8.8	92	13.2
"2019-07-14 17:00:00"	7.9	91	12.1
"2019-07-14 18:00:00"	7.8	98	13.6
"2019-07-14 19:00:00"	7.9	95	13.8
"2019-07-14 20:00:00"	8.2	91	0.0
"2019-07-14 21:00:00"	8.1	87	14.9
"2019-07-14 22:00:00"	7.4	94	13.2
"2019-07-14 23:00:00"	7.3	92	14.2
"2019-07-15 01:00:00"	7.2	94	13.3
"2019-07-15 02:00:00"	6.7	95	11.7
"2019-07-15 03:00:00"	6.8	94	8.2
"2019-07-15 04:00:00"	6.9	93	14.5
"2019-07-15 05:00:00"	6.9	93	9.2
"2019-07-15 06:00:00"	6.9	97	11.7

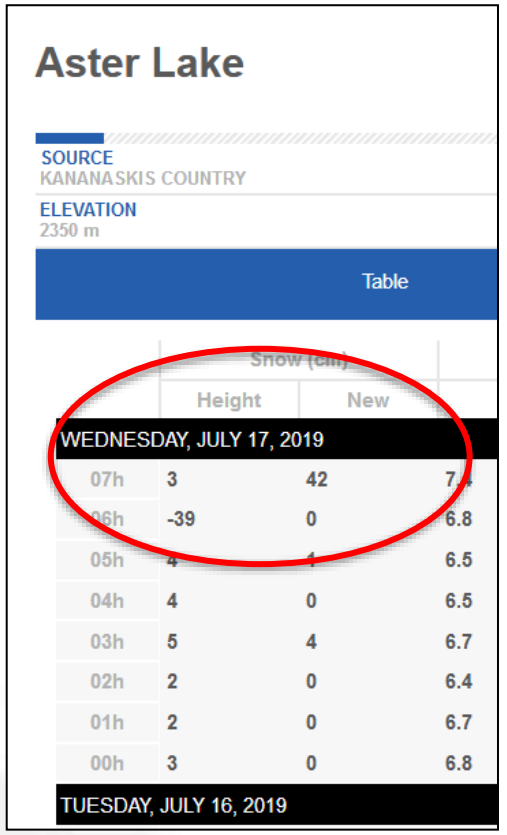
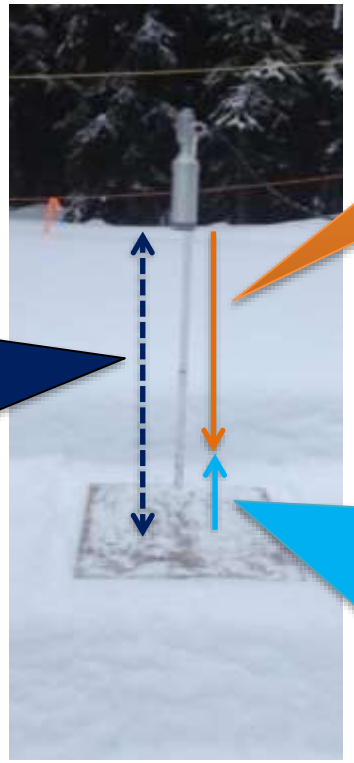


Photo Credit: Steve Conger

Why does the snow depth read wrong?

- In the case that the sensor returns a 0 measurement measurement, it reports the height of the sensor from the target rather than the height of the snow.



Measures distance to top of snow

Sensor knows distance from the board

Subtracts distance to snow from height of sensor and determines height of snow on board

Photo Credit: Ryan Harvey / KHMR

Apply Common Sense Quality Assurance

- With what you know about the sensors and limitations of remote observations, do the measurements make sense?
- In addition to sensors, a camera may provide good precipitation and sky information.
- Has this unattended automated remote weather station provided proof of alien visitation?

Reading Telemetry

Making an observation using remote weather data

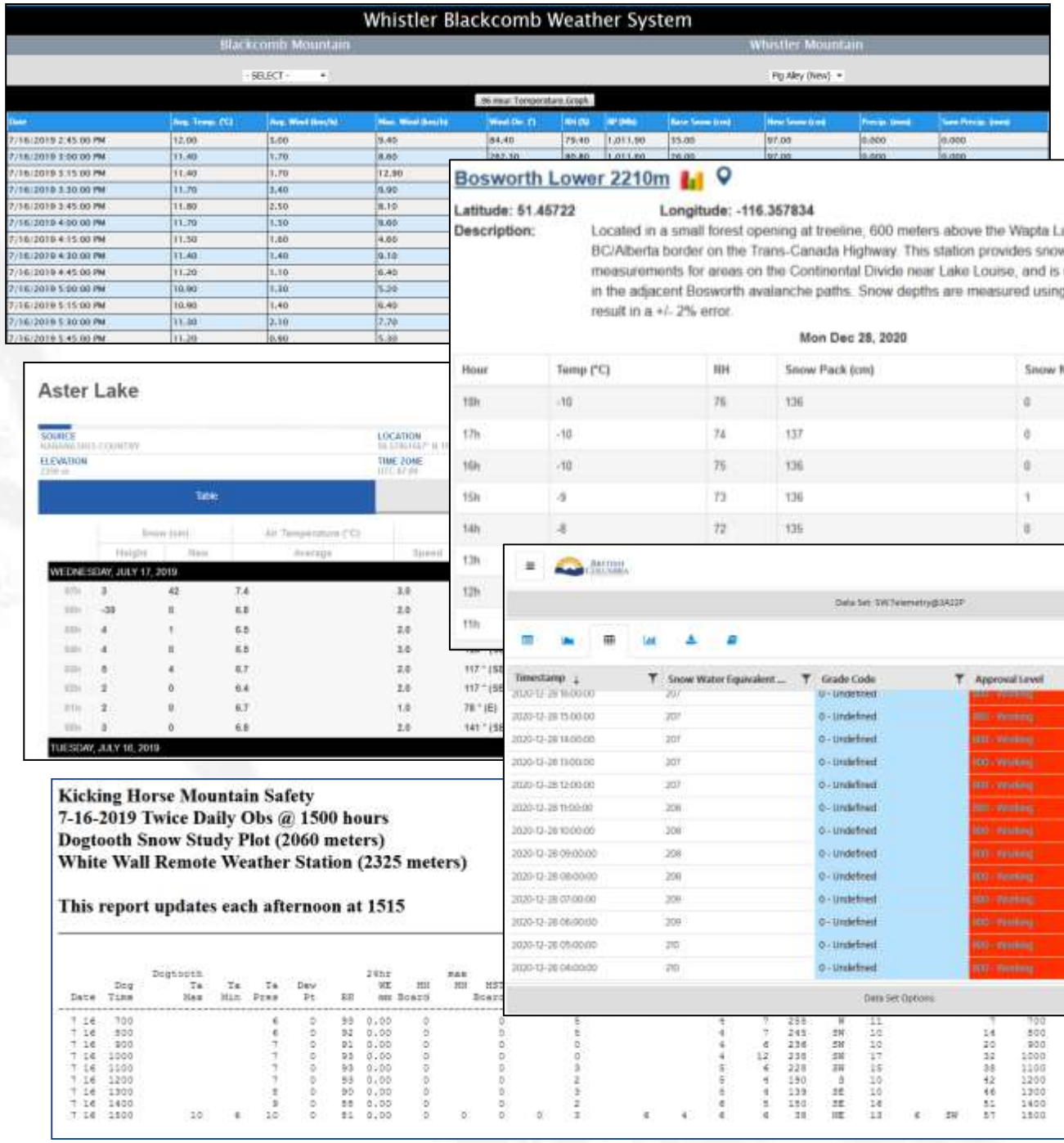
Available presentation formats

- A plethora of styles and formats,
- Leading to a cacophony of information.
- No standardization,
- Raising multiple questions about data quality and source measurement.

- Each delivery website requires nuanced understanding and interpretation.

- Is the top time the most recent or the oldest?
- Is the column an actual measurement or a calculation?
- Is the measurement to WMO, EC, or NOAA standards? Spot measurement or Average?

- There are others not shown here such as the direct report from a Davis station.



Steps to follow

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- Meta data such as elevation, column explanations?

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select current measurements
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
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20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
once daily 24 standard at 0600

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20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
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20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
once daily 24 standard at 0600

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- **Meta data such as elevation, column explanations?**

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
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Hourly Observations
MinMax reset at 0700

Date Time	Ta	24hr Ta Max	24hr Ta Min
20-12-26 00:00	-1.0	0.4	-3.5
20-12-26 01:00	-1.3	0.4	-3.5
20-12-26 02:00	-1.9	0.4	-3.5
20-12-26 03:00	-1.8	0.4	-3.5
20-12-26 04:00	-1.9	0.4	-3.5
20-12-26 05:00	-2.2	0.4	-3.5
20-12-26 06:00	-2.2	0.4	-3.5
20-12-26 07:00	-2.2	0.4	-3.5
20-12-26 08:00	-2.3	-2.0	-2.4
20-12-26 09:00	-1.9	-1.6	-2.4
20-12-26 10:00	-1.8	-1.6	-2.4
20-12-26 11:00	-2.4	-1.6	-2.5

RH	HS	HS Sig Qual	Precip Gauge Total
90	178.3	204	~
93	177.7	253	~
96	177.9	259	~
89	179.6	241	~
89	175.3	229	~
88	175.1	218	~
89	175.8	254	~
86	177.1	352	~
84	568.0	0	~
79	177.1	296	~
78	179.1	268	~
83	175.4	224	~

example:
once daily 24 standard at 0600

Quality Check:

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- Covers Interval? (12, 24 hrs)
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Observe & Record:

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- Select present measurements
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
once daily 24 standard at 0600

Quality Check:

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Observe & Record:

- Scan Ta column for maximum and minimum during interval. **If appropriate use additional data.**
- Select present measurements
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	[illegible]	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	[illegible]	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	[illegible]	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	[illegible]	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	[illegible]	[illegible]	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
[illegible]	-5.5	[illegible]	[illegible]	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example: once daily 24 standard at 0600

Quality Check:

- Correct Date?
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- Bad, Questionable, or Missing Data?
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Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- **Select present measurements**
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	92	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
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Observe & Record:

- Scan Ta column for maximum and minimum during interval.
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189.2
-175.8
13.4

HN24 13.4 cm

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	[illegible]	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	[illegible]	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	[illegible]	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	[illegible]	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
once daily 24 standard at 0600

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- Meta data such as elevation, column explanations?

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
- Make calculated observations
- **Interpret trends and rates**

Ta Trend

Steady

Precip type & rate

nil

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	[illegible]	-1.6	-6.1	92	[illegible]	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	[illegible]	-1.6	-6.1	90	[illegible]	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
once daily 24 standard at 0600

Quality Check:

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- Bad, Questionable, or Missing Data?
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Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	[illegible]	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	246	~	~
20-12-27 10:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	229	~	~
20-12-27 11:00	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	230	~	~
20-12-27 12:00	[illegible]	[illegible]	[illegible]	[illegible]	186.7	231	~	~
20-12-27 13:00	[illegible]	[illegible]	[illegible]	[illegible]	186.6	212	~	~
20-12-27 14:00	[illegible]	[illegible]	[illegible]	[illegible]	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	[illegible]	[illegible]	[illegible]	[illegible]	186.6	222	~	~
20-12-27 18:00	[illegible]	[illegible]	[illegible]	[illegible]	185.9	224	~	~
20-12-27 19:00	[illegible]	[illegible]	[illegible]	[illegible]	185.8	210	~	~

Precip type & rate *nil*

Ta Trend *Steady*

HN24 13.4 cm

example:
twice daily standard at 1800

Quality Check:

- **Correct Date?**
- **Covers Interval? (12, 24 hrs)**
- **Bad, Questionable, or Missing Data?**
- **Meta data such as elevation, column explanations?**

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
- Make calculated observations
- Interpret trends and rates

MinMax reset at 0700

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
twice daily standard at 1800

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- Meta data such as elevation, column explanations?

Observe & Record:

- **Scan Ta column for maximum and minimum during interval.**
- Select present measurements
- Make calculated observations
- Interpret trends and rates

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.8	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.1	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.8	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
twice daily standard at 1800

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20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
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20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	[illegible]	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	[illegible]	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	[illegible]	-1.6	-4.4	[illegible]	[illegible]	211	[illegible]	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	[illegible]	-1.6	-4.5	[illegible]	[illegible]	238	[illegible]	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

example:
twice daily standard at 1800

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- Meta data such as elevation, column explanations?

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
- **Make calculated observations**
- Interpret trends and rates

						HS	Precip	Hour
Date		24hr	24hr			Sig	Gauge	Precip
Time	Ta	Ta Max	Ta Min	RH	HS	Qual	Total	mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	-3.5	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	183.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	-4.3	-1.6	-4.5	96	187.3	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

184.6
-175.8
8.8

H2D 8.8 cm

example:
twice daily standard at 1800

Quality Check:

- Correct Date?
- Covers Interval? (12, 24 hrs)
- Bad, Questionable, or Missing Data?
- Meta data such as elevation, column explanations?

Observe & Record:

- Scan Ta column for maximum and minimum during interval.
- Select present measurements
- Make calculated observations
- **Interpret trends and rates**

184.6
-180.7
3.9

Ta Trend

Steady

Precip type & rate

S4

Date Time	Ta	24hr Ta Max	24hr Ta Min	RH	HS	HS Sig Qual	Precip Gauge Total	Hour Precip mm
20-12-26 00:00	-1.0	0.4	-3.5	90	178.3	204	~	~
20-12-26 01:00	-1.3	0.4	-3.5	93	177.7	253	~	~
20-12-26 02:00	-1.9	0.4	-3.5	96	177.9	259	~	~
20-12-26 03:00	-1.8	0.4	-3.5	89	179.6	241	~	~
20-12-26 04:00	-1.9	0.4	-3.5	89	175.3	229	~	~
20-12-26 05:00	-2.2	0.4	-3.5	88	175.1	218	~	~
20-12-26 06:00	-2.2	0.4	-3.5	89	175.8	254	~	~
20-12-26 07:00	-2.2	0.4	-3.5	86	177.1	352	~	~
20-12-26 08:00	-2.3	-2.0	-2.4	84	568.0	0	~	~
20-12-26 09:00	-1.9	-1.6	-2.4	79	177.1	296	~	~
20-12-26 10:00	-1.8	-1.6	-2.4	78	179.1	268	~	~
20-12-26 11:00	-2.4	-1.6	-2.5	83	175.4	224	~	~
20-12-26 12:00	-2.5	-1.6	-2.6	89	175.6	281	~	~
20-12-26 13:00	-2.9	-1.6	-3.1	96	179.7	229	~	~
20-12-26 14:00	-3.1	-1.6	-3.4	96	177.0	261	~	~
20-12-26 15:00	[illegible]	-1.6	-3.7	97	176.4	260	~	~
20-12-26 16:00	-4.2	-1.6	-4.3	97	184.2	243	~	~
20-12-26 17:00	-4.3	-1.6	-4.4	96	180.7	211	~	~
20-12-26 18:00	-4.4	-1.6	-4.5	97	184.6	217	~	~
20-12-26 19:00	[illegible]	-1.6	-4.5	96	[illegible]	238	~	~
20-12-26 20:00	-4.3	-1.6	-4.5	96	192.2	336	~	~
20-12-26 21:00	-4.5	-1.6	-4.5	96	189.0	249	~	~
20-12-26 22:00	-4.6	-1.6	-4.7	96	180.2	351	~	~
20-12-26 23:00	-5.6	-1.6	-5.6	94	188.7	270	~	~
20-12-27 00:00	-6.0	-1.6	-6.1	93	188.6	276	~	~
20-12-27 01:00	-6.0	-1.6	-6.1	93	187.3	270	~	~
20-12-27 02:00	-5.7	-1.6	-6.1	92	187.9	238	~	~
20-12-27 03:00	-5.7	-1.6	-6.1	92	189.8	336	~	~
20-12-27 04:00	-5.4	-1.6	-6.1	91	189.6	218	~	~
20-12-27 05:00	-5.4	-1.6	-6.1	92	188.8	233	~	~
20-12-27 06:00	-5.5	-1.6	-6.1	92	189.2	232	~	~
20-12-27 07:00	-5.5	-1.6	-6.1	90	188.1	233	~	~
20-12-27 08:00	-5.0	-5.0	-5.6	85	188.6	211	~	~
20-12-27 09:00	-4.8	-4.8	-5.6	85	188.1	246	~	~
20-12-27 10:00	-4.1	-4.1	-5.6	74	187.8	229	~	~
20-12-27 11:00	-4.3	-4.1	-5.6	75	187.0	230	~	~
20-12-27 12:00	-4.0	-3.7	-5.6	77	186.7	231	~	~
20-12-27 13:00	-4.4	-3.7	-5.6	71	186.6	212	~	~
20-12-27 14:00	-3.9	-3.7	-5.6	75	186.4	213	~	~
20-12-27 15:00	-4.1	-3.7	-5.6	70	186.6	227	~	~
20-12-27 16:00	-4.3	-3.7	-5.6	69	186.7	216	~	~
20-12-27 17:00	-4.3	-3.7	-5.6	69	186.6	222	~	~
20-12-27 18:00	-3.8	-3.7	-5.6	63	185.9	224	~	~
20-12-27 19:00	-4.1	-3.7	-5.6	78	185.8	210	~	~

THE END