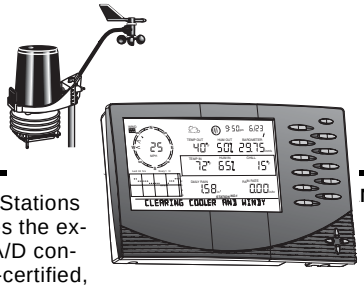
Wireless Vantage Pro® & Vantage Pro Plus™ Stations

Including Fan-Aspirated Models



6150
6160
6151
6161

NTAGE PRO

The Vantage Pro (**6150, 6151**) and Vantage Pro Plus (**6160, 6161**) Wireless Weather Stations include two components: the Integrated Sensor Suite (ISS) which houses and manages the external sensor array; and the console which provides the user interface, data display, A/D conversion, and calculations. The ISS and Vantage Pro console communicate via an FCC-certified, license-free transmitter and receiver. User-selectable DavisTalk ID codes allow up to eight stations to coexist in the same geographic area. The Wireless Vantage Pro Plus Weather Station includes two additional sensors that are optional on the Vantage Pro: the UV Sensor and the Solar Radiation Sensor. The console may be powered by batteries or by the included AC-power adapter. The wireless ISS is solar powered with a battery backup. Use WeatherLInk for Vantage Pro to interface your weather station with a computer, to log weather data, and to upload weather information to the internet.

The **6150** and **6160** rely on passive shielding to reduce solar-radiation induced temperature errors in the outside temperature sensor readings. The Fan-aspirated **6151** and **6161** combine passive shielding with a solar-powered fan that draws outside air in over the temperature and humidity sensors, providing a much more accurate temperature reading than that available using passive shielding alone.

Specifications

Console

Console Operating Temperature	+14° to +140°F (-10° to +60°C)
Display Temperature	+32° to +140°F (0° to +60°C)
Non-operating Temperature	-5° to +158°F (-20° to +70°C)
Current Draw	0.67 mA average, 15 mA peak, (plus 80 mA for display lamps, plus .125 mA for each optional wireless transmitter received by the console) at 4 to 6 VDC
AC Power Adapter	5 VDC, 200 mA, regulated
Batteries	3 C-cells
Battery Life	up to 1 year
Connectors	Modular RJ-11
Housing Material	UV-resistant ABS plastic
Console Display Type	LCD Transflective
Dimensions	
Console with antenna	10.375" x 6.125" x 1.5" (264 mm x 156 mm x 38 mm)
Display	5.94" x 3.375" (151 mm x 86 mm)
Weight (with batteries)	1.88 lbs. (.85 kg)

Integrated Sensor Suite (ISS)

Operating Temperature	-40° to +150°F (-40° to +65°C)
Non-operating Temperature	-50° to +158°F (-45° to +70°C)
Current Draw (ISS SIM only)	0.07 mA (average), 10 mA (peak) at 4 to 6 VDC
Solar Power Panel (ISS SIM / Fan)	0.5 watts / .75 watts
Battery (ISS SIM / Fan (Fan-Aspirated))	CR-123 3-Volt Lithium cell / 2 - 1.2 Volt NiCad C-cells
Battery Life (3-Volt Lithium cell)	up to 2 years, 1 year with no sun
Battery Life (NiCad C-cells)	1 year
Fan Aspiration Rate (Fan-Aspirated)	190 feet/min. (0.9 m/s) (full sun), 80 feet/min. (0.4 m/s) (battery only)
Connectors, Sensor	Modular RJ-11
Cable Type	4-conductor, 26 AWG
Cable Length, anemometer	40’ (12 m) (included) 540’ (165 m) (maximum recommended)
Wind Speed Sensor	Wind cups with magnetic switch
Wind Direction Sensor	Wind vane with potentiometer
Rain Collector Type	Tip bucket, 0.01" per tip, 33.2 in^2 (214 cm^2) collection area
Temperature Sensor Type	Platinum wire thermistor
Relative Humidity Sensor Type	Film capacitor element
Housing Material	UV-resistant ABS plastic
Dimensions	
6150, 6160	11.0" x 9.375" x 15.25" (279 mm x 238 mm x 388 mm)
6151, 6161	11.0" x 9.375" x 21.0" (279 mm x 238 mm x 533 mm)
Weight	
6150, 6160	5.7 lbs. (2.6 kg) / 6.1 lbs. (2.8 kg)
6151, 6161	9.7 lbs. (4.4 kg) / 10.1 lbs. (4.6 kg)

Wireless Communications

Transmit/Receive Frequency	US Models: 916.5 MHz, Overseas Models: 868.35 MHz
DavisTalk‰ ID Codes Available	8
Output Power	916.5 MHz: FCC-certified low power, less than 1 mW, no license required

DAVIS Davis Instruments 3465 Diablo Ave., Hayward, CA 94545-2778
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DS6150 (Rev. C, 01/24/03)

868.35 MHz: CE-certified, less than 10 mW, no license required

Range
- Line of Sight . . . . . up to 400 feet (120 m)
- Through Walls . . . . . 75 to 150 feet (23 to 46 m)

Sensor Inputs

- RF Filtering . . . . . RC low-pass filter on each signal line

Sensor Outputs (as displayed on console)

General
- Historical Data . . . . . Includes the past 24 values listed unless otherwise noted; all can be cleared and all totals reset
- Daily Data . . . . . Includes the earliest time of occurrence of highs and lows; period begins/ends at 12:00 am
- Monthly Data . . . . . Period begins/ends at 12:00 am on the first of the month
- Yearly Data . . . . . Period begins/ends at 12:00 am on the first of January unless otherwise noted
- Current Data . . . . . Current data appears in the right most column in the console graph and represents the latest value within the last period on the graph; totals can be set or reset
- Graph Time Interval . . . . . 1 min., 10 min., 15 min., 1 hour, 1 day, 1 month, 1 year (user-selectable, availability depends upon variable selected)
- Graph Time Span . . . . . 24 Intervals + Current Interval (see Graph Intervals to determine time span)
- Graph Variable Span (Vertical Scale) . . . . . Automatic (varies depending upon data range); Maximum and Minimum value in range appear in ticker
- Alarm Indication . . . . . Alarms sound for only 2 minutes (time alarm is always 1 minute) if operating on battery power. Alarm message is displayed in ticker as long as threshold is met or exceeded. Alarms can be silenced (but not cleared) by pressing the DONE key.
- Update Interval . . . . . Varies with sensor - see individual sensor specs
  Also varies with DavisTalk transmitter ID code - #1=shortest, #8=longest

Forecast
- Variables Used . . . . . Barometric Reading & Trend, Wind Speed & Direction, Rainfall, Temperature, Humidity, Latitude & Longitude, Time of Year
- Update Interval . . . . . 1 hour
- Display Format . . . . . Icons on top center of display; detailed message in ticker at bottom
- Variables Predicted . . . . . Sky Condition, Precipitation, Temperature Changes, Wind Direction and Speed Changes

Outside Temperature (sensor located in ISS)
- Resolution and Units . . . . . Current Data: 0.1°F or 1°F or 0.1°C or 1°C (user-selectable) nominal (see Fig. 1)
  Historical Data and Alarms: 1°F or 1°C (user-selectable)
- Range . . . . . -40° to +150°F (-40° to +65°C)
- Sensor Accuracy . . . . . ±1°F (±0.5°C) up to 110°F (43°C), ±2°F (±1°C) over 110°F (43°C) (see Fig. 2)
- Radiation Induced Error (Passive Shield) . . . . . +4°F (2°C) at solar noon (insolation = 1040 W/m^2, avg. wind speed ≤ 2 mph (1 m/s)) (reference: RM Young Model 43408 Fan-Aspirated Radiation Shield)
- Radiation Induced Error (Fan-Aspirated) . . . . . +0.6°F (0.3°C) at solar noon (insolation = 1040 W/m^2, avg. wind speed ≤ 2 mph (1 m/s)) (reference: RM Young Model 43408 Fan-Aspirated Radiation Shield)
- Update Interval . . . . . 10 to 12 seconds
- Current Data . . . . . Instant Reading (user adjustable); Daily, Monthly, Yearly High and Low
- Historical Data . . . . . Hourly Readings; Daily, Monthly, Yearly Highs and Lows
- Alarms . . . . . High and Low Thresholds from Instant Reading

Extra Temperature Sensors or Probes
- Resolution and Units . . . . . 1°F or 1°C (user-selectable)
  Historical Data and Alarms: 1°F or 1°C (user-selectable)
- Range . . . . . -40° to +150°F (-40° to +65°C)
- Sensor Accuracy . . . . . ±1°F (±0.5°C) up to 110°F (43°C), ±2°F (±1°C) over 110°F (43°C) (see Fig. 2)
- Update Interval . . . . . 10 to 12 seconds (40 to 48 seconds for Leaf Wetness/Temperature and Soil Moisture/Temperature Stations)
- Current Data . . . . . Instant Reading (user adjustable)
- Alarms . . . . . High and Low Thresholds from Instant Reading

Inside Temperature (sensor located in console)
- Resolution and Units . . . . . Current Data: 0.1°F or 1°F or 0.1°C or 1°C (user-selectable)
  Historical Data and Alarms: 1°F or 1°C (user-selectable)
- Range . . . . . +32° to +140°F (0° to +60°C)

Sensor Accuracy	±1°F (±0.5°C) up to 110°F (43°C), ±2°F (±1°C) over 110°F (43°C)
Update Interval	1 minute
Current Data	Instant Reading (user adjustable); Daily and Monthly High and Low
Historical Data	Hourly Readings; Daily and Monthly Highs and Lows
Alarms	High and Low Thresholds from Instant Reading
Wind Speed	
Resolution and Units	1 mph, 1 km/h, 0.1 m/s, or 1 knot (user-selectable)
Range (large wind cups)	2 to 150 mph, 2 to 130 knots, 1 to 67 m/s, 3 to 241 km/h
Range (small wind cups)	3 to 175 mph, 3 to 150 knots, 1.5 to 79 m/s, 5 to 282 km/h
Update Interval	Instant Reading: 2.5 to 3 seconds, 10-minute Average: 1 minute
Accuracy (large wind cups)	±2 mph (2 kts, 3 km/h, 1 m/s) or ±5%, whichever is greater
Accuracy (small wind cups)	±3 mph (3 kts, 5 km/h, 1.5 m/s) or ±5%, whichever is greater
Maximum Cable Length	540' (165 m)
Current Data	Instant Reading; 10-minute and Hourly Average; Hourly High; Daily, Monthly and Yearly High with Direction of High
Historical Data	10-min. and Hourly Averages; Hourly Highs; Daily, Monthly and Yearly Highs with Direction of Highs
Alarms	High Thresholds from Instant Reading and 10-minute Average
Wind Direction	
Display Resolution	16 points (22.5°) on compass rose, 1° in numeric display
Accuracy	±7°
Update Interval	2.5 to 3 seconds
Current Data	Instant Reading (user adjustable); 10-min. Dominant; Hourly, Daily, Monthly Dominant
Historical Data	Past 6 10-min. Dominants on compass rose only; Hourly, Daily, Monthly Dominants
Wind Chill (Calculated)	
Resolution and Units	1°F or 1°C (user-selectable)
Range	-110° to +130°F (-79° to +54°C)
Accuracy	±2°F (±1°C) (typical)
Update Interval	10 to 12 seconds
Source	United States National Weather Service (NWS)/NOAA
Equation Used	Osczevski (1995) (adopted by US NWS in 2001)
Variables Used	Instant Outside Temperature and 10-min. Avg. Wind Speed
Current Data	Instant Calculation; Hourly, Daily and Monthly Low
Historical Data	Hourly, Daily and Monthly Lows
Alarm	Low Threshold from Instant Calculation
Rainfall	
Resolution and Units	0.01" or 0.25 mm (user-selectable) (1 mm at totals ≥ 2000 mm)
Daily/Storm Rainfall Range	0 to 99.99" (0 to 9999 mm)
Monthly/Yearly/Total Rainfall Range	0 to 199.99" (0 to 19999 mm)
Rain Rate	0 to 199.99" (0 to 19999 mm)
Accuracy	For rain rates up to 2"/hr (50 mm/hr): ±4% of total or +0.01" (0.25 mm) (0.01" = one tip of the bucket), whichever is greater For rain rates from 2"/hr (50 mm/hr) to 4"/hr (100 mm/hr): ±5% of total or +0.01" (0.25 mm) (0.01" = one tip of the bucket), whichever is greater
Update Interval	10 to 12 seconds
Storm Determination Method	0.02" (0.5 mm) begins a storm event, 24 hours without further accumlulation ends a storm event
Current Data	Totals for Past 15-min, Past 24-hour, Daily, Monthly, Yearly (start date user-selectable) and Storm (with begin date); Umbrella is displayed when 15 minute Total exceeds zero
Historical Data	Totals for 15-min, Daily, Monthly, Yearly (start date user-selectable) and Storm (with begin and end dates)
Alarms	High Threshold from Latest Flash Flood (15-min. Total, default is 0.50", 12.7 mm), 24-hour Total, Storm Total,
Range for Rain Alarms	0 to 99.99" (0 to 999.7 mm)
Rain Rate	
Resolution and Units	0.01" or 0.25 mm (user-selectable) at typical rates (see Fig. 3 and 4)
Range	0, 0.04"/hr (1 mm/hr) to 100"/hr (0 to 1999.9 mm/hr)
Accuracy	±5% or ±0.04"/hr (1 mm/hr) (up to 10"/hr. (250 mm/hr.)), whichever is greater
Update Interval	10 to 12 seconds
Calculation Method	Measures time between successive tips of rain collector. Elapsed time greater than 15 minutes or only one tip of the rain collector constitutes a rain rate of zero.
Current Data	Instant and 1-min. Reading; Hourly, Daily, Monthly and Yearly High
Historical Data	1-min Reading; Hourly, Daily, Monthly and Yearly Highs
Alarm	High Threshold from Instant Reading

Barometric Pressure (sensor located in console)

Resolution and Units	0.01" Hg, 0.1 mm Hg, 0.1 hPa/mb (user-selectable)
Corrected Range	26.00" to 32.00" Hg, 660.0 to 810.0 mm Hg, 880.0 to 1080.0 hPa/mb
Uncorrected Range	18.00" to 33.50" Hg, 457.0 to 850.0 mm Hg, 592.0 to 1130.0 hPa/mb
Elevation Range	-999' to +12,500' (-305 m to 3810 m)
Uncorrected Reading Accuracy	±0.03" Hg (±0.8 mm Hg, ±1.0 hPa/mb) (at room temperature)
Sea-Level Reduction Equation Used	United States Method employed prior to use of current "R Factor" method
Equation Source	Smithsonian Meteorological Tables
Equation Accuracy	±0.01" Hg (±0.3 mm Hg, ±0.3 hPa/mb)
Elevation Accuracy Required	±10' (3m) to meet equation accuracy specification
Overall Accuracy	±0.04" Hg (±1.0 mm Hg, ±1.4 hPa/mb)
Trend (change in 3 hours)	Change Š0.6" (2 hPa/mb, 1.5 mm Hg) = Rapidly Change Š0.2" (.7hPa/mb, .5 mm Hg)= Slowly
Trend Indication	5 position arrow: Rising (rapidly or slowly), Steady, or Falling (rapidly or slowly)
Update Interval	15 minutes or when console BAR key is pressed twice
Current Data	Instant, 15-min., and Hourly Reading; Daily, Monthly, High and Low
Historical Data	15-min. and Hourly Reading; Daily, Monthly Highs and Lows
Alarms	High Threshold from Current Trend for Storm Clearing (Rising Trend Low Threshold from Current Trend for Storm Warning (Falling Trend)
Range for Rising and Falling Trend Alarms	0.01 to 0.25" Hg (0.1 to 6.4 mm Hg, 0.1 to 8.5 hPa/mb)

Inside Relative Humidity (sensor located in console)

Range	10 to 90% RH
Accuracy	±5%
Update Interval	1 minute
Current Data	Instant (user adjustable) and Hourly Reading; Daily, Monthly High and Low
Historical Data	Hourly Readings; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Reading

Outside Relative Humidity (sensor located in ISS)

Range	1 to 100% RH
Accuracy	±3% (0 to 90% RH), ±4% (90 to 100% RH)
Temperature Coefficient	0.03% per °F (0.05% per °C), reference 68°F (20°C)
Drift	±0.5% per year
Update Interval	50 seconds to 1 minute
Current Data	Instant (user adjustable) and Hourly Reading; Daily, Monthly High and Low
Historical Data	Hourly Readings; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Reading

Extra Outside Relative Humidity (sensor located inside Temperature/Humidity Station)

Range	0 to 100% RH
Accuracy	±3% (0 to 90% RH), ±4% (90 to 100% RH)
Temperature Coefficient	0.03% per °F (0.05% per °C), reference 68°F (20°C)
Drift	±0.5% per year
Update Interval	50 seconds to 1 minute
Current Data	Instant Reading (user adjustable)
Alarms	High and Low Threshold from Instant Reading

Dewpoint (calculated)

Resolution and Units	1°F or 1°C (user-selectable)
Range	-105° to +130°F (-76° to +54°C)
Accuracy	±3°F (±1.5°C) (typical)
Update Interval	10 to 12 seconds
Source	World Meteorlogical Organization (WMO)
Equation Used	WMO Equation with respect to saturation of moist air over water
Variables Used	Instant Outside Temperature and Instant Outside Relative Humidity
Current Data	Instant Calculation; Daily, Monthly High and Low
Historical Data	Hourly Calculations; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Calculation

Heat Index (calculated)

Resolution and Units	1°F or 1°C (user-selectable)
Range	-40° to +135°F (-40° to +57°C)
Accuracy	±3°F (±1.5°C) (typical)
Update Interval	10 to 12 seconds
Source	United States National Weather Service(NWS)/NOAA
Formulation Used	Steadman (1979) modified by US NWS/NOAA and Davis Instruments to increase range of use
Variables Used	Instant Outside Temperature and Instant Outside Relative Humidity
Current Data	Instant Calculation; Daily, Monthly High
Historical Data	Hourly Calculations; Daily, Monthly Highs
Alarm	High Threshold from Instant Calculation

Evapotranspiration (calculated, requires solar radiation sensor)
- Resolution and Units . . . . . 0.01" or 0.25 mm (user-selectable)
- Range . . . . . Daily to 99.99" (999.9 mm); Monthly & Yearly to 199.99" (1999.9 mm)
- Accuracy . . . . . Greater of 0.01" (0.25 mm) or ±5%, Reference: side-by-side comparision against a CIMIS ET weather station
- Update Interval . . . . . 1 hour
- Calculation and Source . . . . . Penman-Monteith Equation as implemented by CIMIS (California Irrigation Management Information System) including Net Radiation calculation
- Current Data . . . . . Latest Hourly Total Calculation, Daily, Monthly, Yearly Total
- Historical Data . . . . . Hourly, Daily, Monthly, Yearly Totals
- Alarm . . . . . High Threshold from Latest Daily Total Calculation

Solar Radiation (requires solar radiation sensor)
- Resolution and Units . . . . . 1 W/m^2
- Range . . . . . 0 to 1800 W/m^2
- Accuracy . . . . . ±5% of full scale (Reference: Eppley PSP at 1000 W/m^2)
- Drift . . . . . up to ±2% per year
- Cosine Reponse . . . . . ±3% for angle of incidence from 0° to 75°
- Temperature Coefficient. . . . . -0.067% per °F (-0.12% per °C); reference temperature = 77°F (25 °C)
- Update Interval . . . . . 50 seconds to 1 minute (5 minutes when dark)
- Current Data . . . . . Instant Reading and Hourly Average; Daily, Monthly High
- Historical Data . . . . . Hourly Average, Daily, Monthly Highs
- Alarm . . . . . High Threshold from Instant Reading

Temperature Humidity Sun Wind Index (requires solar radiation sensor)
- Resolution and Units . . . . . 1°F or 1°C (user-selectable)
- Range . . . . . -90° to +135°F (-68° to +64°C)
- Accuracy . . . . . ±4°F (±2°C) (typical)
- Update Interval . . . . . 10 to 12 seconds
- Sources and Formulation Used . . . . . United States National Weather Service(NWS)/NOAA Steadman (1979) modified by US NWS/NOAA and Davis Instruments to increase range of use and allow for cold weather use
- Variables Used. . . . . Instant Outside Temperature, Instant Outside Relative Humidity, 10-minute Average Wind Speed, 10-minute Average Solar Radiation
- Formulation Description . . . . . Uses Heat Index as base temperature, affects of wind and solar radiation are either added or subtracted from this base to give an overall effective tempertature
- Current Data . . . . . Instant and Hourly Calculation; Daily, Monthly High
- Historical Data . . . . . Hourly Calculation; Daily, Monthly Highs
- Alarm . . . . . High Threshold from Instant Reading

Ultra Violet (UV) Radiation Index (requires UV sensor)
- Resolution and Units . . . . . 0.1 Index
- Range . . . . . 0 to 16 Index
- Accuracy . . . . . ±5% of full scale (Reference: Yankee UVB-1 at UV index 10 (Extremely High))
- Cosine Reponse . . . . . ±4% (0° to 65° incident angle); 9% (65° to 85° incident angle)
- Update Interval . . . . . 50 seconds to 1 minute (5 minutes when dark)
- Current Data . . . . . Instant Reading and Hourly Average; Daily, Monthly High
- Historical Data . . . . . Hourly Average, Daily, Monthly Highs
- Alarm . . . . . High Threshold from Instant Calculation

Ultra Violet (UV) Radiation Dose (requires UV sensor)
- Resolution and Units . . . . . 0.1 MEDs to 19.9 MEDs; 1 MED above 19.9 MEDS
- Range . . . . . 0 to 199 MEDs
- Accuracy . . . . . ±5% of daily total
- Drift . . . . . up to ±2% per year
- Update Interval . . . . . 50 seconds to 1 minute (5 minutes when dark)
- Current Data . . . . . Latest Daily Total (user resetable at any time from Current Screen)
- Historical Data . . . . . Hourly, Daily Totals (user reset from Current Screen does not affect these values)
- Alarm . . . . . High Threshold from Daily Total
- Alarm Range . . . . . 0 to 19.9 MEDs

Soil Moisture (requires soil moisture Sensor)
- Resolution . . . . . 1 cb
- Range . . . . . 0 to 200 cb
- Update Interval . . . . . 62.5 to 75 seconds
- Current Data . . . . . Instant Reading; Daily and Monthly High and Low
- Historical Data . . . . . Hourly Readings; Daily and Monthly Highs and Lows
- Alarms . . . . . High and Low Thresholds from Instant Reading

Leaf Wetness (requires leaf wetness Sensor)
- Resolution 1

Range	0 to 15
Dry/Wet Threshold	User-selectable
Accuracy	±0.5
Update Interval	(to be provided)
Current Data	Instant Reading; Daily High and Low; Monthly High
Historical Data	Hourly Readings; Daily Highs and Lows; Monthly Highs
Alarms	High and Low Thresholds from Instant Reading
Moon Phase	
Console Resolution	1/8 (12.5%) of a lunar cycle, 1/4 (25%) of lighted face on console
WeatherLink Resolution	0.09% of a lunar cycle, 0.18% of lighted face maximum (depends on screen resolution)
Range	New Moon, Waxing Cresent, First Quarter, Waxing Gibbous, Full Moon, Wanning Gibbous, Last Quarter, Waning Cresent
Accuracy	±38 minutes
Sunrise and Sunset	
Resolution	1 minute
Accuracy	±1 minute
Reference	United States Naval Observatory
Clock	
Resolution	1 minute
Units	Time: 12 or 24 hour format (user-selectable) Date: US or International format (user-selectable)
Accuracy	±8 seconds/month
Adjustments	Time: Automatic Daylight Savings Time (for users in North America, Europe and Australia that observe it in AUTO mode, MANUAL setting available for all other areas) Date: Automatic Leap Year
Alarms	Once per day at set time when active

Sensor Charts

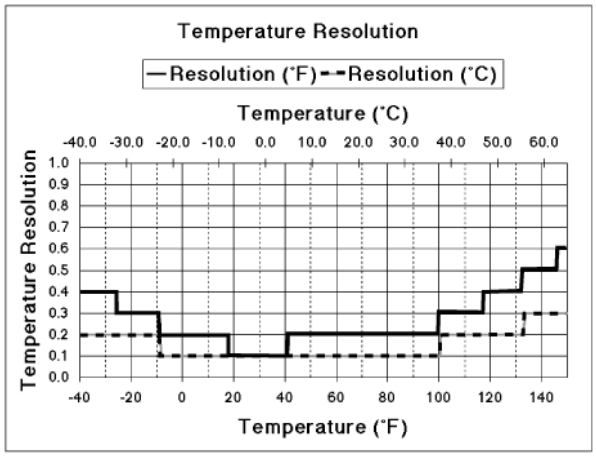

Figure 1. Temperature Resolution

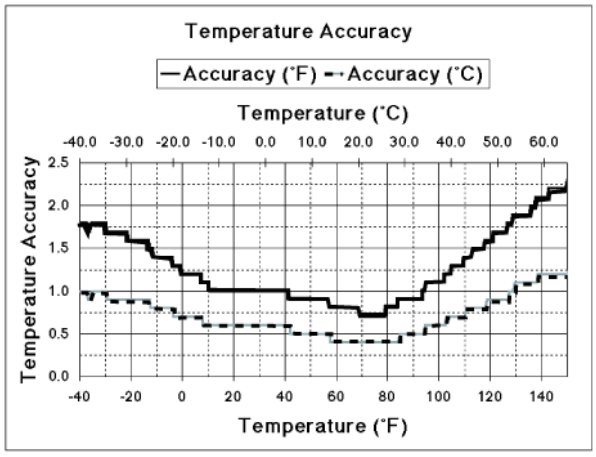

Figure 2. Temperature Accuracy

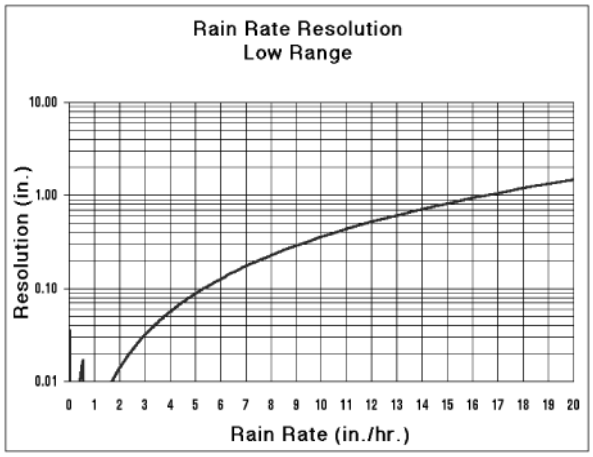

Figure 3. Low Range Rain Rate Resolution

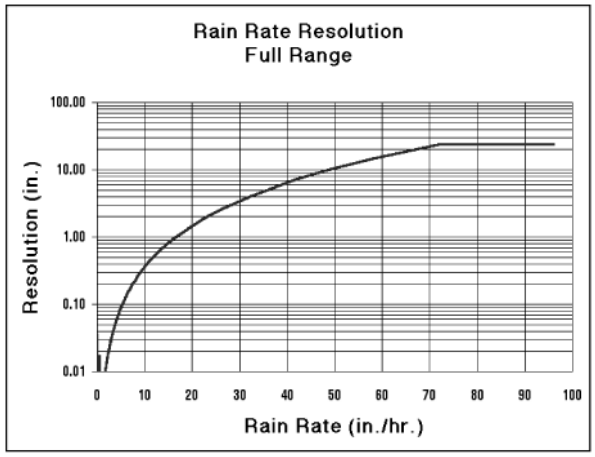

Figure 4. Full Range Rain Rate Resolution