

NOMAD PORTABLE WEATHER STATION

FREQUENTLY ASKED QUESTIONS

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- What sensors are supplied?
- What are the specifications for the sensors?
- Can I add other sensors?
- What are the power supply options?

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- How does the “direct power” option work?
- What is the maximum distance for this cable?



Nomad basic

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- Which telemetry option do I require?
- What sort of radio telemetry can the NOMAD utilize?
- How often can I access data using modems or low power radios and solar power?
- Can several NOMAD systems communicate to a single P.C via low power radio links?
- Can data be combined from NOMADs using different telemetry options?

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- How much does the system weigh?
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- Where should I position the NOMAD?
- How do you position the system towards North for the Wind Direction?
- Will it matter if the NOMAD is not level?
- How stable is the NOMAD in heavy winds?

FAQ'S: SYSTEM HARDWARE

Q: What are the available system configurations?

There are 3 ways to supply / order a system:

1. BASIC SYSTEM

The **basic system** includes the following parts:

- **Tripod** (6 – 9 feet tall) with fixing pegs.
- **Datalogger** – (Sensus) in weatherproof “Pelican” case (with mountings for tripod) together with power supply unit, pressure sensor, solar panel and all plugs and sockets for sensor array and rain gauge.
- **Sensor array** – complete with sensors to measure:
 - **Wind Speed & Direction**
 - **Temperature & Relative Humidity**
 - **Solar radiation**
 - **Tipping Bucket Rain Gauge (0.2mm)**
- **Carry bags** for sensor array and tripod, plus third bag for rain gauge.

2. WIND SYSTEM ONLY

Another version of the system can be supplied as above but with only WS & WD sensors on the sensor array. This can be useful for those applications in which only wind data is required. The other sensors can be added when required.

3. CUSTOM CONFIGURATION

Should any other combination of sensors be required, or addition of optional extra sensors (for example, soil temperature, leaf wetness etc.) the system will be priced as a “special”. Prices are available for most options on the price list.

Q: What sensors are supplied?

The seven most common meteorological parameters are supplied with the system. These enable most applications to be adequately covered, including that of calculated evapo-transpiration rates. They are:

- Wind speed and direction (mph, knots, ms^{-1} , and degrees)
- Temperature & Relative Humidity ($^{\circ}\text{C}$ or $^{\circ}\text{F}$ and %)
- Solar Radiation (Wm^{-2})
- Barometric Pressure (inHg or mb)
- Rainfall (in or mm)

Q: What are the specifications for the sensors?

Sensor	Principle of Operation	Resolution	Units	Range	Accuracy
Wind Speed	Optical encoder	0.1 ms ⁻¹	mph, knots, ms ⁻¹	0 – 75 ms ⁻¹	±0.3 (<3ms ⁻¹) ±1.0 (>3ms ⁻¹)
Wind Direction	GMR (solid state)	1 degree	Degrees	0 to 359°	<±2°
Temperature	PRTD sensor	0.01°C	°C or °F	(-40 – +140°F) (-40 – +60°C)	±0.30 (0°C) ±0.55 (50°C)
Relative Humidity	Capacitive device	1%	%RH	0-100%	±3%
Solar Radiation	Photo Diode	0.1 Wm ⁻²	Wm ⁻²	0 –2000 Wm ⁻²	±2%
Barometric Pressure	Silicon bridge	1mb	InHg, mb, kPa	23.6–32.5 inHg 800-1100mb	±3mb
Rainfall	Tipping Bucket	0.2mm	0.2mm	Unlimited	±1% @ 1L/hr

Q: Can I add other sensors?

Yes, other sensors can be added if required by purchasing the Ground Sensor Connection Box 187057D (up to 4 additional sensor inputs). These sensors may include; Soil Temperature, Leaf Wetness and Grass Temperature. Other aerial sensors will also need the Box, and an additional tripod for mounting the cross arm.

Q: What are the power supply options?

- **Internal Battery Power:** The NOMAD has an internal rechargeable battery pack, which will allow operation for 1 month on its own. While this is not designed for continuous usage, it helps keep the system running in the event of solar power downtime.
- **Solar Power:** A high efficiency solar panel is supplied as standard on the system, which allows regular battery top up. In this way, the unit is capable of continuous and autonomous operation. The panels are selected on the basis of continued operation with 50% efficiency.
- **Direct Power:** The unit may also be directly connected to an auxiliary power source, such as 24VAC (supplied through a mains transformer). This option is most useful when real time data is needed on site, as both power and signal can be transmitted simultaneously down the same cable.

FAQ's: POWER MANAGEMENT

General

As the NOMAD is a portable system that is designed for remote use, the **SENSUS** data logger has been adapted so that it has to be manually turned on. There is a start and stop option on the LCD or Keypad enabling field operation.

Prior to dismantling the NOMAD system the **SENSUS** must be switched off. Conversely, when the data logger is re-assembled, the **SENSUS** must be re-activated by pressing any key on the keypad. If the **NOMAD** is not used for a long period of time it is advised that the battery is disconnected to avoid drainage. When the main lead acid rechargeable battery is disconnected there is a back up battery on the main circuit board of the data-logger that provides current for the real-time clock and holds the configuration information. This battery has sufficient charge to retain this information for up to 5 years of non-activity.

Q: What happens if the solar panels are obscured?

It is a fact of longer term monitoring that solar panels can be obscured by various natural and anthropogenic processes, which include dust deposition, fouling (by guano etc) and vegetation.

The solar panels selected by Casella are of the highest quality, and are proven in the harshest of environments. The panels are provided with charging and over voltage protection, and are supplied in conjunction with the battery supply.

The power rating design allows for 50% reduction in power output due to contamination. This means that in the event of falling output from the cells, due to fouling, or extended periods of low light, the PWS should continue to function for up to **1 year** (based on 5 minute data-logging and transfer of data to PC).

Q: How does the Direct Power option work?

The NOMAD has the potential to use a direct power source derived from 110 Vac mains supply. This method bypasses the solar panels and ensures continuous operation, backed up by the internal battery. Power is supplied from a 24 Vac transformer and can be located up to 1500 feet away from the station.

Q: What is maximum distance for this cable?

Using this power option, the data from the NOMAD can be sent direct to a PC using an RS485 signal as standard. Signals in this format are capable of being transmitted many miles. This option may be useful when real time monitoring of a location is required for emergency procedures etc. Both the power and the signal are sent over the same cable.

FAQ's: TELEMETRY

What telemetry options are available?

- **Laptop PC** – this is the simplest form of communication, enabling direct communication between the Sensus data-logger and a laptop computer running the Casella OnLine software. Data can be downloaded over an RS232 cable and system configuration settings can be changed. A personal site visit is required to download results using this option.
- **Memory cards** – the Sensus data-logger within the NOMAD has a built in slot for PCMCIA cards. Cards can be inserted to collect data from the station, removed when full and swapped with fresh, empty cards. Cards may be read using a reader connected to a PC. Again, a personal site visit is required to download results using this option.
- **GSM (cell) Modem** – Although this option is still fairly expensive in North America due to the cost of hardware and mobile data accounts, it is still a feasible option. GSM telemetry can be used with the NOMAD to enable global communication providing that a digital signal is present at the location of the NOMAD. The set up for the modem can be configured on the software. Please note that mobile “data” accounts must be used.
- **Radio** - Low Power Radios can also be used. These utilize small transmitters at the NOMAD end and receivers connected to the PC, which allow the real time transfer of data.
- **Direct** – (or Landline) Combines data and power (from mains) via cable direct to PC. The cable from the power supply (maximum distance from system 1500 feet) also acts as the data communications cable. This option bypasses the use of the solar panel, as power is continuously supplied.

Q: Which telemetry option do I require?

This depends upon the frequency with which the site is to be visited, the remoteness of the site, and accessibility to mains power and whether data needs to be monitored in real time.

I need real time data!

The options for real time data are either radios or direct connection. However, this assumes that the distance from NOMAD to PC is relatively small - >1500 feet for the direct connection and around 1 mile for low powered radios. Higher-powered radios are available as an option (see below).

I need the cheapest system possible!

The simplest form of data collection is to visit the site and manually collect the data. The memory of the unit will allow up to several months of data to be stored at a time if required. The connection/download software is supplied with the system.

I need data, but don't want to transport a laptop to site!

The credit card sized PCMCIA memory cards are most suited to this scenario. An empty replacement card can be taken to site and swapped with the full one, which can be read by a card reader in the PC.

My monitoring site is remote but I need data often!

This is best achieved by using the GSM modem option, assuming a digital signal is available at the monitoring site. If no signal is available, then regular personal visits to the site will be required.

I do not have access to mains power!

If the system has to operate for longer intervals in an environment where no mains supply is available, such as a remote landfill site, then either the GSM modem or Radio option will be required, in order to send data to the base station when required.

Q: What sort of Radio Telemetry can the NOMAD utilize?

General

Radios are useful when cable installation is not an option. The NOMAD can use either low or high power radios to transmit data short distances. Low power systems (up to 1 mile) need no license and are generally more affordable. High power systems require a license (depending upon location), are more costly, and are better suited to "fixed" rather than "portable" systems.

Low Power Radios

Low power radios offer a convenient method of relaying real time data from the Nomad to a local PC for data processing and presentation. In NOMAD applications, it is envisaged that this distance will be in the region of hundreds of feet to 1 mile at sites with good geographical and radio characteristics (flat site, good line of site etc.). Such low power UHF telemetry links (100mW) provide a reliable method to get real time data onto a customer's site and computer network. It eliminates the need for costly and sometimes inconvenient cable installation.

High Power Radios

For long distance radio communication links, higher power radios with high gain directional antennas are required. For good reliability, a 'line of sight' path between the receive and transmit antennas is required and this frequently involves mounting antennas on nearby buildings or masts. Whilst this is possible, it represents more the needs of a fixed system installation. The need for additional masts, power supply improvement and larger antennas means this option should be considered as a special project specific to the application. Please contact Casella USA for more details.

Q: How often can I access data using modems or Low power radios and solar power?

GSM modem

Using solar power and the GSM option, available power allows 2 data downloads per day (The solar panel calculations take into account power demand day and night based on typical seasonal weather conditions so there are no problems running at night).

Low power radios

Low Power Radio is capable of transmitting real time data every 20 seconds (using Direct Power). Using solar power and radios, data can be transmitted every 1 minute. Data can be transmitted over a 2km range assuming the station is located at latitudes of 52° or any further south (USA, Mexico and most of southern Canada). Any greater latitudes will reduce the available power for transmitted distance.

Q: Can several Nomad systems communicate to a single P.C via low power radio links?

Yes. Several Nomad systems at different locations may transmit data back to a single PC via a low power radio link. The Online PC software application polls different radio channels in order to collect data from each system. In such applications, a more expensive receiver module (used on high power radio telemetry links) is utilized at the PC end. Please contact Casella USA for more details on this option.

Q: Can data be combined from NOMADs using different telemetry options?

Yes, although not as standard. The Online PC software application has been designed to take data from multiple input sources, which may be Direct, Radio, etc. However it must be pointed out that collecting data from systems takes time so it may influence the data capture rate. Also, the configuration may demand additional serial ports on the PC to cope with different input sources.

Whilst the Online software copes well with up to 4 different input sources, a reasonably modern and fast PC is strongly recommended (>800MHz).

The time required for software customization should be considered. This deviates from standard NOMAD Online software installations and will be handled as a special project. Please call Casella USA for more details on this option.

FAQ's: DATA LOGGING

Q: Which data-logger does the system use?

The **SENSUS** data-logger, which is made by Casella. This new logger is a very comprehensive and universal data-logger that can take inputs from a wide range of sensors. It can accept up to 32 single ended inputs (16 differentials). It is also very low powered, consuming only 30mA of current (normal) and 7mA (quiescent). This enables longer operation in the field.

The data-logger has a PCMCIA card slot, which allows for much greater data storage through the use of PCMCIA Compact Flash cards. It also has an integral lead acid charger/solar regulator system, internal real time clock and data storage – all backed up by a lithium battery.

Q: What is basic data storage capacity of the SENSUS?

The **SENSUS** has a 512k Flash memory. Based on monitoring seven (7) sensors, this will allow the following data to be stored. Obviously, systems with fewer sensors yield greater durations and vice versa.

No of channels used:	Data-logging Interval (mins):	Available records:	Available Duration (days):
7	5	14980	52
7	20	14980	208
7	60	14980	624

A general rule of thumb for logger capacity is:

(Memory size in bytes × Number of bits in a K byte) / (((number of channels) × 4) + 7)

So for 2 channels using basic internal memory only (512K):

(512 × 1024) / ((2 × 4) + 7) = 34952 records

(Note that a record contains a time stamped date and time reading of all channels)

Q: What is the shortest logging interval?

The logger can scan the sensors every 2 seconds, and logs this data every 5 seconds.

Q: What are the main features of the SENSUS data-logger?

- **Display:** On-board display featuring 2 line by 20 character LCD for status information. Four keys for display navigation.
- **Inputs:** 32 Digital inputs (via analogue). 16 differential - 32 single analogue channels (8 via expansion socket)
- 4 counter channels
- **Alarms:** 16 alarm channels activating 4 alarm output channels
- Modem alarm dial out facility
- **Data Storage:** 512k Flash memory as standard - (15,000 data sets @ 7 channels)
- **Additional Storage:** Compact Flash slot for expansion to 256 Mb
- **Upgrades:** Firmware field-upgradeable
- Built in math's function - allows scaling of signals to engineering units
- Integrated lead acid battery recharger - solar regulator system
- Data DOS formatted for drag and drop applications

- Optional internal temperature and barometric pressure sensors
- **Current Consumption:** Running (30mA) Sleep mode (7mA)

Q: What are “Compact Flash (CF) memory cards” for?

Compact Flash cards allow the NOMAD to store additional data than just into the internal memory. They also incorporate rapid transfer of data in the field where one data card can easily be removed from the logger and replaced with a fresh one. The retrieved card can be then downloaded into a PC via a PCMCIA card adaptor or Compact Flash card reader. A number of different sizes of cards are available, usually from 8 Mb, up to 32 Mb, 64 Mb, 128 Mb and 256 Mb capacities.

Data is automatically downloaded into the PC via a direct slot or PCMCIA adaptor, and files are stored within the Casella Online software application directory, which can be analyzed by the Online Pro software.

Q: How is information obtained using the Compact Flash cards?

When a blank CF card is inserted into the **SENSUS** Data Logger, the data can be instantly transferred onto the card. When the data is being transferred, the LCD screen shows a busy message and when data transfer is complete, the screen simply displays that the card is present.

If the card already contains data then the new data will be tagged onto the end of the previous data, assuming the configuration of the **SENSUS** has not been changed since the previous data was acquired. Once data has been obtained, the Compact Flash card can be downloaded and used by the software.

Q: Can I use my PCMCIA slot on my PC to access Compact Flash Cards?

Yes. Compact Flash to PCMCIA card adapters are readily available, which is a standard adaptor that allows the Compact Flash card to be directly plugged into any PC with a PCMCIA (or PC card) slot.

If your PC does not have this option then the adaptors are then plugged into “Compact Flash Card Readers” that are also available. These then connect to your PC using either a parallel port or USB port.

Q: What channels / inputs can the SENSUS take?

Voltage (25mV to 2.5V)

Current (inc. 4-20mA)

Resistance (suitable for up to 12kΩ PRTD Sensors)

Pulse counters (2 high speed and 2 medium speed)

Frequency

Q: How do I clear the memory?

The Compact Flash card can only be cleared from the PC and the Sensus memory can also only be cleared from the PC.

FAQ'S: SOFTWARE

Q: What does the Casella OnLine Pro software package do?

The Online pro software package is a 32-bit Windows application, which is used to transfer information between the PC and the NOMAD monitoring system. Information may be in the form of real time, up-to-the-minute data, collected historical data or configuration files. Once collected, historical information can be manipulated using statistical functions and displayed as graphs or tables to form part of an analysis or report.

What are the major features of the Casella OnLine Pro software?

The **Casella Online Pro** software offers the user the ability to perform the following functions:

- Create a configuration for the monitoring station. This specifies which parameters are to be logged, the logging interval, and an "identifier" or name for the instrument. This is particularly useful when more than one system is owned or on site at the same time.
- Transfer this control profile from the PC to the SENSUS data logger.
- Recover data from the SENSUS either via direct cable connection, or via telemetry.
- Accumulation and processing of real time data for historical analysis and report generation
- Production of line graphs based upon historical data
- Allows Dynamic Data Exchange (DDE)
- Tabular and report presentation of data files
- Real time presentation of prevailing conditions, on customer defined display screens, via the RS232 connection.
- Offers alarm facility including e- mails.
- Many stations or other devices such as dust monitors can be accessed from one central location.
- Software can be used on LAN's and WAN's, allowing multi user access.

Q: Can I use the "Casella OnLinePro" PC software with Windows NT Operating Systems?

Yes, the software supplied is configured as 32-bit, which runs on Windows 95, 98, 2000 and NT operating platforms.

Q: Can I use Casella OnLine Pro on a network?

Yes. The software has the capability to run on a networked system within an organization, over a LAN. In this scenario, one computer is chosen as the "master", which is usually the PC to which the NOMAD is connected. Other "slave" PCs are given access to the real time and historical data for analysis purposes.

Q: DDE- what is this?

DDE (Dynamic Data Exchange) allows one application to access data and/or control another. The application providing the data is called the server and the one requesting the data is the client (Casella OnlinePro acts as a server).

OnlinePro allows other applications to request data from it about the real time data it is collecting from the remote weather monitoring stations. This data can then be used for calculations in a spreadsheet, included into a word processor report or even used to keep a web site updated.

FAQ's: GENERAL QUESTIONS

Q: What is unique about the NOMAD?

It is a truly portable, quality weather station. It comes complete with all 7 essential weather sensors, solar power and telemetry as options. It is supplied in three customized carry bags and one small Pelican™ case and can be rapidly deployed by one person in under 5 minutes.

Q: What is the difference between the NOMAD and the Casella Nemesys systems?

The Major difference is in its portability. The NOMAD is the first truly portable system for field use from Casella, and can be quickly deployed or removed from site and transported in a vehicle very easily. It also requires no mains power supply and can rely on the solar panel to power the instrument. Other sensors such as soil thermometers and leaf wetness can be added to the NOMAD whereas the Nemesys does not easily accept any additional sensors.

Q: How portable is it?

The NOMAD unit has a tripod, which collapses down to only 3 feet, and the entire system weighs less than 30 lbs. The Pelican™ case (containing the SENSUS logger) is removed from the tripod and is carried separately. The sensor head is removed, unplugged from the data-logger, and placed in its protective molding within the tripod carry case. The rain gauge also comes within its own carry case. The complete system is contained within two carry cases and a Pelican™ case.

Q: Where could I use the NOMAD?

Potentially you could use the NOMAD anywhere. It has been designed for ease of use and portability. If you need to monitor a variety of areas for periods of time then this station is ideally suited to you. It can be easily downloaded, transported quickly and has a large logging capacity for remote data logging.

Q: Over what temperature ranges will the NOMAD operate?

The NOMAD has been designed to function according to quoted specifications within a broad temperature range of 0°F to 160°F (-15°C to +70°C).

Q: When and where do we use a Nomad as opposed to a fixed installation?

The Nomad is a portable and professional environmental monitoring station. Typical applications may include environmental impact assessment surveys, monitoring of construction or landfill site activities and general consultancy projects where portable and reliable data capture is essential to contract success. These types of applications usually require monitoring to be performed for time periods ranging from days up to several months.

If a system is likely to be deployed in one location for more than 12 months, then a fixed system should be considered as being more versatile, robust and appropriate to the project.

Q: How much does the system weigh?

The complete system weighs 29 lbs, when dismantled and in its carry cases.

Q: How big are the carry bags?

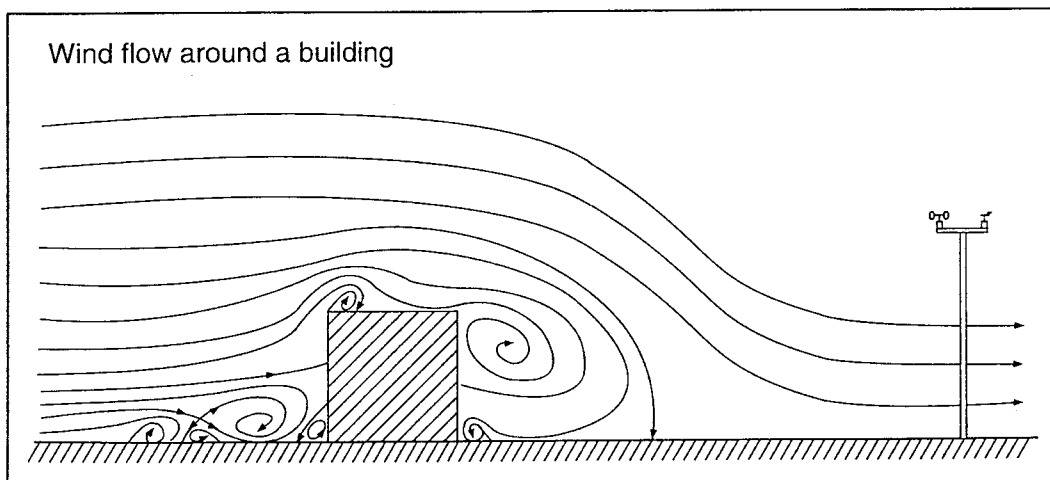
- Tripod bag measures 37" x 12" (950x300mm)
- Raingauge bag measures 14" x 15 x 12" (360x380x300mm)
- Pelican™ case measures 14" x 14" x 10" (350x350x250mm)

Q: Where should I position the NOMAD?

There are various recommendations set by the World Meteorological Organization (WMO). This is a summary of what the Met Office recommended to Casella following discussions regarding this specific station.

The NOMAD should be located in an area representative of the conditions to be measured. If the geographic area of interest is large, the NOMAD should be located in an open area, without interference by buildings or other objects. However, if the area of interest is on top of a building, then that is the best place for the station.

Wind flow and pattern can vary hugely around and on top of buildings. As can be seen from the diagram below, locating a station where there are a variety of buildings in the surrounding area is always difficult. The ideal situation is to locate the station as far away from surrounding buildings as possible.



Q: How do you position the System towards North for the Wind Direction?

North is located with the compass that is supplied with the Nomad system. The end of the cross arm that holds the Wind Direction sensor has to be aligned toward North for the measurements to be accurate.

Q: Will it matter if the NOMAD is not level?

Obviously the ideal location for the Weather Station is on an area of flat ground. If this is not the case, then the ideal location is an area of land as flat as possible. If the ground is too steep then this will affect the Wind Speed and Direction measurements. The bearings in these instruments are affected by changes in angles. If a flat location cannot be found it may be possible to simulate a flat base by shoring up the ground under one of the tripod legs.

Q: How stable is the NOMAD in heavy winds?

The NOMAD comes with guy ropes for the legs, although if added stability is required then sand bags or equivalent may be placed across the legs.

For more information on the NOMAD meteorological system or any of the other Casella CEL products available in North America, please contact us:

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