



9200-PLUS NRG Logger *User's Manual*



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INTRODUCTION

Thank you for purchasing the NRG 9200-PLUS. The 9200-PLUS has been designed for acquiring the maximum amount of data at the minimum overall cost to the user. The NRG 9200-PLUS was developed based on customer experiences with the 9200 and earlier 9000 Series NRG Loggers. We at NRG SYSTEMS feel that the NRG 9200-PLUS represents the best of over 15 years of experience designing and producing instrumentation for the wind energy industry.

Features of the NRG 9200-PLUS:

- 3 wind speed channels, 2 direction channels and one extra analog input channel, a pulsed 5 volt excitation output and a 9 volt auxiliary power input standard
- Very low power consumption (over 6 months operation using 2 standard 9 volt alkaline batteries!)
- User selected averaging interval. (10, 60 minutes)
- Large memory capacity (from 4 days to 681 days depending on DataChips used, number of sensors and averaging interval)
- Displays remaining DataChip memory in days
- Rugged, weathertight fiberglass enclosure
- Built-in battery voltmeter
- Large, easy to read 6 digit LCD display
- Six key data entry pad
- Full 1 year warranty
- Removable 8KB or 32KB EEPROM DataChips (in protective case for easy handling)
- Stable, precise crystal timebase (+/- .0078%, +/- 3 minutes per month)
- User settable software real time clock
- Start and end time, date, and battery voltage are all stored on DataChip
- Instrument serial number and user selectable site number stored on DataChip
- Extra user settable chip number can be stored on DataChip

- Standard deviation (important for turbulence measurements) for each averaging interval and each wind speed input

The NRG 9200-PLUS, NRG TallTower, NRG EEREADER II DataChip reader, and NRG MicroSite software provide you with a complete, cost effective, and reliable data recovery system.

THEORY OF OPERATION

The NRG 9200-PLUS is an ultralow power microprocessor-controlled data logging system. Unlike other "pulsed" systems, the NRG 9200-PLUS is unique in that the microprocessor "core" is always operating. The DataChips, direction sensors, extra analog input and voltmeter are only active when they are required.

The system has user selectable averaging intervals of 10 or 60 minutes. The wind speed and standard deviation values are based on 2 second samples. The 9200-PLUS has been designed to maximize data recovery in the most extreme operating conditions.

We at NRG are committed to providing cost effective, high quality instrumentation, and it is our hope that the LOGGER 9200-PLUS will provide you with years of reliable service.

NOTES FOR FIRST TIME USERS

We urge you to become familiar with the entire data acquisition system before going out in the field. Please take the time to read the manual and try out all the functions and features of the NRG 9200-PLUS. Attach the sensors to the 9200-PLUS in your lab and practice initializing the system, changing chips, and changing batteries. The 9200-PLUS has been designed to keep you out of trouble, but you must still take the time to become familiar with it.

It is also important to familiarize yourself with the NRG EEREADER II and DL9210 software. Take the time to learn how the entire system works from the 9200-PLUS to the EEREADER II. Once you have mastered getting data from the 9200-PLUS to a file on disk, you are ready to go out in the field and install the logger.

COLD TEMPERATURE OPERATION

When using the 9200-PLUS at cold temperatures, be aware of the following potential problems. At low temperatures, wire becomes less flexible and more apt to break. When attaching sensors to the tower, make sure that all sensor wires are securely fastened so that they do not flap and vibrate in the wind. Also be sure that wire connections are tight and securely fastened to minimize breakage in high winds.

Batteries can also be affected by low temperatures. Because the 9200-PLUS has higher power requirements when writing data to the EEPROM DataChips, it needs a low impedance battery. Always use good quality Alkaline or Lithium batteries. Battery life will also vary with temperature, so always play it safe when establishing your battery replacement schedule. After using the system for a while, you will become accustomed to how often batteries need to be changed.

Remember that the 9200-PLUS has been designed to use inexpensive 9 volt batteries and that there is no need for you to "cut it close". **BATTERIES ARE CHEAP, DATA IS NOT !!** So be extra cautious about batteries in cold weather. If there is any doubt about the integrity of the batteries, change them.

FRONT PANEL OPERATING INSTRUCTIONS

Buttons:

↑,↓ : are for navigating the menu Functions

→ : is for navigating the menu Data

SET : is for toggling the setting of programmable data

START : begins logging on a set of DataChips

STOP : stops logging so that DataChips can be changed

The NRG LOGGER provides the following functions selectable from the front panel.

These are:

FUNCTION 1.1	Wind Speed Channel 1 Instantaneous
FUNCTION 1.2	Wind Speed Channel 2 Instantaneous
FUNCTION 1.3	Wind Speed Channel 3 Instantaneous
FUNCTION 1.1P	Wind Speed Channel 1 Peak
FUNCTION 1.2P	Wind Speed Channel 2 Peak
FUNCTION 1.3P	Wind Speed Channel 3 Peak
FUNCTION 1.1A	Wind Speed Channel 1 Average
FUNCTION 1.2A	Wind Speed Channel 2 Average
FUNCTION 1.3A	Wind Speed Channel 3 Average
FUNCTION 2.1	Direction Channel 1 Instantaneous
FUNCTION 2.2	Direction Channel 2 Instantaneous
FUNCTION 2.1P	Direction of Wind Speed Channel 1 Peak
FUNCTION 2.2P	Direction of Wind Speed Channel 2 Peak
FUNCTION 2.1A	Direction Channel 1 Average
FUNCTION 2.2A	Direction Channel 1 Average
FUNCTION 3.1	Extra Channel Temperature
FUNCTION 3.2	Extra Channel Pyranometer
FUNCTION 3.3	Extra Channel Raw Voltage
FUNCTION 4.1	Time
FUNCTION 4.2	Month/Day
FUNCTION 4.3	Year
FUNCTION 5.1	Switches
FUNCTION 5.2	Site Number
FUNCTION 5.3	Chip Number
FUNCTION 5.4	Battery Voltage
FUNCTION 5.5	Days Remaining

These functions are selected using the up, down and right arrow keys. Each time you press the up or down arrow key, the next group of functions (1.X, 2.X, etc) will be

selected in numerical order (*Note: functions wrap around so that pushing the down arrow key at the last function will bring you back to the first function*). Functions within a group (5.1, 5.2, etc) are selected using the right arrow key while in the function of interest. The available functions are determined by the number of sensors selected (see Chart #1 on page 8).

The digit on the far left indicates the Function group being displayed, and the next digit indicates the Data within that group.

See "Logger Installation (for first time users)" for functions available in program mode only.

EXPLANATION OF FUNCTIONS

FUNCTION 1.1 Wind Speed Channel 1 Instantaneous: This function displays the present wind speed in miles per hour or meters per second depending on Units switch setting. The wind speed is updated every 2 seconds.

FUNCTION 1.2 Wind Speed Channel 2 Instantaneous: This function displays the present wind speed in miles per hour or meters per second depending on Units switch setting. The wind speed is updated every 2 seconds.

FUNCTION 1.3 Wind Speed Channel 3 Instantaneous: This function displays the present wind speed in miles per hour or meters per second depending on Units switch setting. The wind speed is updated every 2 seconds.

FUNCTION 1.1P Wind Speed Channel 1 Peak: This function displays the peak wind speed in miles per hour or meters per second, depending on Units switch setting, for the entire logging period. The peak wind speed is updated every 2 seconds.

FUNCTION 1.2P Wind Speed Channel 2 Peak: This function displays the peak wind speed in miles per hour or meters per second, depending on Units switch setting, for the entire logging period. The peak wind speed is updated every 2 seconds.

FUNCTION 1.3P Wind Speed Channel 3 Peak: This function displays the peak wind speed in miles per hour or meters per second, depending on Units switch setting, for the entire logging period. The peak wind speed is updated every 2 seconds.

FUNCTION 1.1A Wind Speed Channel 1 Average: This function displays the average wind speed in miles per hour or meters per second, depending on Units switch setting, for the previous averaging interval. The average wind speed is updated at the end of each averaging interval.

FUNCTION 1.2A Wind Speed Channel 2 Average: This function displays the average wind speed in miles per hour or meters per second, depending on Units switch setting, for the previous averaging interval. The average wind speed is updated at the end of each averaging interval.

FUNCTION 1.3A Wind Speed Channel 3 Average: This function displays the average wind speed in miles per hour or meters per second, depending on Units switch setting, for the previous averaging interval. The average wind speed is updated at the end of each averaging interval.

FUNCTION 2.1 Direction Channel 1 Instantaneous: This function displays the present wind direction in degrees. The direction is updated every 2 seconds.

FUNCTION 2.2 Direction Channel 2 Instantaneous: This function displays the present wind direction in degrees. The direction is updated every 2 seconds.

FUNCTION 2.1P Direction of Wind Speed Channel 1 Peak: This function displays the wind direction in degrees at the time of the Wind Speed channel 1 peak. It uses direction sensor 1.

FUNCTION 2.2P Direction of Wind Speed Channel 2 Peak: This function displays the wind direction in degrees at the time of the Wind Speed channel 2 peak. It uses direction sensor 2.

FUNCTION 2.1A Direction Channel 1 Average: This function displays the average wind direction in degrees of the last averaging interval. It is updated at the end of the previous averaging interval.

FUNCTION 2.2A Direction Channel 2 Average: This function displays the average wind direction in degrees of the last averaging interval. It is updated at the end of the previous averaging interval.

FUNCTION 3.1 Extra Channel Temperature: This function displays the instantaneous extra analog channel scaled for the NRG #110S temperature sensor. It will be in Fahrenheit degrees if English units are selected and Celcius degrees if Metric units are selected.

FUNCTION 3.2 Extra Channel Pyranometer: This function displays the instantaneous extra analog channel scaled for a Li-Cor #LI-200SA pyranometer.

FUNCTION 3.3 Extra Channel Raw: This function displays the instantaneous extra analog channel in raw format (no scaling). It will indicate a range of 0 to 255, corresponding to 0 volts and 2.55 volts respectively.

FUNCTION 4.1 Time: This function displays the 9200-PLUS clock time in hours and seconds. The time goes from 00:00 to 23:59.

FUNCTION 4.2 Month/Day: This function displays the 9200-PLUS clock date, in month and day of month.

FUNCTION 4.3 Year: This function displays the 9200-PLUS clock year.

FUNCTION 5.1 Switches: This function displays three different parameters:

- Averaging Interval selected by the user (center two digits)
- Units (mph or M/s) selected by the user (dash indicates metric units)
- Sensors selected by the user (right digit indicates # of sensors i.e. 1, 2, or 3)

All these settings are done using the bottom 2 DIP switch pairs located under the DataChips.

To set **Averaging Interval**, move left switch of the bottom left switch bank up for 10 minute averaging, down for 60 minute averaging.

To set **Units**, move right switch of the bottom left switch bank up for Metric Units, down for English Units.

To set the **Number of sensors** being logged, use the bottom right switch bank. Three different settings can be selected. Disabling unused channels prevents accumulation of useless “zero” data.

Setting 1 = both switches up

Setting 2 = left switch up, right switch down

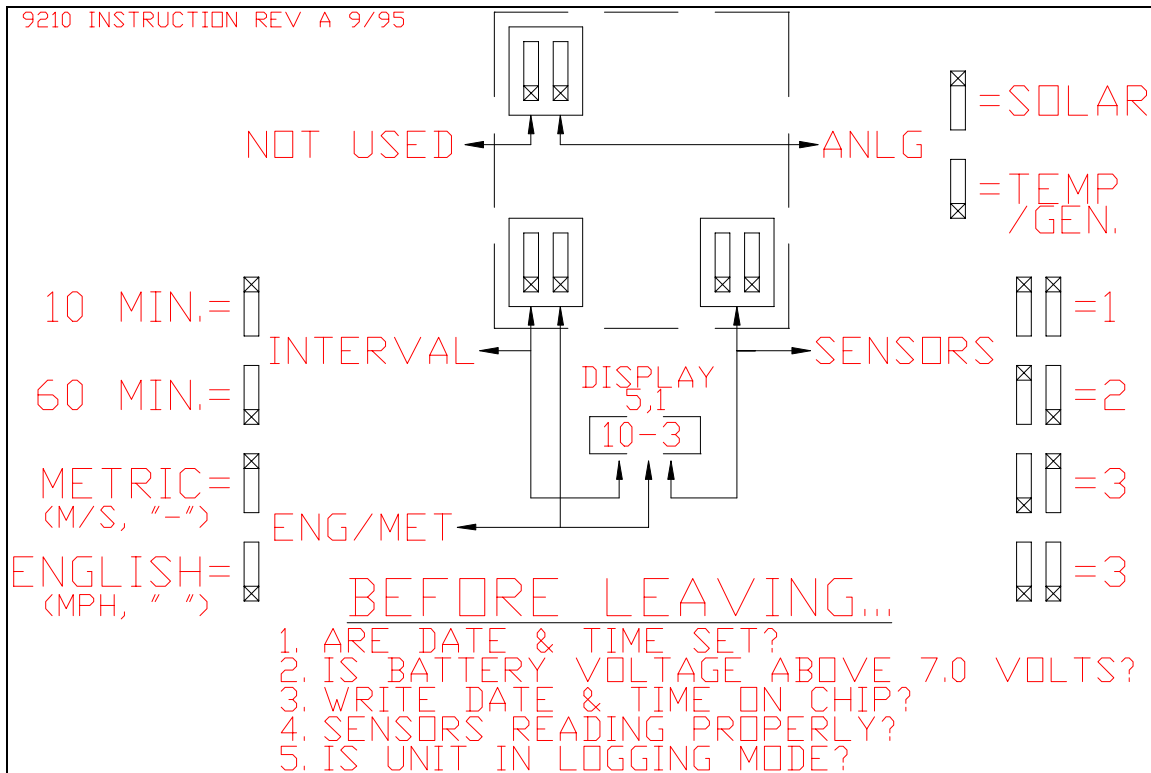
Setting 3 = left switch down, right switch up *or* both switches down.

1 =	WS1	SD1	DIR1							
2 =	WS1	SD1	DIR1	WS2	SD2	DIR2			ANLG	
3 =	WS1	SD1	DIR1	WS2	SD2	DIR2	WS3	SD3	ANLG	GUST1

Chart #1

WS = Wind Speed
SD = Standard Deviation
DIR = Wind Direction
ANLG = Extra Analog
GUST1 = Gust on speed channel #1 during the interval

For example, a display of “10-3” indicates a 10 minute averaging interval, metric units and all channels being logged. A display of “60 1” indicates a 60 minute averaging interval, English units and Wind Speed 1 average/standard deviation and Wind Direction 1 being logged. See instructions on inside of 9200-PLUS enclosure door for diagram of switch settings.



SAMPLE OF INSTRUCTION SHEET LOCATED INSIDE THE LOGGER DOOR

FUNCTION 5.2 Site Number: This function displays the site number. Site number is set while in program mode. This is a number from 0000 to 9999.

FUNCTION 5.3 Chip Number: This function displays the number which will be recorded onto both DataChips as they are used. This number can be used by the operator for anything he/she likes. For example, this can be used to store a customer number. This number will be attached to the data set and therefore can be used to identify data collected for a specific customer. This number is displayed here but cannot be changed until the DataChip is removed while in program mode. This can only be a number between 0 and 99.

FUNCTION 5.4 Battery Voltage: This function displays the present battery voltage. It is updated every 2 seconds. If the voltage drops below 7 volts, the batteries should be changed.

FUNCTION 5.5 Days Remaining: This function displays the number of days before the space in the currently installed DataChips runs out. This is calculated at the end of each averaging interval. *Note: The number of days remaining on DataChips is not related to battery life.*

Note: *The chip sizes are determined when the user puts the 9200-PLUS in logging mode by pressing the START key. If you remove a chip while in logging mode, the logger does not know this and will assume the DataChips are still installed.*

CONNECTING THE SENSORS

1. WIND SPEED SENSOR: (#40 Maximum Anemometer)

Refer to Figures #1 - #3. Slide the anemometer and rubber sensor terminal boot onto the 12" straight stub mast and secure it with the supplied cotter pin and set screw. Notice that one end of the supplied 2 conductor wire has lugs. Loosen the nut on each of the two studs on the sensor and slide on the lugs, being sure that the colors are as shown in the SENSOR CONNECTIONS diagram (Figure #4). Tighten the nuts down using a 1/4" nut driver (*do not overtighten as studs may break off*), lightly coat the terminals with petroleum jelly, and slide the rubber boot over the bottom of the sensor. Secure the bottom of the rubber boot with electrical tape, being sure to leave a hole for drainage of moisture.

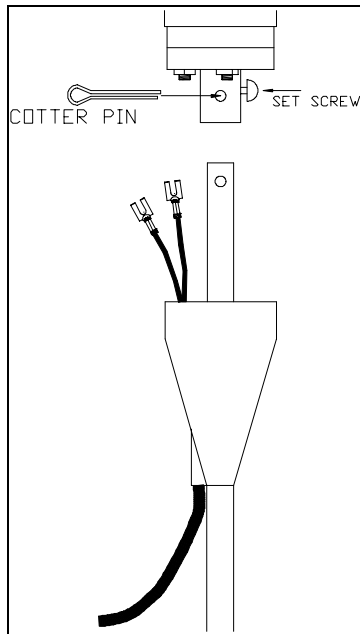


Figure #1

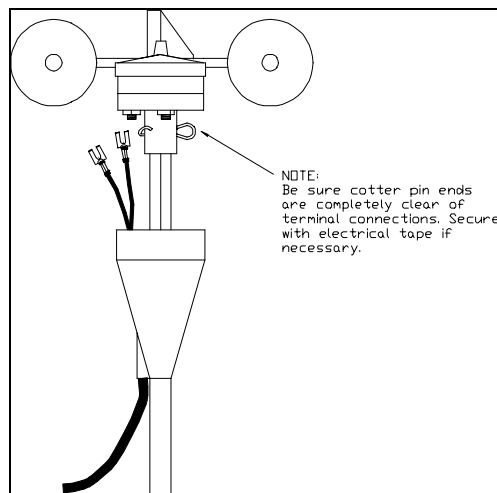


Figure #2

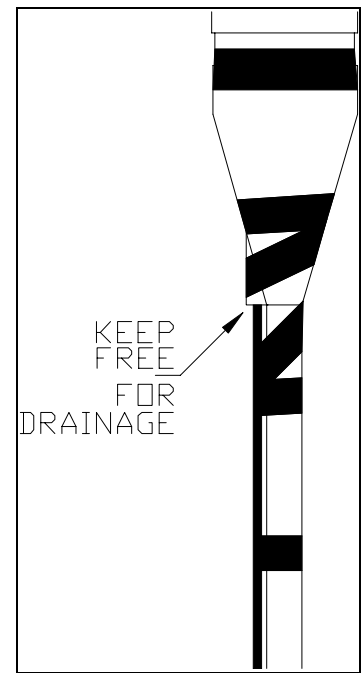


Figure #3

2. DIRECTION SENSOR: (#200P NRG Wind Direction Vane)

Refer to Figures #1 - #3 for reference. Slide the direction sensor and rubber sensor terminal boot onto the Z shaped mast. Rotate the sensor until the notch on the sensor is pointing away from the Z shaped mast. Secure the sensor with the supplied cotter pin and set screw. Loosen the nuts on the three studs and slide the lugs onto the studs, being sure that the colors are as shown in the SENSOR CONNECTIONS diagram (Figure #4). Tighten the nuts using a 1/4" nut driver and check that all three cables are secure. Double check the color coding. Lightly coat the terminals with petroleum jelly, and slide the rubber boot over the bottom of the sensor. Secure the bottom of the rubber boot with electrical tape, being sure to leave a hole for drainage of moisture.

3. ATTACHING SENSORS TO TOWER:

Attach the sensors to the TallTower using mounting booms and clamps as shown in the TOWER CONFIGURATION DIAGRAM in Figure #5. BE SURE THAT THE NOTCH ON THE DIRECTION SENSOR IS POINTING NORTH AFTER THE SENSOR HAS BEEN MOUNTED ON THE TOWER. Spiral wrap the sensor wires along mounting booms, being sure to provide strain relief to the wires every 6 inches or so with electrical tape.

4. DOUBLE CHECK CONNECTIONS, COLOR CODES AND SENSOR ORIENTATION:

Be sure the wires are all in good contact with sensor terminals, all rubber terminal boots are securely positioned, and wire color codes match the SENSOR CONNECTIONS diagram (Figure #4) and sensors are oriented properly. Also double check that the wires are secured to the mounting booms properly so that breakage will not occur.

5. RUN THE WIRES TO THE BOTTOM OF THE TOWER:

Spiral wrap sensor wires down the tower approx. one wrap every 3m (10'), being sure to provide strain relief to the wires approx. every 1.5 meters (5') with electrical tape (Figure #5).

Note: Use several logs, cable spools, sawhorses, etc., to support the TallTower about 0.5 M off the ground when installing sensors. Installation is much easier when the tower is lifted slightly off the ground.

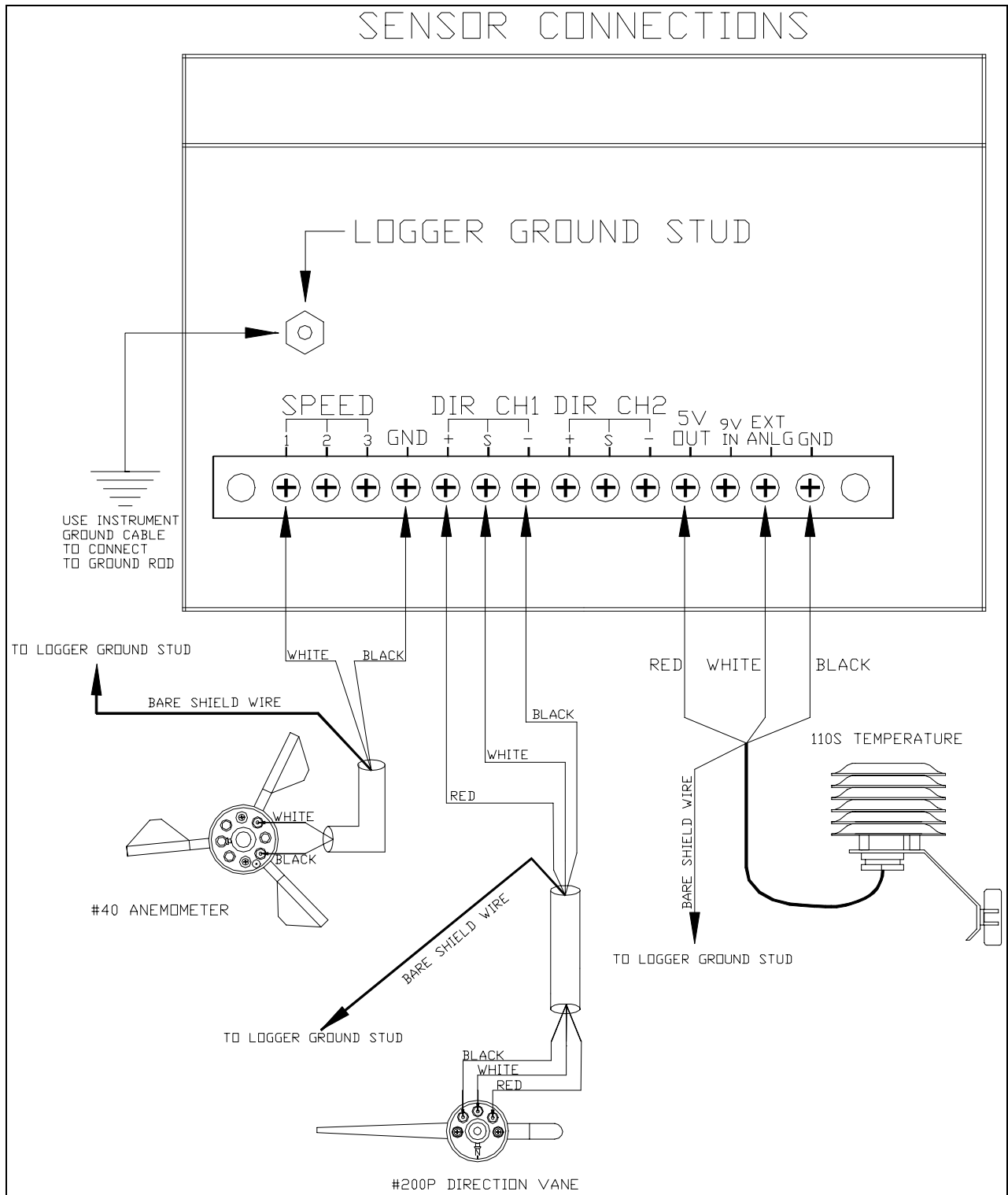
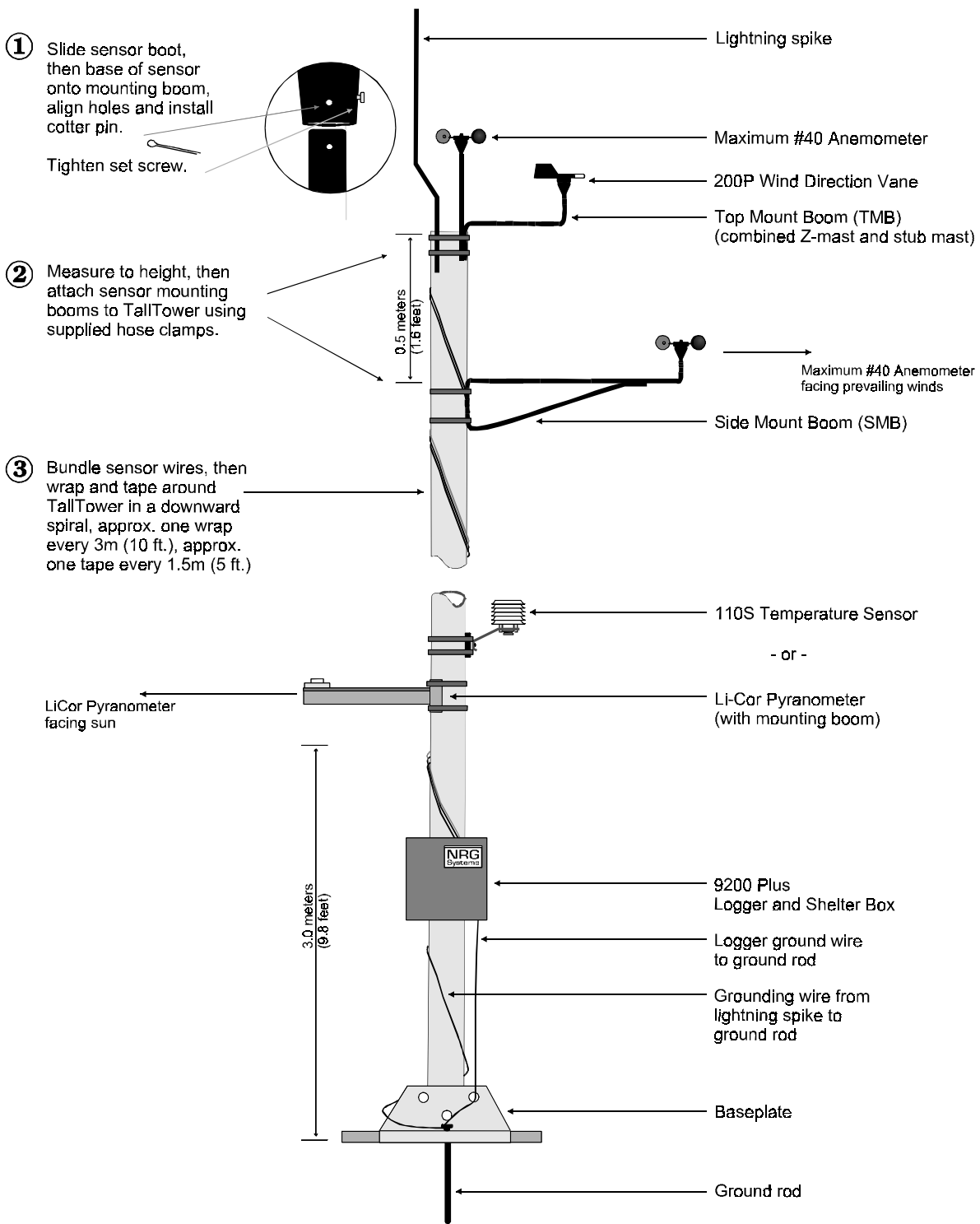


Figure #4



9210stp1.cdr

Figure #5

LOGGER INSTALLATION (SUMMARY FOR EXPERIENCED USERS ONLY)

The NRG LOGGER is installed as follows:

1. Install the LOGGER and sensors on the tower.
2. Connect sensors to the LOGGER as indicated in Figures #1 - #5.
(NOTE POLARITIES !!)
3. Install batteries, and wait for screen to indicate programming mode (Function number will be flashing). Do not have DataChips in at this time!
4. Set the time (Function 4.1), date (Functions 4.2 & 4.3), site number (Function 5.2), and DataChip number (Function 5.3) (make sure switches have been set to desired positions). Check settings for the averaging interval, units, and number of channels (Function 5.1). If you set an invalid date like 4/31/96, the logger will not start/log-on.
5. Now install DataChips.
6. Press and hold START key (release when messages begin to appear on the display) to begin logging. Watch display for the following messages to confirm correct installation:
 1. DataChip sizes
 2. PP
 3. switch settings
 4. remaining days of memory storage.

If you see "--PA--", the logger was less than 20 seconds from the end of the current interval, and is pausing until the interval is complete. It will then log-on as described above. This is done so as not to conflict starting the log-on sequence with an end of interval calculation.

LOGGER INSTALLATION (DETAILED INSTRUCTIONS FOR FIRST TIME USERS)

PARTS SUPPLIED: (Standard Unit #9200-PLUS)

- NRG 9200-PLUS DATALOGGER
- (2) 8 KB (or 32KB) DataChips
- 2.4 meter (8 ft.) ground wire
- (2) 9V Alkaline batteries

TOOLS AND SUPPLIES REQUIRED:

- wire strippers (only needed if you shorten wires)
- wire cutters
- regular slotted screwdriver (#3 is best)
- 1/4" nut driver
- petroleum jelly
- electrical tape

INSTALLATION

Attach shelter box with supplied U-bolts to tower.

1. Attach LOGGER to shelter box using supplied screws through back of shelter box.
2. GROUND THE LOGGER TO THE EARTH GROUND ROD WITH THE GROUND CABLE PROVIDED! *NOTE: The ground stud on the bottom of the Logger is not labeled. See SENSOR CONNECTIONS diagram (Figure #4).*
3. Cut excess sensor wire leaving approximately 1 meter extra length (excess can also be bundled in shelter box).
4. Strip off outer jacket on all sensor cables, approx. 50 mm (2").
5. Strip back wire insulation approx. 5 mm (1/4") on sensor wires.
6. Attach wind speed sensor wires to the SPEED inputs on the logger's terminal strip. See Figures #1 - #3, and SENSOR CONNECTIONS diagram (Figure #4). *NOTE: Polarity of wind speed sensor wires does not matter.*
7. Attach direction sensor wires to the direction sensor input terminals (labeled DIR CH1 & DIR CH2 on the logger's terminal strip). **NOTE POLARITY!!** Connect the **red** wire to "+", the **white** wire to "S", and the **black** wire to "-". See Figures #1 - #3, and SENSOR CONNECTIONS diagram (Figure #4).

Note: For a Pyranometer see instructions with unit.

8. Attach the drain wires (shielding) to the GND terminal. *Note: Do not attach to the “-” terminals. See SENSOR CONNECTIONS diagram (Figure #4).*
9. Remove any DataChips from the sockets. Install the two FRESH 9 volt batteries in the battery holders, being careful of polarity. The logger should display "8.888:8.8" , then its serial number, and then its version number. The 9200-PLUS should then enter program (P) mode. You can tell you are in program mode if the left 2 digits are alternating between “P” and a function number. The first function number displayed in programming mode is 4.1 (Time). *Note: Functions 1 through 3 are displayed in logging mode only.*

10. "P4.1" MODE: TIME

Press the SET key so that only minutes are displayed. Now increment or decrement the minutes by using the up and down arrow keys. When the minutes have been set, press SET again to display the hours. Again, set the hours using the up and down arrow keys. Pressing SET again will display both hours and minutes. If you need to change these again, you may repeat the above process.

VALID TIME: 00:00 through 23:59

11. "P4.2" MODE: MONTH/DAY

Press the right arrow key to enter the date set routine. Use the SET, up arrow and down arrow keys as described above to set the current month, then the current day.

VALID DATE: 0101 through 1231

12. "P4.3" MODE: YEAR

Press the right arrow key to enter the year set routine. Use the SET, up arrow and down arrow keys as described above to set the current year. Note that you only need to set the “95” part of 1995. The logger assumes that any year from 95 to 99 is 199X and any year from 00 to 49 is 20XX.

VALID YEAR: 1995 through 2049

13. "P5.1" MODE: SWITCHES

Press the up arrow or down arrow keys to get to the set averaging interval routine. Then use the dip switches in the DataChip sockets to set:

- **AVERAGING INTERVAL:** The leftmost bottom switch sets the interval. Select 10 minutes (up) or 60 minutes (down).
- **UNITS:** The next switch to the right sets the units. *Note: Units are for display only and do not affect the data being stored to the DataChips.* Select Metric (up) or English (down). The bar will be present if metric is selected.

- **NUMBER OF SENSORS:** To set the number of sensors being logged, use the bottom right switch bank. Three different settings can be selected.

Setting 1 = both switches up

Setting 2 = left switch up, right switch down

Setting 3 = left switch down, right switch up *or* both switches down.

See Chart #1, Page 8

For example, a display of “10-3” indicates a 10 minute averaging interval, metric units and all channels being logged. A display of “60 1” indicates a 60 minute averaging interval, English units and Wind Speed 1 average/standard deviation and Wind Direction 1 being logged. See instructions on inside of 9200-PLUS enclosure door for diagram of switch settings.

Although it is not displayed, the solar switch must be up when a pyranometer sensor is installed.

14. "P5.2" MODE: SITE NUMBER

Press the right arrow key to enter the site number set routine. Press the SET key to set the least significant 2 digits of the site number. Use the up arrow and right arrow keys to increment the least significant 2 digits of the site number. Once the least significant part of the site number is entered correctly, press the SET key again to set the most significant part of the site number using the up arrow and down arrow keys. Press the SET key when done to return to the site number display routine.

VALID SITE NUMBER: 0000 to 9999

15. "P5.3" MODE: CHIP NUMBER

Press the right arrow key to enter the chip number set routine. To change the chip number, press the SET key and the chip number will flash. Now use the up arrow and down arrow key to change the number. Press the SET key when you have entered the correct number.

VALID CHIP NUMBER: 0 to 99

16. CHECK ALL SETTINGS.

Using the up arrow, down arrow and right arrow keys to check the clock, averaging interval, site number and DataChip number for accuracy.

17. INSTALL DATACHIPS.

Note: Be sure the batteries are fresh before you begin logging data.

18. START LOGGING.

To resume logging, press and hold the START key. The 9200-PLUS will display the size of chips installed in the sockets. The display will briefly flash an 8 or 32 or -- on the left and right side of the display indicating the respective DataChip size ["8" being 64Kb (same as 8KB), "32" being 256Kb (same as 32KB) and "--" being no chip]. If no chip is in socket 1, the logger will automatically return you to program mode. Otherwise, it will display "--PP--" followed by the averaging interval, units and number of channels selected, followed by the number of days left before the chip(s) fill up. After this it will display function 1.1 (Wind Speed channel 1 instantaneous). From here you can use the up, down and right keys to look at whatever data you like.

If you see "--PA--", the logger was less than 20 seconds from the end of the current interval, and is pausing until the interval is complete. It will then log-on as described above. This is done so as not to conflict starting logging-on with an end of interval calculation.

CHANGING DATACHIPS

CAUTION: DATACHIPS SHOULD NOT BE CHANGED DURING A STORAGE CYCLE AT THE END OF AN INTERVAL. THE DISPLAY WILL SHOW PROGRAMMING CODES ("L1, L2, L3...") TO INDICATE IT IS WRITING DATA ONTO THE DATACHIP.

The DataChip is changed at the site as follows:

1. CHECK BATTERY VOLTAGE:

Using the up arrow and down arrow keys, advance to the battery volt meter function (FUNCTION 5.4). If the battery voltage is below 6.00 volts, change the batteries according to instructions AFTER pulling the DataChip(s) (see CHANGING BATTERIES).

2. CHECK REAL TIME CLOCK:

If Reboot has occurred (PL), note that reboot occurred. Note actual Stop Time for editing when later processing data.

3. PULL DATACHIP(S):

Press and hold the STOP key until "PLL- 1" or "PLL-12" is displayed (approximately 1 second). "PLL- 1" indicates that you must pull the left DataChip and " PLL-12" indicates that you must pull both DataChips. If "PLL- 1" is displayed and there are 2 DataChips installed, the right DataChip should be empty. The DataChip(s) may now be removed. The 9200-PLUS is now in programming mode.

4. INSTALL NEW DATACHIP(S):

Replace batteries now if necessary. The DataChip is installed with the notch oriented up, as shown on the front panel. **Install DataChips bottom end first, then push the top end firmly into the socket (do not rock side to side).** If you are only installing one DataChip, it must be placed in the left socket. You will not be allowed to enter logging mode if no DataChip is installed in the left socket, and the logger will automatically return you to programming mode.

5. STARTING LOGGING:

To start logging, press and hold the START key. The 9200-PLUS will display the size of chips installed in the sockets (the display will briefly flash an 8 or 32 or -- on the left and right side of the display indicating the respective DataChip size [" 8" being 8KB (same as 64Kb), "32" being 32KB (same as 256Kb) and "--" being no chip]. The display will then show "--PP--", followed by the switch settings (averaging interval, units, and number of channels selected), followed by the number of days left before the DataChip(s) fill up. After this, the logger will display function 1.1 (Wind Speed channel 1 instantaneous). From here you can use the arrow keys to confirm sensor operation.

If you see "--PA--", the logger was less than 20 seconds from the end of the current interval, and is pausing until the interval is complete. It will then log-on as described above. This is done so as not to conflict starting logging-on with an end of interval calculation.

READING DATACHIPS

Data stored on DataChips are transferred to the computer (PC) as follows:

1. Power up the PC and run the program "DL9210" (Refer to DL9210 user's manual).
2. Connect the EEREADER II to the PC according to instructions (Refer to EEREADER II instructions).
3. Insert the DataChip into the EEREADER II socket.
4. Follow the instructions provided at the program menu.

CHANGING BATTERIES

The NRG 9200-PLUS is designed with 2 batteries so that the batteries can be changed without powering down, and to provide redundancy for increased reliability. The 9200-PLUS will operate with only one battery if necessary, but we strongly suggest using two.

First, stop current logging cycle and remove DataChips.

To change the batteries, simply remove one battery and replace it. Then remove the other battery and replace it. We advise changing both batteries on a scheduled basis to ensure reliable operation. REMEMBER: Batteries are MUCH cheaper to replace than data.

Never remove both batteries at the same time, unless you want to power down the logger. Replace one and then the other.

We strongly recommend using *only Alkaline batteries*. Using standard 9 volt batteries will work, but the life expectancy is greatly reduced (2 to 4 times less than Alkaline). Alkaline battery life will be reduced at lower temperatures, but should work reliably down to -40 degrees C (-40 degrees F). For extended exposure to extreme cold temperatures, we recommend an additional battery pack or Lithium batteries.

RECOMMENDED BATTERIES

- Gold Peak 1604A Alkaline
- DURACELL 9 volt Alkaline MN1604

QUESTIONS AND ANSWERS

Q. What if the battery voltage is very low when I want to change the chip on a site visit ?

A. If the 9200-PLUS is still running but the battery voltage is very low, simply stop the logging by pressing the Stop button, remove the DataChips, replace the batteries (one at a time), insert ERASED DataChips, and start logging again by pressing the Start button. **WE DO NOT RECOMMEND LETTING THE VOLTAGE DROP BELOW 6 VOLTS !!** The logger will run down to 5.6 volts, but batteries should be changed when voltage is 6 - 7 volts.

Q. What will happen if I power up the logger with the DataChips already installed?

A. If you power the unit up with the DataChips installed the following will happen:

Once the batteries are installed the logger will display “8.888:8.8” followed by the serial number followed by the version number. It first determines and displays what size DataChips are installed in the sockets. “32 --” indicates a 32KB DataChip is installed in the left socket and no DataChip is installed in the right socket. At this point, the logger will look for an empty memory block in the DataChip(s). First it looks in the left chip. You will see a counter increment on the left side of the screen as it looks through the DataChip. If no empty space is found on the left DataChip, it then looks for empty space on the right DataChip. Once it has found a block of empty data, the display will flash "--PL--". The chips should then be removed and the logger powered down. Then power up the logger according to instructions, program as necessary, then install **ERASED** Datachips.

Q. I visited my site to change DataChips, and the logger display read “--PL--”. What does this mean?

A. “--PL--” indicates that the power was lost. This is a precaution in the event of a system crash due to lightning, improper grounding, etc. If you return to a site and this is displayed, you will know that a power loss took place and the cycle described above was initiated. Push any button to return to logging mode, then Push STOP, replace DataChips, and then push START.

Q. Can the DataChip be plugged in backwards ?

A. No. The DataChips used in the 9200-PLUS can only be plugged in one way. This is a feature that keeps the user from inadvertently destroying the DataChips and also allows the use of untrained personnel to retrieve data (an additional cost savings). Be sure to push DataChips in bottom end first. Avoid rocking chips side to side when inserting into sockets to prevent bending of pins.

Q. What if my wind speed readings are zero and/or the direction readings don't make sense ?

A. Check all the sensor connections. Be sure that the direction sensor is connected with the proper polarity. Technically, the velocity sensor has no polarity. Also check that all wires are intact. Resistance across the anemometer should be approximately 600 to 700 ohms (if not spinning). A spinning anemometer will read approximately 0.5 volts AC at 25 mph. The direction sensor should read approximately 10,000 ohms from red lead to the black lead. The reading from the white lead plus either the red or black lead should read between 0 and 10,000 ohm.

Q. What happens when the LOGGER has been left too long and the data has overflowed?

A. The logging operation stops as soon as the memory is filled. The display will read “PLL- 1” or “PLL-12”. Pushing any key will bring the logger into programming mode. Simply remove the DataChip(s) and reinstall new chips as described in the instruction manual. All data past the chip capacity will not be recorded.

Q. What will happen if the logger status is changed from logging mode and left in programming mode?

A. The logger will stay in programming mode for up to 1 hour before automatically attempting to return to logging mode. If DataChips are installed and have room to store data, logging will begin automatically. It does this by seeing that the user pressed the STOP key and therefore placed the unit in programming mode. From this time on the logger will count down 1 hour. At that time the logger will attempt to log back on in hopes that the user has forgotten to press the START button, but did leave DataChip(s) in the unit. If the logger finds a DataChip(s) it will **NOT write a header**, and will search for where the first available space for writing data is and start logging there. It will indicate this by the “—PL—“ on the screen. If no DataChips are installed, the logger will be unable to return to logging mode.

Q. The Logger is installed in a very wet environment. Also, what can I do for additional corrosion protection?

A. For additional corrosion protection, apply a petroleum jelly (Vaseline) or a silicone sealer to all the terminals. Put additional dessicant packs in the LOGGER enclosure to keep electronics dry. Avoid allowing rain or snow to enter the logger. Because the logger enclosure is completely weatherproof, moisture cannot escape or evaporate once the door is closed. A small amount of moisture can usually be taken care of with a few dessicant packs.

Q. When does the right hand DataChip get its header information written?

A. When the left DataChip is full the logger will write the stop header information on the left DataChip and write the start header information on the right DataChip. Now the logger is writing information to the right DataChip.

TECHNICAL SUPPORT

In order that we may perfect this product to better meet your needs, we welcome your comments and suggestions on how to make our product better. Please contact NRG Systems at:

**NRG Systems, Inc.
110 Commerce Street
Hinesburg, VT 05461 USA**

For customer support, please contact NRG Systems at

**TEL 800-448-9463 (North America)
TEL 802-482-2255
FAX 802-482-2272
EMAIL sales@nrgsystems.com**

TECHNICAL SPECIFICATIONS

TIMEBASE AND CLOCK

Timekeeping accuracy: +/- 3 minutes per month
Software programmable clock
24 hour time base
Automatic leap year adjustment

MECHANICAL

Instrument Weight	2.3 kg (5 lbs)
Shipping Weight (complete)	5 kg (10 lbs)
Instrument Size HxWxD	229mm x 191mm x 115mm (9" x 7.5" x 4.5")
Shipping Size	105mm x 508mm x 229mm (12" x 20" x 9")
Enclosure	Weathertight Molded fiberglass, NEMA Type 4, Type 4X, Type 12 and Type 13 Stainless Steel hardware Hasp for padlock Quick-release latches
Recommended Steel Shelter Box	305mm x 305mm x 153mm (12" x 12" x 6") Rain proof Painted 16 ga. galvanized steel NEMA Type 3R

POWER REQUIREMENTS

Battery Voltage	9 volt nominal 5.6 volt minimum
Normal Operating Current	Less than 200 microamps (0.20 milliamps)
Battery Life	two 9 volt Alkalines over 6 months

SAMPLING

Wind Speed	
Conversion time (count integrated)	2 sec
Resolution	0.1 mph stored 1 mph (displayed)
Accuracy	+1, -0 mph

Wind Direction

Conversion Time	13 milliseconds
Sample Time	2 secs
Resolution	1 of 256 (1.4 deg)

DATA STORAGE

Length of Operation (in days)

Configuration	DataChip Size			
	<u>1-8K</u>	<u>2-8K</u>	<u>1-32K</u>	<u>2-32K</u>
<u>10 minute interval</u>				
Setting 1	14.1	28.2	56.7	113.5
Setting 2	7.0	14.1	28.3	56.7
Setting 3	4.7	9.4	18.9	37.8

(see page 8)

<u>60 minute interval</u>	<u>1-8K</u>	<u>2-8K</u>	<u>1-32K</u>	<u>2-32K</u>
Setting 1	84.7	169.5	340.7	681.5
Setting 2	42.3	84.7	170.3	340.75
Setting 3	28.2	56.5	113.5	227.1

(see page 8)

EXTRA ANALOG CHANNEL

Raw 0-255 counts = 0 - 2.55 volts respectively

Temperature -40 to +160 degrees F.
 -40 to +60 degrees C.
 Scaling:
 degrees F = Raw count - 123.5
 degrees C = (Raw count ÷ 1.8) - 86.39

Pyranometer 0 - 255 μA = 0 - 255 counts
 Typical pyranometer calibration is 90 μA per 1000 w/m^2
 Pyranometer reading = counts x 1000 w/m^2 ÷ 90 μA

OPTIONS

EEREADER II

DL9210 Basic Reading Software

MicroSite Data Analysis Software

Steel Shelter Box

Mounting booms

Tower Grounding Kit

Extra DataChips

NRG TallTower (10M to 50M)

Temperature/humidity/pyranometer sensors

Any 0 - 2.55VDC analog output sensor



EU Declaration of Conformity

In accordance with **ISO / IEC Guide 22** and **EN 45014**

Product Category **Meteorological Data Logger**
Product Type **NRG Logger 9200 PLUS**
Model Number **9210**
Manufacturer's Name **NRG Systems**
Manufacturer's Address **110 Commerce Street**
 Hinesburg VT 05461 USA
 Telephone: 802-482-2255 FAX: 802-482-2272

The above-mentioned products comply with the following EU Directives:

89/336/EEC, "Council Directive of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility"

73/23/EEC, "Council Directive of 19 February 1973 on the harmonization of the laws of the Member states relating to electrical equipment designed for use with certain voltage limits"

The compliance of the above-mentioned product with the Directives and with the following essential requirements is hereby confirmed:

Electromagnetic Emissions	Electromagnetic Immunity
EN55022:1994 Class B	EN50082-1:1992

The technical files and other documentation are on file with Mr. Barry King, Engineering Manager

As the manufacturer we declare under our sole responsibility that the above-mentioned products comply with the above-named directives.

<hr/>	Hinesburg, Vermont	31 October 1996
Barry J. King Engineering Manager, NRG Systems	Place	Date

Data Retrieval from NRG Data Loggers

9200 Data Logger

If you are using 9200 Data Loggers you must use **DL9200** software with an EEReader II for reading your DataChips to create your binary and ASCII files. The binary file can then be imported into MicroSite™, the ASCII file can be used by spreadsheet programs.

9200-PLUS Data Logger

If you are using 9200-PLUS Data Loggers you must use **DL9210** software with an EEReader II for reading your DataChips to create your binary and ASCII files. The binary file can then be imported into MicroSite™, the ASCII file can be used by spreadsheet programs.

9300 Systems

If you are using a 9300SA Data Logger you must use **BaseStation™** software and a TermReader to read your DataCards. If you are using a 9300 CELLogger or 9300 TelePort Logger it will call and download data into the BaseStation. BaseStation™ creates binary files that can be imported into MicroSite™ and has a convert option to produce ASCII files that can be used in spreadsheet programs.

NOTE: In all cases, the **RAW BINARY** files are the files to use with **MicroSite™**.

NOTE: If you have MicroSite™ data analysis software you must have **version 1.07** or higher to be able to read data from a **9200-PLUS** Data Logger. You may receive an update to MicroSite™ on your first purchase of a 9200-PLUS Data Logger.

If you need upgraded software please contact Customer Service
phone (802) 482-2255 or fax (802) 482-2272

Magnetic Declination and Wind-Direction Sensors

Introduction

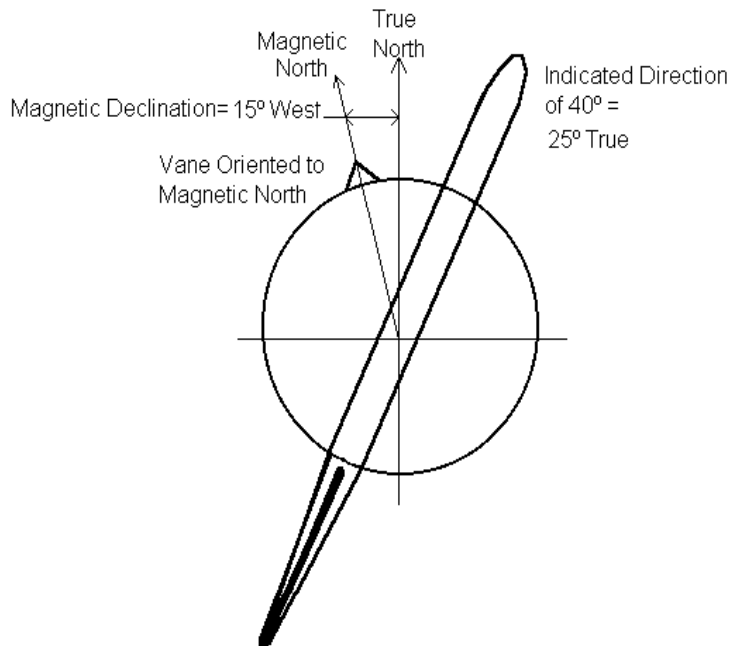
A magnetic compass does not point to the north pole of the earth, but rather to the north magnetic pole. Since magnetic compasses are commonly used to orient wind direction sensors, the difference between the two must be taken into account to provide wind direction data corrected to True North.

Some Definitions

True North is the direction to the geographic north pole of the Earth. A **True direction** is expressed in compass degrees relative to True North.

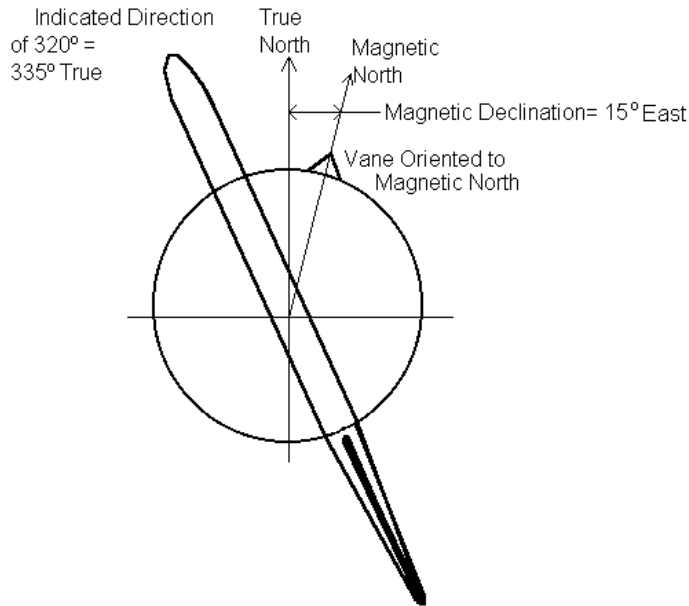
Magnetic North is the direction to the magnetic north pole of the Earth. Magnetic compasses point to Magnetic North. A **Magnetic direction** is expressed in degrees relative to Magnetic North.

The difference between Magnetic North and True North is referred to as **Magnetic Declination**. Magnetic Declination varies with location. The Magnetic Declination of a location is specified as the True direction of Magnetic North. For example, at NRG in Hinesburg, VT, a magnetic compass points 15 degrees West of True North, so the Magnetic Declination is specified as 15 degrees West. To give another example, in Davis, CA, a magnetic compass points 15 degrees East of True North, so the Magnetic Declination is specified as 15 degrees East.



Correcting Magnetic Direction data to True Direction

To obtain a True Direction from a Magnetic Direction for **Westerly Magnetic Declinations, Subtract the declination angle** from the Magnetic Direction. To use Hinesburg VT, as an example again: a Magnetic Direction of 315 degrees is $315 - 15 = 300$ degrees True. A Magnetic Direction of 40 degrees is $40 - 15 = 25$ degrees True. (See figure at left.)



To obtain a True Direction from a Magnetic Direction for **Easterly Magnetic Declinations, Add the declination angle** to the Magnetic Direction. To return to the example of Davis, CA: a Magnetic Direction of 90 degrees (East), is $90 + 15 = 105$ degrees True. A Magnetic Direction of 320 degrees is $320 + 15 = 335$ degrees True. (See figure at left)

Orienting Wind Direction Sensors

For convenience in the field, some people orient their wind direction sensors relative to Magnetic North, that is, the sensor indicates 0 degrees when the wind is out of Magnetic North. NRG's data conversion software supports this by making a correction for the Magnetic Declination, based on the Magnetic Declination value that you enter.

BaseStation's Convert Function uses the Declination stored in the BaseStation SITE file for the site to give True wind direction in converted (ASCII) files. MicroSite uses the Declination in the database for the site to correct for Magnetic Declination when importing raw data, so that the wind directions in the MicroSite database are True directions. For sites with easterly Magnetic Declinations, the conversion program adds the declination angle to the Magnetic direction to obtain true direction. For sites with westerly Magnetic Declinations, the conversion program subtracts the declination angle from the Magnetic direction to obtain true direction.

The conversion programs correctly handle the cases where corrections cross True North. For example: for an indicated wind direction of 350 degrees, correcting for Magnetic Declination in Davis, CA, adds 15 degrees giving $350 + 15 = 365$ degrees. The corrected result is 5 degrees. For an indicated direction of 10 degrees, correcting for Magnetic Declination in Hinesburg, VT, gives $10 - 15 = -5$ degrees. The corrected value is 355 degrees.

If you orient your wind direction sensors to True North, no correction is needed. Set the Magnetic Declination field in your Site information to zero to disable the Magnetic Declination correction.

Using Offsets for Wind Direction Sensors

To correct the wind direction data when a direction vane is oriented other than North for any reason, use the Offset field in BaseStation or MicroSite. Do not use the magnetic declination field for this correction.

One reason for using this feature is that Potentiometer wind direction sensors such as NRG's Model 200P have a narrow "Deadband" around 0 degrees indicated direction, where the sensor's output does not change. When the prevailing wind at a site is from the North, you may want to orient the direction sensor to some other direction to shift this Deadband away from the prevailing direction.

When using the Offset, remember that the value you enter is added to the indicated direction when the data are converted. For example, if you orient the direction sensor to East (90 degrees), the sensor will indicate 0 degrees for winds from the East. To obtain true direction, enter 90 for the Offset. Then, indicated values of 0 will be converted to the correct True direction of $0 + 90 = 90$ degrees. As with the Magnetic Declination correction, the conversion programs correctly handle the cases where corrections cross True North.

If you are orienting your sensors relative to Magnetic North, and also have need for an offset, you can use both features. For example, if a Direction Vane is Oriented to 270 degrees Magnetic, you could enter the Offset of 270 degrees, **and** enter the Magnetic declination for the site. Then **both** corrections will be applied to obtain wind direction data in True direction.



Information about Returns to NRG

If you wish to return an item to NRG Systems for repair or any other reason, please

- before shipping - contact NRG's Service Dept. by phone (802) 482-2255 or fax (802) 482-2272

to obtain a Return Material Authorization (RMA) Number. The RMA Number allows us to track and route your shipment and repair. Note the RMA Number on all boxes shipped to us and refer to it in your correspondence or phone calls to us. Please fill out a copy of this sheet and send it along with your shipment to us:

Date _____ Your Name _____ RMA No. _____

Items being returned _____ Serial Number _____

Reason for return _____

Warranty Yes No Not Sure Purchase Date / Invoice No. _____

Estimate for Repair Charges requested Yes No Repair not to exceed US\$ _____

Person to be contacted with estimate _____ phone _____

Person to issue Purchase Order for repair _____ phone _____

Billing Address

Shipping Address

Send your shipment

FREIGHT PREPAID and INSURED against loss or damage in transit.

to:

NRG Systems, Inc.
Attn: Receiving Dept., RMA No. _____
110 Commerce Street
Hinesburg, VT 05461, USA

Thank you.

SHIPMENTS SENT FREIGHT COLLECT WILL NOT BE ACCEPTED BY NRG SYSTEMS.

International Customers

Please state in your shipping documents the following:

**"THESE ITEMS ARE BEING RETURNED TO THEIR U.S. MANUFACTURER.
COUNTRY OF MANUFACTURE AND ORIGIN IS U.S.A. HS CODE 9801.00.1025."**

TWO YEAR LIMITED WARRANTY

NRG Systems, Inc. (NRG) warrants its products for a period of two years from date of original purchase solely for the benefit of the original consumer purchaser. If this NRG product is determined to be defective in materials or workmanship, NRG will, at NRG's option, repair or replace this product without charge. This warranty does not cover damage due to improper installation or use, accident or misuse, lightning or damages due to any unauthorized service. This warranty also will not apply if any seal on any instrument or sensor is broken or the equipment is not grounded.

To return a defective product, call NRG Systems at the telephone number listed below for an RMA number. You must also have available when you call the serial number of the item as well as date bought. *No products will be accepted for warranty work without an RMA number.* The product must be returned, postage prepaid, to NRG with a brief description of the problem, RMA number and a return address with phone number.

The foregoing limited warranty is given in lieu of all other warranties, express or implied. NRG specifically disclaims all implied warranties including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose.

The above limited warranty expressly excludes, and NRG shall not be liable for, any incidental or consequential damages caused by or related to the use of, inability to use or malfunction of this product.

Prompt disposition: NRG will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within warranty, first contact NRG or representative from whom product was purchased and ask for an RMA number.

NRG will also make a good faith effort for prompt service after the warranty period; contact NRG with the nature of the problem and obtain an RMA number.

Inspect your shipments for damages to the packages or missing packages immediately upon receipt. Record any such exceptions on the freight receipt of the delivery agent. If any contents are damaged or missing, report this in writing to the freight carrier and send NRG a copy of the damage report. If you insured the shipment yourself, report any damages to your insurance.

TEL: 802-482-2255

FAX: 802-482-2272

EMAIL: sales@nrgsystems.com