WS 2010

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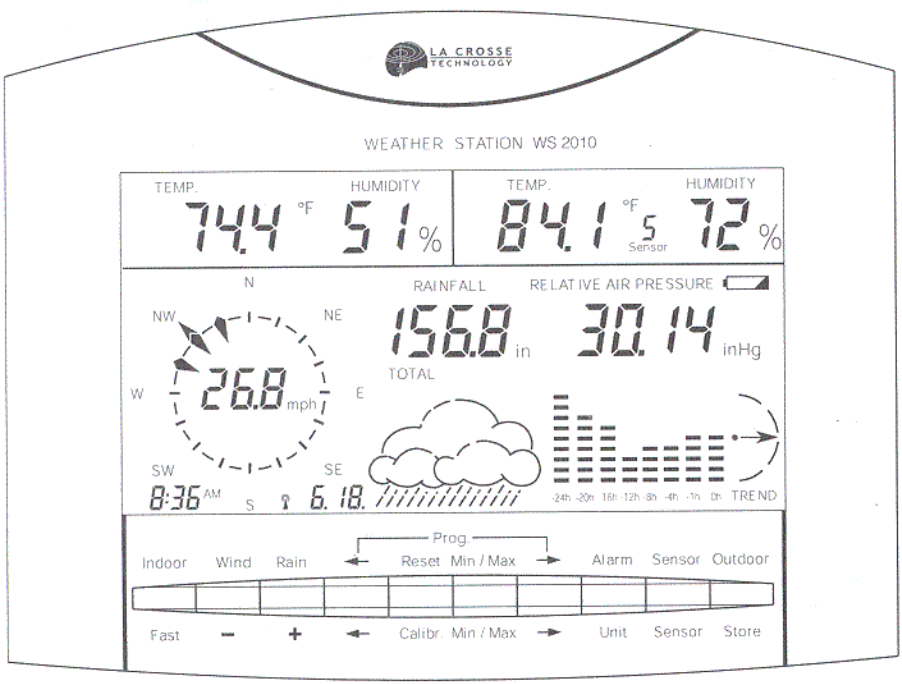

WS 2010

USA

Professional Wireless Weather Station
Operating Instructions

Contents

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1. General Information and Function

The Professional Wireless Weather Station WS 2010 represents a highly sophisticated, easy to use, complete weather station which can record, evaluate and display data from up to nine external remote sensors for temperature and humidity, a remote sensor for wind and another for rain.

The measuring options provided by the WS 2010 are listed below:

- Indoor temperature and humidity with air pressure and one of eight other temperatures with associated relative humidity.
- Up to nine different, combined humidity/temperature measuring points, of which two are displayed simultaneously in the display.
- Calculation and display of the dewpoint and windchill equivalent temperature.
- Air pressure, inHg or hPa.
- Air pressure tendency display (steady, rising, rising steeply, falling, falling steeply).
- Graphical display of the air pressure changes over the previous 24 hours.
- Symbolic display for weather forecast (sunny, partly cloudy, cloudy, rain).
- Wind speed, selectable in mph, knots, m/s, km/h or Beaufort scale.
- Wind direction in the form of a wind rose displaying wind direction fluctuation (instead of wind speed, the wind direction can be displayed with 5° resolution)
- Time and date for accurate assignment of measured values.
- Storing of the minimum and maximum measured values for all sensors with associated time and date (the wind direction is also displayed with the wind speed).
- Compilation of the rainfall in in. or mm (as total, over 24 hr. or over 1 hr.).
- Programmable alarm option for certain weather conditions, e.g. danger of frost, storm, unfavorable air pressure and temperature tendencies when at sea, in the mountains, or as an indicator for so called biological weather, for instance. Up to 39 possible alarms may be programmed.

All the important weather information appear simultaneously in the display, so that no operations on the unit are necessary to establish the weather.

Several base units can be operated simultaneously enabling the data from sensors at various points to appear in the display at the same time

Please read this operating instruction manual thoroughly before using the equipment for the first time in order to prevent functional faults and incorrect operation.
Pay special attention to the assembly and calibration notes on the measuring transmitters.

The WS 2010 indoor/outdoor sensor system operates exclusively with wireless data transmission. This means that the measuring value transmitters can be placed up to 100 m (330ft.) from the base station (depending on local conditions, refer to Section 8 'Range'). Therefore, pay careful attention to the positioning and assembly instructions concerning these components to ensure the entire system works correctly.
Please note that in order to operate the weather station, at least one wireless sensor is required because the basic unit has no sensor of its own.

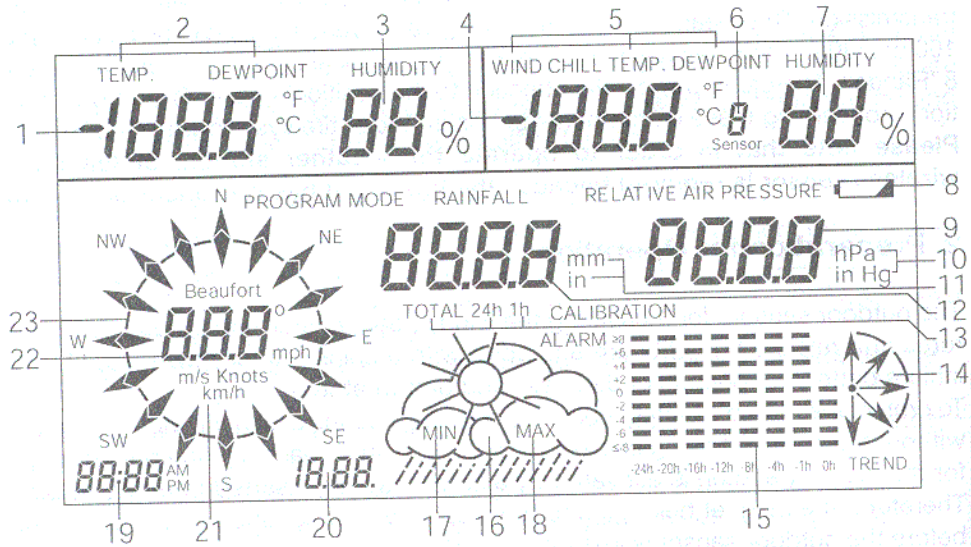
2. Preparation for Operation

The outdoor sensors for measuring the wind speed, rainfall and outdoor temperatures and relative humidity are equipped with a solar cell for power supply and lithium battery for periods of darkness and bad weather.
To protect the valuable battery from total discharge during a longer period of storage without the solar cell being exposed to light (e. g. in its packing), the power supply for the initial operation is activated by a small magnet, inserted from the outside. Therefore, the magnet belonging to the respective sensor should be inserted just before the outdoor sensor is installed outside.
In order to ensure the unique assignment of sensor data, the basic unit should only be put into operation after the sensors have all be running for ten minutes.
This is an important point because the sensors operate in a test mode for up to ten minutes after the operating power is applied (inserting the magnets in the outdoor sensors or inserting the batteries in the indoor sensors). During the test phase, data is transferred in a 4-second cycle instead of a 3-minute cycle.
The outdoor temperature and relative humidity sensors must be addressed according to Section 2.3.4.

2.1. Inserting the magnets in the outdoor sensors

In the case of the outdoor wireless sensor WS 2010-25, the magnet to activate the system is inserted in a opening designed for the purpose in the housing cover.
Activating the wind transmitter is also performed by inserting a small magnet in the opening provided. The magnet holder is located above the retaining tube (opposite the solar cell).
To insert the magnet in the rainfall measuring system WS 2010-16, the upper section of the casing must be separated from the lower section by pressing it and turning it clockwise. The housing cover of the funnel integrated in the electronics casing is equipped with a clip-in holder for the small, round magnet. After pressing the magnet into the holder, the rainfall measuring system starts to transmit.

View of the display area



1. Indoor temperature sensor
2. Current indoor measurement: temperature **or** dew point
3. Indoor humidity sensor
4. Temperature of selected outdoor or indoor/outdoor temperature/humidity sensor
5. Current outdoor measurements: windchill **or** temperature **or** dew point
6. Display of selected outdoor sensor
7. Humidity value of selected outdoor or indoor/outdoor sensor
8. Battery capacity indicator
9. Air pressure indicator
10. Air pressure unit: inHg **or** hPa
11. Rainfall quantity unit: in. **or** mm
12. Rainfall quantity
13. Rainfall measuring period: total **or** past 24 hrs. **or** last hr.
14. Air pressure tendency
15. Air pressure history over past 24 hours
16. Weather forecast symbol
17. Symbol to call in minimum values
18. Symbol to call in maximum values
19. Time display
20. Date display
21. Wind speed unit: mph **or** knots **or** m/s **or** km/h **or** Beaufort
22. Wind speed **or** wind direction (in steps of 5°)
23. Wind rose, display in steps of 22.5° with fluctuation range of wind direction changes

2.2. Preparing the base station

Preparation of the base station simply comprises inserting four AA alkaline cells in the two battery compartments on the rear side of the unit. Refer to Chapter 5 'Changing the Batteries' for instructions.

The base station should only be switched on after the connected sensors have been in operation for at least ten minutes.

Then install the unit at the required site by means of the positioning clamp or hang it up using the eyes integrated in the rear side of the housing.

After inserting the battery, there is a short initialization phase during which all the segments of the display are indicated.

Following the segment test, the WS 2010 automatically switches to a test mode during which all the received data appears in the display and is acknowledged by an acoustic signal. For more clarity, only the data received from the last sensor is displayed and the previous data received is deleted. This makes it easy to check that data is being received correctly from all the sensors.

In areas of unfavorable reception conditions, this test mode also simplifies determining the best location for equipment. The sensor in question can be switched to test mode so that it transmits a telegram every 4 seconds.

To activate test mode, remove the batteries from the indoor sensors and the magnets from the outdoor sensors, wait for five minutes and insert them again.

The test mode running on the base station is automatically stopped after approx. 30 minutes and it switches to normal operation. Test mode can be stopped at any time by pressing a button.

In order to assign the sensor data uniquely, the test mode on the base station may only be stopped when all of the sensors are no longer in test mode.

When the test mode has been completed, i.e. when all the sensors have been clearly assigned, set the time and date according to Section 4.4.

The time plays a central roll with regard to some of the unit's display functions.

To simplify starting up, take the base station to within the vicinity of the sensors. The correct transmission of data from the sensor can then be checked.

After the test phase, the data in the installed sensors is transmitted in a cycle of about 3 minutes and appears in the fields in the display. Please refer to the data on the adjacent page in respect of the position of the various data in the display.

2.3. Description, assembly and starting up the measured value transmitter

The sensors in the WS 2010 are divided into two groups. The basic requirement to operate the weather station is the indoor wireless sensor WS 2010-20 (refer to Section 2.3.1 for more information). It transmits a fixed data telegram which permanently displays the temperature and humidity in the field for indoor values at the top left of the display. The sensor is immediately operational since an addressing is only necessary in a few exceptional cases.

Addressing is only necessary if two base stations with respective indoor sensor are to be operated within the sensor range (up to 100 m). Base station 1 should display the data from indoor sensor 1 and base station 2 the data from indoor sensor 2.

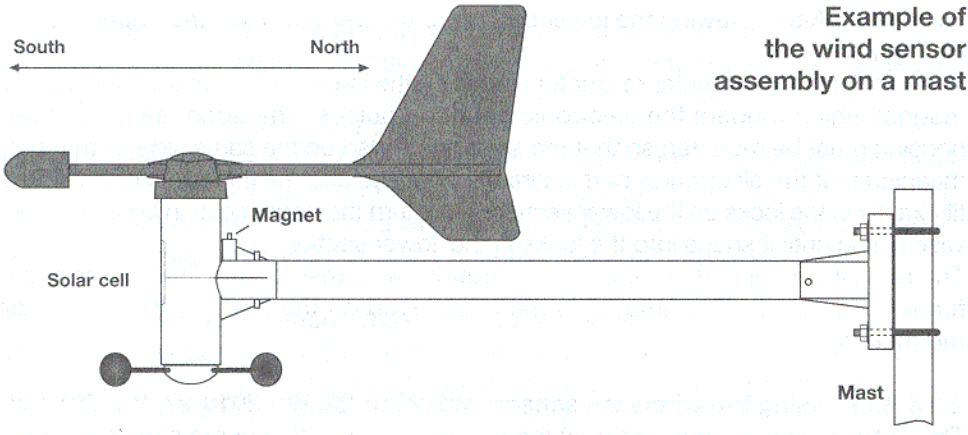
The rainfall wireless sensor WS 2010-16 and wind sensor WS 2010-15 have fixed addresses and also belong to this group because the measured values have defined positions in the display (refer to Page 6 'View of the display area').
The second group of sensors are the WS 2010-22, WS 2010-27 and WS 2010-25. These sensors transmit data signals for the outdoor indicator area at the top right of the display. A maximum of 8 sensors can be chosen via the sensor selector in the display. Therefore, these sensors must be assigned an address in order to define their position in the right-hand display area. Observe the notes on addressing with respect to these sensor types.

2.3.1 Indoor wireless sensor WS 2010-20

The indoor wireless sensor WS 2010-20 requires two round cell batteries to operate. It contains a temperature, humidity and air pressure sensor. The data transmitted always appears in the indoor display area at the top left of the display. The WS 2010-20 measures the indoor temperature, humidity and air pressure and is the central component for displaying air pressure, air pressure tendency, weather tendency and air pressure history.
To insert the batteries, open the battery compartment on the rear side of the housing. Read the information on polarity in the battery compartment and insert the batteries accordingly. Then close the compartment. The sensor can then be brought to its installation site. Note that this sensor is not designed for use outdoors or in rooms with high humidity. The sensor is operational directly after inserting the batteries.

2.3.2 Wind wireless sensor WS 2010-15

The wind wireless sensor compiles both wind speed and direction at the installation site. It is supplied with power from a solar cell with backup battery for periods of darkness. It is assigned a fixed address which the user cannot manipulate.
It can be installed on a mast or at the top of a wall.
The important factor for the installation site is that the solar cell in the sensor housing faces south and is in an exposed space, i.e. the wind must be able to approach the sensor from all sides. Accurate alignment of the sensor, pointing the solar cell due south, is an essential factor because it represents the reference point for measuring the wind direction. It must be assembled absolutely vertically in the retaining tube in order to receive accurate measurements.
Screw the retaining tube and sensor tight, ensuring a firm fit of all the components. In its basic setting, the wind sensor is in an exact North - South direction (solar cell facing south) to ensure an accurate north reference point for the evaluation electronics.



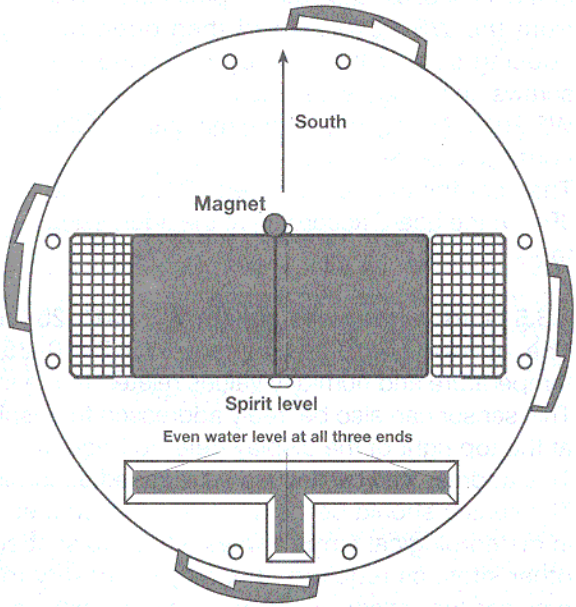
Example of the wind sensor assembly on a mast

2.3.3 Rainfall measuring system WS 2010-16

The rainfall measuring system is also solar powered and is provided with a fixed address which cannot be manipulated by the user. The solar cell must be accurately aligned to face south.

The rainfall measuring system must be positioned on an absolutely horizontal surface and fixed by means of screws inserted in the holes in the base of the housing. Remove the upper section beforehand by pressing it and turning clockwise. There is a recess in the lower section which, when filled with water, provides a perfectly horizontal alignment without any other resources required. Fill the recess with a little water and then align the lower part of the housing according to the spirit level principle. After marking the installation position exactly, drain off the water. Ensure the solar cell faces south. The short side of the integrated spirit level must point north (refer to diagram).

To enable good transmission (wide range), it is better not to set the rainfall transmitter directly on the ground. Installing it approx. 1 m above ground level produces the best results and protects the system from dirt (especially the

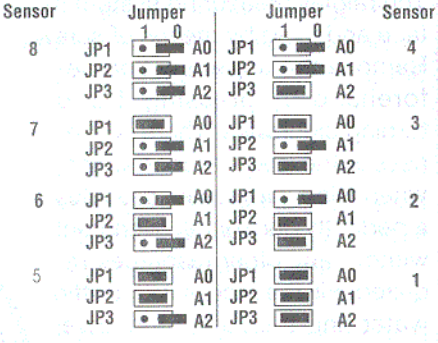


Aligning the WS-2010-16. Using the spirit level and position of the transmitting magnet

solar cells). After screwing the lower section to the base, replace the upper section as follows:
In the middle of the counter rocker for rainfall on the lower section at the side is a bar magnet which triggers the electronic counting pulses. The upper section of the housing must be mounted so that the solar cell is also on the same side as magnet, meaning that the electronics part is directly opposite and the three retaining latches fit exactly in the locks on the lower section. Then turn the upper section counterclockwise a little until it snaps into the locks in the lower section.
The rainfall sensor is then ready for operation. As a test, pour a little water in the funnel very slowly. The amount is then displayed on the basic unit in inches or millimeters.

2.3.4 Addressing the wirelesss sensors WS 2010-22, WS 2010-27, WS 2010-25

The outdoor sensor concept enables the use of up to 8 sensors simultaneously whose data appears at the top right of the display in the area for outdoor values. Each sensor in the system must be assigned an address which enables the receiver to integrate the data within the complete system without any interference. At the factory, each sensor of the type WS 2010-25 is defined as Sensor 1 and types WS 2010-22 and WS 2010-27 as Sensor 2. The programmable assignment is illustrated in the adjacent diagram. The addressing can be performed by the user by setting the jumpers on the component side of the sensor board. First of all, unscrew the protective cover from the WS 2010-25 and then open the housing sensor housing by removing the screws on the rear side. The WS 2010-22 and WS 2010-27 only require the rear panel of the housing to be removed.
Then set the jumpers labeled JP1, JP2 and JP3 on the board according to the addressing table.



2.3.5 Outdoor wireless sensor WS 2010-25 (included)

The outdoor wireless sensor WS 2010-25 enables the transmission of temperature and humidity values related to the site of its installation.
This sensor can also be freely addressed for display within the outdoor display area at the top right of the display (refer to Page 6).
This address can be defined as required according to Section 2.3.4).
The sensor should be installed in a shaded area because temperature information in meteorological terms always relates to shaded areas. It can also be installed at other sites, as required. It is only necessary to ensure that the solar cell which provides the sensor with power is always exposed to light. The sensor should not be located near obstacles, such as leaves, which cast shadows and interfere with the power supply from the solar cell.

A good installation site, for example, is underneath a roof overhang.
The sensor is designed for installation on a mast or wall and should be mounted as follows: Mount the sensor wall bracket either exactly vertical on a wall using four screws or on a mast using the holding clamp.
Insert the sensor in the wall bracket and screw the parts together using the screws supplied. The protective cover should be at the top and the solar cell exposed to light. During periods of darkness or bad weather with little or no sunlight, power is provided to the sensor by an internal, solar buffered, backup battery system.

2.3.6 Indoor wireless sensor WS 2010-22 (Optional)

The indoor wireless sensor WS 2010-22 corresponds to the indoor sensor WS 2010-20 with regard to operation and function. However, it only contains a temperature and humidity sensor, but no air pressure sensor. The sensor can be freely addressed for display within the outdoor display area at the top right of the display (refer to Page 6). This address can be defined as required according to Section 2.3.4).
This sensor is well suited for use in indoor areas, such as a garage, cellar or even attic, because it is battery operated and continues to function in the dark.

2.3.7 Indoor/Outdoor temperature wireless sensor WS 2010-27 (Optional)

In order to operate, the WS 2010-27 requires the insertion of 2 round cell batteries. The electronically remote, encapsulated temperature sensor connected to a 5 m long connection line enables it to measure the temperature in garden ponds or ground areas, etc.
This sensor can also be freely addressed for display within the outdoor display area at the top right of the display (refer to Page 6).
This address can be defined as required according to Section 2.3.4).
The electronics housing can then be installed at the required location and the temperature sensor placed in or on the required object.

2.3.8 Notes on storing the solar cell power supplied outdoor sensors

These sensors receive their operating power supply from a solar cell which buffers an internal battery for periods of darkness. If such a sensor remains out of operation for a longer period and receives no light, there is no risk to the internal battery if the magnets, inserted to activate the operating voltage, are removed. The sensor can thus remain stored, e.g. in its packing, for several years.

3. Operation

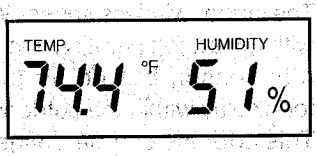
Following installation of the sensors and subsequently putting the base station into operation (only terminate test mode after the last sensor test has been completed) the data received appears in the corresponding areas of the display. If nothing appears, refer to Section 6 'Faults' note on eliminating faults.
Please note that only data is displayed for which the corresponding sensor has been installed. This means, for example, that no rainfall measurement can be displayed if no rainfall sensor has been installed.

Since all relevant data appears in the display at the same time, operation is basically confined to selecting sensors or more detailed weather data by pressing the relevant button.

The Chapter 'Operation' is only concerned with **normal operation**; the button labels **above** the row of buttons apply.
Functions which need to be programmed are described in the Chapter 'Program Mode', which involves the labels underneath the row of buttons.

3.1. Indoor values

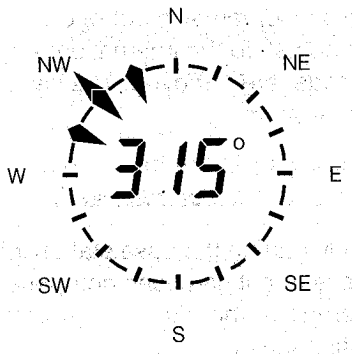
In normal operation, the indoor value area of the display at the top left indicates the temperature and humidity at the installation site of the indoor sensor.
Press **the 'Indoor' button once** and the dew point appears (refer to 'Glossary').
Press 'Indoor' again to return to normal operation.



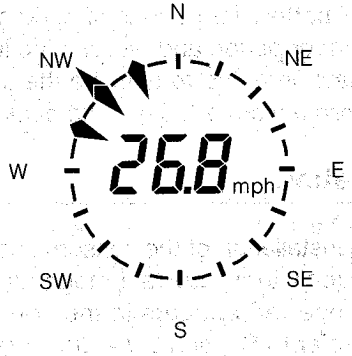
3.2. Wind

Pressing the **'Wind' button** causes the **unit of measurement for the wind speed indicator** to change or switches the wind speed indicator to a **digital wind direction indicator**, steps of 5°, at the left-hand side of the display. The switching and display sequence is as follows:

- wind speed in mph
- wind speed in knots
- wind speed in m/s
- wind speed in km/h
- wind speed in Beaufort scale
- wind direction in a 5° resolution instead of wind speed



Digital display of the wind direction

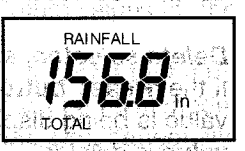


Digital display of the wind speed in mph

3.3. Rainfall

Pressing the **'Rain' button** calls in the display of **rainfall over the past hour** (on the half-hour of each hour), **over the past 24 hours** (compiled between 7:30 and 7:30 a.m.) and **total rainfall** (since beginning the measurement or last reset) in sequence, positioned in the middle of the display.
The times and periods are based on internationally applied standards of meteorology.

Basic display:	Total rainfall
Press x1:	Last hour
Press x2:	Last 24 hours
Press x3:	Total rainfall (again)
	(refer to diagram)



If the **'Reset' button** is pressed for 2 sec. while the total rainfall is being displayed, the **accumulated value is deleted.**
The time and date of deletion are stored by the weather station.
By pressing the Reset button briefly, the time and date of the last deletion are displayed.

3.4. Min/Max function

The Min/Max function is used to call in the minimum and maximum values of all the measured features since the last time the Min/Max memory was deleted. It is possible to select whether date or time of occurrence of the value should be displayed.

Min/Max value display

Press x1:	Display all minimum values
Press x2:	Display all maximum values
Press x3:	Return to current display

If all the minimum or all maximum values are displayed, there is no additional time and date display. Neither are the weather symbol, air pressure or air pressure history displayed. Instead, the current selection appears, either MIN or MAX, at the bottom of the display. There is no display for MIN wind or rainfall. If no MAX windspeed or rainfall is displayed, press the corresponding Wind or Rain key.

Delete all stored values

If the **'Reset' button** is pressed for approx. 2 sec. during the Min. or Max. value display, **all the stored values are deleted.**

Individual values with time and date

If the **arrow button ' ->'** is pressed during the Min. or Max. value display, either **only** the **Min. or Max. value of the indoor temperature** is displayed or, **on pressing the arrow button '<-', the air pressure** with relevant time and date.

------ All other display fields remain dark ----------

Using the **arrow buttons and Min./Max. buttons, each individual minimum or maximum value can be selected** and appears in the display with **the time and date** the corresponding value was stored.

------ All other display fields remain dark ----------

In the case of the maximum wind speed, the system not only stores the time of occurrence but also the wind direction at that moment.

Delete selected, stored value

If the **'Reset' button** is pressed for approx. 2 sec. while the selected Min. or Max. value is being displayed, the **corresponding individual minimum or maximum value** is deleted.

3.5. Alarm function

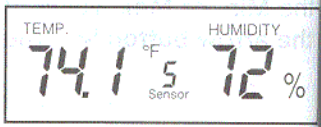
As soon as one of the measured values received in the weather station rises above or falls below an alarm value the tendency, air pressure history, weather symbols and wind direction displays are all deactivated. Only those displays appear whose values are outside the defined alarm limits. In addition, 'ALARM' appears.
If several display fields or measuring points are affected, their alarm displays also appear.
By using the **'Sensor' button**, the alarms from the outdoor sensors can be requested. The first alarm which arrives is displayed first with all the relevant sensor information.
In the case of an alarm, the weather station remains in 'Alarm' status until the **'Alarm' button** is pressed and the display of the current values reappears. The system also issues an acoustic signal, consisting of five individual tones, in the case of an alarm. The signal is issued every 30 minutes for a maximum of 7.5 hours. The alarm is deleted when the value at the measuring point concerned reverts to a value within the permissible range and pressing the **'Alarm' button**. (The current values return to the display.)

3.6. Sensor selection

The **'Sensor' button** enables **selection of the outdoor temperature/humidity sensor** regardless of the weather station operating mode. The sensor selected appears in the 'Sensor' display field with its corresponding sensor number.

3.7. Outdoor display field

In normal operation, the outdoor display field at the top right indicates the temperature and humidity at the site of the sensor selected with the 'Sensor' button.
Press the **'Outdoor' button once** and the **Dewpoint** appears (refer to Glossary).
After pressing the **'Outdoor' button twice**, the temperature display in this field changes to the **Wind-chill equivalent temperature**. Obviously, the wind-



chill display can only appear if the wind sensor WS 2010-15 is a component part of the weather station.
After pressing the **'Outdoor' button** again, the display returns to the normal temperature display.

4. Program Mode

Programming mode can be used to set the maximum and minimum values for the alarm function.
Please note that the row of labels underneath the buttons applies and that if no button on the unit is pressed within 60 seconds, it returns to normal operation mode.
Activate **Program Mode** by pressing the **'<-' and '->' buttons** simultaneously. PROGRAM MODE appears in the display together with the set minimum alarm values. The weather symbols, air pressure tendency air pressure history and wind rose are deactivated.
After pressing the Min/Max button, the maximum alarm values appear. If the Min/Max button is pressed again, the minimum alarm values reappear. The alarm values, e.g. rising or falling below a certain ground temperature, exceeding a specific wind strength etc., can now be adjusted in programming mode.

4.1. Setting the alarm min./max. values

Use the two arrow buttons **'<-' and '->' buttons,** and the 'Sensor' button, if necessary, to select the required **measuring point or quantity**.

Min/Max selection

The **'Min/Max' button** is used in this mode to enter the minimum and maximum values as required. The button function and function sequence corresponds to that described in Section 3.4 'Min/Max Function'. Firstly, all the minimum then all the maximum values can be entered or each measuring site can be assigned a minimum and maximum value directly.

Set values

Use the **'+' and '-' buttons** to set the required numeric value. Keep the button pressed and the unit automatically increases or decreases the value correspondingly.

Increase counting speed

By pressing the **'Fast' '+' or '-' buttons simultaneously,** the **counting factor is increased by 10**.

4.2. Calibration mode

Calibration Mode enables settings to be defined which only needs to be carried out once. It is used to calibrate the height compensation for baromeric air pressure, balancing the rainfall transmitter and to set the required measuring units for air pressure and rainfall. An important function in Calibration Mode is setting the time

and date. This mode can also be used to adjust the address of the indoor sen
be received, the wind transmitter and rainfall transmitter when necessary.
Access Calibration Mode by simultaneously pressing the buttons **'<-' + 'Cali**
'->' . Then use the arrow buttons **'<-' and '->'** to select the relevant display

Adjusting the height compensation for barometric air pressure
After selecting the air pressure display field, press the **'+' or '-' buttons**, tog
with **'Fast'** if necessary, to enter the height above sea level of the installation s
meters (a value between 0 and 1999 is possible). Heights in feet must first be
verted to meters using the factor 3.048. For example, if the air pressure senso
a height of 1000 ft, the equation is 1000 : 3.048 = 328. Enter the value 328 a
height compensation factor. The unit used in the display to indicate the pres
has no effect on the height compensation of the barometric air pressure.
After pressing the **'Store' button,** the values set are stored and the display re
to normal operation.

Rainfall transmitter compensation
The rainfall measuring system leaves the factory in a very accurate stat
that readjustment should not normally be necessary.
A compensation is only necessary where an extremely high degree of acc
cy is required. The factory has preset this to "1.45in" or "37.0mm".
Before beginning with the rainfall transmitter compensation, proceed accordir
Section 3.3. 'Rainfall' with the display in normal operation to reset any accumul
rainfall quantity to zero.
Then pour exactly 0.1 gallons of water, very slowly, into the funnel of the rai
transmitter.

Caution!
Pouring too quickly falsifies the measuring results. Pour the water so slo
that no water remains in the funnel at any time.

The diameter of the funnel is 51.18 in., i.e. has a surface area of 0.206 sq. in.,
setpoint value of 0.1 gallons poured in must produce a rainfall total of 11.24
When the water has completely run through the funnel, the actual value in the dis
should ideally read 11.24 in.
The ratio of setpoint value to actual value defines the calibration factor. Howe
since a calibration factor has already been entered earlier, this must be taken
account in the calculation.

New calibration factor:

$$\frac{\text{Setpoint value (e.g. 11.24) x old calibration factor}}{\text{Actual value (display value after filling the water)}}$$

To obtain the old calibration factor, press the buttons '<-' + **'Calibr.'** + '->' simultaneously to access Calibration Mode. Press the **'<-'** button to select the Rainfall the display field.
After the first transmission from the rainfall transmitter, the old calibration factor appears in the display. Press the **'+' or '-' buttons,** together with **'Fast'** if necessary, to set the new value.
After pressing the **'Store' button**, the value set is stored and the display returns to normal operation.

4.3. Changing units of measurement

If the **'Unit' button** is pressed when the system is in Calibration Mode, the following units can be selected in the corresponding display fields; **in or mm** in **'RAINFALL'**, **inHg or hPa** in **'RELATIVE AIR PRESSURE'** and, when the set sensor address is being displayed, **°F or °C** for the various **TEMP.** displays.

4.4. Setting the clock

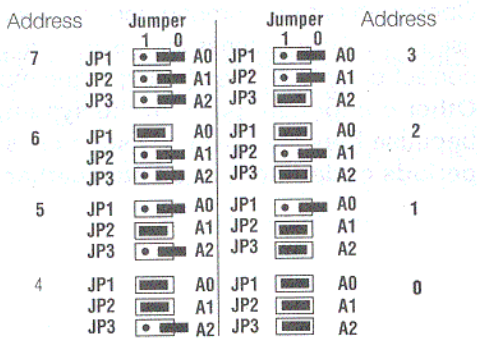
The weather station WS 2010 is equipped with an integrated clock which can also be set in Calibration Mode.
When in Calibration Mode, (Section 4.2) press the arrow **button '<-'** twice. Only the time and date appear in the display. The setting can then be made according to Table 1.

Table 1: Set Time and Date

Function	Button
Hour	-
Minute	+
Month	Unit
Day	Sensor

4.5. Changing the basic addresses of sensors with fixed assignments

Adjusting the addresses of the indoor sensor WS 2010-20, rainfall sensor and wind sensor is not necessary under normal circumstances.
The multifunctional operation represents a special feature, which enables any number of basic units to be operated within the respective wireless sensor ranges. This means that one base station can be operated in the living room, another in the office, etc. all displaying the same data.
If a basic unit (display unit) is installed in each room in which the indoor temperature is to be displayed in the first display field (top left of the display), the indoor sensors for temperature/humidity with air pressure must be assigned



different addresses, according to the diagram above. The relevant jumpers are identified on the board with JP1, JP2 and JP3.
In order that the base station only receives data from the sensor assigned to it, the corresponding address must also be set. To modify the basic address, activate Calibration Mode and press the arrow button '<-' three times and then select the required address using the **'Indoor' button.**
The basic address of the wind and rainfall transmitters can also be modified in this operating mode, processes which are seldom necessary. Modifying the addresses of the wind or rainfall transmitters is only necessary when two neighboring wind or rainfall sensors are installed within the range of one base station. The basic addresses of the wind and rainfall transmitters must be changed by the manufacturer, so that it may be necessary to return the sensor concerned.

5. Changing the Batteries

Wirelesss sensors WS 2010-20, WS 2010-22 and WS 2010-27
All the batteries in these sensors have a working life of up to 3 years (alkali batteries). They must be replaced when the display of the corresponding sensor does not appear for over 24 hours and no other general, longer term interference in the transmission path needs to be taken into account. This can generally be determined if data transmission from other sensors located nearby is not displayed either (refer to Chapter 6 'Faults').
The batteries are changed by opening the battery compartment on the front of the sensor housing, removing the used batteries and inserting two new round cell batteries of the type AA Alkaline, ensuring correct polarity according to the markings on the compartment cover. The sensor is operational again after replacing the cover. The data from the sensor should reappear in the display after the base station has completed its sensor polling cycle (refer to Chapter 6 'Faults').

Base station WS 2010
The base station indicates that the battery is becoming weaker by means of the battery symbol at the right of the display.
Since stored data is lost following a change of battery, call it into the display and note down the values required.
Open both battery compartment covers on the rear side of the unit, remove the four used, round cell batteries and inserting four new ones of the type AA Alkaline, ensuring correct polarity corresponding to the markings in the compartments.
Other component parts of the system do not require changing the batteries because they are driven via solar cells. Integrated backup batteries overcome periods of darkness and bad weather.

6. Faults

If transmission is not received from a sensor for 12 hours, its value disappears from the display. At 8:00 a.m. and 6:00 p.m. the base station polls all sensor transmitters for 6 minutes, in case intermittent radio interference on the path has affected the synchronization between sensor and base station. Transmission occurs in a very short period of time. After this period of 6 minutes, a faulty reception should have been cleared.

Possible faults which prevent correct display of transmitted data are:

Undefined values after starting up
Note that the base station test mode may only be terminated when none of the sensors is still test mode so that defined data can be received immediately and to ensure the correct assignment of data telegram to display position

No reception - distance between transmitter and receiver is too great
Reduce the distance between transmitter and receiver.
No reception - interfering material between transmitter and receiver (thick walls, concrete,...)
Find a new location for the transmitter or receiver. Also refer to Chapter 8.

Batteries of transmitter or receiver empty
Change batteries. Check base station battery indicator.

Transmitter over powered by source of interference
(radio, headphones, loudspeakers)
Eliminate the source of the interference or find a new location for the transmitter. If no data is received for 12 hours, the corresponding display value is deactivated so that no more measured data is displayed because the system assumes that the sensor no longer exists. No more attempts are made to receive data in order to save battery power. At 8:00 a.m. and 6:00 p.m., the receiver automatically starts new synchronization, whereby sensors which have not been received for over 12 hours are deactivated.

A newly added wireless sensor (e.g. following a change of batteries) is automatically accepted by the system and the related data is displayed.
Faults are often restricted to limited periods (radio communication) or can be easily eliminated. If a unit, e.g. radio headphones, baby monitor, etc is operated your house or a neighbor's at 433 MHz, the period of activity is normally limited. Most of these units can be changed to an interference-free frequency. Such measures can normally eliminate faults effectively.

Wireless sensor interferes with other units
The transmissions from wirelesss sensor can cause short-term interference on units

operating on the same channel (every 3 minutes for approx. 200 ms). This interference is negligable. If possible, change the channel on the unit experiencing interference.

7. Technical Data

Measuring interval, outdoor sensor: ..... 3 min
Measuring interval, indoor sensor: ..... 3 min
Frequency of transmission: ..... 433.92 MHz
Range in open space: ..... Max. 330 ft (100 m)
Measuring range for indoor temperature: ..... 32 °F to 176 °F (0°C to 80°C)
Measuring range for outdoor temperature: ..... -22 °F to 176 °F (-30 °C to 80 °C)
Temperature resolution: ..... 0.1 °F (0.1 °C)
Temperature accuracy: ..... ± 2°F (1 °C)
Measuring range of the relative humidity: ..... 5% to 95%
Relative humidity resolution: 1%
Relative humidity accuracy: ..... ±8%
Measurement of air pressure: ..... 23.62 to 32.48 inHg (800 to 1100 hPa)
Air pressure resolution: ..... 0.03 inHg (1 hPa)
Air pressure accuracy: ..... ±0.03 inHg (1 hPa)
Air pressure history resolution: ..... 0.06 inHg (2 hPa) / mark
Measuring range of rainfall: ..... 0 - 157.4 inch (0 - 3999 mm)
Rainfall resolution: ..... < 0.02 inch (0.5 mm)
Rainfall accuracy: ..... ±2% ± 0.04 inch (±2% ±1mm)
Wind speed (average value more than 3 min): ..... 0 - 124 mph (0 - 200 km/h)
Wind speed resolution: ..... 0.1 mph (0.1 km/h)
Wind speed accuracy: ..... ±3% ± 0.6 mph (±3% ± 1 km/h)
Wind direction: ..... graphic resolution 22.5°, numeric resolution 5°
Power supply (main unit): ..... 4 batteries AA (Alkaline)
Dimensions (W x H x D): ..... 8.54 x 6.30 x 1.18 inch (217 x 160 x 30 mm)

8. Ranges

Under optimum conditions, the open field range is 330 ft, i.e. when there is 'visual' contact between the transmitter and receiver. Walls and reinforced concrete constructions can be passed through, but they do affect the range correspondingly. A reduced range may be due to the following reasons:

- High frequency interference of all types
- Buildings of all types and vegetation
- Especially in the case of the wind sensor, metal roofs or roof insulation with foil sealed glass wool can reduce the range
- Transmitter and receiver clearance from conductive surfaces or objects which affect radiation characteristic and thus the range (including human bodies and the ground)
- Broadband interference in built-up areas may reach levels which lessen the entire signal-to-noise ratio, thus reducing the range

- Units with neighboring operating frequencies may affect the receiver
- Poorly screened PCs may affect the receiver and reduce the frequency

9. Repeater for Increasing the Range

Buildings which reduce ranges can be compensated for by means of a special repeater designed for the weather station. The battery powered repeater, equipped with transmitter and receiver receives the data from the required sensors and transfers them on with only a minimum delay. The repeater is housed in a waterproof casing and is suitable for installation both indoors and out. Several repeaters can be cascaded to overcome greater distances.

10. Glossary

Air pressure history - storing and graphically representing the air pressure situation over the past 24 hours. Used to draw conclusions concerning general weather developments. Graphical display indicates changes of 2 hPa per part line.

Air pressure tendency - Calculated from the developments over the past hours

Dew point - A temperature point which is dependent on the combination of a certain air pressure, temperature and humidity. At this point, the humidity starts to condense, forming dew i.e. the humidity in the air becomes liquid. If the dew point for the humidity in the air is below freezing point, condensation may lead to the formation of frost.

Weather tendency - Weather forecast display by means of weather symbols, calculated from the speed with which the air pressure rises or falls.

Windchill equivalent temperature - A fictive temperature felt by people rather than the real temperature measured, often used when temperature get low. It is defined from how wind speeds feel at certain temperatures. The conditions relate to temperatures under 91.4 °F and wind speed in excess of 2.6 m/s which have a determined as a cooling effect on the naked skin at a constant skin surface temperature of 91.4 °F.

Quick Reference

The button functions appear as consecutive steps on pressing the corresponding button repetitively. The first item indicates the display in its initial state The numbers in brackets indicate the relevant section in the operating instructions. Calibration is described in Section 4.2

Normal operation (3) Buttons:

Indoor	Wind	Rain	Alarm	Sensor	Outdoor
Temperature	Speed mph	Total	Active	Select	Temperature
Humidity	Speed, knots	Last hour	Alarm value	Outdoor sensor	Humidity
Dewpoint	Speed m/s	Last 24 hours	Display		Dewpoint
Humidity	Speed km/h		Alarm		Humidity
	Wind direction				Windchill
					Humidity

Button Min/Max (3.4)

Display all minimum values
Display all maximum values

Arrow buttons (3.4)

Pressed when min. or max. values are displayed: individual display of the stored values of the individual measuring points with date and time of occurrence of the min. and max. value

Reset

Press 2 s during normal operation
Delete accumulated rainfall total
Press 2 s when min. or max. values are displayed: delete all stored values (min. or max.)

Press 2 s during selective display via the arrow buttons: Only delete min. or max. value of the selected measuring point.

Program Mode (4)

Activate Program Mode by pressing the two arrow keys simultaneously
Display: PROGRAM MODE

Setting alarm min/max values (4.1)

Use the arrow buttons **'<-' or '->'**, and the **'Sensor' button** if necessary, to select **the required measuring point or measuring quantity.**

Min/Max selection: Use the **Min/Max buttons** to enter any minimum or maximum values required. The button functions and function sequence corresponds to the Min/Max function described above. In this way, all the minimum values can be set at first then the maximum values, or the respective min. and max. values can be set on the individual sensor.

Set value: Use the **'+' and '-' buttons** to set the required values. Hold the button pressed in and the unit automatically counts up or down, respectively.

Increase counter speed: **The counting speed factor can be increased by 10** by pressing '+' '-' and **'Sensor' buttons** simultaneously.

Calibration (4.2)

Calibration Mode, display: CALIBRATION (press the buttons **'<-' 'Calibr' and '->' simultaneously).** The display fields for air pressure sensor, rainfall transmitter and clock can be selected using the **'<-' and '->'** buttons. The basic addresses of sensor assignments (4.5) can be changed and display of temperature in °F or °C selected. The settings for height compensation regarding barometric air pressure and correction of the calibration factor for the rainfall transmitter can be modified using the **'+' and '-'** buttons. The time and date are set according to Table 1.

Changing unit of measurement (4.3)

After pressing the **'Unit' button**, the RAINFALL display can be set to *in* or *mm*, RELATIVE AIR PRESSURE to *inHg* or *hPa* and temperature displays to °F or °C.