Ramonville, 17th January 2006

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NS/NT/GC/06.006

# eLocust2 user manual

# (FAO Locust application)

# Contents

# 1 Presentation of the application eLocust2

## 1.1 General purpose

The application eLocust2 has been developed by Novacom Services in collaboration with the FAO, in order to help the locust survey officers to report data about the locust activities.

The software is embedded in a Wescor, plugged on a vehicle driven across the areas where locust swarms are damaging crops. An antenna is put on the roof of the vehicle to send locust data and receive the precise GPS position of the vehicle, so that the place of the observation is perfectly known. The whole asset is powered from the cigar lighter adaptor.

## 1.2 The Wescor


The Wescor RX600 Touchpad is composed of a monochrome LCD touchscreen (-1-) and several buttons on the right part of the terminal:

- five buttons numbered from *F1* to *F5* (-2-)
- a multidirectional cross (-3-)
- a *SELECT* button (-4-)
- a *CANCEL* button (-5-)
- a *EMG* button (for “Emergency”) (-6-)
- a *PWR* button (for “Power”) (-7-)

In the following, the Wescor RX600 Touchpad is simply referred to as “Wescor”.

The user has two ways of acting on the Wescor:

- by pressing the buttons;
- by touching the screen on an active field or on an icon.

## 1.3 Functionalities

As an overview, the embedded software allows the user to:

- retrieve the present time and GPS position;
- fill in a report about the evolution of locusts in an area;
- send this report with the GPS position over satellite, or save it on the Wescor;
- review old reports previously saved on the Wescor;
- complete an old report with specific data;
- display the status of the satellite link;
- download old reports on a computer.

## 1.4 Preliminary installation

Before running your asset, you need to install it. If not already done, read the document *NS-06.007 eLocust2 installation guide* explaining how to install the asset.

## 1.5 SAT-201

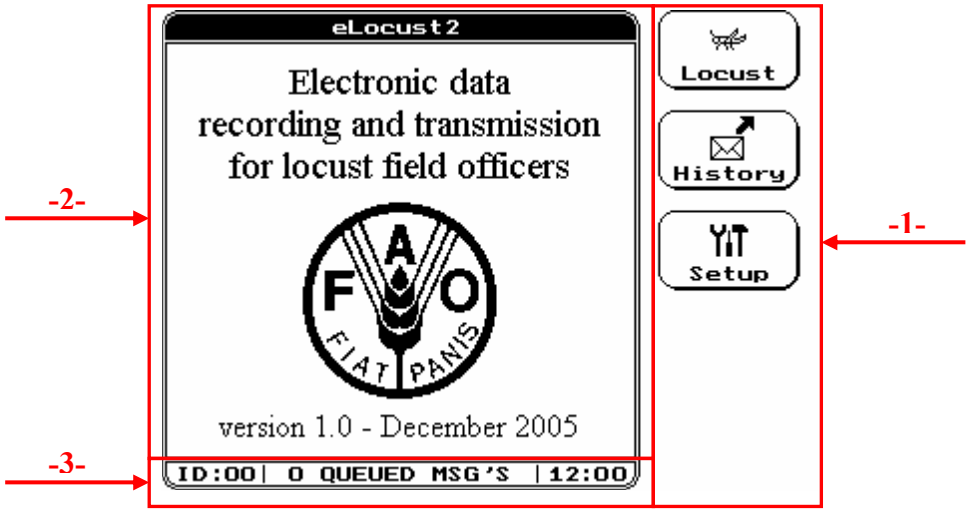
eLocust2 is based upon a specific antenna: the SAT-201 (below). This antenna contains a GPS receiver and a satellite transmitter/receiver.

Note that eLocust2 will not work with a different antenna.

# 2 General structure of the application

The embedded application presents a graphical architecture in three parts:

- the navigation bar (-1-),
- the main screen (-2-),
- the status bar (-3-).




This screen organization is the same throughout the application.

## 2.1 Navigation bar

The icons on the right side of the screen are used to navigate through the application. The functionality for a button is different from screen to screen. Each button has a text and an icon to clarify its purpose.

On the start-up page (with the FAO logo), you can access to the three following menus:

- the *Locust* menu, where you can fill in a new locust report;
- the *History* menu, where you can review the previously edited reports, and complete them;
- the *Setup* menu, where you can modify the settings of the application.

## 2.2 Main screen

The content of this screen depends on the active form currently displayed. The title of the active form is displayed on the top of this screen.

Each screen contains different fields of data. For each field, the user can enter a value:

- as a number, either entered digit by digit, or step by step. Most of the fields have a maximum range of values and do not allow the user to enter values out of it;
- among selectable boxes. For some of these fields, the user can only select a single box, while other fields allow multiple selection;
- from a list;
- as a date.

Underlined values are modifiable. To change such a value, you must first touch it to select it. When a value is selected, it is framed, and the digit on the right of the value is highlighted. With the up and down arrows, you can increase or decrease the value of this digit. With the left and right arrows, you can change the currently highlighted digit. Once you are satisfied with the value of the current field, validate it by touching the screen anywhere.


Selectable boxes are another kind of active field. If a box is highlighted, the parameter it represents is selected. Select/deselect a parameter by touching the box.


To choose an item from a list, touch the list. Then scroll through the items by using the multidirectional cross, or by pressing the arrows next to the list. Validate your choice by touching the screen anywhere. You can erase the content of the list by trying to select the item before the first, or after the last item of the list.


To select a date, touch it on the screen. Choose the field you want to change (the day, the month or the year) with the left and right arrows of the multidirectional cross. Then increase or decrease the value of this field with the up and down arrows. Invalid dates (like 31 Apr, or 29 Feb 2005) cannot be entered. Validate the date by touching the screen anywhere. You can erase the date by trying to enter a year before 2004.


## *2.3 Status bar*

This bar on the bottom of the screen informs the user of:

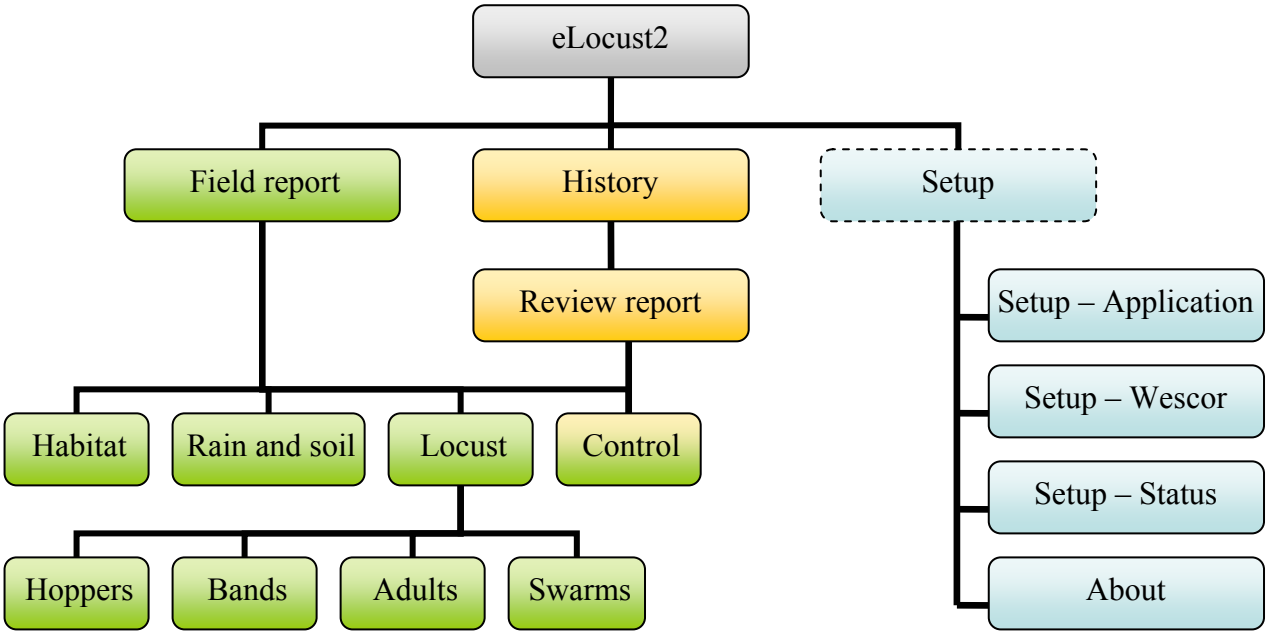
- the identity of the user (a number between 1 and 99 that is specific to each locust survey officer);
- the number of messages queued in the unit, waiting to be sent over satellite (cf. § 6.3: *Sending procedure*). This number gives a good indication of the time it will take to send a whole report;
- the local time (received from the GPS satellite).

## 2.4 Buttons

- The buttons *F1*, *F2*, *F3*, *F4* and *F5* are associated to the icons nearby in the navigation bar. Pressing a *Fx* button or touching the icon next to it has the same effect.
- The multidirectional cross is used to modify a value or to navigate through a list.
- The *CANCEL* button can be used to blank the screen immediately. The screen is restored to the previous settings from the moment the user presses another button.
- You can activate/deactivate the backlight of the screen by pressing the *PWR* button, then pressing the *SELECT* button while holding pressure on *PWR*.
- The emergency button (the red button *EMG* in the top-right corner of the Wescor) is not used in our application.

## 2.5 Tree structure

The navigation through the different screens of eLocust2 is based upon the following pattern:




The *Field report* menu and its submenus are used to do statements of the locust situation in an area.

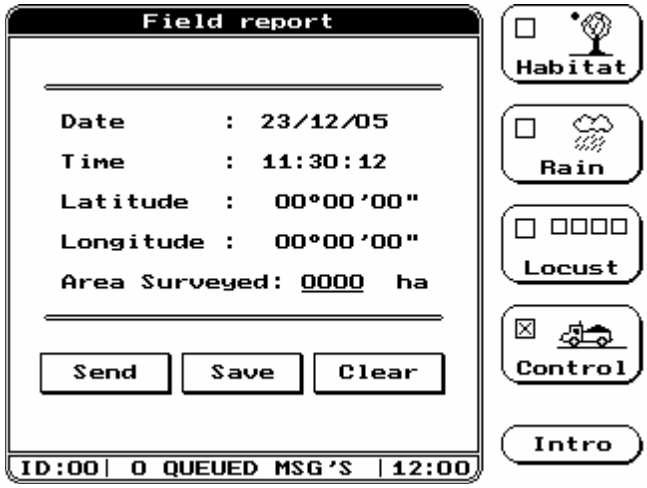
The *History* menu and its submenus are used to review the data stored in previous reports, and also to complete some of these reports with additional data.

The *Setup* menus are used for various adjustments and troubleshooting.

The complete description of the screens and their contents is given in the next chapters.

# 3 "Field report" menu

This menu is the major purpose of the application. It allows you to fill in a report summarizing your observations about locusts.




You first have to fill in a certain number of fields in the different submenus.

The fields *Date*, *Time*, *Latitude* and *Longitude* in the *Field report* screen are the only non-modifiable fields in the *Locust* menus. These data are provided by the SAT-201.

You can enter a value for the field *Area surveyed* by pressing it. The value must be comprised between 1 and 9999.

There are tick boxes next to each icon. A tick box is toggled if the user has entered the menu accessible with this button, and has filled in at least one parameter of the corresponding menu. On the picture above, you can see that only the *Control* menu has been visited by the user.

Note that the *Locust* button has no icon but a large tick box with four smaller tick boxes. Each small tick box corresponds to one of the four *Locust* submenus. If at least one parameter of a submenu has been filled in, the associated tick box is ticked.

If you quit the *Field report* menu (to return to the start-up page for instance), all the parameters that you had already filled in are kept. You will get all these parameters back when you come back to the *Field report* menu. However, the parameters are not stored if the Wescor is shut down meantime.

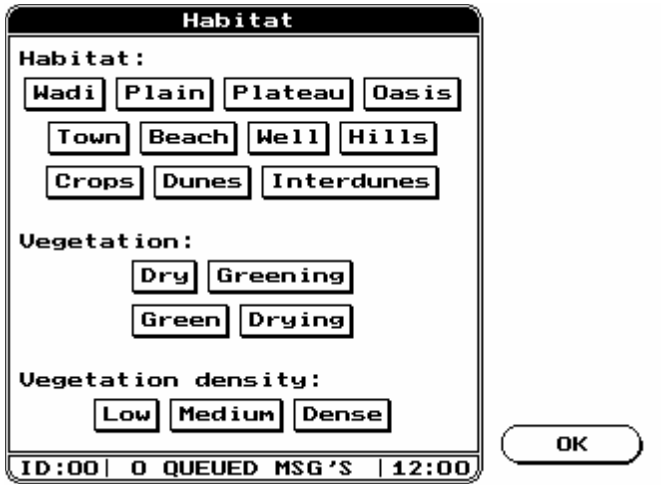
At anytime, you can start over a new report by pressing the *Clear* button then confirming.

When a report is ready, you can send it by pressing the *Send* button, then confirming. Then the report is saved on the Wescor and sent by satellite. However, you can also only save the report without sending it by pressing the *Save* button.

The complete procedure of sending/saving a report is detailed in § 6: *Report editing procedure*.

## 3.1 "Habitat" screen

This menu specifies the nature of the area observed. All the fields of this menu are mandatory.



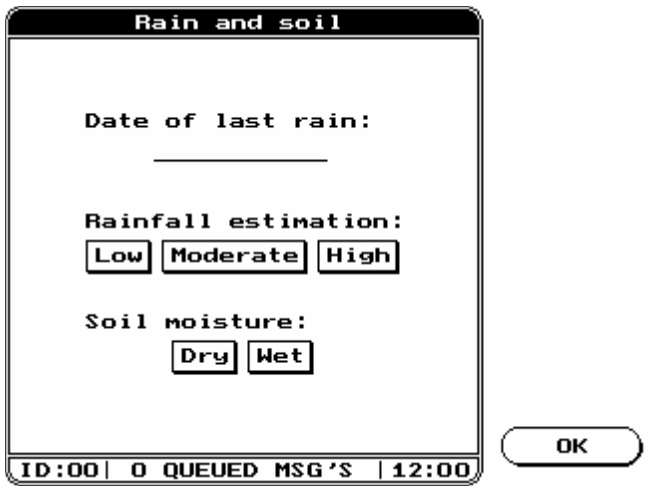

- *Habitat*: Indicates the environment observed.
- *Vegetation*: Indicates the state of the vegetation. Single choice selection.
- *Vegetation density*: Single choice selection.

When all the fields are filled in, press *OK* to go back to the *Field report* menu.

The field *Habitat* allows multiple choices selection. However, the FAO wants the users to choose only one item per report for this field. Be careful not to toggle more than one item for this field, even though the application authorizes it.

## *3.2 "Rain and soil" screen*

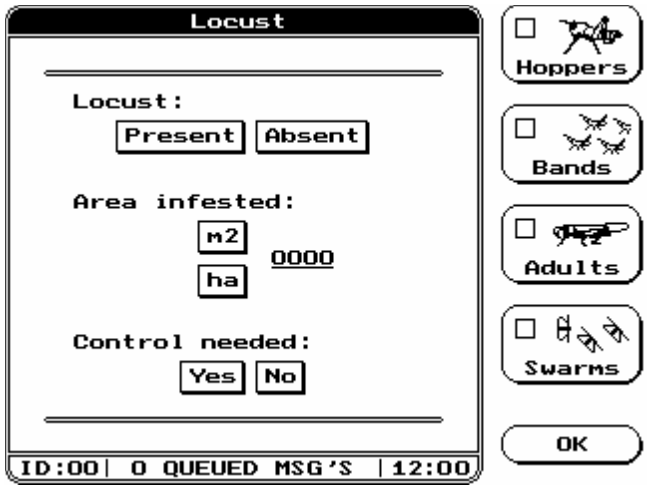
With this menu you can enter data about rainfalls.




- *Date of last rain*: Enter a date between the 1st January 2004 and the 31st December 2018.
- *Rainfall estimation*: Single choice selection.
- *Soil moisture*: Single choice selection. This field is mandatory.

## 3.3 "Locust" screen

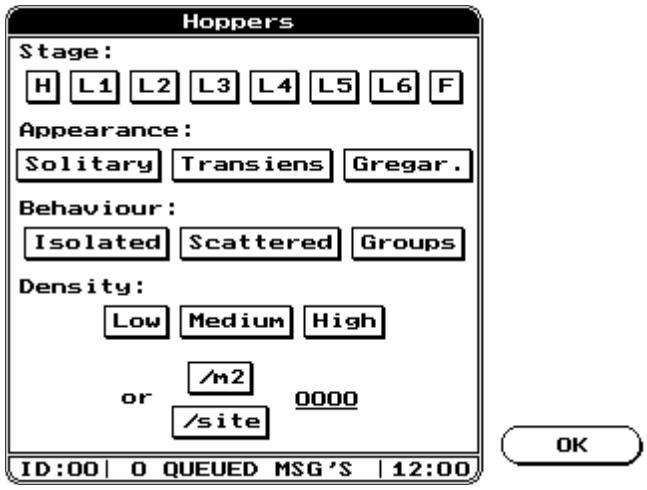
This menu and its submenus allow the description of the kind of locusts observed, their number, their evolution, etc.




- *Presence*: Indicates if locusts are present or not. This field is mandatory.
- *Area infested*: Surface in hectares or in square meters. If a value is entered, you must choose the units.
- *Control needed*: Enter *Yes* if a control is needed but not immediately provided, *No* otherwise. This field is mandatory.

If locusts are present, you can give more details with one or more of the four submenus, depending on the kind of locusts encountered. Each submenu is optional.

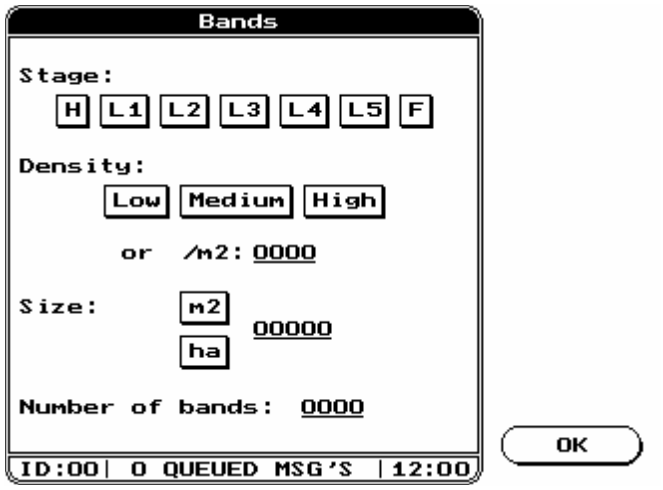
### 3.3.1 "Hoppers" screen




- *Stage*: Multiple choices selection between *Hatchling*, *L1*, *L2*, *L3*, *L4*, *L5*, *L6* and *Fledging*.
- *Appearance*: Multiple choices selection ("*Gregar.*" means gregarious).
- *Behaviour*: Multiple choices selection.
- *Density (estimation)*: Single choice selection.
- *Density (m2/site)*: Number of hoppers per square meter or per site, limited to 9999. If a value is entered, do not forget to choose either "/*m2*" or "/*site*".

The fields *Density (estimation)* and *Density (m2/site)* are exclusive. If a value is entered for one field, the value in the other field is automatically cleared.

### 3.3.2 "Bands" screen

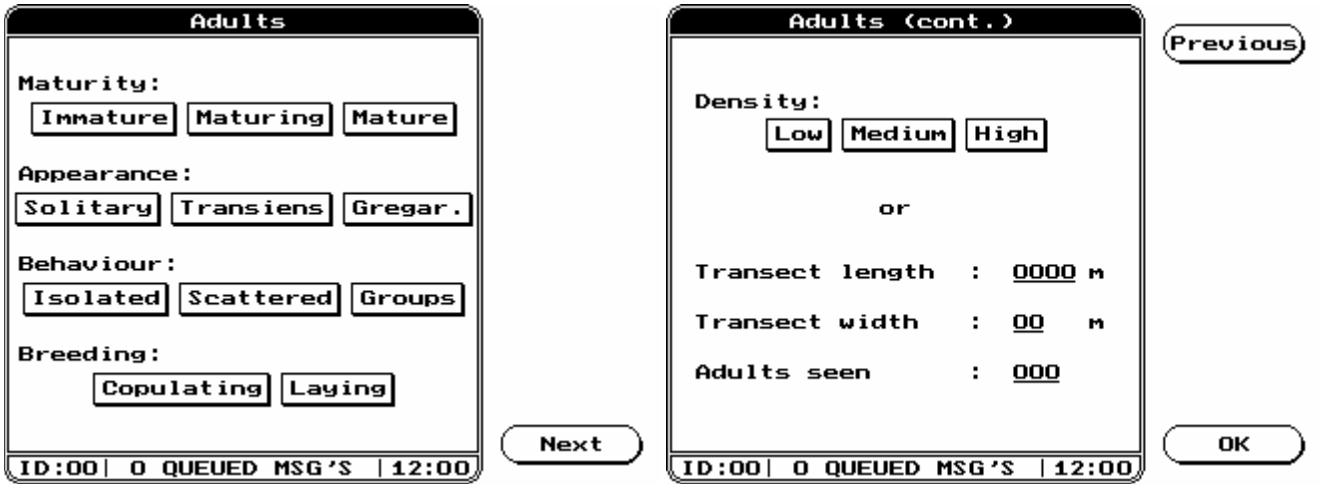



- *Stage*: Multiple choices selection between *Hatchling*, *L1*, *L2*, *L3*, *L4*, *L5* and *Fledging*.
- *Density (estimation)*: Single choice selection.
- *Density (per m2)*: Number of locusts per square meter, limited to 9999.
- *Size*: Surface covered by the bands, limited to 30000. If a value is entered, do not forget to precise the units.
- *Number*: Number of bands observed, limited to 1000.

The fields *Density (estimation)* and *Density (per m2)* are exclusive. If a value is entered for one field, the value in the other field is automatically cleared.

### 3.3.3 "Adults" screens

This menu is split in two parts, because the screen is not large enough to display all the parameters. Start completing the first screen, then press *Next* to get into the second screen. After you have completed it, you can press *OK* to get back to the *Locust* screen. Otherwise you can press *Previous* to get back to the first *Adults* screen.




- *Maturity*: Multiple choices selection.
- *Appearance*: Multiple choices selection ("*Gregar.*" means gregarious).
- *Behaviour*: Multiple choices selection.
- *Breeding*: Multiple choices selection.
- *Density*: Single choice selection.
- *Transect length*: Limited to 1000 meters, with a precision of 50 meters.
- *Transect width*: Limited to 50 meters.
- *Adults seen*: Limited to 999.

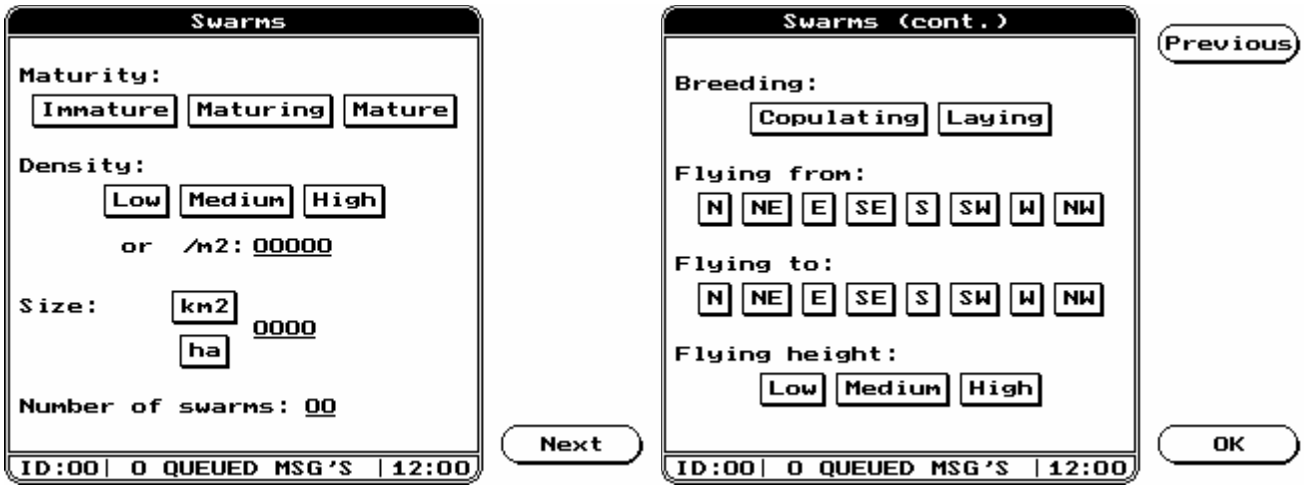
The fields *Density* and the group of fields *Transect length*, *Transect width* and *Adults seen* are exclusive. If a value is entered for the *Density*, then the fields *Transect length*, *Transect width* and *Adults seen* are cleared. On the opposite, if a value is entered either for the field *Transect length*, *Transect width* or *Adults seen*, then the field *Density* is cleared.

Navigation

- *Next*: To get from the *Adults* screen to the *Adults (cont.)* screen.
- *Previous*: To get from the *Adults (cont.)* screen back to the *Adults* screen.
- *OK*: To validate your selections and get back to the *Locust* screen.

### 3.3.4 "Swarms" screens

The navigation through the two *Swarms* screens is made the same way as for the *Adults* screens.

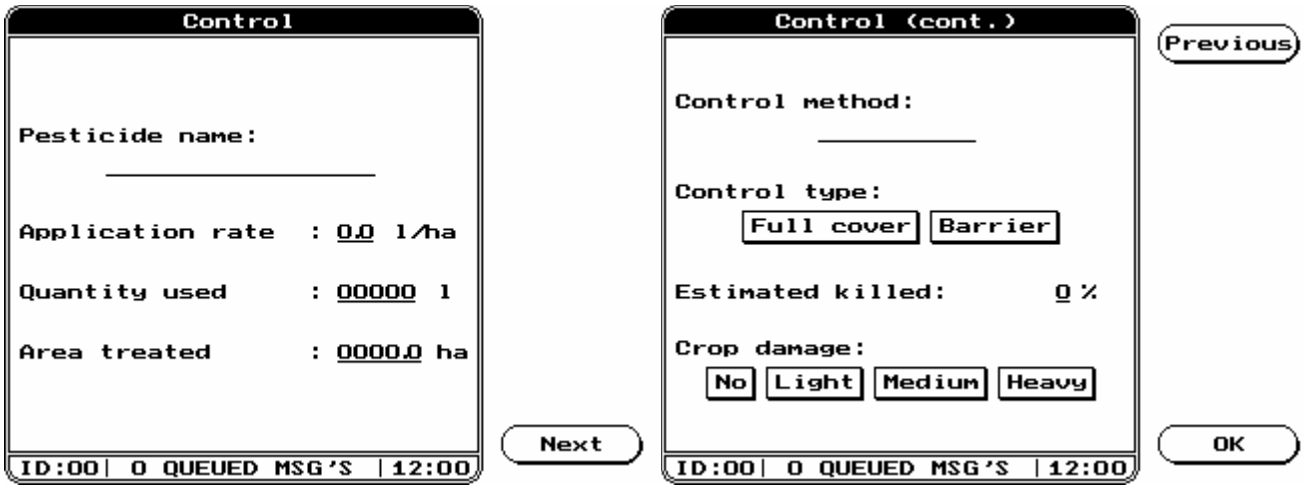



- *Maturity*: Multiple choices selection.
- *Density (estimation)*: Single choice selection.
- *Density (per m2)*: Number of locusts per square meter (limited to 20000).
- *Size*: Surface covered by the swarms (limited to 1000 square kilometers or 1000 hectares). If a value is entered, do not forget to precise the units.
- *Number*: Number of swarms observed (limited to 99).
- *Breeding*: Multiple choices selection.
- *Flying from*: Single choice selection between North, North-East, East, etc.
- *Flying to*: Single choice selection between North, North-East, East, etc.
- *Flying height*: Single choice selection.

The fields *Density (estimation)* and *Density (per m2)* are exclusive. If a value is entered for one field, the value in the other field is automatically cleared.

### 3.4 "Control" screens

This optional menu allows the user to present the methods used to fight the locusts and their results.

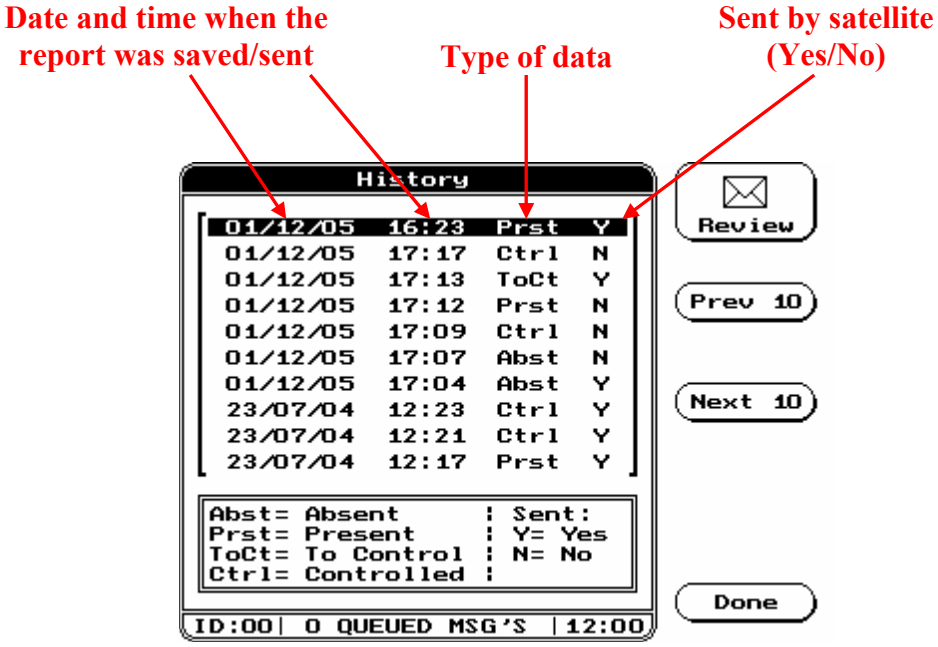



- *Pesticide name*: Single choice selection between:
  - bendiocarb,
  - chlorpyrifos,
  - deltamethrin,
  - diflubenzuron,
  - fenitrothion,
  - fipronil,
  - lambdacyhalothrin,
  - malathion,
  - metarhizium,
  - teflubenzuron,
  - triflurnuron,
  - other.
- *Application rate*: Limited to 3.0 litres per hectare.
- *Quantity used*: Limited to 20000 litres.
- *Area treated*: Limited to 9999.9 hectares.
- *Control method*: Single choice selection between *mechanical*, *handheld*, *vehicle* and *air*.
- *Control type*: Single choice selection.
- *Estimated killed*: Precision of 5%.
- *Crop damage*: Single choice selection.

# 4 "History" menu

## 4.1 "History" screen

The *History* menu allows you to review the reports previously stored on the Wescor, and to complete some of them to a certain extent. To enter the *History* menu, press the *History* button in the *eLocust2* screen. The following screen appears:




This screen displays a list of the old reports stored on the Wescor, either stored by pressing the *Send* or the *Save* button in the *Field report* screen.

Only the last 64 reports are visible in the list. When you store a new report on the Wescor beyond the 64th, the eldest report is removed.

The reports are ordered by date, the last report being put on top. You scroll through the reports by using the up and down arrows. Two buttons are also available to jump 10 reports back or in front.

You see a summary of the content of the reports in the list. There are four distinct types of reports:

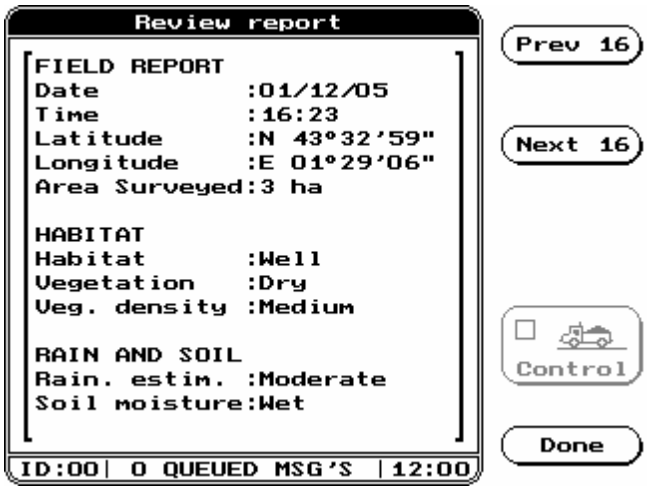
- absent (*Abst*), if no locust has been found;
- present (*Prst*), if locusts have been found, but no control has been done nor is needed;
- to control (*ToCt*), if a control is needed but did not occur yet;
- controlled (*Ctrl*), if a control has been done.

The last parameter *Sent* precises if the report has been sent by satellite (*Y*) or simply saved on the Wescor without having been sent (*N*).

Finally, you can see in details the content of a report by highlighting it (with the up and down arrows) then pressing the *Review* button on the right of the screen.

## 4.2 "Review report" screen

This menu allows you to review in details one of the reports selected in the *History* menu.

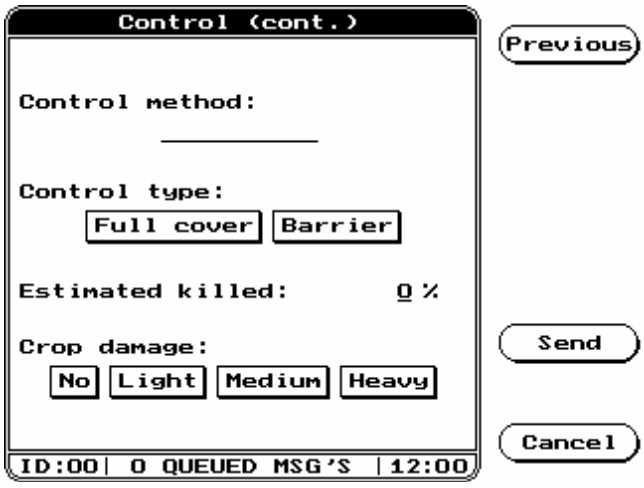



The different fields of data entered with this report are listed in the same order as they are presented in the screens of the application, and regrouped screen by screen. Only the fields for which a value has been entered are displayed.

## 4.3 Adding data to a report

Under specific conditions, you can add data to a report. If a report is identified as *To control* in the *History* list, you can complete it by reviewing it, then pressing the *Control* button on the right of the screen. The *Control* button is visible only for the reports identified as *To control*.

Thus, you get into the Control screens, as they are presented in the § 3.4: *"Control" screens*. You can add any data, then press the *Send* or *Save* button in the *Control (cont.)* screen (the button is called *Send* if the report under completion was initially sent by satellite, *Save* otherwise).



Once done, the current report will now be identified as *Controlled*, and the newly added data will be displayed with the rest of the report in the *Review report* screen. The date associated to the report will remain the one of the first sending/saving.

A *To control* report can only be completed during the 7 days following its first edition.

# 5 "Setup" menu

This menu contains all the settings for the software and hardware. You can modify the settings the same way as you enter data into a report. A setting is saved and updated from the moment you change it.

Four *Setup* submenus are available:

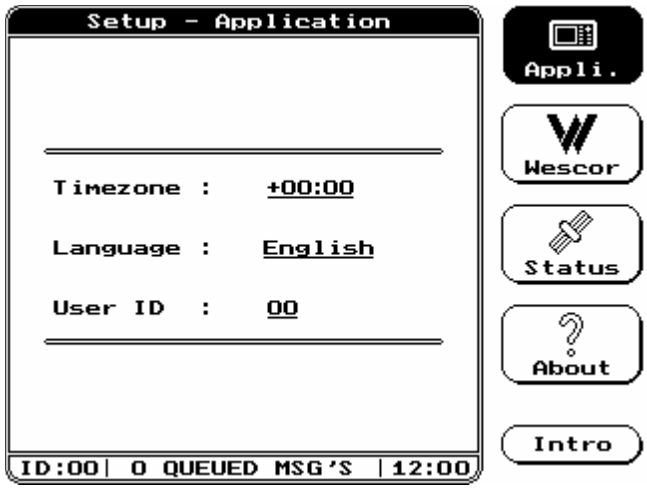
- Application settings (button "*Appl.*"),
- Wescor settings (button "*Wescor*"),
- Status of the satellite connection (button "*Status*"),
- General information (button "*About*").

Once you press the *Setup* button in the start-up page, you are automatically directed to the *Setup – Application* page. Then you can navigate through the other screens by pressing the corresponding icons.

The button of the screen currently displayed is highlighted.

You can return to the start-up page by pressing the *Intro* button.

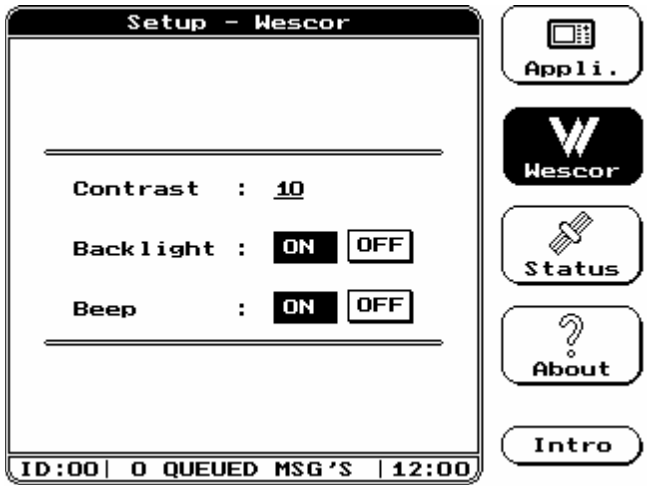
## *5.1 "Setup – Application" screen*




You can set the following parameters:

- *Timezone*: The difference between the local time and the UTC time. You can set the time zone with an accuracy of 15 minutes
- *Language*: The language can be selected between English and French. Once changed, the whole application (fields, titles, buttons and logos) is instantly translated.
- *User ID*: A key to identify the user of the Wescor (between 1 and 99). This field is recalled in the status bar.

## 5.2 "Setup – Wescor" screen

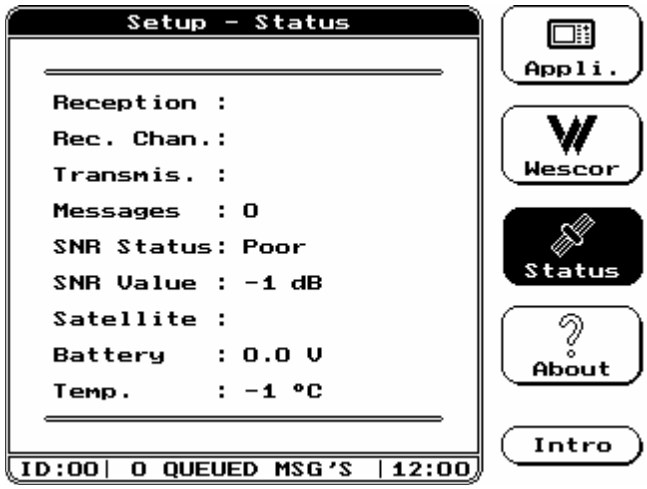



In this menu, you can:

- adjust the contrast of the screen, between 0 (light) and 20 (dark),
- turn the backlight on and off,
- turn the beep of the buttons on and off.

## 5.3 "Setup – Status" screen

This menu displays information about the SAT-201 and the state of the satellite connection.



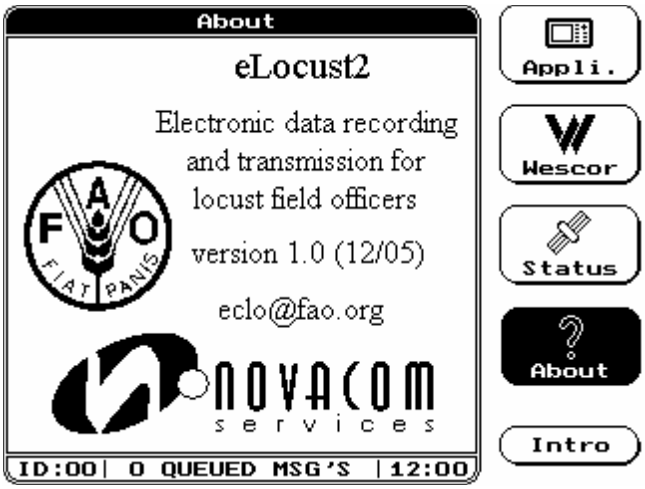
Note:

The majority of this information is of no concern for the user. Indeed, this status table is especially useful in case of maintenance or troubleshooting.

| Field | Description |
|---|---|
| Receive Channel Status (Rx) | The status of the SAT-201 if it is receiving |
| Channel | Indicates whether the SAT-201 is listening to the Bulletin Board or to the Traffic Channel |
| Transmit Channel Status (Tx) | The status of the SAT-201 if it is sending |
| Messages | The number of messages stored in the asset and waiting to be sent |
| SNR Status | Indicates whether the signal level is poor (<14dB) or good (>14dB). |
| SNR Value | Signal to noise ratio in dB |
| Satellite | Indicates which one of the 4 Inmarsat D+ satellites is visible, among:<br>• AOR-E: Atlantic Ocean Region East<br>• AOR-W: Atlantic Ocean Region West<br>• POR: Pacific Ocean Region<br>• IOR: Indian Ocean Region |
| Battery voltage | The input voltage of the SAT-201 (between 9V and 30V) |
| Unit temperature | The internal temperature of the SAT-201. It should be comprised between -40° and +70° C. |

### *5.4 "About" screen*

Displays the logos of the FAO and Novacom Services.



# 6 Report editing procedure

The software eLocust2 offers many ways for a locust survey officer to communicate data concerning the locust situation in a given area. Indeed, with eLocust2, a survey officer can:

- edit a report and save it on the Wescor for further consultation;
- edit a report, save it on the Wescor and send it by satellite;
- consult reports that have been previously saved on the Wescor;
- complete some of the previously saved reports with specific data.

The current chapter describes how to use these functionalities.

## *6.1 Conditions for a complete report*

### 6.1.1 Connection with the antenna

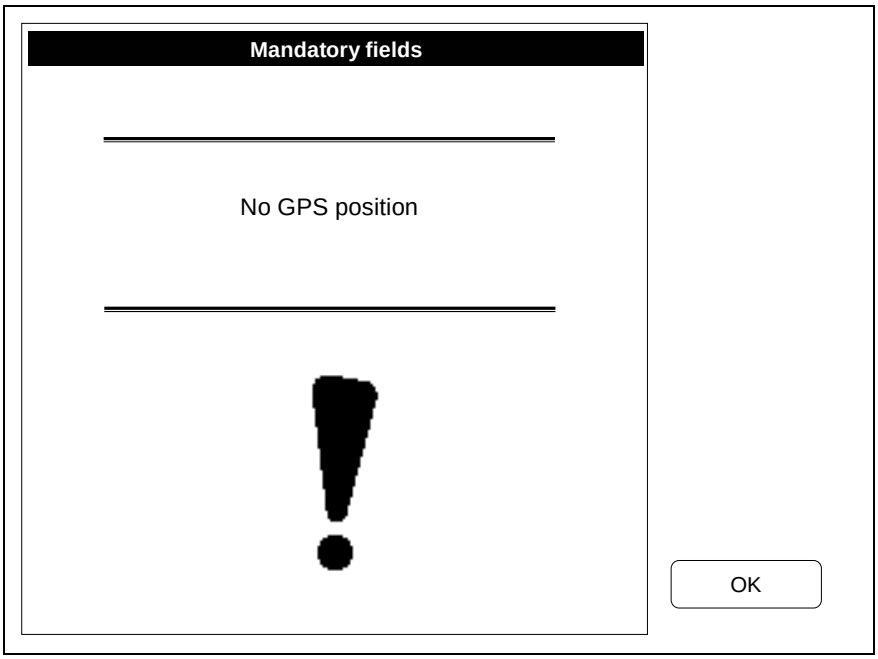
Once powered, when the startup page appears, the message *SAT-201 NOT READY* is displayed during a few seconds in the status bar. It corresponds to the period necessary for the SAT-201 to start-up. After a few seconds, this message will normally be replaced by *0 QUEUED MSGs*, which indicates that the asset is ready to be used and contains no message waiting to be sent.

If the message *SAT-201 NOT READY* does not disappear after 10 seconds, it means that the SAT-201 is not connected to the Wescor. You will not be able to send nor to save any report with the asset. Check the connection between the Wescor and the SAT-201. If the message *SAT-201 NOT READY* is still displayed, try another cable for the connection between the Wescor and the SAT-201.

### 6.1.2 Valid GPS time and position

The SAT-201 needs some time to get GPS coordinates. It can sometimes take one minute or more. Before valid GPS data are received, the default position displayed in the *Field report* screen is 0°00’00”, and the date is 01/01/92. It will be considered as invalid GPS coordinates. No report can be sent nor saved until a valid GPS position is registered on the Wescor.

Before sending or saving a report, check that the fields *Latitude*, *Longitude*, *Date* and *Time* display meaningful values in the *Field report* screen. If your GPS position is still incorrect when you try to send or save the report, the following message appears and you cannot send nor save the report:



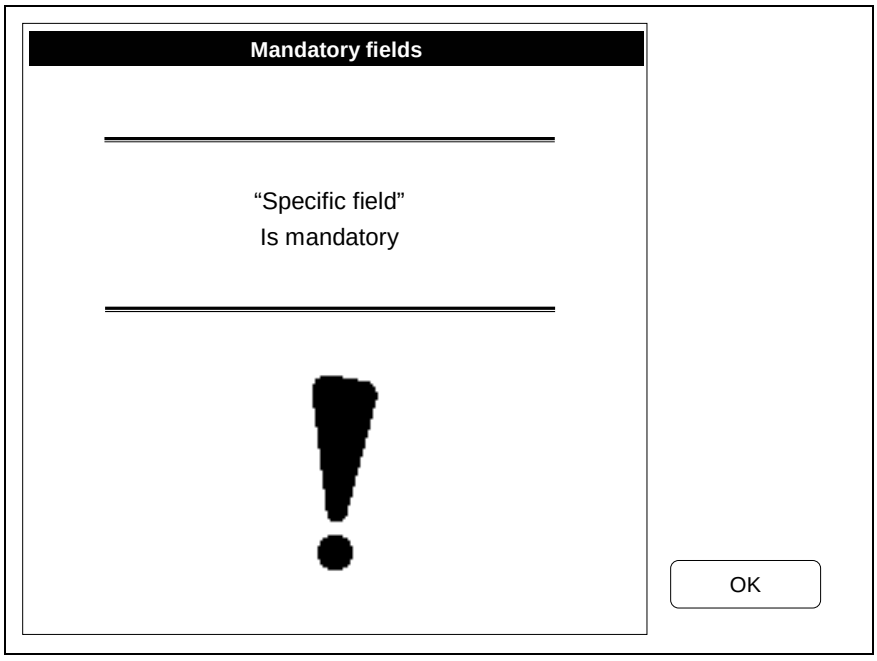

In this case, try to move the SAT-201 to an open area where the GPS reception is better.

### 6.1.3 Mandatory fields

A report must contain a minimum of information. Before you can send or save a report, the following mandatory fields have to be filled in:

- Field report / Area surveyed
- Habitat / Habitat
- Habitat / Vegetation
- Habitat / Vegetation density
- Rain and soil / Soil moisture
- Locust / Presence
- Locust / Control needed
- Setup – Application / User ID

If a mandatory field has not been filled in, a warning message is displayed, specifying which field is empty. The user must first fill in this field before trying to send again.




### 6.1.4 Fields with selectable units

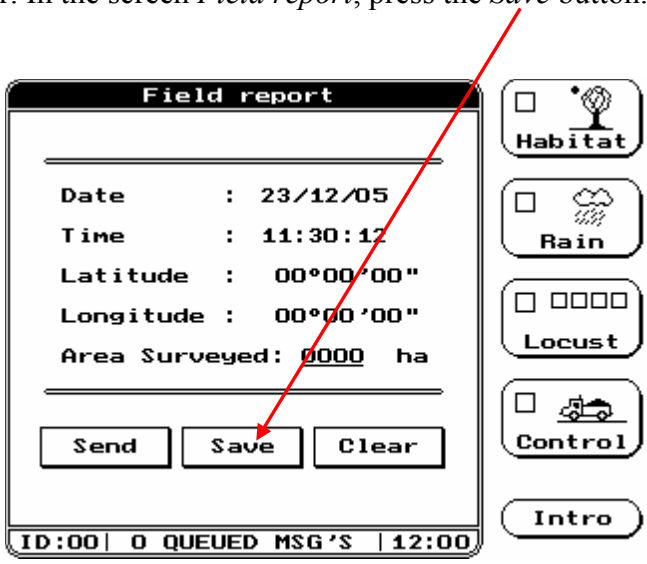
Check that no value is entered without units for the following fields:

- Locust / Area infested
- Hoppers / Density (m2 / site)
- Bands / Size
- Swarms / Size

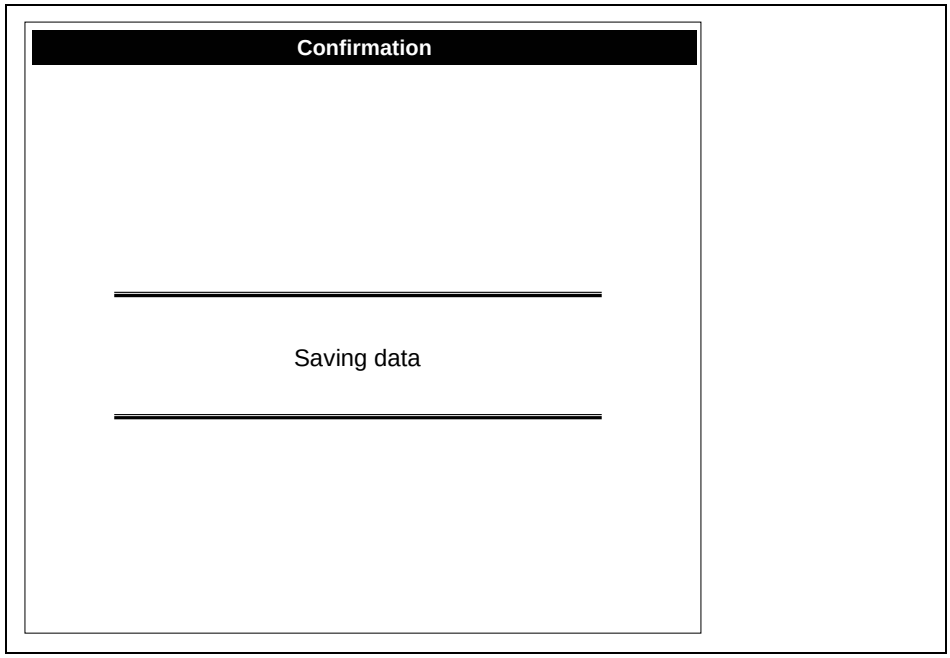
In case of value without units, a warning is displayed.

## 6.2 Saving procedure

Once the different steps above have been followed, you can save the report currently under edition on the Wescor. In the screen *Field report*, press the *Save* button.




The data are instantly saved on the Wescor. The following message is displayed for a few seconds for confirmation:

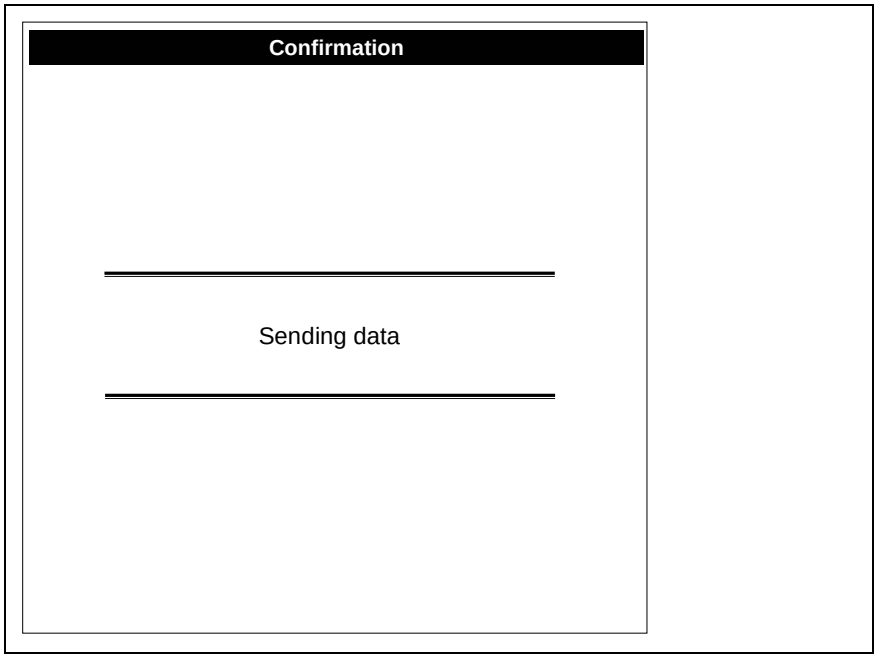



Note: The data are NOT sent towards satellite. However, the connection with the SAT-201 is necessary to get valid GPS time and position. Thus, you cannot save a report on the Wescor if the SAT-201 is not connected.

## 6.3 Sending procedure

Instead of just saving a report on the Wescor, you can also send it by satellite. Edit your report in the same way as described in § 6.1. Once finished, validate your report by pressing the *Send* button (instead of *Save*) in the screen *Field report*.

The following message is displayed to indicate either that the report is being saved on the Wescor (exactly in the same way as when pressing the *Save* button), and that the sending process is started:

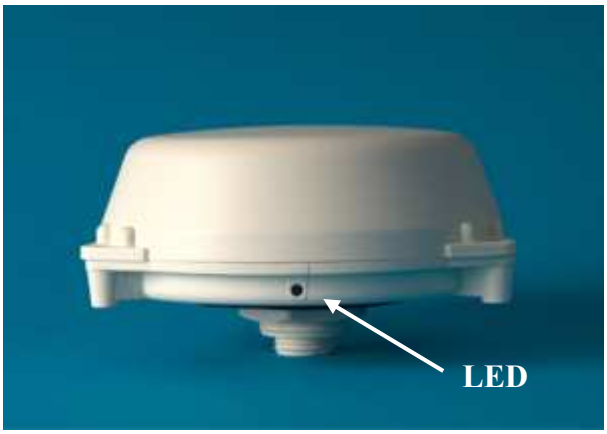



Indeed, the report has to be sent towards satellite. When a valid report is sent, it is encoded in a various number of messages (from 2 to 7) queued in the asset. The more *Locust* submenus filled in, the more messages queued. The number of messages queued is displayed in the status bar, as:

*x QUEUED MSGs*

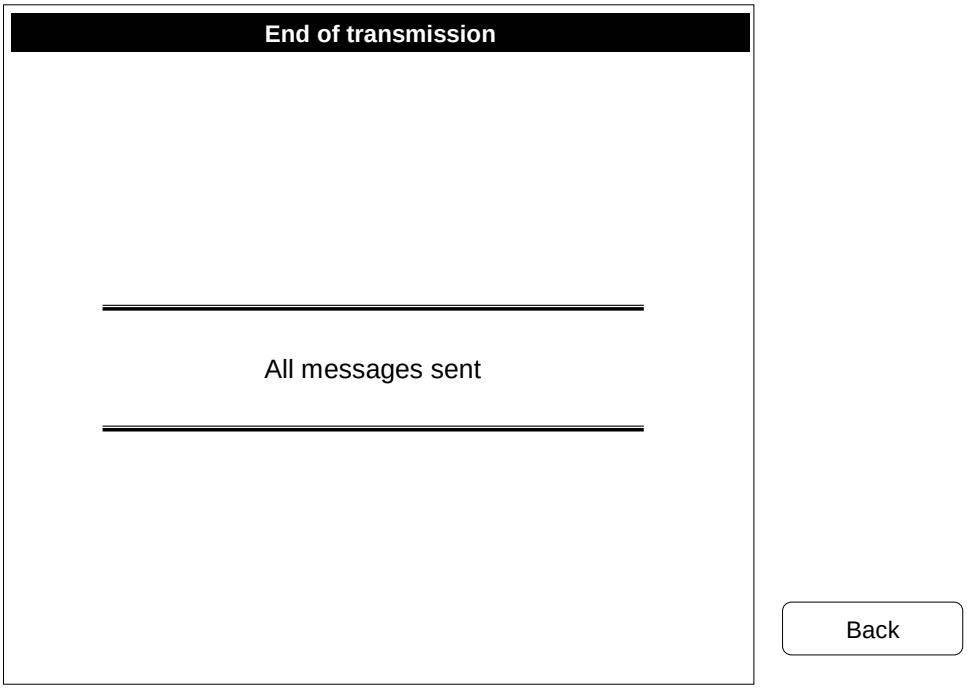
The number of queued messages should slowly decrease while the messages are sent one by one towards the satellite. Each message is sent in a time slot of the satellite. A time slot lasts about 2 minutes, thus it takes at least NUMBER OF MESSAGES x 2 MINUTES to send the whole report. If the connection with the satellite is good, you should see the number of messages stored in the asset slowly decrease (1 every two minutes).

To check that messages are correctly sent to the SAT-201, go back to the start-up page, then to the *Setup – Status* menu. The number of messages stored in the SAT-201 is repeated in the field *Messages*. If this field displays *-1*, it means your SAT-201 is not correctly connected. Check that it is correctly linked and powered (on the side of the SAT-201, you should see a small LED slowly blinking – cf. picture below).




Wait until the number of messages queued falls down to zero before you switch off the asset, otherwise the messages not sent will be lost.

When all the messages are sent, the Wescor displays the following message with a beep:



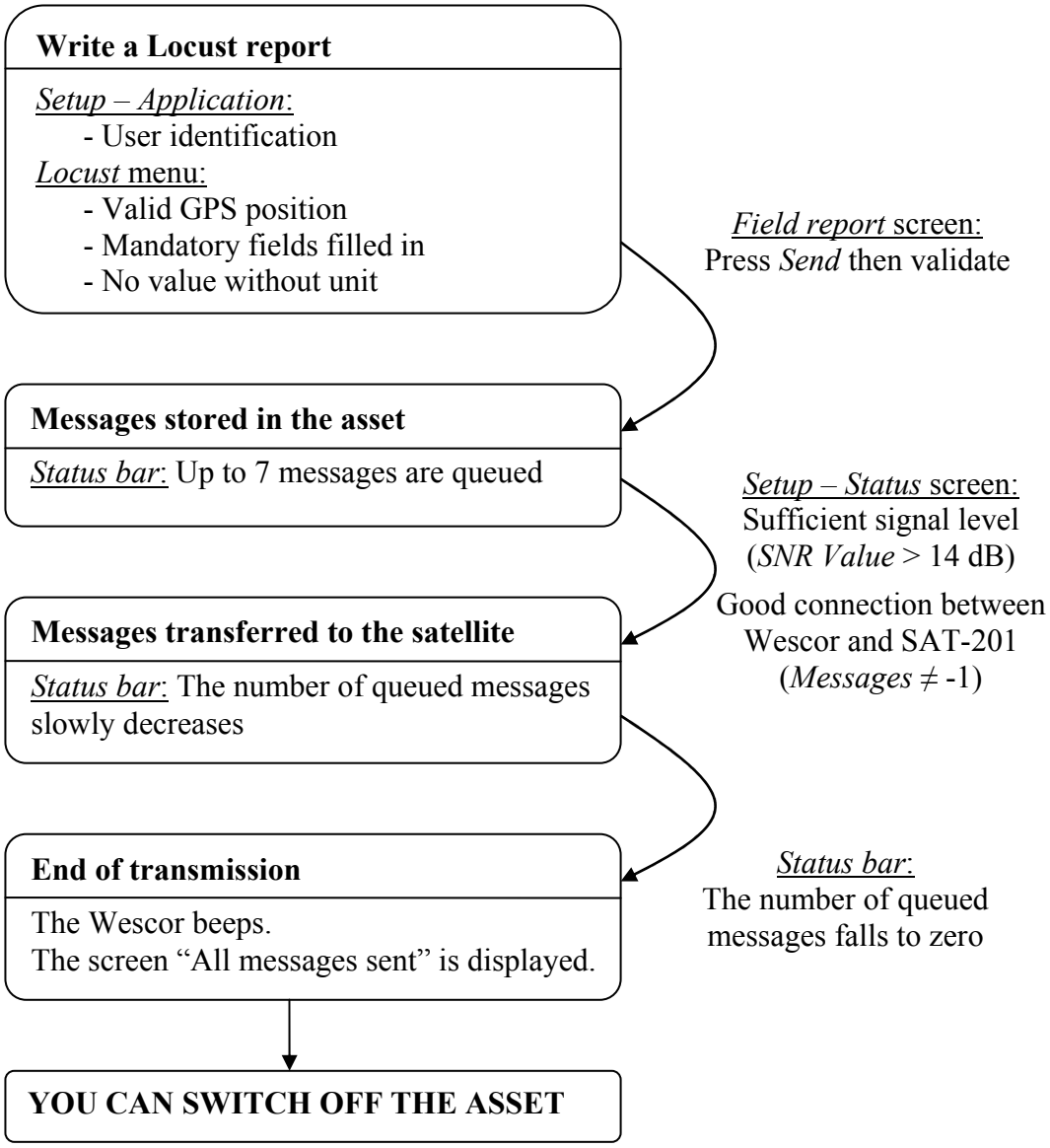

After this message has been displayed, you can turn off the asset.

If the number of messages still does not decrease after a few minutes, check the signal level in the screen *Setup – Status*. If the value of the field *SNR Value* is below 14 dB, the transmission is not good enough. Look for a better location for your antenna, until the number of messages stored in the SAT-201 starts decreasing.

Note 1: The Inmarsat satellites are above the Equator. Thus, if you are in the Northern hemisphere, you should look for a good visibility towards the South.

Note 2: Remember that messages are queued only if you SEND a report, not when you only SAVE it.

The figure below summarizes the successive steps of a complete sending process.



## 6.4 Consultation of former reports

Once a report has been saved on the Wescor (either by pressing *Send* or *Save*), you can review its content on the Wescor (cf. § 4: *"History" menu* for more details).

## 6.5 Completion of a former report with Control data

In some cases, a locust survey officer might prefer to edit a report in two times (cf. § 4.3: *Adding data to a report* for more details):

- the first time, the locust survey officer enters his observations of the situation, and asks for a control (if this one cannot be realised at the same time as the observation);
- the second time, the locust survey officer enters the results of the delayed control.

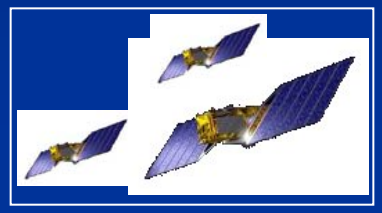
Once you have entered the new data to add, press the *Send* or *Save* button. Depending on the way the report has been initially stored on the Wescor (with the *Send* or the *Save* button), the name of the button is different. The new data will be added to the report under consultation. From now on, this report will be identified as *Controlled* in the *History* menu, and the additional data from the *Control* menu will be displayed with the data from the initial report in the *Review report* screen.

Besides, if you *Send* the *Control* data, a new message is enqueued in the asset, then sent towards satellite. This message contains only the new *Control* data. When the transmission is finished (which should be quite short, as there is only one message to send), a beep is emitted and a warning is displayed, in the same way as for the transmission of a complete report.

# eLocust2 data flow

1. Enter field data
2. Get GPS position
3. Send data via satellite
4. Process data
5. Send data by email into RAMSES

GPS satellites



Inmarsat satellite

2

3

SAT-201

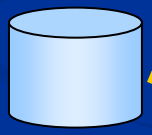
1

Locust officer

Wescor

Inmarsat earth station

4



Novacom (Toulouse)

5

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RAMSES