MULTIPERFORMER
ISO 11783 - ISOBUS

ELECTRONIC EQUIPMENT for LIQUID and MICROGRANUAL
PRODUCT DISTRIBUTION CONTROL

USER INSTRUCTION
MANUAL

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1 INTRODUCTION

This document describes the basic interface program functions relating to the work operations of the Multiperformer system working in conformity with the ISO 11783 standard also known as ISOBUS.

The Multiperformer interface program based on the ISOBUS protocol is run on the tractor terminal in the cabin and can be directly accessed by the operator.

The video display terminal is already installed in tractors/traction units enabled according to standard ISO 11783 and it is generally referred to as a Virtual Terminal (VT).

The specific interface program for the Multiperformer application is activated and managed by the terminal according to the modes that the tractor manufacturer has decided to adopt.
Therefore, it is necessary for the user to refer to the tractor user manual and its virtual terminal in order to activated and therefore to gain access to the Multiperformer graphic interface.

This Manual does not refer to the program selection and start-up; it takes into consideration only the implementation and functional part regarding the management of the Multiperformer Startec system.

Another aspect that is beyond the scope of this Manual, as regards the interface program functions is the button, list selection modes, or the entering of text and numbers from the virtual terminal. Although the most common technology is the touch-screen, it cannot be excluded that on some terminals it could be necessary to use buttons or encoder hardware. In order to find further details on these aspects, it is necessary to refer to the tractor Manual.

2   GENERAL

In order to completely understand the program functions, it is necessary to define the items involved and their connection modes.

The Startec Multiperfomer system uses the following fundamental elements:

- Only one master unit, enabled in order to communicate with the Virtual terminal in ISOBUS.
- The slave units (performer) control the engines and communicate with the master unit.
- The Virtual Terminal, the video display terminal present in the cabin.
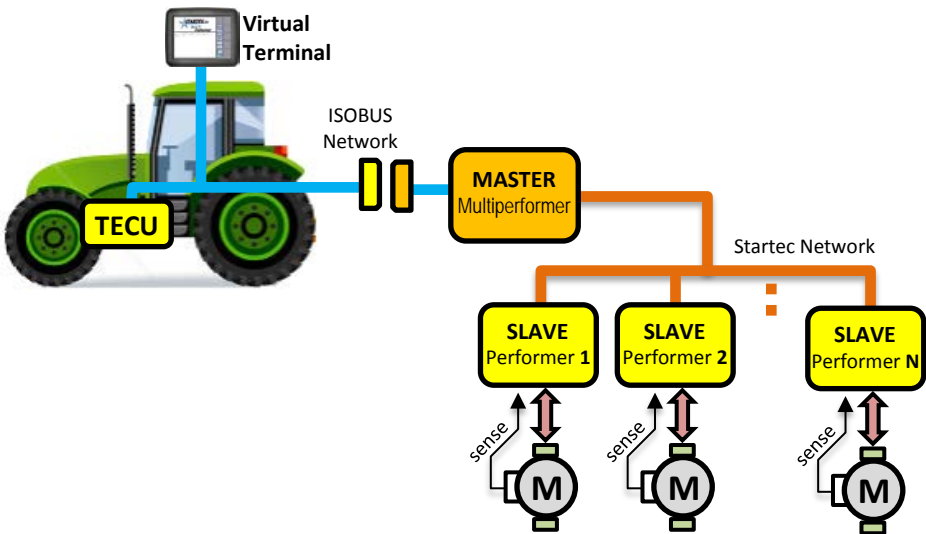- TECU, Tractor Electronic Control Unit for the operational control of the tractor.

Figure 1: Multiperformer connection layout

The master unit communicates on two communication networks. The first is the ISOBUS network that allows access TECU data as well as the software operating on the virtual terminal; the second network is towards the slave units (performer) in order to co-ordinate operation and supervision activities.

The connected slave units are capable of supervising the control of an engine relating to the distribution of the desired product; for this reason we will also refer to them with the term PERFORMER. Their involvement in the processing operation is managed by the master unit via the programming defined by the user by means of the interface software operating on the Virtual Terminal.

2.1 LIFTER SPEED

The tractor speed, together with the operational status of the lifter, is at the basis of field product distribution.

The tractor speed, together with other parameters such as the dose to be distributed, determines the operating speed of the slave performer engines.

Instead, the lifter status represents the work enabling condition (start/stop), and therefore relating to the starting or the stopping of the foreseen product distribution.

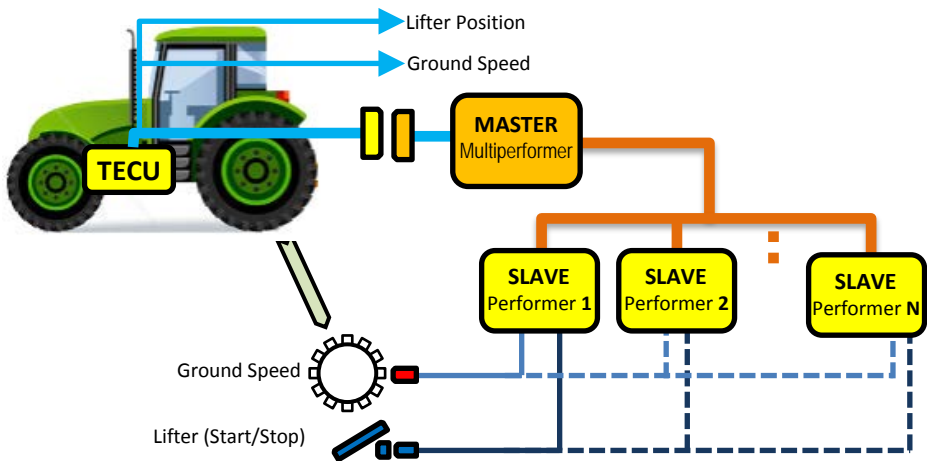*Figure 2: Speed and lifter input solutions*

During the movements at the bottom of the field or on the road, the lifter is in the Stop condition as regards product distribution. Regardless of the tractor speed, this condition keeps the engines stationary.

The lifter speed and status (Start/Stop) can be obtained in the following ways:

- From the tractor TECU
- From the Multiperformer system slave unit (Performer)

Potentially, each slave unit (Performer) can receive signals relating to the ground speed and the lifter status. However, normally, it is slave number 1 that has already been enabled with connections for these sensors, that can be used or not.

In the same way, the lifter speed and status can be obtained from the TECU data. In this way, it refers to the speed that has already been calculated and obtained through the ISOBUS network.

The choice of the origin of these signals is part of the programming procedure on the virtual terminal by means of the Multiperformer Interface software. This operation is described in chapter 3.5.

2.2 SLAVE ADDRESSING PROCEDURE

As in all communication networks, also in the Multiperformer network, the connected slave units (Performers) must be recognised in an unequivocal manner. For this purposes, each Performer is identified by means of a unique **Serial Number**.

The Serial Number is a 14-figure hexadecimal number (or rather, it is composed of 14 numbers from 0 to 9 or from A to F).

In order to identify the slave hardware in a simple way, it has been designed to use a serial number with numbers that are all the same and that go from 1 to 9.

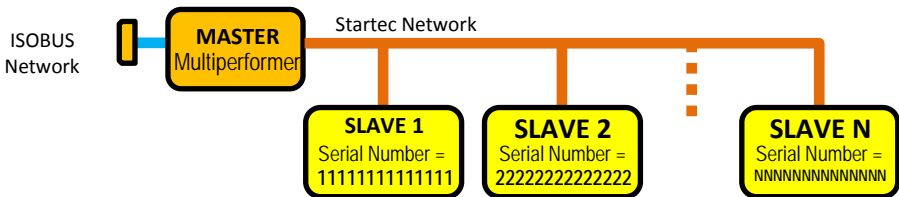Therefore an identification code similar to the one that follows can be obtained:

Figure 3: Slave unit addressing methods

By working with the interface software on the Virtual Terminal, the slave unit labelled number 1 will be identified with the serial number 11111111111111, the one labelled number 2 with serial number 22222222222222, and so on.

REMEMBER
The identification of a slave unit (Performer) is carried out exclusively by means of the recognition of its *SERIAL NUMBER*, and in no other way whatsoever.

Should it be necessary to substitute a slave unit, maintaining its address, it is possible to act on a rotary switch on the circuit card in order to choose the correct serial number. For this purpose, please refer to the Maintenance Manual.

The addressing and the recognition of the master unit towards the ISOBUS network is dealt relates to the protocol of standard ISO 11783 and is not dealt with in this Manual.

2.3   FIRST PERFORMER CONNECTION ON ISOBUS

The first time that the Multiperformer system is connected to the ISOBUS connector on the tractor, the Virtual Terminal carries out the formal recognition and the downloading of the interface program according to the typical tractor modes. An icon with a progress bar can appear as follows:

This icon is only indicative and it depends on the type of Virtual Terminal.

At the end of the downloading procedure, the program will start automatically but the intervention of the operator will most probably be required according to the modes established by the tractor manufacturer and the model of the Virtual Terminal.

A subsequent Multiperfomer re-connection or re-start will not be followed by a download but, once recognised, it will be possible for the interface program to start immediately.

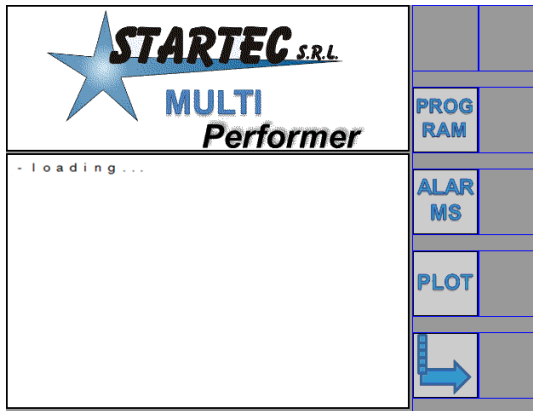| WARNING |
|---|
| The first download, or rather the first connection, may require several minutes during which it is advisable to suspend any other operation in progress. |

| NOTE |
|---|
| If the download should interrupt before completion, or should none Multiperformer program be available at the end of the download procedure, it is necessary to try to disconnect the ISOBUS Multiperformer connector and, once at least a minute has passed, re-connect it. This operation should start another download procedure. |

3   PROGRAM

The Multiperformer program starts with the following window:

The "***loading …***" message may be seen for a few seconds at the end of which the following window will appear:
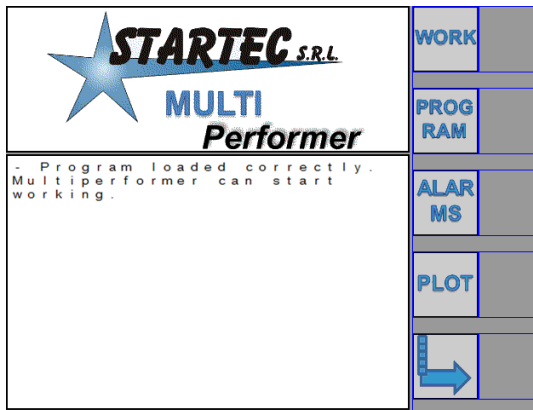

WARNING

As for problems on the ISOBUS network or for accidental disconnections, the "***loading ...***" message may **not** disappear. In this case, it is necessary to disconnect the ISOBUS Multiperformer connector or to re-start the system including the Virtual Terminal.

The first button at the top right, WORK, may not be visible if the connection conditions with the slave units are not coherent with the work program loaded.
This type of window can appear:
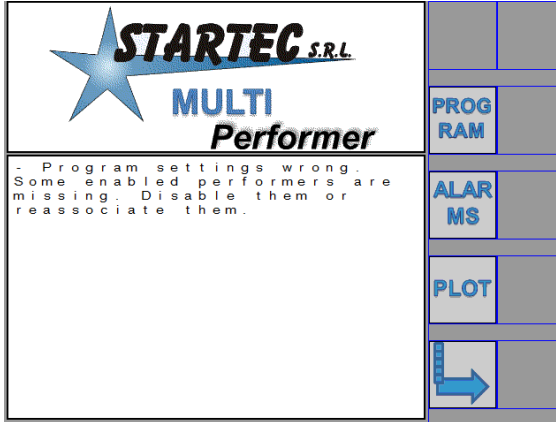
The necessary conditions in order to enter the operational working page that can be selected by means of the WORK button are listed as follows:

1. The selection and visibility of the ground speed source.
2. The selection and visibility of the lifter status (Hitch).
3. The visibility of the Slave units defined in the work program on the Startec network.
4. Ground speed equal to zero, or rather the tractor must be still.

As for Visibility one refers to the recognition and identification of the indicated elements on the Startec or ISOBUS network.

NOTE
In reality, these conditions are all necessary to operate in the *Automatic* mode. The lack of speed or of the lifter allows the operator to enter the working page in any case, but only in the *Manual* mode.
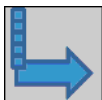
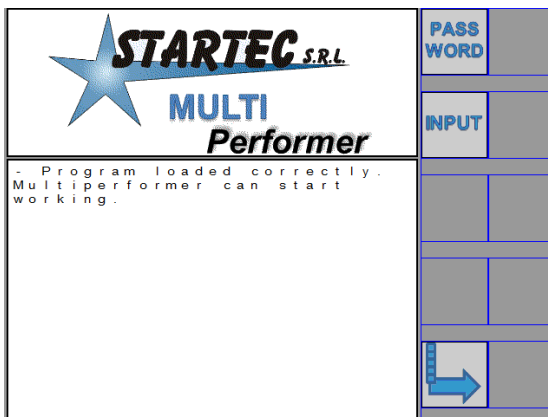From the home page, by pressing this button, further commands will be displayed in order to gain access to other pages of the Multiperformer interface.

The following page is displayed:

As shown previously, the main message depends on the start-up conditions of the work program.

The page change button allows the operator to return to the home page.

In the following pages that will be described, this button will be frequently seen and which allows the operator to leave the page displayed and to return to the previous one.

3.1   WORKING PAGE, GENERAL CONCEPTS

WORK This button introduces the operator to the operational working page, for the supervision and management of the slave units, (performers), specified in the work program.

A possible example of the working page is represented by the window below, which is valid for a program using four Performers (slave units):
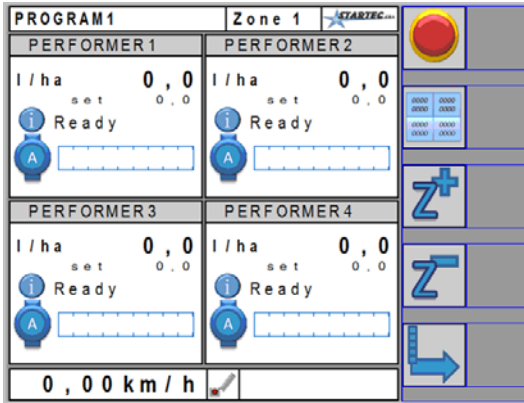
The number of performers displayed depends on the settings carried out in the work program. In any case, the page displays a lot of essential information, as can be seen as follows:

Figure 4: Description of working page fields

An in-depth explanation relating to the various fields illustrated here will be dealt with in the following chapters.

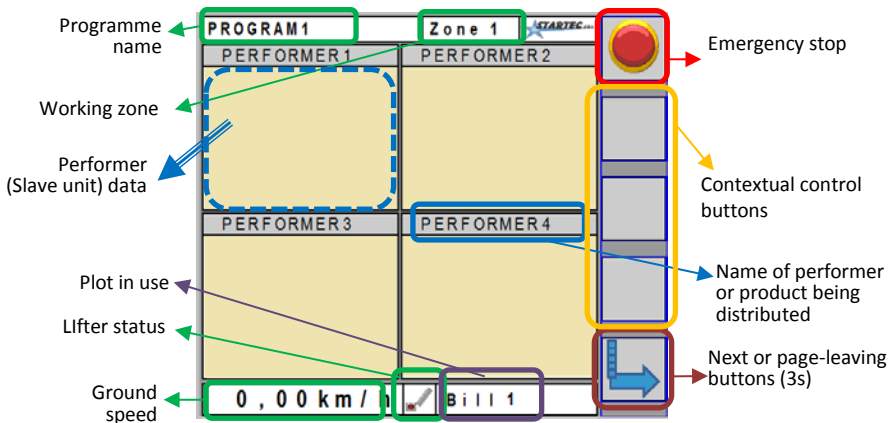As can be seen, the working page, relating to the Performer data, is divided into four areas to which we will refer to in the definition of the program by means of the following symbols:

1 Left-Top

2 Right-Top

3 Left-Bottom

4 Right-Bottom
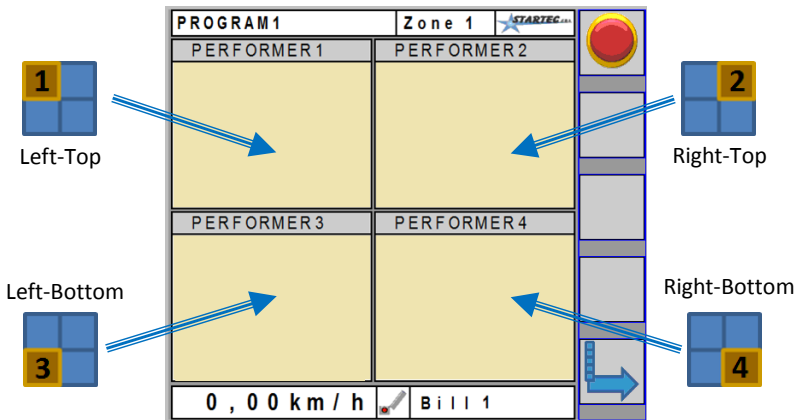
Figure 5: Performer working data allocation

The areas have a topological reference as shown and on the display they will be assigned with the data of a specific performer, recognised by means of its Serial Number.

The numbers from 1 to 4, visible at the sides of the screen, are a reference for the association that will be made during the definition of the work program.

REMEMBER
The position of the slave unit (performer) data is independent from its number or serial number, but this is an arbitrary allocation according to a choice willingly made by the operator in preparing the work program.

3.2   PROGRAM PAGE

PROG RAM

By pressing this button, the page relating to the selection or the definition of the work program can be accessed as shown as follows:

Access this field to change the selected program

```
┌─────────────────────────────────────┐
│ P r o g r a m   c h o i c e   STARTEC │  →│
│ Current program:                      │
│ PROGRAM1                              │
│                                    EDIT│
│                                       │
│ Choose the desired program by         │
│ selecting on list.                    │
│ Press Edit softkey for                │
│ editing.                              │
│                                       │
└─────────────────────────────────────┘
```
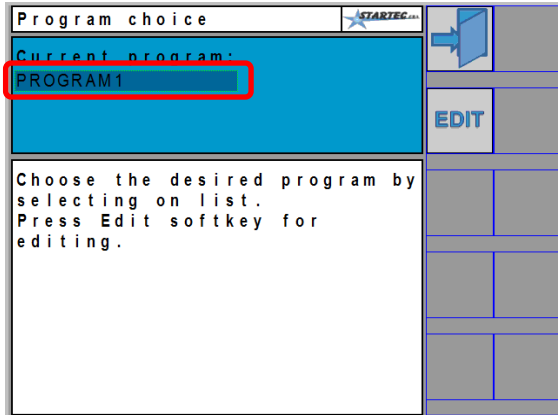
The Multiperformer system makes it possible to manage up to 10 programs that are initially called "PROGRAM1", "PROGRAM2"... "PROGRAM10". These names can be personalised by accessing the EDIT page.

In order to **change the desired program,** it is necessary to reach the field relating to the program name (as shown), by touching it (if the display is a touch-screen type) or by operating the appropriate commands for the specific Virtual Terminal in use.

Therefore, the program list is accessed, which could already have personalised names, among which it is possible to select the desired one. Once this has been selected, its name will appear in the abovementioned window.

NOTE

It is important to take into account that this Manual cannot describe the different access modes to the various editable (or rather modifiable) fields; for this purpose, please refer to the Virtual Terminal User Manual.

The display can be accessed by pressing the EDIT button and therefore also access is obtained to the modification of the selected program. A page such as the one that follows is displayed:

Access this field to change the Program name

This check-Box is to activate the working area associated with the Performer

Access this field to change the Zone Number

What is shown is the situation relation to a program that is still **empty**, or rather up to now, the number of performers and which ones are to be used have not yet been specified.

Therefore, on this page the following fields can be accessed:

- • Program Name
- • Use of Performer 1, for data in the Left-Top position
- • Use of Performer 2, for data in the Right-Top position
- • Use of Performer 3, for data in the Left-Bottom position
- • Use of Performer 4, for data in the Right –Top position
- • Zone Number

By selecting the **program name** it is possible to change it according to the operator's needs. It is important to remember that the program name entry mode is attributable to the virtual terminal and this can be easy, more or less.

The check boxes beside the names Performer 1 … 4, refer to the activation for the use of a specific performer the data of which will be displayed in the position as illustrated in.

As the check boxes are gradually selected, the corresponding icons appear on the right button bar together with the graphic destination of the performer data.

Therefore a page as follows is obtained:
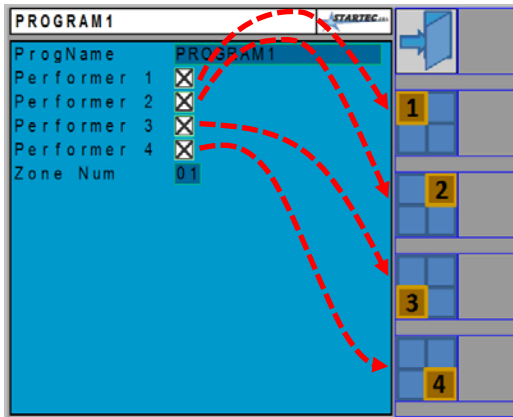
The red dotted lines reproduce the relationship between the selection of the check box and the appearance of the relative icon/button.

3.2.1 ZONE NUMBER

The use of the zone number is associated with the **product dose** that is being distributed. The product dose, as is well-known, is the objective of the Multiperformer application and it is one of the parameters that will be described later.

Each performer has the objective of controlling the engine as regards a product dose defined by the operator.

The **zone number** represents the possibility of storing as many doses as the defined number of zones. Each performer will have its own dose set that can be different from that of the others. Moreover, these doses can be different for each program.

The change of zone that is carried out on the Working page (see below) changes the assigned to the various performers according to what has been defined in the program. Therefore, each performer will assume the stored dose and relating to the currently chosen zone as the dose to be distributed.

The zone number can vary between 1 and 10.

3.2.2 SERIAL NUMBER ASSOCIATION

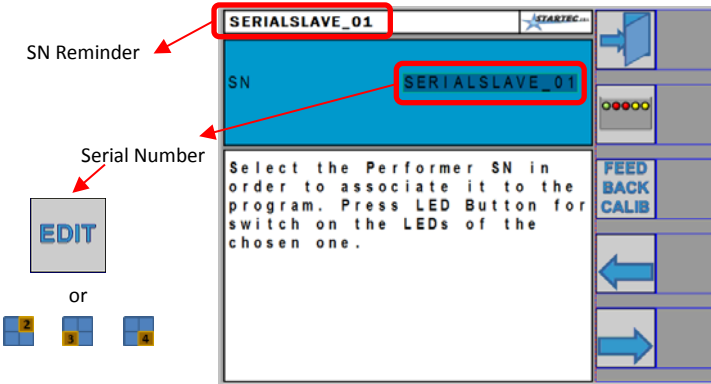By pressing the illustrated button, relating to Performer 1, or one of the others [2] [3] [4], access is obtained to the true parameterisation of the Performer, the data of which will go into the graphic area as represented by the chosen button.

SN Reminder
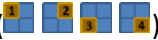
Serial Number

It is at this point that the **Serial Number**, **SN** of the Performers (slave units) that have been connected and recognised by the master unit comes into play. In fact, on this page we must establish which performer the data that will be displayed in area 1 belongs to (as for the example shown here).

Therefore, it is necessary to select the field of the serial number **SN** and to choose from those available that are all and only those which the Master unit recognises as connected to the Startec network.

Thus, we will find ourselves choosing from the following SNs (as long as they are connected):

11111111111111, 22222222222222, …, 99999999999999

WARNING

The program does not verify whether a performer has already been assigned to a graphic area (   ).

Therefore, it is necessary to pay attention so that the association is unique and not repeated within the program being edited.

NOTE

The construction of a program necessarily implies its **visibility** (or rather connection) **of the Performers** towards the Master unit.

It is necessary that the Performers that one wishes to associate in the program are operational and functional.

Should a program be loaded where the defined performers of which are not all visible, access to the Working page will be prohibited. In this case, if it is really indispensable to work, it is necessary to remove the selection of the non-visible performer, by modifying, in fact, the relative work program, or to create a completely new program.
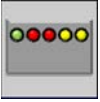
By means of this button, it is possible to send a special command to the performer with the selected serial number. The slave unit (performer) will make a LED flash quickly for at least 30 seconds or until receiving the shutdown command.

When the start command has been sent, the button changes to become as can be seen on the left hand side. By pressing this, it sends the shutdown command and it forces the slave unit to switch off the LED signal before the maximum established time has passed.

In this way, by selecting from time to time a different serial number, it is possible to recognise which performer is being associated to the graphic zone and to all parameters defined in the program.

This button allows access to the calibration procedure of the product constant (engine control feedback). This procedure is dealt with in paragraph 3.2.5.

These buttons allow the parameters to be scrolled through one by one (forward and back) and these refer to the programming data of the performer selected.

The scrolling of the parameters is cyclic. Once the end of the list of parameters has been reached, upon pressing the button again, the scrolling starts again from the first parameter (scrolling to the right) or from the last parameter (scrolling to the left).

3.2.3 **PROGRAM PARAMETERS**

By using the forward ➡ or back ⬅ buttons the program parameters of the relative performer can be scrolled through.

WARNING

<table>
<tr><td>⚠</td><td>When a displayed parameter is modified, the new value becomes immediately effective without having to carry out any particular commands or to change page.</td></tr>
</table>

The table with the list of parameters, relating to a performer, within a specific work program can be seen below.

Table 1: List of Program parameters

	Name	**Unit of Measurement**	**Notes**
1	Performer Name	-	Max. 10 characters
2	Product constant (FB)	pulses/kg or pulses/litres	
3	Dose	litres/ha or Kg/ha	A value for each zone
4	Dose variation	litres/ha or Kg/ha	
5	Row width mode		total - per row
6	Total width	m	
7	Number of rows	-	
8	Distance between rows	m	
9	Alarm upon dosage error	%	
10	Lifter function	-	Start/Pause/Pause+Start
11	Engine re-start value	%	0 is equivalent to ==
12	Start delay time	seconds	
12	Pre-Start Time	seconds	

Performer Name: This is the name that is displayed in the performer working area as described in paragraph 3.1, Figure 4. The name has a purely descriptive function and can simply recall the type of product distributed or the number of the slave unit.

Product constant: This represents the conversion value between the feedback of the encoder or the flow-meter and the quantity of product distributed. The value of this constant can be effectively determined by means of the calibration procedure described in paragraph 3.2.5.

Dose: This refers to the value of the product dose to distribute during field processing. The program will request this value as many times as the number of zones defined for this work program. Also a *zero value is accepted.* In this case, when it is operational, it has the effect of maintaining the engine stopped. This possibility can be used to treat the work field areas (zones) in different ways.

Dose variation: During field processing, it is possible to change the dosage, from the working page by using the ➕ and ➖ buttons. The dose will consequently be increased or reduced by the quantity indicated by this parameter.

Row width mode: The value of the working width, which is data of fundamental importance for the management of the engine working regime depending on the desired dose, can be set as the total width or as the number of rows multiplied by their distance between each other. This parameter establishes the working width calculation mode. Depending on this choice, the following parameters will be proposed or not.

Total width: This is the value of the working width on which the product dispensed from the performer will be distributed.

Number of rows: Together with the distance between rows, this allows the calculation of the working width value on which the product dispensed from the performer will be distributed.

Distance between rows: Together with the number of rows, this allows the calculation of the working width value on which the product dispensed from the performer will be distributed.

Alarm upon dosage error: This represents the error threshold value relating to the distribution of the product according to the dose defined and beyond which the alarm condition is signalled to the operator.

Lifter function: This parameter can consist of three values that are indicated as Pause, Start and Pause+Start. The description of the different operating modes is described in paragraph 3.2.6.

Engine re-start value: This can have values ranging between 0 and 100% and it represents the engine power command at the moment in which it re-starts following a pause caused by the lifter. The 0 value is equivalent to the function specified as **==** and it has the aim of storing the last engine power command (in %) before the beginning of the pause.

Start delay time: This refers to the performer engine start-up delay when the lifter changes status and relates to start-up consent. When this value is different from zero, on the working page of the relative performer area, an icon in the form of an hourglass appears ⏳.

Pre-Start Time: as regards the Start and Pause+Start functions, regardless of the tractor speed, the performer engine is commanded to the engine re-start value until a tractor speed higher than the minimum is recognised, or for a maximum period of time equal to the value assigned with this parameter.

3.2.4   PROGRAM and GLOBAL SAVE PARAMETER DATA

By scrolling the parameters using the ➡ or ⬅ commands, a page with the program and global save buttons appears as shown below:
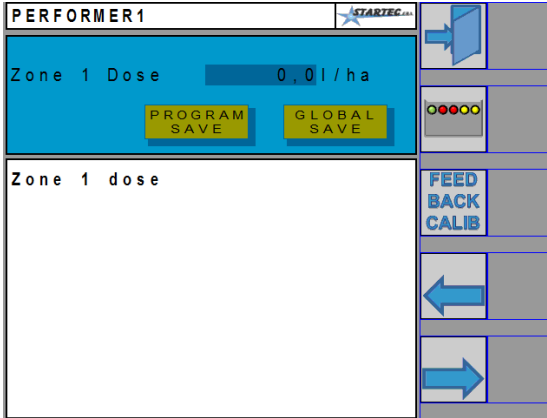
PROGRAM SAVE By pressing this button, the value of the parameter displayed is applied to all the performers of only the work program selected which is being modified.
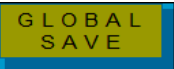
GLOBAL SAVE By means of this button, the value of the parameter displayed is applied to all the performers in all work programs.

The actions relating to the **Program Save** and **Global Save** buttons are effective regardless of whether the parameter has been modified or not.

WARNING

No confirmation whatsoever is requested when the function of these buttons is activated.
It is therefore suggested to pay particular attention when using them and to use them when only when it is really necessary.

3.2.5   PRODUCT CALIBRATION CONSTANT

By pressing the ⬛ button, access is obtained to the assisted procedure relating to the practical determination of the product constant value of the performer selected.

REMEMBER

The performer selected (number one 🔲 in the example given) has been associated to a slave unit recognised by means of the Serial Number value. The calibration procedure interacts with this unit.

In practice, the assisted procedure will start the performer engine for a certain period of time so that it dispenses a quantity of product that must be measured precisely using scales or other equipment. The number of feedback pulses that the performer counts, compared with the quantity of product dispensed, will allow the correct calculation of the constant.

The steps that will be requested to be carried out by the operator:

1. The choice of the quantity of the product to be dispensed (Kg or litres).
2. The choice of the percentage of engine power command.
3. The start-up of the performer engine. During this stage, the feedback pulse count value is displayed; it is also possible to adjust the engine command value in order to increase or reduce its speed.
4. The stopping of the engine.
5. The measurement of the quantity actually dispensed.
6. The entry of the correct quantity of product dispensed with the immediate display of the calculated product constant.
7. The saving and end of the procedure.

It is important to remember that the value of the product constant is always accessible and modifiable directly as an individual parameter.

The pages relating to calibration are as follows.
First page:
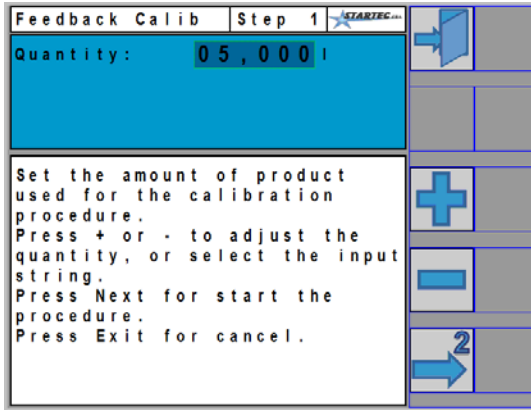
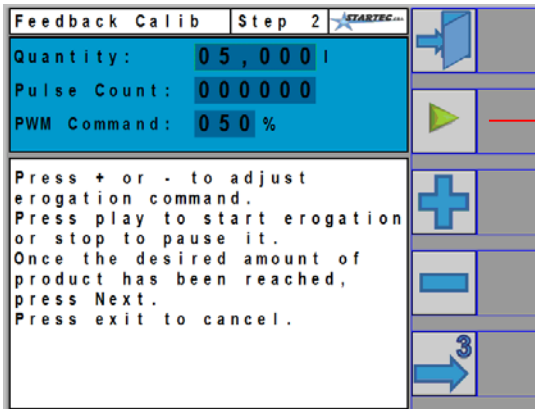These buttons allow the modification of the quantity of product that one intends to dispense. By keeping the button pressed down, the value of the quantity will start to change at an increasingly rapid rate.

By means of this button, access can be obtained to the second page of the assisted calibration procedure.

Second page:

When the engine is running, the button changes icon

These buttons allow the Performer engine to be started or stopped when required.

By means of these buttons the engine command value can be increased or reduced (PWM) in order to change the operating speed.

By means of this button the third and final page of the assisted calibration procedure can be accessed.

Third page:

Once the real quantity of the product dispensed has been measured, by means of these buttons it is possible to modify the value relating to the product quantity in order to align it to what has just been measured. It can be seen how the product constant is automatically re-calculated.

By means of this button, the constant value measured is saved and the assisted calibration procedure is terminated.

NOTE

In order to modify the quantity value on the first and the third pages of the assisted procedure, the contextual buttons ➕ and ➖ are to be used.

In any case, it is possible to directly access this value according to the modes defined by the Virtual Terminal used.

This button, which is always present, allows the calibration procedure to be abandoned without modifying the product constant value.

3.2.6   LIFTER FUNCTION

In this paragraph, the meaning of the values given to the *Lifter Function* parameter is described and which is visible in the list of program parameters of Table 1.

This parameter works together with the lifter status, the tractor speed and as well as with the following parameters:

- Engine re-start value
- Start delay time

Below, we will refer to the lifter status by using the following terms:

- **Run Allowed**, product distribution consent given
- **Run Denial**, product distribution stop

PAUSE With the lifter in the *Run Denial* status, the Performer engine is stopped even if the tractor speed is greater than the minimum value or, in any case high.

With the lifter status changes to *Run Allowed*, and if the tractor speed is greater than the minimum value, for half a second the engine starts at the speed defined by the parameter "Engine re-start value" and then it follows the tractor speed trend.

START Regardless of the stable level of the lifter status, the distribution engine follows the tractor speed trend. When the speed falls under the minimum value (the tractor is, in fact, stationary) the distribution engine stops.

The lifter status is important only during the transition between *Run Denial* and *Run Allowed* (or rather, when the distribution starts). If, during this transition, the speed is less than the minimum value, the distribution engine is actuated at the "Engine re-start value" parameter value for a maximum period of time equal to the value of the "Start Delay Time" parameter. If, in the meantime, the tractor does not exceed the minimum speed, or rather, it remains stationary, the engine stops, otherwise it follows the tractor speed trend.

PAUSE + START: This is the combination of the Pause and Start modes.

With the lifter in the *Run Denial* status, the Performer engine remains stationary even if the tractor speed is greater than the minimum value or in any case high.

When the lifter status changes to *Run Allowed*, for half a second, the engine starts at the speed defined by the "Engine re-start value" parameter and then it follows the tractor speed trend if it is greater than the minimum value.

If, upon the changing of the lifter status to *Run Allowed*, the tractor speed is less than the minimum value, the distribution engine is actuated at the "Engine re-start value" parameter value for a maximum time equal to the value of the "Start Delay Time" parameter. If, in the meantime, the tractor does not exceed the minimum speed, or rather, it remains stationary, the engine stops, otherwise it follows the tractor speed trend.

3.3   ALARM PAGE

By pressing this button, access is obtained to the alarm page relating to the Performers defined in the work program in use.

The active alarms are listed on this page.

By using the selection buttons, the list will refer to the alarms of the relative Performer of the work program.

By keeping a selection button pressed (in the example, the first button) for at least 3 seconds, the request to reset, if possible, the active alarms will be sent to the Performer associated with the button itself.

REMEMBER

The **ENGINE STUCK** alarm that could be activated (at the moment, in this procedure, the reasons for this are not important) **must be reset** on this page, otherwise the Performer remains blocked.

3.4   LAND PLOT PAGE

PLOT	By pressing this button, access is obtained to the display and selection of plot data. The total number of plots foreseen is 10 plus one.

The first page displayed regards the Total Bill as shown below.

This page contains the general working data of the various Performers as a result of the work carried out also in several programs.

The number of data areas and the name of the Performer that this page displays are those defined in the program loaded. Moreover, apart from the name given to the Performer, the data refers to a specific Performer identified by its Serial Number.

	This button allows the selection of a particular Performer as regards the Reset command application. The Performer selected can be recognised by the change of the background colour of its reference name, as can be seen in the page above. The selection moves cyclically between a Performer and another, including the global selection.

RESET   This button resets the data of the Performer selected.
This may not be visible if a Privileged User Password is active (see chapter 3.6).

By continuing with the scrolling buttons ➡ or ⬅ the other 10 plots can be seen as follows:

Number of the plot displayed

Enabling for the use of the program loaded

The selection and reset buttons have the previously described function.

A check box is visible in the plot and it can be selected for use during the working stage.

On the working page, by accessing the plot screen, the data relating to the plot selected here will be displayed. In the case that no plot is activated the data of the Total Bill will be seen.

WARNING

⚠️   The selection of a plot makes this latter active, excluding any selection carried out previously.
It is not possible to activate several plots at the same time.
In fact, the last plot selected is the one active for the work page.

3.5 INPUT PAGE

INPUT

This button is found on the second home page that can be reached by means of the change page button ➥.

On this page the choice of the origin relating to the ***ground speed*** and ***lifter status*** data.

A page such as the following appears:

Reminder of page displayed →


```
Speed  sensor  input          STARTEC
TECU                    ▨▨▨▨  km / h
SERIALSLAVE_01
SERIALSLAVE_02
SERIALSLAVE_03
SERIALSLAVE_04
SERIALSLAVE_05
SERIALSLAVE_06
```

NOTE

i
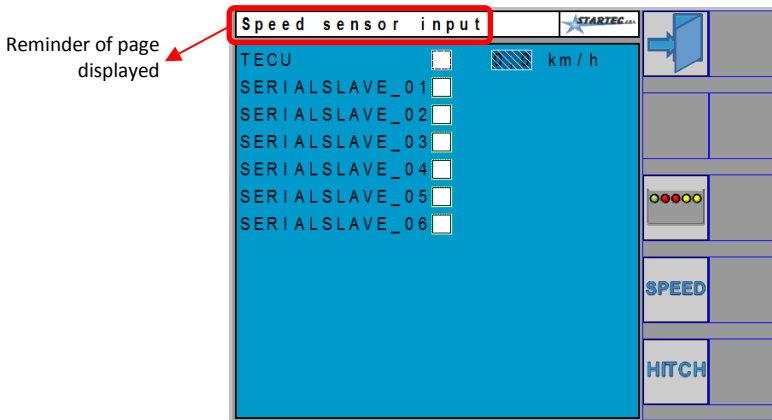
The specific Serial Number, with the relative check box, will be visible only if the speed input has been enabled and is active. This enabling depends on the arrangement of the hardware and it is managed as a Performer parameter by means of the settings performed during technical support activities.

In order to choose which speed source to use, it is necessary to select at least one check box.

By selecting the TECU check box, the speed is picked up by the tractor control unit. In any case, the minimum speed has still to be defined, level below which the distribution motors are kept stationary.

In the case in which the speed obtained from a Performer Unit is used, its minimum speed level has already been defined in the parameters of the relative Performer, access to which gained during technical assistance.
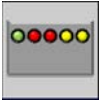
In order to physically identify a Performer, it is possible to use this button. A special command is sent to the Performer, with the selected Serial Number, that will make a LED flash rapidly for at least 30 seconds or until the shutdown command is received.

By means of these buttons, it is possible to move between the speed selection page and the lifter selection page. The title at the top of the page acts as a reminder of the selection that is being made.

The page relating to the lifter selection is, in fact, very similar to that relating to speed and it looks like the figure below:
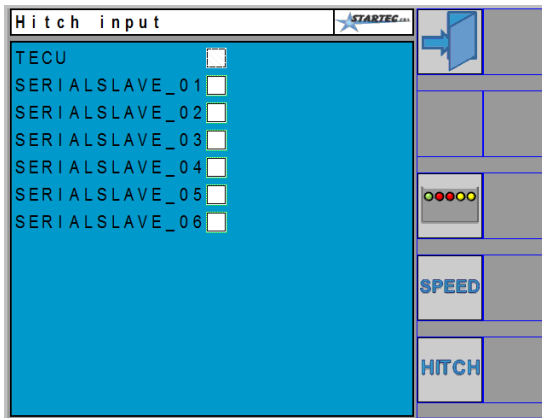
Also in this case, only the Serial Numbers will be displayed relating to the Units, the lifter input of which has been enabled by means of settings performed during technical assistance.

It is important to consider that the list of the Serial Numbers relating to the lifter can be different from those regarding speed.

REMEMBER
As regards access to the work page and the Automatic operating function, it is necessary to define the speed and lifter inputs.

3.6   PASSWORD PAGE

PASS WORD   This commando is in the second home page that can be reached by means of the change page button ⬅️.
The Password page allows access to particular and sensitive settings that require a more in-depth knowledge of the system.

A page such as the following appears:
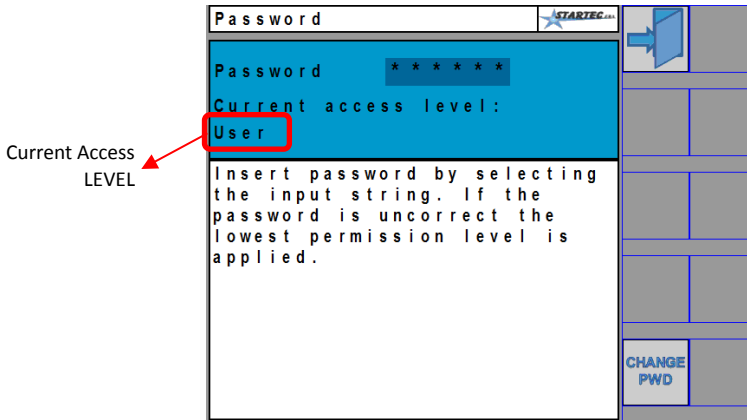
The access levels that can be used by the user are two:

- **GEST level**: minimum level of access, least freedom of action.
- **USER level**: in order to protect the resetting of the Total Bill.

In fact, the Interface Program does not have a defined USER Password and so the interface grants the user the USER access privileges. In order to activate the USER Password, it is necessary to press the following button:

CHANGE PWD   By means of this command, a 6-figure number can be entered and which, from now onwards, will represent the Password in order to gain access as a USER. Therefore, upon start-up, the interface software will be proposed with a GEST authorisation level.

By pressing the Password change button, a page such as the following appears:

Current Access LEVEL
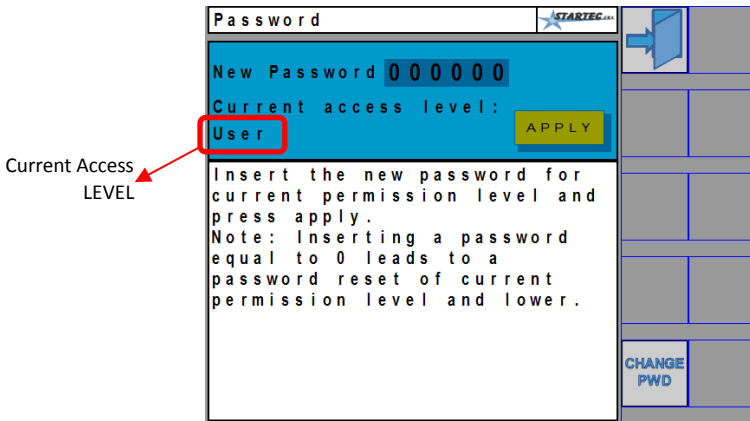
Access the "New Password" field in order to enter the desired value and therefore press the APPLY button.

For more details about access level contact the Technical Assistance.

WARNING
The Password change is applied to the currently active level, as shown in the figures. In order to change the User level access Password it is necessary to be activated as a User by means of the defined Password.

REMEMBER
It is recommended to take note of the new Password entered. Should it be forgotten, it will be necessary to contact the Technical Assistance.

4   WORK, WORKING PAGE

WORK   By pressing this button, from the home page, the working page is accessed, for the supervision and management of the Slave Units, (Performers), defined in the work program.

The general aspects of the work page have been introduced in paragraph 3.1. A typical working page is visualised as follows:
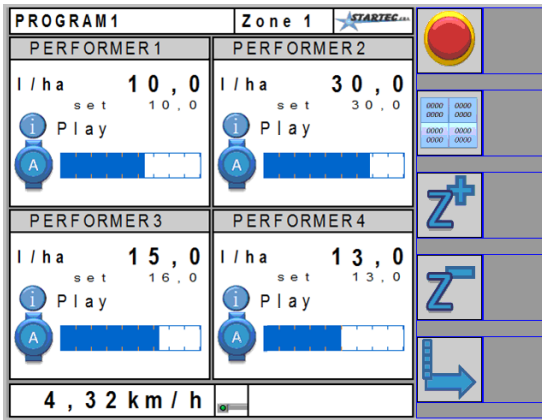
The area relating to each individual Performer collects a lot of information, as can be seen below:
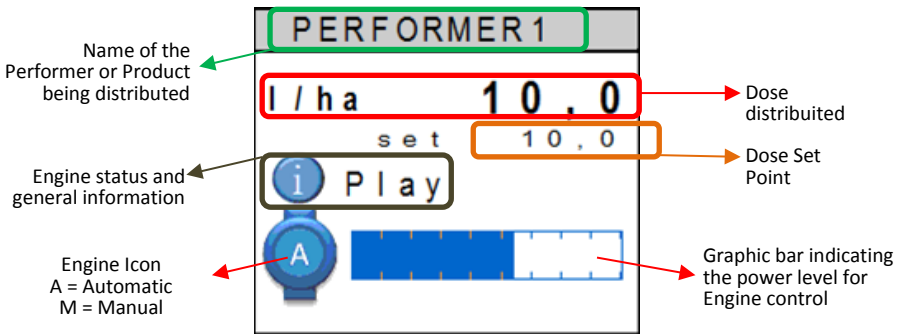
The name of the Performer and the Dose Set Point are parameters defined in the program as described in paragraph 3.2.3.

Dose Distributed: This value is the dose that the Performer is actually distributing and it should coincide with the Set Point value visible slightly underneath. The non-correspondence with the Set Point may derive from variations in tractor speed or the exceeding of engine power limits. In any case, excessive discordance is signalled by an appropriate alarm.

Set Point: This is the dose that the user wants to distribute and it is defined in the work program.

Engine Status: This is an icon and wording that indicate the working condition of the engine. At the onset of an alarm, these elements change in order to display what has occurred.

Engine Icon: This represents the type of control between *Automatic* or *Manual*. In the first case, the engine icon is represented by the letter **A**, in the second case with the letter **M**.

Graphic Bar: This represents the quantity of power with which the engine is actuated. The uncoloured graphic bar represents 0%, while the entirely coloured graphic bar is equivalent to 100%. In the Operating Manual, a line that defines the Set Point required by the operator is visible.

Hourglass: This appears when, as regards the relative performer, the "*Start Delay Time*" program parameter is different from zero, as described in paragraph 3.2.3.

The area relating to the data of the individual performer, can also state the data regarding the auxiliary input as shown below:
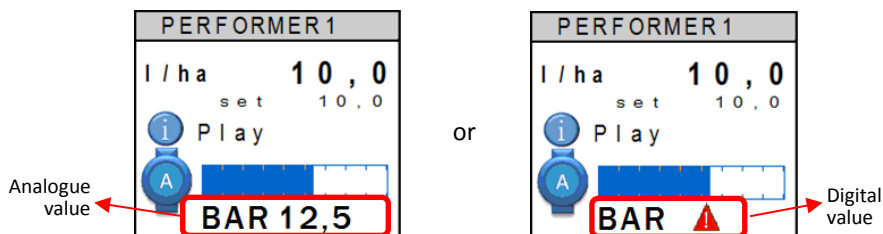
In the first case, the auxiliary input was configured as an analogue input with a BAR unit of measurement (pressure), while in the second case, it was configured as a digital input and it signals the status, for example, of low pressure.

4.1   CONTEXTUAL COMMANDS
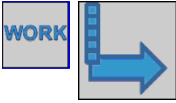
 By pressing this button on the working page, access is obtained to the other commands as shown below:
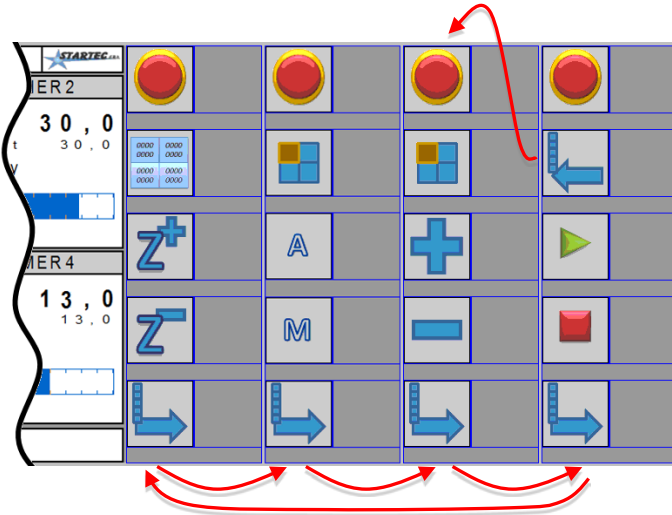
By repeatedly pressing the change page button from time to time the commands are proposed as shown.

 2s   **EMERGENCY** button is always accessible.
If this button is kept pressed for at least two seconds, it allows the immediate block of the engines and the possibility to exit the working page.
Warning: the possibility to return to the working page, once it has been exited by pressing this button, will not be possible until at least 10 seconds have passed.

 3s   By keeping this button pressed for at least 3 seconds, the working page is exited.
Warning: the exiting of the working page is allowed only if all engines are stationary, in both the Manual and the Automatic modes.

By means of this button, the page relating to the measurements and the active plot.

These buttons make it possible to change the working Zone by passing to either the next or the previous one.

As described in paragraph 3.2.1, the zone number is a program parameter and it can vary between 1 and 10. Each zone defines a specific value for the dose to be distributed and it is different for each Performer.

The pressing of these buttons causes the immediate change of the desired dose (Set Point) as defined in the program.

This button allows the selection of a particular Performer as regards the application of the commands which will be described as follows.

The Performer selected is recognised by the change of the background colour of its name of reference. The selection moves cyclically by selecting the individual Performers one by one or all together.

This button changes the working mode of the Performer selected **Manual**.

Warning: The change command is possible only when the tractor is stationary.

This button changes the working mode of the Performer selected to **Automatic**.

Warning: The change command is possible only when the tractor is stationary.

These buttons have an effect on the Performer selected according to the active mode:
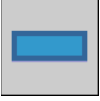
- In the **Automatic** mode, there is an increase or a reduction of the *dose* distributed relating to the quantity defined by the "*Dosage Variation*" parameter value, described in Table 1. It is important to take into consideration that the dose defined in this way is not stored, in fact it is lost when a change of zone is carried out or the working page is exited.

- In the **Manual** mode, there is an increase or a reduction in the Performer engine command percentage.

On the Performer selected and in the *Manual Mode*, these buttons allow the **Start** and **Stop** of the engine.

In order to facilitate the manual control of the engines, this button that is present only on the Start and Stop command column, makes it possible to return to the engine power increase and reduction commands.

4.2   STATISTICS
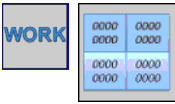
WORK By pressing this button, on the working page, it is possible to access the measurements as shown below.

PROGRAM01	Zone 1
PERFORMER 1	**PERFORMER 2**
l/min **0 , 0 0**	l/min **0 , 0 0**
ha/h **0 , 0 0**	ha/h **0 , 0 0**
Error % **0**	Error % **0**
PERFORMER 3	**PERFORMER 4**
l/min **0 , 0 0**	l/min **0 , 0 0**
ha/h **0 , 0 0**	ha/h **0 , 0 0**
Error % **0**	Error % **0**

0 , 0 0 km / h

PLOT

The following data can be seen on this page for each Performer defined dal program:

- **Litres/min or Kg/min**, represents the quantity of product distributed per minute
- **ha/h** – represents the hectares per hour processed
- **Error %** - represents the error percentage between the dose distributed and the requested dose

PLOT By means of this command, it is possible to proceed with the visualisation of the active plot page.

4.3   ACTIVE PLOT
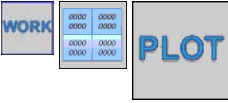
By pressing this button on the statistics page, it is possible to access the plot page as shown below.

Plot name

REMEMBER

The plot displayed is the one that is active, as described in paragraph 3.4. If no plot has been selected, the Total Bill data will be displayed.

The following data can be seen on this page for each Performer defined by the program:

- **Ha** – represents the area processed measured in hectares
- **Litres or Kg** – represents the quantity of product distributed
- **Time** – represents the working time carried out
- **Km** – represents the distance covered

4.4 ALARMS

The onset of any alarm conditions is signalled in the working page in instead of the Engine Status as shown below:
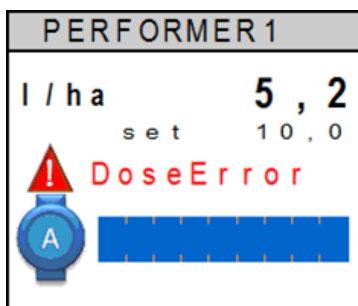
Ripetition time:
3 seconds

In the example shown, a dose alarm is signalled, as the dose requested is 10.0 and the one dispensed is 5.2.

Together with the Warning icon ⚠ and the flashing error message, there is also an alert tone, repeated about every three seconds.

REMEMBER

 Given the nature of the alarms foreseen, the alert tone will be heard for the entire duration of the error condition.

In case more alarms are present at the same time, the writing at the side of the Warning icon will cyclically change between the alarms signalled.

The following table describes the possible alarm conditions:

Table 2: List of foreseen alarm conditions

	Alarm	**Description**	**Blocking**
1	**DOSE ERROR**	Error in the dose dispensed when compared to the Set Point	
2	**COMM. ERROR**	Communication error with the Performer	Yes
3	**OVERVOLTAGE**	General overvoltage	
4	**UNDERVOLT**	General undervoltage	
5	**ENGINE VOLT**	Engine power supply undervoltage	
6	**SENSORSVOLT**	Sensor power supply undervoltage	
7	**CAN VOLTAGE**	CAN Driver power supply undervoltage	
8	**OVERCURRENT**	Engine overcurrent	Yes
9	**OVERLOAD**	Engine overload	Time-limit
10	**ENC TIMEOUT**	Lack of feedback pulses from flowmeter	Yes
11	**ENGINESTUCK**	Engine block	Yes
12	**ENC OVERFL.**	Overflow of feedback pulses from flowmeter	
13	**OVER SPEED**	Overflow of ground speed pulses	
14	**MEMORY FAIL**	Data reading or writing error in Memory	
15	**SETUP FAIL**	No configuration data present in Memory	

The term "Yes" in the *Blocking* column indicates that the alarm described blocks the Performer engine operation and that in order to restore this, it is necessary to exit the Working page and to access the Alarm page, so as to actuate a reset command, as described in paragraph 3.3. Instead, if the alarm is not of a blocking nature, this means that if the engine control is jeopardised, it is restored after the alarm condition has been solved.

The various alarms and their possible solutions are explained in detail below. It is important to take into consideration that, with the exception of particular conditions, the breakage of the Performer board is, in any case, a general valid cause of all alarm conditions.

DOSE ERROR: This alarm indicates that the dose dispensed and the one desired (Set Point) differ more than the value of the "*Alarm upon dosage error*" described in Table 1. The reasons for this alarm can be the following:

- High tractor speed or excessive dosage desired
- Engine under strain

In the first case, it is necessary to slow down or to reduce the dosage, while in the second case; an inspection of the distribution system is required in order to understand why the engine is not capable of running at the speed desired.

COMM. ERROR: This is a blocking alarm and it indicates the loss in communication with the relative Performer. This alarm can occur for the following reasons:

- Prolonged power surges on the Performer power supply
- Wear and tear of the Performer connection cables
- Breakage of the Performer board

In the first case, this alarm may occur more frequently when the engines are started and therefore it is necessary to control that the cables and connectors are in a good state. In the other cases, it is necessary to repair any damage or breakages by seeking help from the Technical Assistance department.

OVERVOLTAGE: This alarm is triggered when the voltage measured by the Performer exceeds 18.0 Volts. In this case, it is necessary to control the state of the tractor battery and alternator. The prolongation of this condition does not prevent the Performer from working but this could increase the probability of further damage being caused.

UNDERVOLT: This alarm is triggered when the voltage measured by the Performer is less than 11.0 Volts and it may occur for the following reasons:

- Low tractor battery voltage
- Excessive power cable voltage drop

The prolongation of this condition does not prevent the Performer from working but it jeopardises the engine capacity from working at the nominal power rate.

ENGINE VOLT: This alarm is activated when the voltage that the Performer uses for engine control drops to less than 8.0 Volts and it may occur for the following reasons:
- Low tractor battery voltage
- Excessive power cable voltage drop

The prolongation of this condition stops the engine from working and this is automatically restored once the alarm condition has been solved.

SENSORSVOLT: This alarm regards the power supply of the sensors and in particular the engine control feedback sensor. This alarm is triggered when the sensor voltage drops to less than 9.0 Volts and it may occur in the following conditions:
- Excessive power load towards the sensors
- A short-circuit of one or more sensors
- Low tractor battery voltage
- Excessive power cable voltage drop

The prolongation of this alarm condition stops the engine from working due to the fact that the measurement of the feedback is considered unreliable. In the same way, the measurement or the control of other sensors is suspended. All functions associated with the sensors are automatically restored once the alarm condition has been solved.

CAN VOLTAGE: This alarm is triggered when the voltage relating to CAN bus communication is insufficient. This alarm can be due to an excessive power load on the Started CAN network. In any case, it is necessary to seek technical assistance.

OVERCURRENT: This blocking alarm is triggered when the engine current exceeds the **Maximum current** defined by the manufacturer, even if only for a few seconds and this causes the immediate blocking of the engine. This may occur in the following conditions:

- Engine block or with an excessive load
- A short-circuit of the engine

Due to the fact that this alarm blocks the engine, the *ENGINESTUCK* alarm is consequently actuated.

In order to restore engine control, it is necessary to access the alarm page and to send a reset command.

OVERLOAD: This alarm is triggered when the engine is overloaded, or rather the engine current exceeds the value of the **rated current** by more than 5%.

If this condition persists, after a certain time associated with the percentage of overload (several minutes for low overloads, a few seconds for overloads close to the maximum current rate), the engine blocks and the *ENGINESTUCK* alarm is consequently activated.

In order to restore engine control, it is necessary to access the alarm page and to send a reset command.

ENC TIMEOUT: This alarm regards the feedback of the engine, the encoder or the flowmeter relating to the control of the dose to be distributed. This alarm is triggered when there are no pulses and when the engine has been in any case started. This may occur in the following conditions:

- The product to be distributed has finished
- Engine block
- Engine feedback sensor faulty
- Wear and tear of the feedback sensor cables

Before actuating this alarm, the Performer attempts to start the engine several times, following which the engine is blocked and the *ENGINESTUCK* alarm is consequently triggered.

In order to restore engine control, it is necessary to access the alarm page and to send a reset command.

ENGINESTUCK: This alarm is the result of the engine block caused by one of the alarms explained previously. In order to restore the engine control, it is necessary to access the alarm page and to send a reset command as described in paragraph 3.3.

ENC OVERFL.: This alarm is triggered when the pulses coming from the engine feedback sensor, the encoder or the flowmeter are too rapid or unstable and they exceed the measurement capacities of the Performer. It may occur in the following conditions:
- Defective engine feedback sensor
- A poorly-executed engine feedback sensor connection

The functions associated with this sensor are automatically restored when the alarm condition has been solved.

OVER SPEED: This alarm is triggered when the pulses coming from the ground speed measurement sensor are too rapid or instable and they exceed the measurement capacities of the Performer. It may occur in the following conditions:
- Defective ground speed measurement sensor
- A poorly-executed ground speed sensor connection

The functions associated with this sensor are automatically restored when the alarm condition has been solved.

MEMORY FAIL: This alarm is triggered when the Performer encounters errors in the reading or saving of settings in its memory that have been carried out by means of the interface program. This alarm does not prevent the Performer from working but it indicates that upon the next start-up, any variation made to the parameters may not have been stored.
If this alarm persists, it is necessary to seek Technical Assistance.

SETUP FAIL: This alarm is triggered when, upon the start-up of the Performer, it does not recognise any valid parameter stored in its memory relating to its hardware and functional configuration. This alarm does not prevent the Performer from working in that, in any case, the default data is used.
It is necessary to seek Technical Assistance.

PROGRAM NAME: _____

	Parameter description	Performer 1	Performer 2	Performer 3	Performer 4	
1	Performer (or Product) name					
2	Product constant (FB)					pulses/kg or pulses/litres
3	Dose					litres/ha or Kg/ ha
4	Dosage variation					litres/ha or Kg/ha
5	Row width mode					Total or Rows x Dist.
6	Total width					metres
7	Number of rows					1 ÷ N
8	Distance between rows					metres
9	Alarm upon dosage error					%
10	Lifter function					Pause, Start, Pause+Start
11	Engine re-start value					%
12	Start Delay Time					Seconds
13	Pre-Start Time					seconds

PROGRAM NAME: _____

	Parameter description	Performer **1**	Performer **2**	Performer **3**	Performer **4**	
1	Performer (or Product) name					
2	Product constant (FB)					pulses/kg or pulses/litres
3	Dose					litres/ha or Kg/ha
4	Dosage variation					litres/ha or Kg/ha
5	Row width mode					Total or Rows x Dist.
6	Total width					metres
7	Number of rows					1 ÷ N
8	Distance between rows					metres
9	Alarm upon dosage error					%
10	Lifter function					Pause, Start, Pause+Start
11	Engine re-start value					%
12	Start Delay Time					Seconds
13	Pre-Start Time					seconds

PROGRAM NAME: _____

	Parameter description	Performer **1**	Performer **2**	Performer **3**	Performer **4**	
1	Performer (or Product) name					
2	Product constant (FB)					pulses/kg or pulses/litres
3	Dose					litres/ha or Kg/ha
4	Dosage variation					litres/ha or Kg/ha
5	Row width mode					Total or Rows x Dist.
6	Total width					metres
7	Number of rows					1 ÷ N
8	Distance between rows					metres
9	Alarm upon dosage error					%
10	Lifter function					Pause, Start, Pause+Start
11	Engine re-start value					%
12	Start Delay Time					Seconds
13	Pre-Start Time					seconds

PROGRAM NAME: _____

	Parameter description	Performer 1	Performer 2	Performer 3	Performer 4	
1	Performer (or Product) name					
2	Product constant (FB)					pulses/kg or pulses/litres
3	Dose					litres/ha or Kg/ha
4	Dosage variation					litres/ha or Kg/ha
5	Row width mode					Total or Rows x Dist.
6	Total width					metres
7	Number of rows					1 ÷ N
8	Distance between rows					metres
9	Alarm upon dosage error					%
10	Lifter function					Pause, Start, Pause+Start
11	Engine re-start value					%
12	Start Delay Time					Seconds
13	Pre-Start Time					seconds