ARAG®
SPRAYING AND IRRIGATION

BRAVO **300**

USE AND MAINTENANCE

SPRAY CONTROL

CE

46730X

ATTENTION!
This device is for controlling the ARAG general, section and adjustment valves installed on agricultural machines used for weeding and spraying.
Please read the instructions contained in this handbook carefully.
ARAG cannot be held liable for damage caused by improper installation or use.

This equipment comes within the limits provided for by EN 50081-1 and EN 50082-1 concerning radio-frequency interference.

PRECAUTIONS!
In order to safeguard the functionality of the BRAVO30X the following instructions must be observed:

- Do not spray water on the equipment.

- Do not use solvent or benzenes to clean the outer parts of the container.

- Observe the foreseen power supply voltage (12 Vdc).

- When arc welding, make sure the BRAVO30X power supply is disconnected. If necessary, disconnect the leads of the tractor battery.

- Use only genuine ARAG spare parts and accessories.

The illustrations and technical data contained in this publication refer to the date of printing. ARAG reserve the right to modify the specifications and instructions at any time without notice.

For any requests for spare parts or after-sales service, please call your ARAG Dealer or call the ARAG Technical Service on +39 0522 622036.

Table of Contents

Introduction

BRAVO30X is a computer capable of controlling distribution of chemical products on sprayers equipped with valve control unit from 1 to 5 section valves. It is composed of a control panel, to be kept within the operator's reach, allowing control of all the valves.

BRAVO30X can also operate in manual mode; in this case the litres/hectare adjustment is made using the adjustment keys. If necessary, it is possible during automatic spraying to adapt delivery to treat aread of concentrated growth, temporarily or increasing or decreasing the dosage by ±50%.

The large display of the BRAVO30X allows the operator to keep a constant eye on all data relating to the operation in progress, e.g. speed of the vehicle, the litres/hectare sprayed, total surface area treated and the quantity of liquid sprayed.

Technical and operating particulars

Description	Value
Display	custom LCD, backlit blue
Power supply voltage	12 Vdc ±10%
Consumption (not including valves)	200 mA
Working temperature	0° ÷ +70 °C
Distance travelled	0.001 ÷ 9999 km
Working time	1min ÷ 9999 ore
Speed	0.1 ÷ 99.9 km/h
Liquid delivered per hectare	1 ÷ 1999 l/ha
Surface area treated	0.001 ÷ 9999 ha
Liquid delivered	1 ÷ 99999 litres
Wheel circumference	0.01 ÷ 999.99 cm
Boom width	0.01 ÷ 99.99 m
Number of sections	1 ÷ 5 (BRAVO305)
Flow-meter constant	1 ÷ 99999 pulses/litre
Digital signals	square wave max 1500 pulses/second
Sensor power supply output	Bravo power supply

Main assembly diagram

A. Control panel
B. Starter key
S. Speed sensor
C. Magnets
M. Pressure sensor (opt.)
F. Flowmeter
R. Foam marker
D. Loading pump
T. Filling up flowmeter
(or rpm sensor)
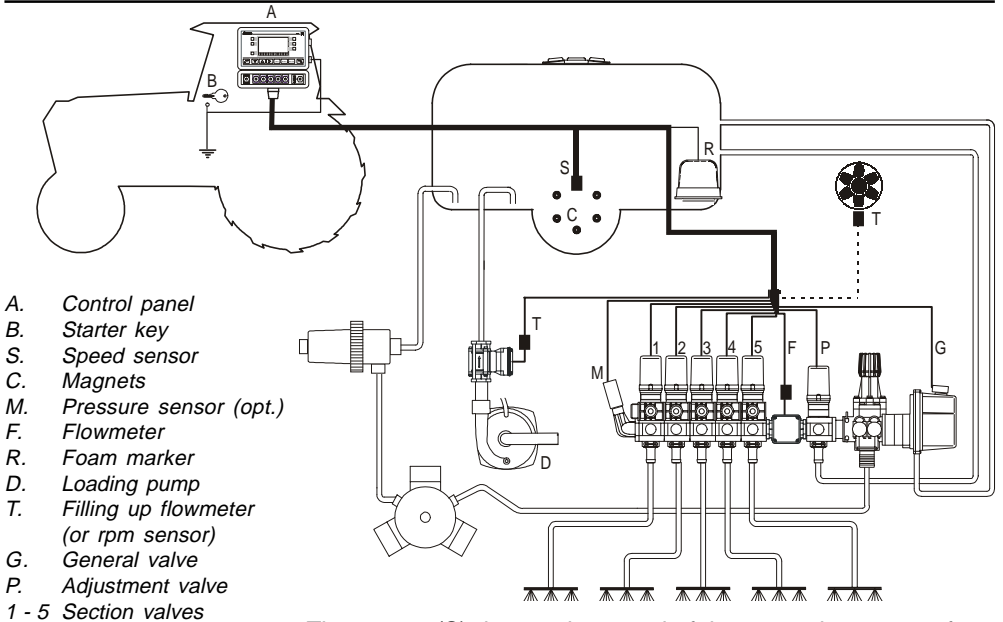G. General valve
P. Adjustment valve
1 - 5 Section valves

fig.1 assembly diagram

The sensor (S) detects the speed of the tractor by means of the magnets (C) and at the same time sends the data to the flow-meter (F) and/or pressure trasducer (M) so that the control panel (A) can handle the control unit.

Illustration of control panel

BRAVO30X has a large backlit multifunction display on which the user can display all the data defining the treatment in progress.
6 function keys at the side of the display allow the user to view and set the distribution parameters on the display, together with the other keys on the panel.
Below, the function keys are identified by the names F1...F7.

Description of keys and symbols

The following is the list of the functions provided by the keys and the meanings of the symbols shown on the display:
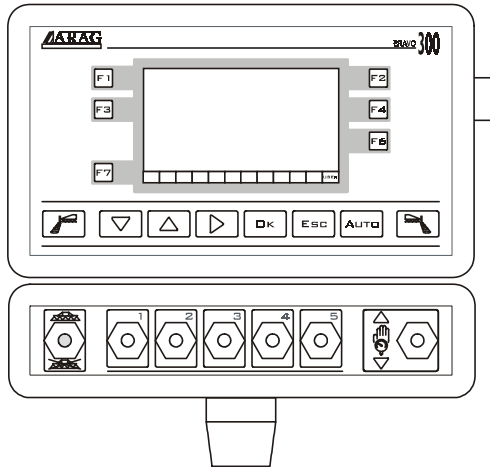
fig.2 BRAVO305 control panel

Control keys

F1	Distribution value setting
F2	Alternates display of the following data on the display:
∿	Distance travelled
🕐	Time worked
▱	Surface area treated
F3	Access to the user programming menu
F4	Alternates display of the following data on the display :
🔋	Tank level
💧	Liquid distributed
🔋	Battery voltage
F6	Alternates display of the following data on the display :
🚰	Flow-rate
Q	Pressure
Rpm	Rpm
F7	Allows nozzle selection
▱	Activates the left-hand side of the foam marker
▱	Activates the right-hand side of the foam marker

AUTO	Selects automatic or manual operation
△	Increase key
	In Manual mode: Increases the quantity for distribution
	In Automatic mode :Increases the quantity for distribution in steps of 5%
▽	Decrease key
	In Manual mode: Decreases the quantity for distribution
	In Automatic mode :Decreases the quantity for distribution in steps of 5%
(main valve symbol)	Opens/Closes main valve
(section symbol 1)	Controls opening/closing of sections
(increase/decrease symbol)	Increase/Decrease of quantity for distribution

N.B.: For correct operation, if the number of switches on the control panel is different from the number of section valves, connect the cables as shown in the table below:

N Sections	Switches to be used	Cables to be connected
2	2, 4	2, 4
3	2, 3, 4	2, 3, 4
4	1, 2, 4, 5	1, 2, 4, 5

Adjustment keys

△	Increases the digit of the value for modification
▽	Decreases the digit of the value for modification
▷	Moves on to the next digit
OK	Confirms the value entered
Esc	Exits without modification
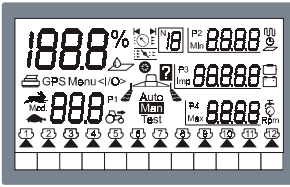
Fig.3
Display test

Switching on
To activate BRAVO30X, position the starter key on "start";
BRAVO30X performs a display test, lighting up all the symbols
(fig.3). After two seconds it displays the software release
(fig. 4) and then switches to the main menu page (fig. 5).

Setting the contrast
To modify the display contrast, press the ⬆ and ⬜ keys to
increase or ⬇ and ⬜ to decrease.

Fig.4
Software release

Distribution   Number of active field
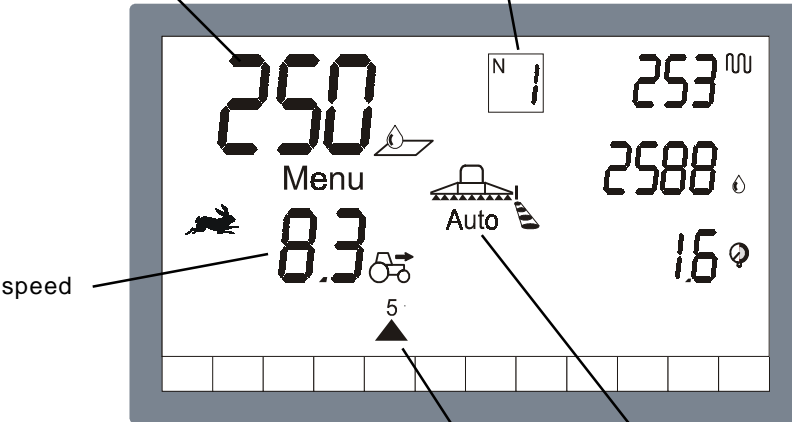
tot. distance
tot. time
tot. surface area

battery voltage
liquid in tank
tot. liquid distr.

Flow-rate
Pressure
rpm

speed

Treatment data display

Man/Auto Indicator

Fig.5
Main menu page

Nozzle type

Introduction
Before starting treatment, some settings are necessary to inform the BRAVO30X about the characteristics of the vehicle on which it is installed (by means of the wheel constant), the characteristics of the liquid distributed (by means of the density), the type of flow-meter connected and the type of nozzle fitted.

Calculating the wheel constant

It may be necessary to change the wheel on which the speed sensor magnets are installed, or the vehicle on which the sensor itself is installed, meaning that the circumference of the wheel changes.

In this case the constant on the BRAVO30X has to be changed to allow it to measure the distance travelled correctly, and thus make a correct calculation of the quantity of liquid delivered per unit of surface area.

The wheel constant is the distance the vehicle travels for each pulse received from the speed sensor.

The following is the **procedure for calculating the wheel constant:**
Measuring the distance travelled in 10 turns of the wheel the speed sensor is installed on (with the tyres inflated at working pressure).

This is the **formula to calculate the wheel constant:**

$$\text{⊛} = \frac{\textbf{Space travelled (m) x 10}}{\textbf{number of magnets}}$$

Example:
- space travelled in 10 turns of the wheel = **25.4 m**
- number of magnets installed = **10**

The wheel constant is:

$$\text{⊛} = \frac{\textbf{25.4 x 10}}{\textbf{1}} = \textbf{25.4}$$
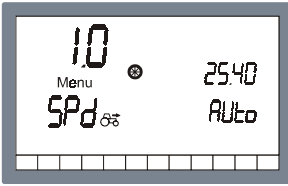
Fig.6
Wheel constant display

Fig.7
Automatic setting of wheel constant

Wheel constant menu

To modify the wheel constant, the user programming menu must be accessed by pressing the F3 key until the screen shown on the left (menu 1.0) appears.

Manual setting

The F4 key can be pressed to insert the value calculated for the wheel constant directly: use the modification keys to change and confirm the new value (the value set on the display is 25.40 cm/pulse).

Automatic setting

BRAVO30X is able to calculate the wheel constant automatically, on the basis of the number of pulses received from the speed sensor, when a distance of known length is travelled. To carry out automatic the constant setting correctly, proceed as follows:

1) Prepare the tractor with the tank 50% full
   (the test can be carried out with just water).
2) Drive the tractor to the start of the straight track of known length and stop.
3) If the length of the track is different from that set, press F2 and use the modify keys to enter the new value.
4) Press the F6 key beside the word AUtO and drive along the track.
5) At the end of the track, stop the tractor and press the F6 key: BRAVO30X calculates the wheel constant automatically and shows it on the display.

N.B.: The test should be carried out on ground of medium hardness. If distribution is on very soft or very hard ground, the difference in wheel diameter may lead to a difference in the wheel speed reading, with a consequent error in calculation of the distribution.
In this case, the wheel constant setting procedure should be repeated.

Fig.8
Density factor programming menu

Variation of the density factor of the product delivered

When distributing products other than water (e.g. liquid fertilisers) the values read by means of the blade or turbine flow-meter may be inaccurate, causing errors on distribution. To overcome this problem, it is possible to modify a density factor which acts as multiplier on the values read by the flow-meter.

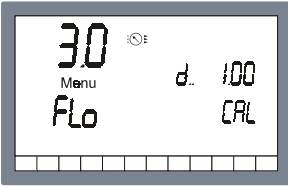N.B.: The ARAG ORION model flow-meter is unaffected by this problem.

Density factor programming menu
This menu is accessed from the main display screen by pressing the F3 key for one second.
Use the △ ▽ keys to locate on menu 3.0 shown on the left. To modify the value of the density factor, press F4 and use the modification keys (in the example, the factor is 1.00).
Press OK to confirm the value and exit or Esc to exit without modifying.
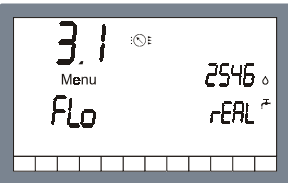
Fig.9
Automatic density calibration

Automatic density calibration
The automatic density calibration procedure is carried out as follows:

1) Fill the tank with a known quantity of water
2) Reset the field data (page 14)
3) Distribute the product (page 16)
4) Calculate the amount of liquid distributed
5) Press F3 to access the programming mode
6) Select menu 3.0
7) Perform the calibration

Calibration is started by pressing the F6 key beside the word CAL (fig.8).
The screen shows the amount of liquid counted by the computer (in the example 2546 litres) during the last distribution, with the density value currently memorised.
Press the F6 key beside the word rEAL, and enter the quantity of liquid actually delivered during the treatment: the computer will calculate and memorise the new density factor.

Fig.10
Modifying the nozzle data

Nozzle Flow-Rate

If the computer is not connected to a pressure transducer, it may still be able to calculate and display the pressure on the basis of the flow-rate value measured by the flow-meter and the nozzle flow-rate data.

N.B. For correct pressure measurement, the nozzles must be in good condition, so that the real flow-rate is the same as the rated flow-rate.

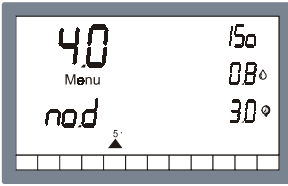If the operator is using nozzles which do not correspond to the ISO standard, he can modify the default settings of the eleven preset ISO nozzles.

This menu is accessed from the main menu screen by pressing the F7 key for one second.

Use the △ ▽ keys to locate on menu 4.0 (fig.10).

As can be seen, nozzle number 5 (red colour ISO 11004) is set to deliver 0.8 litres/minute at a pressure of 3.0 bar. The operator can press the F4 and F6 keys to modify the flow-rate and pressure value as appropriate to the nozzle in use.

To restore the ISO value, simply press the F2 key and confirm the values with the ok key.

See appendix for table 1, showing the relationship between pressure and flow-rate for ISO nozzles.
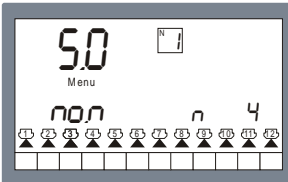
Fig.11
Modifying the nozzle data

Number of Nozzles
(467302 and 467304 versions only for 2- 4-way orchard sprayers)

If the computer is installed on an orchard sprayer it is possible to specify, according to requirements, the number of nozzles used on each spray boom. By doing this the calculation of pressure is more accurate if there is no pressure transducer or the regulation is more stable if it is done referring to the data read by the transducer.

You can access this menu from the main menu, press the F7 key for one second.

With keys △ ▽ go to menu 5.0 (fig.11).

Press the F2 key and the keys △ ▽ to select the spray boom for which you want to set the number of nozzles.

Press key F6 to access data modification and set the number of nozzles wanted by pressing keys △ ▽.

Press ok to confirm the data and exit or esc to exit without changing the data.

Fig.12
Resetting the counters

Before each treatment, the following operations should be carried out:
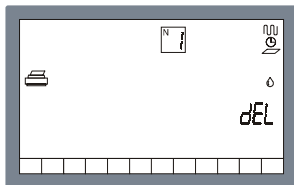
1) Set the field number
2) Reset the field counters
3) Set the amount of liquid put in the tank
4) Select the nozzle to be used.
5) Set the distribution value.

Field number
BRAVO30X automatically records of the space travelled, time worked, surface area treated and liquid distributed data. BRAVO30X offers the possibility of nineteen partial counter units (known for the sake of simplicity as fields), to which the treatment counts can be addressed.

N.B.: Field number 0 contains the device's absolute counter and cannot be deleted.

To set the field number, keep the F2 field pressed until the screen shown on the left appears.
The ▽ △ keys can be pressed to select the number of the field; pressing ▫ᴋ confirms the number selected.
Pressing Esc aborts the selection made and returns to the main menu screen.

Resetting the field counters
The F6 key can be pressed to reset the display of one or more of the counters relating to the field currently selected; the count selected and the dEL symbol flash: pressing ▫ᴋ confirms the reset, or pressing Esc exits from the deletion mode.
N.B.: the counts relative to the symbols which are lit up are reset (in the example in fig. 12, the space travelled, time worked, surface area treated and liquid distributed counts are reset). To change count, press F2.
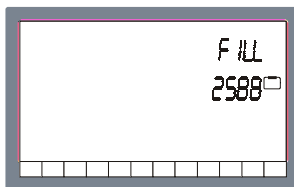
Setting the amount of liquid placed in the tank
BRAVO30X is able to calculate the amount of liquid left in the tank starting from the filling value and subtracting the liquid distributed from it. The computer also warns when the liquid level reaches the low threshold by sounding a beeper and by flashing the tank level indicator light 🔲 .

Fig.13:
Setting the tank filling level

The amount of liquid placed in the tank is programmed by pressing F4 until the screen on the left is displayed.

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Pressing the $\boxed{\text{F2}}$ keys sets the tank level at the maximum filling level envisaged by the manufacturer.

To set a level different from the maximum filling value, press $\boxed{\text{F4}}$ so that the liquid in tank value flashes and use the modification keys to change it.

Filling the tank by means of the flowmeter
So the computer stores the exact quantity of liquid put into the tank, it is possible to fill the tank up with the specific flowmeter.

To do this, access the filling up menu by pressing the $\boxed{\text{F4}}$ key on the main screen page until the screen page shown in Fig. 13 appears.

Now fill the tank up by starting the loading pump.

The computer shows in real time the quantity of liquid that has been put inside the tank which is added to the liquid that is already inside it, until the loading pump stops. (In the example given in Fig. 13 there are 2,588 litres inside the tank).

Once filling up is finished, return to the main screen page by pressing key $\boxed{\text{Esc}}$.
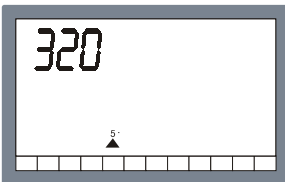

Fig.14:
Setting the tank filling level

Selecting the nozzle
The user will have selected the nozzle to be used for the treatment on the basis of the speed at which the treatment is to be performed and the quantity of liquid per hectare to be used. This information is fundamental if using a pressure transducer to regulate the distribution, but with a flow-meter alone, it is only used to correct display of the pressure value calculated by the computer (it does not affect the distribution setting).

Nozzle setting is begun by pressing the $\boxed{\text{F7}}$ function key for one second, until the screen shown in fig14 appears.

A flashing 5 symbol appears in the bottom of the screen, indicating the type of nozzle selected (in the example, number 5).
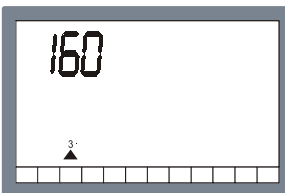

Fig.15:
 ISO11002 nozzle selection

The flashing symbol is underneath coloured indicators repre-senting the standard ISO nozzle colours.

If the nozzle chosen is ISO, e.g. ISO11002 (yellow), simply bring the flashing symbol above the rectangle of the same colour (yellow) with the $\boxed{\triangle}$ $\boxed{\triangledown}$ keys.

Press $\boxed{\text{ok}}$ to confirm the new nozzle and exit or $\boxed{\text{Esc}}$ to abort.
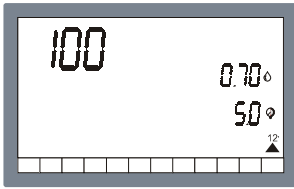
Fig.16:
"USER" nozzle

If the operator wishes to use a non-ISO nozzle but still be able to select the ISO nozzles directly, he can access a nozzle known as "USER" in which he can set the data of the nozzle in use.
To do this, display the nozzle selection screen as described earlier and bring the flashing nozzle symbol into the ⑫ position (fig.16); the display will contain the indication of the number of litres per minute delivered by the nozzle at a given pressure (in the example, the nozzle delivers 0.70 l/min at a pressure of 5.0 bar).

The number in the top left-hand corner indicates the distribution value (in litres/hectare) which the computer will maintain with the nozzle selected. To change the last value set, simply press the F1 key and use the modification key.

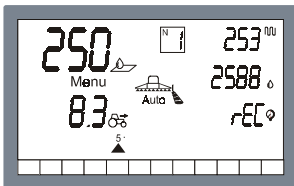N.B.: for each nozzle, BRAVO30X always sets the last distribution value used with that nozzle.

Fig.17: Requesting calibration of the calibrated returns

Valves with calibrated returns
If the unit is fitted with valves complete with calibrated return, and if BRAVO30X has been programmed for operation with calibrated return during installation of the system, at each nozzle change the flashing message rEC appears on the right of the display.
This reminds the user that he has to perform a new procedure to adjust the calibrated returns.

N.B.: The calibrated return adjustment procedure is necessary to allow the computer to adjust and display the distribution correctly when one or more section bars are closed.
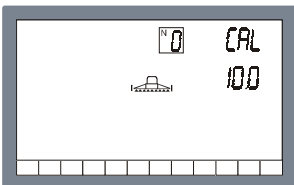

Fig.18:
Setting the calibrated returns

Setting the calibrated returns
Setting of the calibrated returns is started by keeping the F6 function key pressed for 1 second (fig.18).
Open all the section valves and the master valve; the flow-rate value currently read by the flow-meter (10.0 in the example) is displayed beside F4 .
Close the first section valve: the flow-rate information before the closure is frozen on the display, while the flow-rate value currently read by the flow-meter (with the section valve discharging on the calibrated return), given by the sum of the flow-rates to the boom and the tank, by means of the calibrated
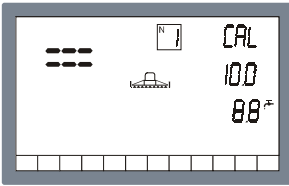
Fig.19:
Adjusting section n.1

return is shown beside F6.
(In the example if fig. 19, this is 8.8).
At this point the calibrated return has to be adjusted so that the two values are the same: when they coincide the section valve can be reopened and the operation can be repeated for all the other section valves.
Adjustment of the calibrated return is assisted by a beeper and indicator lights; as the calibrated return approaches the optimal setting, the intermittent sound emitted by the beeper becomes quicker and quicker, until it becomes continuous (setting OK). During the adjustment three flashing segments indicate whether the flow-rate generated by the calibrated return is too high or too low (in the example, it is too low).

Caution: the section valves must be closed one at a time: if more than one section valve is closed simultaneously, the display shows a dash in the position of the field; otherwise, the number of the closed section valve appears.
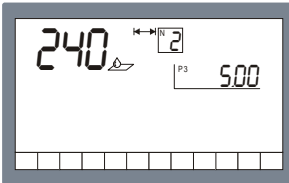Press Esc to exit from the calibrated return setting procedure.

Starting the treatment

Fig.20:
Setting l/ha for distribution

Treatment controlled in automatic mode

Setting the litres/hectare to distribute
Prior to each distribution you first have to make sure that the distribution set is correct: press F1 until the value to distribute flashes (Fig.20) and use the modification keys to change and confirm the value.

Setting the distance between rows
(467302 and 467304 versions only for the 2- and 4-way orchard sprayers)
In the case of the orchard sprayer versions 467302 and 467304 you will also have to set the distance between the rows so that the computer can then make the correct adjustments. By pressing the F3 key followed by the modification keys, you can select one out of the nine storable distance values.
If necessary, it is possible to access modification of one of these values by pressing the F4 key and setting another value by pressing keys △ and ▽ .
Press OK to confirm the data and exit or press Esc to exit without changing the data.

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Fig.21:
Controls for varying the distribution.

Start of treatment in the automatic mode
To perform a treatment in automatic mode, proceed as follows:
1)   Check that the Auto symbol in the centre of the display has illuminated, or press the [AUTO] key so that it appears.
2)   Open the section valves using the relative keys.
3)   Go to the beginning of the field for treatment.
4)   Open the master valve.

During automatic operation, BRAVO30X keeps the litres per hectare applied constant at the value set previously.
The control keys can be provided to make a temporary variation in the volume to be distributed (fig.21).
The display shows the percentage variation of the volume to be distributed in alternation with the volume actually applied.
To cancel the temporary variation, return the percentage variation to zero.

Treatment controlled in manual mode
To perform a treatment in manual mode, proceed as follows:
1)   Check that the Man symbol has illuminated in the centre of the display or press the [AUTO] so that it appears.
2)   Open the section valves using the relative keys.
3)   Go to the beginning of the field for treatment.
4)   Open the master valve.
5)   Use the control keys to modify the value of the amount to be distributed (fig.21).

Attention: in the versions for the 467302 and 467304 orchard sprayers it is also necessary to set the distance between rows so the computer can display the correct data (page16).

Foam marker
If the foam marker kit is installed, the computer is able to control it in 2 modes:

Fig.22:
Left-hand side foam marker active .

Manual mode:
Press the [key or [keys to activate the side of the foam marker required, and press the same key again to stop it.
N.B.: the foam marker is disabled automatically when the master switch is closed.

Automatic mode:
If the foam marker function has been set for automatic operation, the foam marker stops automatically when the master valve is closed and restarts from the opposite side when it is reopened.
The active side of the foam marker is indicated by the flashing row symbol above the boom symbol (fig.22).
To stop the foam marker, press the foam marker key 🖊 or 🖊 relating to the active side.
After a manual stoppage of the foam marker, next time the master valve is opened the row symbols above the boom symbol flash simultaneously to instruct the operator to activate the side of the foam marker required.

Consulting the treatment data
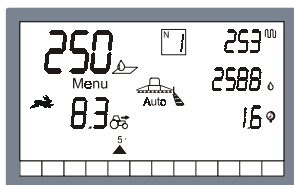
Fig.23
Counts

Displaying the counts
Once the treatment is complete, the operator can consult the data relating to it.
The counts made available by the computer are:

⑂	Space travelled	(Km)
⊕	Time worked	(hh.mm)
◻	Surface area treated	(hectares)
◊	Liquid distributed	(litres)

The counts refer to the number of the field currently selected.
When the F2 and F4 keys are pressed, the symbols illustrated above appear beside the keys in succession.
The figure beside the symbol is the value of the count.
In the example in fig. 23, for field number 1, the distance travelled is 253 Km, while the liquid distributed amounts to 2588 litres.

N.B.: the distance count only works with the master valve closed. This count can therefore be used to measure the distance between the field and the operator's home, or to measure the length of a field.

N.B.: the time worked count can be stopped or started by pressing the ▷ key.
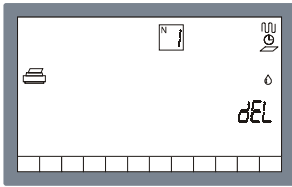When the count is enabled, the ⊕ symbol flashes.

Fig.24
Printing the treatment data

Counters printout

If the printer (code 467001) or the download software of data on the personal computer (code 467002) is connected to BRAVO30X, it will be possible to print the data of the field counters.

Press keys F2 until the screen page depicted in Fig. 24 appears.

Once you have selected the field wanted, press the F3 key to have the printout of the treatment data.
With the counters' printout you can glean the following information:

---- TREATMENT DATA -------------------------

Area:	73.0700 ha
Consumption:	10040L
Average distrib.:	137.4 L/ha
Distrib. set:	100.0 L/ha
Nozzle:	3
Time:	3.009 hhhh.mm
Area per hour:	0.0023

---- GUIDELINE DATA ----------------------------

Distance	2.0330 Km
Time	0.15 hhhh.mm

---- OTHER DATA -----------------------------------

Total time	3.32 hhhh.mm

Operating errors

BRAVO30X monitors all distribution parameters constantly.
In case of a malfunction, the following error messages appear on the display:

Nr	ERROR MESSAGE	CAUSE	REMEDY
1	and ?	- During treatment it is not possible to distribute the quantity of liquid per unit of area set	- Reduce vehicle speed - Use nozzles capable of higher delivery rates - Increase the maximum working pressure
2	and ?	- During treatment it is not possible to distribute the quantity of liquid per unit of area set	- Increase vehicle speed - Use nozzles capable of lower delivery rates
3	and ?	- In AUTO mode the Bravo 300 is not receiving the flow-meter signal - In AUTO mode the master valve switch is on ON but the control unit is not receiving any liquid	- Check the connection between the flow-meter and the Bravo 300 - Check that the pump is operating - Check that there is liquid in the tank
4	and ?	- In AUTO mode the Bravo 300 is not receiving the speed sensor signal - In AUTO mode the master valve switch is on ON but the machine is not moving	- Check the connection between the speed sensor and the Bravo 300 - Put the machine in motion
5	and and ?	- In AUTO mode the Bravo 300 is not receiving the speed sensor and flow-meter signals - In AUTO mode the master valve switch is raised but the machine is at a standstill	- Check the Bravo 300's connections to the speed sensor and flow-meter - Put the machine in motion and start up the pump
6	Ero	- While regulating balancing-valves, Bravo 300 surveys a flow-rate, that is too low	- Check connection between flow-meter and Bravo 300 - Check flow-meter constant's set-up
7	Error	While setting wheel constant, Bravo 300 didn't get the correct pulses to calculate the constant	- Repeat wheel constant's automatic set-up
8	rEC	- After changing nozzle type, balancing valves must be adjusted	- Adjust balancing valves
9		- Liquid in tank is below reserve level	- Fill the tank

Troubleshooting

No	DEFECT	CAUSE	REMEDY
1	The display does not show data	-No power supply	-Turn the starter key onto "Start -Check the connections on the power supply cable -Check the main fuse
2	It is not possible to control the valves	-The valves are not connected -Fuse blown	-Connect up the connector -Check the main fuse
3	The display does not show the speed	-Faulty programming -The signal is not arriving at the speed sensor	-Check the ✷ programming -Check the connections with the speed sensor -Check the distance between magnets and sensor
4	The speed displayed is imprecise	-Faulty programming	-Check the ✷ programming -Check the no. of magnets -Check the distance between magnets and sensor
5	Display is unstable even at constant speed	-Insufficient number of magnets	-Increase the number of magnets
6	Imprecise " ⬡ " display	-Faulty programming	-Check the programming the boom length -Check the programming of the "Flow-meter constant" and the density -Check the ✷ programming
7	The " Tot. ⬡ " value displayed on the computer is different to the value of the hectares actually treated	-Faulty programming -The meter has not been zeroed	-As for point no. 3 -Zero the " Tot. ⬡ " meter
8	The " Tot. ◊ " value displayed on the computer is different to the value of litres actually delivered	-Faulty programming -The meter has not been zeroed	-Check the programming of the "Flow-meter constant" and " Dens. " -Zero the " Tot. ◊ " meter

Unit of measure

	EU	EU t	US
Surface	Hectare (Ha)	Hectare(Ha)	Acre
Dist. travell.	Km	Km	Mile
Time	Hours	Hours	Hours
Capacity	Litres	Tons	Gallons
Voltage	Volt	Volt	Volt
Pressure	bar	bar	psi
Flow rate	Litres/min	t/min	Gal/min
Speed	Km/h	Km/h	Miles/h
Distribution	Litres/Ha	t/Ha	Gal/Acre
Sect.width	metres	metres	feet
Nozzle dist.	metres	metres	inches
Flow constant	pulse/l	pulse/t	pulse/Gal
Wheel const.	metres/puls	metres/puls	inches/puls.
Tank cap.	Litres	Tons	Gallons
P.T.O.	rpm	rpm	rpm

Relationship between ISO nozzle type and flow-rate

Table 1 shows the flow-rate value (expressed in litres/minute) measured at the pressure of 3bar, for the ISO nozzles.

Color	Code	lt/min
Orange	ISO110011	0,40
Dark green	ISO110015	0,60
Yellow	ISO11002	0,80
Blue	ISO11003	1,20
Red	ISO11004	1,60
Brown	ISO11005	2,00
Grey	ISO11006	2,40
White	ISO11008	3,20
Cambridge blue	ISO11010	4,00
Light green	ISO11015	6,00
Black	ISO11020	8,00

Terms of warranty

1. ARAG guarantee BRAVO30X for a period of 12 months from the date of sale to the user customer (the freight bill of the goods shall bear witness to this).
   The parts composing the equipment, which at the unquestionable judgment of our Company turn out to be defective due to an initial defect in the material or manufacture, shall be repaired or replaced free of charge at the closest Service Centre in operation at the time of requesting the work. Exceptions to this are the expenses concerning:
   - transportation of the equipment to the Service Centre;
   - dismantling and reassembling of BRAVO30X from the machine;

2. Warranty does not cover:
   - transit damage (scratches, dents and the like);
   - damage due to faulty installation or initial defects from an insufficient or inadequate electrical system, or alterations deriving from environmental, climatic, or other conditions;
   - damage deriving from using unsuitable liquids;
   - failures caused by negligence, tampering, user incapability, or repairs made by non-authorized personnel;
   - installation and adjustment;
   - system references or convenience checks;
   - maintenance such as cleaning filters, nozzles, etc.;
   - what may be considered normal deterioration due to use;

3. The equipment shall be restored in the limits of time compatible with the organizational requirements of the Service Centre; the Units or components to be repaired or replaced shall have to first be washed and cleaned of the residues of the chemical products used;

4. Repairs made under warranty do not give rise to its extension or renewal

5. No one is authorized to change the terms and conditions of warranty or to issue other statments or writings

6. ARAG shall not be held liable for any damage caused to persons or things by failure or forced suspension of using the equipment

7. Parts replaced under warranty remain property of ARAG

8. For any controversy the Court of Reggio Emilia is the competent one.