BRAVO 180S SERIES COMPUTER
CROP SPRAYING

INSTALLATION, USE AND MAINTENANCE
This manual is an integral part of the equipment to which it refers and must accompany the equipment in case of sale or change of ownership. Keep it for any future reference; ARAG reserves the right to modify product specifications and instructions at any moment and without notice.
MANUAL FOREWORD AND USE

This manual provides instructions to assemble, connect and set the computers of the BRAVO 180S family. Any other information is provided in specific sheets to be used exclusively by the installer, containing specific information of each computer model.

MANUAL USE MODES

The section of this manual dedicated to the installation contains information for installers. For this reason we have used technical terms without providing explanations which would be necessary for end users only.

THE INSTALLATION MUST BE CARRIED OUT BY AUTHORISED AND SKILLED PERSONNEL ONLY. THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY OPERATION SPECIFIED IN THIS MANUAL CARRIED OUT BY UNAUTHORISED OR UNSKILLED PERSONNEL.

LIMITATIONS

The descriptions of the assembly phases refer to a “general” computer, so specific models will not be mentioned, unless a certain installation procedure concerns exclusively one computer type.

RESPONSIBILITY

The installer must carry out workmanlike installations and ensure to the end user the perfect operation of the whole system both with ARAG components only and other brands’ components.

ARAG always recommends using its components to install control systems. The installer will be held responsible for any malfunction if he decides to use other brands’ components even without actually changing the system parts or harness. The compatibility check with components and accessories of other manufacturers shall be carried out by the installer. If the computer or the ARAG components installed together with other brands’ components get damaged because of what stated above, no direct or indirect warranty will be provided.
1 PRODUCT DESCRIPTION

The device you have purchased is a computer which, when connected to a valve or suitable control unit, makes it possible to control all phases of treatment in agricultural applications directly from the cabin of the farming machine it is installed in.

These computers can be connected to different sensor types. The computer is directly connected to the system by means of two cables connected to the hydraulic and control unit valves and the sensors. In the cabin you find all controls necessary to manage the system ensuring great safety during the job.

The BRAVO 18x computer display allows the operator to constantly monitor all data of the current operations, such as vehicle speed, sprayed fluid quantity, the whole sprayed area and so on.

2 BRAVO DSB

ARAG has designed and manufactured a diagnostics system for Bravo series computers and the systems they may be connected to. BRAVO DSB (code 467003) provides reliable diagnostics of computer, control unit or the whole system troubleshooting any potential problems experienced with the BRAVO DSB system.

3 RISKS AND PROTECTIONS BEFORE ASSEMBLY

All installation works must be done with battery disconnected, using suitable tools and any individual protection equipment deemed necessary.

⚠️ Use ONLY clean water for treatment tests and simulations: using chemicals during simulated treatment runs can seriously injure persons in the vicinity.

4 INTENDED USE

This device is designed to work on agricultural machinery for spraying and crop spraying applications. The machine is designed and built in compliance with UNI EN ISO 14982 standard (Electromagnetic compatibility - Forestry and farming machines), harmonized with 2004/108/EC Directive.

5 PRECAUTIONS

⚠️ • Do not aim water jets at the equipment.
    • Do not use solvents or fuel to clean the case outer surface.
    • Do not clean equipment with direct water jets.
    • Comply with the specified power voltage (12 VDC).
    • In case of voltaic arc welding, remove connectors from BRAVO and disconnect the power cables.
    • Only use ARAG genuine spare parts and accessories.
6  PACKAGE CONTENT

The table below indicates the components that you will find in the BRAVO computer package:

<table>
<thead>
<tr>
<th>BRAVO 180S COMPUTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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<td>4</td>
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<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
</tbody>
</table>

Legend:
1 Bravo 180S
2 Instruction manual
3 Power cable
4 Fixing kit
5 Power supply connector
6 Valve and sensor harness
7 Inductive speed sensor
8 Section valve connector seals

Fig. 1

<table>
<thead>
<tr>
<th>BRAVO 180S COMPUTER WITH HYDRAULIC CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
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<tr>
<td>4</td>
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<tr>
<td>5</td>
</tr>
<tr>
<td>6a</td>
</tr>
<tr>
<td>6b</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8a</td>
</tr>
<tr>
<td>8b</td>
</tr>
</tbody>
</table>

Legend:
1 Bravo 180S
2 Instruction manual
3 Power cable
4 Fixing kit
5 Power supply connector
6a Valve and sensor harness
6b Hydraulic unit harness
7 Inductive speed sensor
8a Section valve connector seals
8b Hydraulic valve connector seals

Fig. 2
7 POSITION ON FARMING MACHINE

7.1 System recommended composition

The computer must be directly connected to the farming machine battery.

* Do not connect the computer to key-operated switch (15/54).
The computer must be directly connected to the farming machine battery.
* Do not connect the computer to key-operated switch (15/54).
Computer positioning

- The BRAVO 180S series computer must be placed in the control cabin of the farming machine. Observe the following precautions:
- Do NOT install the monitor in areas where it would be subjected to excessive vibrations or shocks, to prevent any damage or accidental use of the control keys;
- Install the device in a visible position within easy reach by hand; bear in mind that the monitor should not obstruct the operator’s freedom of movement or block his view.

Consider all necessary connections of the computer, the cable length, and make sure there is enough space for connectors and cables. An identification symbol is located next to each connector to indicate its function. For any reference to the system configuration read par. 7.1 System recommended composition.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CONNECTION POINTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control unit and sensors</td>
</tr>
<tr>
<td>2</td>
<td>Hydraulic unit</td>
</tr>
<tr>
<td>3</td>
<td>Power supply</td>
</tr>
<tr>
<td>4</td>
<td>Auxiliary connections</td>
</tr>
<tr>
<td>5</td>
<td>USB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECTIONS</th>
<th>MASTER</th>
<th>PRESSURE</th>
<th>WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>•</td>
<td>•</td>
<td>5.98”</td>
</tr>
<tr>
<td>2</td>
<td>•</td>
<td>•</td>
<td>5.98”</td>
</tr>
<tr>
<td>3</td>
<td>•</td>
<td>•</td>
<td>5.98”</td>
</tr>
<tr>
<td>4</td>
<td>•</td>
<td>•</td>
<td>8.74”</td>
</tr>
<tr>
<td>5</td>
<td>•</td>
<td>•</td>
<td>8.74”</td>
</tr>
<tr>
<td>7</td>
<td>•</td>
<td>•</td>
<td>10.55”</td>
</tr>
</tbody>
</table>
Bracket fixing

The monitor must be mounted after having fixed the bracket at the desired location (the previous paragraph shows the bracket drilling template). The bracket must be slid out of the monitor seat (A, Fig. 8) and fixed using the supplied screws (B). Make sure the bracket is securely mounted, fit the monitor on it, and push it until it locks in place (C).

Fig. 8

Control unit position

The control unit must be fixed with the special brackets supplied and fitted to the unit, positioning it as shown in the manual provided with the assembly.

MAKE SURE TO FOLLOW ALL THE SAFETY INSTRUCTIONS GIVEN IN THE CONTROL UNIT’S MANUAL.

Hydraulic unit positioning

The hydraulic unit shall be secured to the machine, making sure it is well protected against the elements and the fluid sprayed by the machine.

ARAG IS NOT LIABLE FOR ANY DAMAGE RESULTING FROM THE INSTALLATION BY UNSKILLED PERSONNEL. ANY SYSTEM DAMAGE CAUSED BY A WRONG INSTALLATION AND/OR CONNECTION AUTOMATICALLY VOIDS THE WARRANTY.

WARNING! DO NOT CONNECT HYDRAULIC UNITS OTHER THAN THE SPECIFIED ONES (SEE ARAG GENERAL CATALOGUE). ARAG IS NOT LIABLE FOR ANY DAMAGE TO THE PRODUCT, MALFUNCTION ERRORS AND ANY KIND OF RISK IF THE MODULE IS CONNECTED TO NON ORIGINAL UNITS OR UNITS NOT SUPPLIED BY ARAG.
8 COMPUTER CONNECTION TO THE FARMING MACHINE

8.1 General precautions for a correct harness position

- **Securing the cables:**
  - secure the harness so that it does not interfere with moving parts;
  - route the harnesses so that they cannot be damaged or broken by machine movements or twisting.

- **Routing the cables to protect against water infiltrations:**
  - the cable branches must ALWAYS be faced downwards (see figures below).

<table>
<thead>
<tr>
<th>DIRECT CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Fig. 9" /></td>
</tr>
</tbody>
</table>

- **Fitting the cables to the connection points:**
  - do not force the connectors by pushing too hard or bending them: the contacts may be damaged and computer operation may be compromised.

⚠️ Use ONLY the cables and accessories indicated in the catalogue, having technical features suitable for the use to be made of them.
8.2 Power supply connection

The package includes the power connector (Fig. 1 and Fig. 2 on page 6) to be connected to the farming machine battery; Fig. 13 shows the drilling template of the power connector. Connect the power connector to the battery wires using two 0.250” faston connectors, as indicated in Fig. 11 and Fig. 12. Use the cable provided with the package (Fig. 1 and Fig. 2 on page 6) to connect the computer to the power supply.

![Fig. 11](image1.png) ![Fig. 12](image2.png) ![Fig. 13](image3.png)

**WARNING:**
To avoid short circuits, do not connect the power cables to battery before the installation is completed. Before powering up the computer and control unit, make sure the battery voltage is as specified (12 Vdc).

BRAVO 180S is supplied directly by the farming machine battery (12 Vdc): ALWAYS switch on the computer through the monitor, and then remember to switch it off using the specific key on the control panel.

If BRAVO 180S remains on for a long time with the machine off, the tractor battery could run flat: in case of prolonged breaks of the machine with engine off, make sure the computer is off, too.

The power source must be connected as indicated in Fig. 14: the computer must be connected directly to the farming machine battery. DO NOT connect the computer to key-operated switch (15/54).

![Fig. 14](image4.png)

**WARNING:**
- The power circuit shall ALWAYS be protected by a 10 A fuse like the ones for automotive applications.
- All cables connected to the battery shall have a minimum cross-section of AWG 14.
- To avoid short-circuits, connect the power cable connector only after completing installation.
- Use cables with suitable terminals ensuring correct connection of all wires.
9 HARNESS CONNECTION TO THE CONTROL UNIT, THE HYDRAULIC UNIT
AND THE AVAILABLE FUNCTIONS

![Warning: Use only the cables provided with the ARAG computers. Take care not to break, pull, tear or cut the cables. Use of unsuitable cables not provided by ARAG automatically voids the warranty. ARAG is not liable for damages to the equipment, persons or animals caused by failure to observe the above instructions.]

9.1 Multicore cable connection
Connect the multicore cable to the monitor (connections 1 and 2 on page 9) and the other cable end to the control unit and the hydraulic unit. Ensure it is correctly in place and turn the ring nut clockwise until blocking it.

9.2 Control unit valve connection

![Warning: Use ARAG valves: use of unsuitable valves not provided by ARAG automatically voids the warranty. ARAG is not liable for damage to the equipment, persons or animals caused by failure to observe the above instructions.]

Make sure the seals are correctly fitted to avoid water infiltration when using the control unit.

Connector 1 shall control the valve which in turn is connected to the section 1, and so on with the other valves.
Connect "connector 1" to "valve 1" and then the other connectors with increasing numbers from left to right: section 1 is the furthest from the machine on the left, looking at the machine from the rear side (Fig. 15).

![Fig. 15]

Valve 1  Valves 2 - 4  Valves 3 - 4  Valves 1 - 2 - 4 - 5

Section 1  Section 2  Section 3  Section 4  Section 5

Fix the connectors to the relevant valves according to the initials indicated in your assembly general diagram (7.1 System recommended composition):
- Remove the protection cap (1, Fig. 16) from the electric valve.
- Place the seal (2) onto the connector (3), and push the connector fully on (4): be careful not to bend the contacts upon insertion on the valve.
- Tighten the screw (5) fully home.

In case there are more monitor switches than section valves, connect the cables as indicated in the table:

<table>
<thead>
<tr>
<th>SECTION VALVE NO.</th>
<th>SWITCHES TO BE USED</th>
<th>CABLES TO BE CONNECTED TO THE SECTION VALVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2 - 4</td>
<td>2 - 4</td>
</tr>
<tr>
<td>3</td>
<td>2 - 3 - 4</td>
<td>2 - 3 - 4</td>
</tr>
<tr>
<td>4</td>
<td>1 - 2 - 4 - 5</td>
<td>1 - 2 - 4 - 5</td>
</tr>
</tbody>
</table>
9.3 Hydraulic valve connection

Bravo 180S can control up to 5 hydraulic functions through double-acting valves.

Fix the connectors to the relevant valves according to the initials indicated in your assembly general diagram (7.1 System recommended composition).

- Position seal (1) onto connector (2), then connect the latter pressing it fully home (3): during this operation, take special care not to bend valve electric contacts.
- Insert screw inside connector, and screw it (4) until it is tightened.

The function of each switch on the hydraulic function control panel is described below.

• Connect the connector marked with "DD" to the pilot valve, and then the other connectors, as specified on the table:

<table>
<thead>
<tr>
<th>CONTROL</th>
<th>MOVEMENT</th>
<th>CONNECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section movement / AUX switch opening</td>
<td>Opening</td>
<td>↑</td>
</tr>
<tr>
<td>Closing</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Boom height</td>
<td>Opening</td>
<td>↑</td>
</tr>
<tr>
<td>Closing</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Boom locking</td>
<td>Opening</td>
<td>↑</td>
</tr>
<tr>
<td>Closing</td>
<td></td>
<td>↓</td>
</tr>
<tr>
<td>Boom leveling</td>
<td>Opening</td>
<td>↑</td>
</tr>
<tr>
<td>Closing</td>
<td></td>
<td>↓</td>
</tr>
</tbody>
</table>
9.4 Connection of sensors and other available functions

Fix the connectors to the relevant functions according to the initials indicated in your assembly general diagram (par. 7.1).

Harness cables are marked with a symbol denoting their functions: please see the table for correct harness connection.

Use ARAG sensors: use of unsuitable sensors not provided by ARAG automatically voids the warranty.

ARAG is not liable for damage to the equipment, persons or animals caused by failure to observe the above instructions.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>CONNECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Flowmeter</td>
</tr>
<tr>
<td>M</td>
<td>Pressure sensor</td>
</tr>
<tr>
<td>R</td>
<td>Foam marker</td>
</tr>
<tr>
<td>S</td>
<td>Speed sensor</td>
</tr>
<tr>
<td>X</td>
<td>Level sensor</td>
</tr>
<tr>
<td>P</td>
<td>Control valve</td>
</tr>
<tr>
<td>G</td>
<td>Main valve</td>
</tr>
</tbody>
</table>

- The products are supplied with the sensor installation instructions.

- Connection of:
  - flowmeter;
  - pressure sensor;
  - level sensor
  - foam marker.

All ARAG sensors use the same type of connector. Connect the sensor connector to the relevant harness; make sure it is correctly fitted and push it until locking it.

9.5 Pen drive

The pen drive may be used to exchange data with the BRAVO 180S computer.

Before using it make sure the pen drive is not protected.

All pen drives with up to 8 GB memory are compatible.
10 SETUP

10.1 Computer switching on/off

• Ordinary switching on

Software version

Bravo 180S
SPR Ver 1.3.0

----- Menu -----  
--- Spraying ---

Keep key **ESC** pressed until switching on the display; after the software version, Bravo 180S displays the job screen (Fig. 19).

• Switching on to activate the advanced setup

Software version

Bravo 180S
SPR Ver 1.3.0

----- Menu -----  
--- Advanced ---

Contemporaneously press the key sequence until switching on the Bravo. Release key **ESC** keeping pressed the arrow keys until the display shows the Advanced menu (Fig. 20).

• Switching off

Keep key **ESC** pressed until the display shows the message **Power OFF... Release ESC key**. Release the key and wait for the saving process to complete (Fig. 21); after a few seconds the computer turns off.

**WARNING:** ALWAYS use the special key to switch off the computer; otherwise ALL data concerning the spraying and the programming will be lost.

During switching off do NOT press any other key and do NOT disconnect the power supply until Bravo 180S turns off.
10.2 Use of keys for setup

1. Press the arrow keys in succession to move across the menu items. (▼ next item, ▲ previous item): the selected item will be displayed (Fig. 22).

2. Press OK to access the menu: during set-up, a cursor blinks on the display (Fig. 23).

Fig. 22

DATA SELECTION

When it is a about a simple selection of data, BRAVO 180S displays the active value (Fig. 23):

3a. Press the arrow keys in succession to select another value. (▼ next value, ▲ previous value); the selected value will be displayed.

4a. Confirm with OK.

Quick scrolling: keep one of the arrow keys pressed.
Exit without confirming the change: press ESC.

Fig. 23

ACCESS TO A SUBMENU

If there is a sub-menu, BRAVO 180S displays three dots "..." (Fig. 24):

3b. Press OK to access the submenu.

4b. Press repeatedly to toggle from one item to another of the submenu (▼ next item, ▲ previous item); the selected item will be displayed.

5b. Click OK to access the selected item.

Quick scrolling: keep one of the arrow keys pressed.
Press ESC to go back to the previous level of the menu.

Fig. 24

ENTERING A NUMERICAL VALUE

6. Press in succession to move the cursor across the digits (▼ shifting to the LEFT, ▲ shifting to the RIGHT).

7. Press in succession to change the value selected by the cursor. (▼ increase, ▲ decrease).

8. Press OK to confirm the data.

Quick increase / decrease: keep one of the arrow keys pressed.
Exit without confirming the change: press ESC.

Fig. 25

Below is a summary of key functions during setup.
11 ADVANCED SETUP

The computer can be set-up with all the data required to ensure a correct distribution of the treatment product. This operation must be done once only, when installing the computer.

11.1 Tests and checks before programming

Before computer setup, check:
• that all components are correctly installed (control unit and sensors);
• the correct connection to the power source;
• the component connection (main control unit and sensors).

Failure to correctly connect system components or to use specified components might damage the device or its components.

ACCESS TO ADVANCED MENU

For a correct use of the keys during setting, refer to par. 10.2.

The minimum and maximum values relevant to the data that can be set are indicated in chap. 16.

ADVANCED MENU - STRUCTURE

The screens indicated in the following paragraphs refer to setup key-points only; the display could change when pressing the keys described in the text.

When setting the data, the relevant value blinks on the display.
11.2 Language

Set the language of Bravo 180S, among those available.

- Italian, English, Spanish, Portuguese, French, German, Polish, Croatian, Hungarian, Greek, Russian, Turkish, Czech.

Fig. 28

11.3 Units of measur.

Set the units of measurement used for Bravo 180S.

- EU (l/h, km/h, bar)
- US (GPA, mil/h, PSI)
- US TURF (applied volume = gal / 1000 square feet, mil/h, PSI)

Fig. 29

11.4 No. of sections

Set the number of installed section valves.

Fig. 30

11.5 Total boom width

This parameter represents the nozzle actual spraying range on the ground: for example, by positioning 8 nozzles at a distance of 19.69" one from the other, the boom section width to be set is 13.1 ft.

The displayed value (Fig. 31) represents the sum of the section width values, therefore to change the parameter it is necessary to set the width of each boom section: the sum of the width values will be re-calculated automatically.

1 After selecting the menu Total boom width, press OK to gain access to the sub-menu to select / modify the single sections.
2 Use the keys to scroll the sections in the sub-menu Section until viewing the section to be modified: the section number is indicated on the top right side of the display, whereas the first line shows the current value (Fig. 32).
3 Press OK to confirm the access to the modification function.
4 Enter the section width value and repeat the setting procedure for each section.

Total boom width 65.6 ft

Fig. 31

Section 13.1 ft

Section 2/5

Section number

Fig. 32

Section 13.3 ft

Section 2/5

Fig. 33

11.6 Variable rate

Enable / disable the variable application rate.

- No
- Yes

With option Yes, the computer is preset to select the application rate Variable when setting the jobs (par. 12.1).

Variable rate No

Fig. 34
In this menu carry out all settings to calculate the speed. Usually the computer calculates the information concerning the speed thanks to pulses received by the sensor installed on the wheel.

If a GPS receiver is directly connected to the Bravo 180S, this menu allows selecting the receiver as alternative source to the wheel sensor, and so to receive in real time the speed data provided by the GPS.

After selecting the menu Speed sensor, press OK to access the sub-menus.

Wheel

This parameter is used by the BRAVO 180S computer to calculate the vehicle driving speed and, according to this, the instantaneous application rate. The wheel constant relates to the type of wheel being used and the number of detection points of the sensor installed on it. BRAVO 180S can save 3 different wheel constants.

In case of replacement of the wheel featuring the detection points of the speed sensors, the wheel constant can change.

In this case it is necessary to set the parameter again.

1 Select the wheel type (3 types available).
2 Press OK. The constant can be entered with two different procedures (Manual setup or Automatic calc.), described below.
3 Select the desired procedure and press OK to enter the constant.

**Manual setup**

Allows to enter the wheel constant value calculated with the suitable formula.

\[
K_{\text{wheel}} = \frac{\text{distance traveled} (\text{inches})}{\text{no. of detection points} \times \text{wheel rpm}}
\]

- <distance traveled> distance expressed in cm covered by the wheel along measurement travel.
- <no. of measurement points> number of measurement points (e.g. magnets, bolts, etc.), mounted on wheel.
- <no. of wheel revolutions> number of wheel revolutions required to travel measurement distance.

The wheel constant can be calculated with a good approximation by detecting the distance traveled by the wheel with the speed sensor.

(The longer the distance traveled, the more accurate wheel constant calculation).

**Automatic calc.**

BRAVO 180S can automatically calculate the wheel constant using the number of pulses sent by the speed sensor when driving on a 300 feet (US - US TURF) straight path.

- After selecting Automatic calc. (point 3), the display indicates that it is possible to move forward with the vehicle.
- Cover the requested distance: the number of pulses will increase during the path. Stop the tractor at the end of the distance.
- Press OK to stop the counting. The computer will indicate the calculated constant. Wheel constant has been saved.

**GPS source**

With option Yes, the computer is preset to receive speed data from the GPS receiver directly connected to the auxiliary port.
11.8 Valves

Set the type of valves installed on the system and the relevant data. After selecting the menu **Valves**, press **OK** to gain access to the sub-menus.

**Fig. 42**

> **Section valves:** indicate the type of installed section valves.
  - 2-Ways: valves without calibrated backflows
  - 3-Ways: valves with calibrated backflows

> **Sections manag.** Indicate the section valve operation mode, especially if the section automatic closing is active when the main control valve is closed.
  - **Manual (P Mode)**
  - **Auto (M Mode)**

> **Regulation:** indicate the type of installed control valve.

> **Main:** indicate the type of installed main control valve.
  - 2-Ways: drain valve (valve type - Arag 463 series)
  - 3-Ways: main valve (valve type - Arag 464 - 471 series)

11.9 Flowmeter

Select the type of flowmeter installed:
- **Orion**
- **Other...**

11.10 Flowmeter constant

This parameter sets the flowmeter constant value; it indicates how many pulses are sent by the flowmeter per unit of sprayed fluid.

The constant value is indicated on the label on your flowmeter.
For the parameter value of **ORION** flowmeters only, to be entered in the computer, refer to section "Technical data" of the User manual attached to the flowmeter.
11.11 Pressure sensor

Indicate the full scale of the pressure sensor installed on the system. If there is no pressure sensor, set item Disabled.

Fig. 45

11.12 Flow calculation *

Set the type of sensor to be used to calculate the rate:

> Flowmeter

Pressure sensor

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE BOTH THE INDICATED OPTIONS

Flowmeter const. ✓ par. 11.10
Pressure sensor ✓ par. 11.11

11.13 Press. calc. *

This parameter allows deciding whether you want to display a pressure value in the Spraying menu calculated according to the rate detected by the flowmeter and the selected nozzle.

> No

Yes

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
to display it you must disable the shown option.

Pressure sensor ✗ par. 11.11

11.14 Nozzle qty *

This parameter allows setting the total number of nozzles installed on the boom. With this parameter BRAVO 180S calculates the system pressure according to the rate detected by the flowmeter, or the system rate based on the pressure detected by the relevant sensor (according to the device being used, par. 11.12).

Fig. 48

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS

Flow calculation ➤ Pressure sensor par. 11.12
Press. calc. ✔ par. 11.13

11.15 Tank source

In this menu select a tank level reading mode. The management of the Tank source, described in par. 11.16, will be different according to the selected mode.

Possible options:

> Manual

Level Sensor

The level sensor installed in the system allows displaying the tank level in real time.

This mode operates correctly ONLY if the level sensor has been calibrated, or if the calibration of a similar tank has been loaded from pendrive.

The procedure is described below, under section Tank profile > Load.
11.16 Tank setup

Allows to set data relevant to the tank.
After selecting the menu Tank Setup, press OK to gain access to the sub-menus.

Fig. 50

> **Tank volume** (can be modified only in mode Tank source > Manual)
This parameter sets the quantity of fluid the tank can contain: it indicates the maximum quantity of fluid that can be filled in the tank by the user.
If there is a level sensor, the computer displays the tank capacity calculated after the calibration.

> **Tank reserve**
This parameter sets the “reserve” value below which the computer triggers a visual and acoustic alarm: when the reserve value is reached during the spraying, the tank symbol (Fig. 51) blinks on the display.

Fig. 51

The acoustic alarm stops when the tank is completely empty.

> **Calibration** *: enters the calibration procedure of the level sensor.

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE THE INDICATED OPTION.
Tank source > Level Sensor par. 11.15

The level sensor calibration is ONLY possible if the system is provided with a flowmeter (par. 11.9 and 11.10)

Before starting the procedure carry out the following operations:

1. Make sure that the main switch is in the OFF position.
2. Fill in the tank with clean water WITHOUT ADDING CHEMICAL SUBSTANCES.
   The tank must be full. Visually check the reached level.
3. From the job screen check that the manual mode is active (the display shows M). Otherwise activate it by pressing AUTO.
4. Set the output to the maximum value by keeping the control valve switch pressed (nearly 7 s).
5. Switch off the computer and on again in advanced setup mode.
6. Enter the Tank source menu, activate the Level Sensor mode.
7. Enter the Tank Setup menu and select Calibration.
8. Bravo 180S requests to enter the tank capacity: enter the value.
9. Immediately after that, the computer passes to the calibration start screen: the display shows the message Calib. phase > Activate Main.
10. Start the spraying system: open, in succession, ALL section valves and the main control (switches in position ON).
   The display shows the message Calib. phase > In progress... Press ESC to interrupt the calibration without saving.
11. When the rate value reaches zero and remains so for at least 10 s, Bravo 180S automatically finishes the procedure and displays the message Calib. phase > Complete.
   Press OK: the calibration is finished and saved and replaces the current calibration.

After having completed the calibration and checked the sensor correct operation, we recommend to memorise the calibration on pendrive (menu Tank profile > Save on page 24).
Par. 10.2

Shifting of the cursor

• Confirm access to menu or data change

Menu item scrolling or Data increase/decrease

Quits the menu or the data change

ADVANCED SETUP

> 0 calibration *

0 calibration
4,000 mA

- Press OK to reset the sensor residual signal.

Faulty values detected; check the sensor operation.
If problem persists, check for residual fluid in the tank.

Fig. 52

> Tank profile *

Tank profile

The level sensor calibration can be loaded or saved on pendrive to reconfigure the device if necessary, solve problems, or configure another Bravo 180S without having to repeat all operations.
Before any other operation, insert the pendrive in its slot (par. 7.2).

Fig. 53

> Save: select this option and press OK.
The confirmation message OK TANKTLK is displayed once the saving process is completed.

USB not found

Saving alarm: pendrive not inserted.

> Load: select this option and press OK.
The confirmation message OK TANKTLK is displayed once the configuration process is completed.

USB not found

File not found

Configuration alarms:
- Pendrive not inserted.
- The tank configuration TANKTLK is not saved on the pendrive.

11.17 Spraying Menu

Upon spraying it is possible to display and check in real time the current spraying data.
BRAVO 180S can display such data in extended or short mode.

The table indicates the two display modes:

<table>
<thead>
<tr>
<th>Data</th>
<th>extended</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Pressure**</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Flowrate</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Surface</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Sprayed fl.</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Tank level</td>
<td>•</td>
<td>--</td>
</tr>
<tr>
<td>Time</td>
<td>•</td>
<td>--</td>
</tr>
<tr>
<td>Distance</td>
<td>•</td>
<td>--</td>
</tr>
</tbody>
</table>

** MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS

Pressure sensor ✓ par. 11.11
Press. calc. ✓ par. 11.13

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE THE INDICATED OPTION.

Tank source > Level Sensor par. 11.15
Before starting a treatment, some settings are necessary for a correct job. Once all necessary data have been set, it is possible to immediately start spraying.

**USER SETTING**

Before starting a treatment, some settings are necessary for a correct job. Once all necessary data have been set, it is possible to immediately start spraying.

**Access to the User Menu**

User setting (from computer on)
- Keep key OK pressed until the menu is displayed.
- For a correct use of the keys during setting, refer to par. 10.2.
- The minimum and maximum values relevant to the data that can be set are indicated in chap. 16.

**User Menu - Structure**

The screens indicated in the following paragraphs refer to setup key-points only; the display could change when pressing the keys described in the text. When setting the data, the relevant value blinks on the display.
12.1 Jobs setup

In this menu it is possible to set 10 different types of treatments.

- First select the job to be set (Fig. 57).

- After selecting the job, the computer automatically passes to the setting screen of Rate Type\* for the selected treatment (Fig. 58):
  
  **Constant**
  
  Bravo 180S carries out the treatment by keeping the set application rate.

  **Variable**
  
  BRAVO 180S changes the output according to the data sent by the Skipper satellite navigator (duly connected), that indicate the exact quantity of fluid to be sprayed in each point of the field.

- Press **OK** to automatically pass to the setting screen of the other parameters (Fig. 59).

**MENU VISIBLE ONLY WITH SPECIFIC SETTINGS: **

**TO VIEW IT, ENABLE THE INDICATED OPTION.**

* Variable rate
  
  par. 11.6

- **A** Set application rate: set the application rate for the selected treatment.
- **B** Type of nozzle: set the type of nozzle (ISO or USR).
- **C** Nozzle: select the nozzle among those available in the ISO or USR type.

The **RATE** key allows passing from one setting to the other; the value that can be modified blinks.

Press **OK**, in this screen, to confirm the setting of the entire job and automatically go back to the job selection (Fig. 57).

- Repeat the setup FOR EACH job (set the used types and disable the others).

**MENU VISIBLE ONLY WITH SPECIFIC SETTINGS: **

**TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS**

* Flow calculation
  
  par. 11.12

* Pressure sensor
  
  par. 11.13

Press, calc.
12.2 Nozzle data *

This menu allows setting and viewing the values of the nozzles being used.

- First select Nozzles type (ISO or USR, Fig. 60).
- Then the computer automatically passes to the selection of the nozzle to be set (Fig. 61).

ISO nozzles CAN NOT BE MODIFIED.

- Press OK to automatically pass to the setting of the flowrate for the selected nozzle (Fig. 62).
- Press OK to automatically pass to the setting screen of the reference pressure (Fig. 63).

- Repeat the setup for each available "user" nozzle.

The data of the nozzle being used allow Bravo 180S to calculate the pressure without a pressure sensor.

### NOZZLES

<table>
<thead>
<tr>
<th>Nozzle type</th>
<th>Unit of measurement</th>
<th>Flowrate (GPM)</th>
<th>Pressure (PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO Orange</td>
<td>US - US TURF</td>
<td>0.100</td>
<td>40</td>
</tr>
<tr>
<td>ISO Green</td>
<td>US - US TURF</td>
<td>0.150</td>
<td>40</td>
</tr>
<tr>
<td>ISO Yellow</td>
<td>US - US TURF</td>
<td>0.200</td>
<td>40</td>
</tr>
<tr>
<td>ISO Lilac</td>
<td>US - US TURF</td>
<td>0.250</td>
<td>40</td>
</tr>
<tr>
<td>ISO Bluee</td>
<td>US - US TURF</td>
<td>0.300</td>
<td>40</td>
</tr>
<tr>
<td>ISO Red</td>
<td>US - US TURF</td>
<td>0.400</td>
<td>40</td>
</tr>
<tr>
<td>ISO Brown</td>
<td>US - US TURF</td>
<td>0.500</td>
<td>40</td>
</tr>
<tr>
<td>ISO Gray</td>
<td>US - US TURF</td>
<td>0.600</td>
<td>40</td>
</tr>
<tr>
<td>ISO White</td>
<td>US - US TURF</td>
<td>0.800</td>
<td>40</td>
</tr>
<tr>
<td>ISO Light blue</td>
<td>US - US TURF</td>
<td>1.000</td>
<td>40</td>
</tr>
<tr>
<td>ISO Light green</td>
<td>US - US TURF</td>
<td>1.500</td>
<td>40</td>
</tr>
<tr>
<td>ISO Black</td>
<td>US - US TURF</td>
<td>2.000</td>
<td>40</td>
</tr>
</tbody>
</table>

### USER SETTING

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS: TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS

Flow calculation  >  Pressure sensor par. 11.12
Press. calc.   ✓ par. 11.13
12.3 Minimum regulation pressure *

This menu allows setting a pressure value below which BRAVO 180S blocks the automatic regulation function (Disabled: block disabled).

Warning: The control is active ONLY during treatment AUTOMATIC control (par. 14.3.1).

For the procedure to be followed in case of alarms, please refer to par. 15.1 Operation errors.

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS

- Pressure sensor ✓ par. 11.11
- Press. calc. ✓ par. 11.13

12.4 Wheel selection **

Once the wheel constants (max. 3) have been saved, they can be retrieved as selection of the wheel type. As an alternative it is possible to retrieve the GPS source, only if it is enabled in the advanced setting.

The display will show only the types of wheel for which a constant has been set.

** MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS

- At least 2 types of wheel ✓ par. 11.7
- 1 type of wheel + GPS source ✓ par. 11.7

12.5 Minimum speed

BRAVO 180S interrupts the spraying when the detected speed is lower than the set one. (Disabled: block disabled).

Warning: The control is active ONLY during treatment AUTOMATIC control (par. 14.3.1).

For the procedure to be followed in case of alarms, please refer to par. 15.1 Operation errors.

12.6 Rate correction

When using a paddle flowmeter and the sprayed fluid has a different density than the water one, the computer could display wrong measurements; to correct them change the sprayed fluid factor:
- if at the end of the spraying the tank still contains fluid, reduce the factor;
- if the fluid finishes before the job has ended, increase the factor.

Rate correction 1.00

Set the density factor of the sprayed fluid.

Flowmeters of the ORION series (code 462xxx) are not affected by the density difference of the fluids: set the factor to 1.00.
12.7 Level correction

* MENU VISIBLE ONLY WITH SPECIFIC SETTINGS: TO VIEW IT, ENABLE THE INDICATED OPTION.

Tank source  > Level Sensor  par. 11.15

If the sprayed fluid has a different density than the water one, the computer could display wrong measurements; to correct them change the sprayed fluid weight for 1 l of product.

12.8 Display contrast

Allows adjusting the display contrast.

12.9 Test device

Allows checking the correct operation of Bravo 180S.

Tests are READING-ONLY data.

Display operation test

Battery voltage

Bravo 180S displays the supply voltage.

Working on the control panel switches it is possible to test their operation.

- Main control ON
- Section valves ON (the display shows the number of present sections)
- Proportional regulation (+ increase / - decrease)
- Presence of an external main control to start the spraying

Level Sensor

Pressure

Speed

Ext. Speed

Flow

The computer detects frequency and current sent by each sensor on the system.

Press the keys to view the relevant item.

Keys:

- RATE KEV
- LEFT KEV
- OK KEV
- RIGHT KEV
- AUTO KEV

GPS data

Latitude

Longitude

Satellites

HDOP

Status

Update frequency

If you connect a satellite receiver or a SKIPPER navigator, Bravo 180S displays the received GPS data.

SW Version

Bravo 180S displays software versions.
12.10 Totalizers

- there is a totalizer for each preset job (10 available), plus the “T00” one (that can not be reset) which includes all jobs performed by the device.
- the current job data are summed to the relevant totalizer each time you select a new job (par. 14.1).
- It is possible to save the totalizer reports on pendrive using the relevant function Export (Fig. 71).
- It is possible to delete all job data (par. 14.2).

**TOTALIZER RECORD FILE**

- SAVING THE TOTALIZER ON PENDRIVE
  - Select Export (Fig. 71) and press **OK**.
  - In the example of Fig. 72, Bravo 180S saves the **T01-0003.RPT** file on the pendrive.
  - At each following saving the computer will increase the report number (**T01-0004.RPT**, etc.)

Data in the file can be displayed on Personal Computer with a text editor. Each file will contain the following data*:

Job’s data
- Job No. : 01 [Active]
- Area : 0.000 ac
- Sprayed qty : 0 gal
- Time : 00:00 h
- Productivity : 0.0 ac/h
- Target rate : 32.1 GPA
- Rate applied : 0 GPA
- Nozzle type : ISO-Blue
- Nozzle qty : 40
- Distance : 0.000 miles

* These data represent just a mere example. In real facts they will always be different according to the type of treatment.

---

12.11 Settings manag.

The Bravo 180S settings can be loaded or saved on pendrive so as to reconfigure the device if necessary, solve problems or configure another Bravo 180S without repeating all operations manually.

Once installation is completed, and you checked machine correct operation, we recommend you to store the whole configuration onto pendrive.

To use the menu items inert the pendrive in the suitable slot (par. 7.2).

> **Save**

- Select Save (Fig. 73) and press **OK**.
  - The confirmation message **Ok SETUP.BIN** is displayed once the saving process is completed.
  - Press **ESC**.

Saving alarms:
- USB not found
- Pendrive not inserted.
- Error!
- Space available on pendrive is over: eliminate some files from the memory and try saving again.
  - If the problems persist, please contact the service centre.
- File not found
  - The SETUP.BIN configuration has not been saved on the pendrive.

> **Load**

- Select Load (Fig. 74) and press **OK**.
  - The confirmation message **Ok SETUP.BIN** is displayed once the configuration process is completed.
  - Press **ESC**.

Configuration alarm: pendrive not inserted.
13 USE

13.1 Display

Fig. 75

13.2 Controls on computer

Legend:
1 Keys to check the computer and the spraying phases
2 Operating switches for control unit valves
3 Switches to use the hydraulic functions

13.2.1 Keys to check the computer and the spraying phases

- Change value of output *
- LEFT Foam marker
- Data confirmation
- Data decrease / browsing
- Data increase / browsing
- ON/OFF
- Right Foam marker
- Manual / Automatic Output

* It allows resetting or setting the increase/decrease percentage of the output value.

13.2.2 Operating switches for control unit valves

Upon computer switching on, if main control is set to ON, the message Disable Main will be displayed: no function can be accessed until main control is set again to OFF.

Main control ON Main control OFF Open section Closed section Increase of output* Decrease of output*

* Manual function: increases/decreases the quantity of fluid to be sprayed; Automatic function: increases/decreases the quantity of fluid to be sprayed at intervals of 10% with respect to the set value.

13.2.3 Operating switches for hydraulic valves

Release of the boom Block of the boom Leveling of the boom clockwise Leveling of the boom counter-clockwise Increase of the boom height Decrease of the boom height Boom section movement: opening Boom section movement: closing

The LED turns on when one of the possible sprayer movements is activated.
Keep the relevant switch pressed to activate the movement. Release it to stop the movement.
14. TREATMENT PRELIMINARY SETTINGS

<table>
<thead>
<tr>
<th>TO BE CARRIED OUT UPON FIRST USE OF THE COMPUTER</th>
<th>SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed sensor</td>
<td>11.7</td>
</tr>
<tr>
<td>Boom width</td>
<td>11.5</td>
</tr>
<tr>
<td>Job setup</td>
<td>12.1</td>
</tr>
<tr>
<td>Nozzle data</td>
<td>12.2</td>
</tr>
<tr>
<td>Minimum regulation pressure</td>
<td>12.3</td>
</tr>
<tr>
<td>Minimum speed</td>
<td>12.5</td>
</tr>
<tr>
<td>Display contrast</td>
<td>12.8</td>
</tr>
<tr>
<td>Save settings to pendrive</td>
<td>12.10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TO BE CARRIED OUT BEFORE EACH TREATMENT</th>
<th>SET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select the wheel type</td>
<td>12.4</td>
</tr>
<tr>
<td>Flowrate correction factor</td>
<td>12.6</td>
</tr>
<tr>
<td>Level correction factor</td>
<td>12.7</td>
</tr>
<tr>
<td>Select the job program</td>
<td>14.1</td>
</tr>
<tr>
<td>Reset the totalizers</td>
<td>14.2</td>
</tr>
<tr>
<td>Tank filling</td>
<td>14.5.1</td>
</tr>
</tbody>
</table>

After having carried out the indicated settings start the treatment selecting between MANUAL (par. 14.3.2) and AUTOMATIC (par. 14.3.1) modes.

14.1 Selecting the job program (for automatic control only)

Before starting the treatment select the correct job, among those pre-set in the User Menu (Par. 12.1).

1. In the Spraying Menu, keep the key pressed to gain access to the job selection section.
2. Press to scroll the pre-set jobs.
3. Confirm selection.

*MENU VISIBLE ONLY WITH SPECIFIC SETTINGS:
TO VIEW IT, ENABLE ONE OF THE INDICATED OPTIONS:
Flow calculation > Pressure sensor par. 11.12
Press. calc. □ par. 11.13

14.2 Azzeramento dei totalizzatori

1. In the Spraying Menu, keep the key pressed to gain access to the job selection section.
2. Press to scroll the pre-set jobs.
3. Press the keys at the same time until viewing the message Reset?
4. Press OK to confirm the reset.
14.3 Application rate regulation

Bravo 180S regulates the chemical products output in two different ways.
Press the AUTO key to select the desired mode: the type of active regulation during the job will be displayed.

14.3.1 Automatic operation (DEFAULT)

Bravo 180S keeps the set application rate constant regardless of the changes in speed and boom section status.

If necessary, during spraying, it is possible to intervene on the dedicated switch to adjust output to crop conditions, increasing or decreasing momentarily the application rate up to ±50%.

Press RATE to restore the set output value.

1 Enable the automatic operation.
2 Open the desired section valves.
3 Position the tractor at the beginning of the field to be sprayed.
4 Turn the main switch to ON.
5 Start the treatment.
6 Use the control valve switch to temporary change the application rate.

14.3.2 Manual operation

Rate manual regulation shall be carried out with the suitable switch.

1 Enable the manual operation.
2 Open the desired section valves.
3 Position the tractor at the beginning of the field to be sprayed.
4 Turn the main switch to ON.
5 Start the treatment.
6 Use the control valve switch to adjust the desired quantity.

14.4 Automatic closure of the main valve (through SKIPPER)

BRAVO 180S can automatically switch off main valve through SKIPPER: the navigator can autonomously manage valve opening and closing, thus preventing the overlapping of already-sprayed areas.

To use the automatic closure, connect SKIPPER to BRAVO 180S and carry out the AUTOMATIC operation procedure (par. 14.3.1):
for further information, refer to the user’s manual supplied with the SKIPPER satellite navigator.

WARNING: automatic closing is NOT active during manual operation.
This menu contains the description of the functions available during the treatment.
A sub-menu is available for almost all data; to gain access to it press keys ▲ and ▼ at the same time for 1 second.

- **Instantaneous speed indication**

  ![Speed simul.](Speed simul. Yes)
  
  The driving speed simulation allows spraying the product even without a speed sensor installed on the wheels.
  
  The simulation is set to 6 km/h and can be varied by keeping key ▼ K pressed and pressing keys ▲ and ▼.
  
  With this function the application rate can not be the real one since the speed can not be detected.

- **Pressure indication**

  ![Reset?](Reset? 3 psi)
  
  Activate the "zero" calibration procedure of pressure sensor.
  
  In case a pressure value is displayed despite the absence of pressure inside the circuit, it is necessary to perform zero setup of the sensor.
  
  - Press ▼ K to reset the pressure sensor residual signal.
  
  ![Check sensor!](Faulty pressure values detected; check the transducer operation. If problem persists, check for residual pressure in the system.)

- **Instantaneous rate indication**

  ![Flow](Flow)
  
  ![Covered area count](Area)
  
  ![Sprayed fluid count](Sprayed qty)
  
  ![Tank level*](Tank level 0 gal)
  
  ![Operation time calculation*](Time)
  
  ![Traveled distance count*](Distance)

* this menu item is displayed only if the EXTENDED view mode of the spraying menu is selected (par. 11.17).
14.5.1  Tank filling

1 From the Spraying Menu, press until selecting **Tank level**.
2 Press the keys at the same time to access the tank filling procedure.

The filling will be managed in different ways according to the mode preset in the menu **Tank source** (par. 11.15). Possible options:
- Manual (**3a**)  
- Level Sensor (**3b**)  

**TANK LEVEL - MANUAL MODE**

From point 2 pass to menu **Tank filling**. BRAVO 180S displays the tank capacity: the value has been set in advanced setup.

**3a** Set the real quantity of fluid filled in the tank.

**4a** Press **OK** to confirm the data.

*It is not possible to set values higher than tank total capacity.*

**TANK LEVEL - LEVEL SENSOR MODE**

From point 2 pass to screen **Tank level**.

**3b** Press to scroll through the items:
- **Tank level**  
BRAVO 180S displays the real quantity of fluid inside the tank, detected by the level sensor.
- **Filled qty**  
Start the filling pump and stop it at the end of the filling procedure.

When the level sensor is connected, the display shows the filling data in real time.
15 MAINTENANCE / DIAGNOSTICS / REPAIRS

15.1 Operation errors

The indicated messages blink alternatively

<table>
<thead>
<tr>
<th>Job mode</th>
<th>Message on display / cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAN. + AUTO</td>
<td>Machine stopped! 0.0 MPH A</td>
<td>Move main switch downwards (position OFF).</td>
</tr>
<tr>
<td>AUTO</td>
<td>Machine stopped! Main switch ON with machine stopped</td>
<td>Start the farming machine. Move main switch downwards (position OFF).</td>
</tr>
<tr>
<td>AUTO</td>
<td>Missing flow! Main switch ON with machine stopped but rate at zero</td>
<td>Start the pump and move the farming machine.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Slow down! The rate does not reach the value required for output</td>
<td>Decrease the farming machine speed. Check that the flowmeter constant value has been set correctly.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Accelerate! The flowrate exceeds the value required for output</td>
<td>Increase the farming machine speed. Check that the flowmeter constant value has been set correctly.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Check sensor! Faulty pressure values have been detected</td>
<td>Check the pressure sensor status and make sure there is no residual pressure in the system.</td>
</tr>
<tr>
<td>MAN. + AUTO</td>
<td>USB not found The pendrive is not inserted correctly</td>
<td>Turn off the computer and check the insertion of the pendrive.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Error! The pendrive is blocked The pendrive has not free space</td>
<td>Switch off the computer and release the pendrive. Space needed for new information: delete the unnecessary files from the pendrive.</td>
</tr>
<tr>
<td>AUTO</td>
<td>File not found (SETUP.BIN) The computer configuration has not been saved</td>
<td>Save the data.</td>
</tr>
<tr>
<td>AUTO</td>
<td>File not found (TANK.TKL) The tank configuration has not been saved</td>
<td>Save the data.</td>
</tr>
<tr>
<td>AUTO</td>
<td>Wrong file The file relevant to the computer configuration (SETUP.BIN) is faulty. The file relevant to the tank configuration (TANK.TKL) is faulty.</td>
<td>Try to save the data again.</td>
</tr>
<tr>
<td>AUTO</td>
<td>GPS timeout Wrong cable connection for receiver The receiver connection cable is damaged The receiver is damaged</td>
<td>Check connection to receiver Replace the cable Replace the receiver.</td>
</tr>
</tbody>
</table>
### 15.2 Troubleshooting

<table>
<thead>
<tr>
<th>FAULT</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>The display does not switch on</td>
<td>No power supply</td>
<td>• Check power supply connection (par. 8.2)</td>
</tr>
<tr>
<td></td>
<td>Computer is OFF</td>
<td>• Press the ON key</td>
</tr>
<tr>
<td>Valve controls take no effect</td>
<td>Valves not connected</td>
<td>• Connect the connectors (par. 9.2)</td>
</tr>
<tr>
<td>One valve does not open</td>
<td>No power supply to valve</td>
<td>• Check valve electric connection and operation</td>
</tr>
<tr>
<td>The display no longer shows the speed</td>
<td>Wrong setup</td>
<td>• Check the setup of the wheel constant (par. 11.7)</td>
</tr>
<tr>
<td></td>
<td>No signal coming from the speed sensor</td>
<td>• Check connections to speed sensor (par. 9.4)</td>
</tr>
<tr>
<td>The displayed speed is not precise</td>
<td>Wrong setup</td>
<td>• Check the setup of the wheel constant (par. 11.7)</td>
</tr>
<tr>
<td>Output volume readout inaccurate</td>
<td>Wrong setup</td>
<td>• Check the setup of the boom width (par. 11.5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check the setup of the section valve type (par. 11.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check connections to speed sensor (par. 9.4)</td>
</tr>
<tr>
<td>Covered area count displayed does not match actual distance covered</td>
<td>Wrong setup</td>
<td>• Check the setup of the wheel constant (par. 11.7)</td>
</tr>
<tr>
<td></td>
<td>The totalizer has not been reset</td>
<td>• Reset the totalizer (par. 14.2)</td>
</tr>
<tr>
<td>Distance traveled count displayed does not match actual distance covered</td>
<td>Wrong setup</td>
<td>• Check the setup of the wheel constant (par. 11.7)</td>
</tr>
<tr>
<td></td>
<td>The totalizer has not been reset</td>
<td>• Reset the totalizer (par. 14.2)</td>
</tr>
<tr>
<td>Sprayed fluid count displayed does not match litres/gpm actually sprayed</td>
<td>Wrong setup</td>
<td>• Check the setup of the flowmeter constant (par. 11.9)</td>
</tr>
<tr>
<td></td>
<td>Use of three-way section valves without setting calibrated backflows</td>
<td>• Perform setting</td>
</tr>
<tr>
<td></td>
<td>The totalizer has not been reset</td>
<td>• Reset the totalizer (par. 14.2)</td>
</tr>
<tr>
<td>Unable to reach output volume value set for the automatic operation</td>
<td>Wrong setup</td>
<td>• Check application rate setup (par. 12.1)</td>
</tr>
<tr>
<td></td>
<td>System not adequately sized to provide required rate</td>
<td>• Check the setup of the boom width (par. 11.5)</td>
</tr>
<tr>
<td></td>
<td>Control valve malfunction</td>
<td>• Check maximum pressure valve adjustment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Make sure control valve is adequate for specific system</td>
</tr>
<tr>
<td>Instantaneous pressure readout inaccurate</td>
<td>Wrong setup</td>
<td>• Check full scale setup for pressure sensor (par. 11.11)</td>
</tr>
<tr>
<td></td>
<td>Pressure sensor not calibrated</td>
<td>• Check the settings of the nozzles being used (par. 12.1 - 11.14 - 11.5)</td>
</tr>
<tr>
<td></td>
<td>Pressure sensor wrong installation</td>
<td>• Perform the calibration (par. 14.5)</td>
</tr>
<tr>
<td></td>
<td>• Check connections to pressure sensor (par. 9.4)</td>
<td></td>
</tr>
<tr>
<td>Instantaneous pressure is not displayed</td>
<td>Wrong setup</td>
<td>• Check pressure sensor setting (par. 11.11)</td>
</tr>
<tr>
<td></td>
<td>Computer does not receive signals from pressure sensor</td>
<td>• Check connections to pressure sensor (par. 9.4)</td>
</tr>
<tr>
<td>Pressure sensor wrong installation</td>
<td>• Check connections to pressure sensor (par. 9.4)</td>
<td></td>
</tr>
<tr>
<td>The displayed tank level is not precise</td>
<td>Level sensor not calibrated</td>
<td>• Perform the calibration (par. 11.16)</td>
</tr>
<tr>
<td></td>
<td>Level sensor wrong installation</td>
<td>• Calibrate the level sensor again (par. 11.16)</td>
</tr>
<tr>
<td>During the tank calibration procedure, the sprayed quantity is always steady on zero</td>
<td>Wrong installation / no flowmeter installed.</td>
<td>• Check connections to the flowmeter (par. 9.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Install the flowmeter (par. 7.1)</td>
</tr>
<tr>
<td></td>
<td>Section valves and main control valve set to OFF</td>
<td>• Take section valves and main control valve to ON (par. 13.2.2)</td>
</tr>
</tbody>
</table>

### 15.3 Cleaning rules

- Clean only with a soft wet cloth.
- DO NOT use aggressive detergents or products.
- DO NOT clean equipment with direct water jets.
## TECHNICAL DATA

### Advanced menu

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Min.</th>
<th>Max.</th>
<th>UoM</th>
<th>DEFAULT</th>
<th>Other values that can be set / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>Display language</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>English</td>
<td>English, Italian, Spanish, Portuguese, French, German, Polish, Croatian, Hungarian, Greek, Russian, Turkish, Czech.</td>
</tr>
<tr>
<td>Units of measur.</td>
<td>Display unit of measurement</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>EU</td>
<td>US, US TURF</td>
</tr>
<tr>
<td>No. of sections</td>
<td>Number of section valves in the system</td>
<td>1</td>
<td>7</td>
<td>--</td>
<td>5</td>
<td>--</td>
</tr>
<tr>
<td>Total boom width</td>
<td>Section 1 ÷ 7</td>
<td>0.0</td>
<td>100.0</td>
<td>ft</td>
<td>13.1</td>
<td>To view this value it is necessary to set the width of each boom section</td>
</tr>
<tr>
<td>Variable rate</td>
<td>Application rate regulation carried out through Skipper</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>GPS source</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Valves</td>
<td>Section valves</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3-Ways 2-Ways</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sections manag.</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Manual (P Mode) Auto (M Mode)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Regulation</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3-Ways 2-Ways</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Main</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>3-Ways 2-Ways</td>
<td></td>
</tr>
<tr>
<td>Flowmeter</td>
<td>Orion</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Data necessary to calculate the rate</td>
</tr>
<tr>
<td></td>
<td>Other...</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Flowmeter const.</td>
<td>Constant</td>
<td>Disabled</td>
<td>30000</td>
<td>US - TURF:</td>
<td>2271</td>
<td>Data necessary to calculate the rate</td>
</tr>
<tr>
<td>Pressure sensor</td>
<td>Data necessary to determine the instantaneous pressure</td>
<td>Disabled</td>
<td>14500</td>
<td>US - TURF:</td>
<td>Disabled</td>
<td>--</td>
</tr>
<tr>
<td>Flow calculation*</td>
<td>Sensor used to calculate the output</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Flowmeter</td>
<td>Pressure sensor Only if the pressure sensor is enabled</td>
</tr>
<tr>
<td>Press. calc.</td>
<td>Enabling/disabling the pressure calculation</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Nozzle qty*</td>
<td>Number of nozzles on the boom</td>
<td>1</td>
<td>1000</td>
<td>--</td>
<td>40 * Only if “Yes” is set in the previous item (Pressure calc.).</td>
<td></td>
</tr>
<tr>
<td>Tank source</td>
<td>The active option affects the entire configuration of the Setup Cisterna</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Manual Level Sensor</td>
<td></td>
</tr>
<tr>
<td>Tank Setup</td>
<td>Manual</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Tank volume</td>
<td>Manual</td>
<td>1</td>
<td>5500 US - TURF:</td>
<td>1000</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Tank reserve</td>
<td>No</td>
<td>264 US - TURF:</td>
<td>50</td>
<td>Below this value the computer triggers an acoustic and visual alarm</td>
<td></td>
</tr>
<tr>
<td>Spraying Menu</td>
<td>Allows selecting whether to view the totalizers</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Large</td>
<td>Short</td>
</tr>
</tbody>
</table>

### User menu

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Min.</th>
<th>Max.</th>
<th>UoM</th>
<th>DEFAULT</th>
<th>Other values that can be set / Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs setup</td>
<td>Select a job that can be set</td>
<td>1</td>
<td>10</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Rate type</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Constant Variable, Disabled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Target rate</td>
<td>Off</td>
<td>600</td>
<td>US - TURF:</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Nozzle type</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>ISO</td>
<td>USR A ÷ E</td>
</tr>
<tr>
<td>Nozzle data</td>
<td>Nozzles type</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>Selection of nozzle to be set: ISO, USR</td>
</tr>
<tr>
<td></td>
<td>Flow</td>
<td>0.01</td>
<td>99.99</td>
<td>US - TURF:</td>
<td>1.00</td>
<td>Value that can be modified ONLY for customised nozzles</td>
</tr>
<tr>
<td></td>
<td>Pressure</td>
<td>0.00</td>
<td>9999</td>
<td>US - TURF:</td>
<td>3.0</td>
<td>--</td>
</tr>
<tr>
<td>Wheel selection</td>
<td>Selection of pre-set wheel</td>
<td>1</td>
<td>3</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Minimum speed</td>
<td>Below this set value the computer interrupts the spraying</td>
<td>Disabled</td>
<td>99.9</td>
<td>US - TURF:</td>
<td>Disabled</td>
<td>--</td>
</tr>
<tr>
<td>Rate correction</td>
<td>Fluid density factor</td>
<td>0.01</td>
<td>10.0</td>
<td>--</td>
<td>1.00</td>
<td>--</td>
</tr>
<tr>
<td>Level correction</td>
<td>Fluid weight</td>
<td>0.01</td>
<td>1000.0</td>
<td>US - TURF:</td>
<td>1.00</td>
<td>--</td>
</tr>
<tr>
<td>Display contrast</td>
<td>Contrast adjustment</td>
<td>0</td>
<td>100</td>
<td>%</td>
<td>50</td>
<td>--</td>
</tr>
</tbody>
</table>
### Output values

<table>
<thead>
<tr>
<th>Data</th>
<th>Min.</th>
<th>Max.</th>
<th>UoM</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume applied</td>
<td>0.0</td>
<td>99999.9</td>
<td>US: GPA</td>
<td>Quantity of sprayed fluid for unit of surface</td>
<td>Shown on the first line of the display, during treatment</td>
</tr>
<tr>
<td>Speed</td>
<td>0.0</td>
<td>199.9</td>
<td>US: MPH</td>
<td>Vehicle driving speed</td>
<td></td>
</tr>
<tr>
<td>Pressure</td>
<td>0.0</td>
<td>9999</td>
<td>US: PSI</td>
<td>Output pressure</td>
<td>Present only if YES has been set in the advanced menu &quot;Pressure calculation&quot;</td>
</tr>
<tr>
<td>Flow</td>
<td>0.0</td>
<td>999.9</td>
<td>US: GPM</td>
<td>Fluid sprayed per time unit</td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>0.000</td>
<td>999999</td>
<td>US: acres</td>
<td>Sprayed surface</td>
<td>Floating point</td>
</tr>
<tr>
<td>Sprayed qty</td>
<td>0.0</td>
<td>999999</td>
<td>US: gal</td>
<td>Sprayed fluid</td>
<td>The totalizer increases when the main switch is ON</td>
</tr>
<tr>
<td>Tank level</td>
<td>0.0</td>
<td>5500</td>
<td>US: gal</td>
<td>Remaining fluid in the tank</td>
<td>Floating point</td>
</tr>
<tr>
<td>Time</td>
<td>00:00</td>
<td>10000</td>
<td>EU: h</td>
<td>Treatment time</td>
<td>The totalizer increases when the main switch is ON</td>
</tr>
<tr>
<td>Distance</td>
<td>0.000</td>
<td>999999</td>
<td>US: miles</td>
<td>Traveled distance</td>
<td>Floating point</td>
</tr>
</tbody>
</table>

### Computer technical data

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>Alphanumeric LCD</td>
</tr>
<tr>
<td></td>
<td>2 lines x 16 characters, backlit</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>11 ÷ 14 Vdc</td>
</tr>
<tr>
<td>Consumption (valves excluded)</td>
<td>150 mA</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>+32°F ÷ +140 °F</td>
</tr>
<tr>
<td></td>
<td>0°C ÷ 60 °C</td>
</tr>
<tr>
<td>Digital inputs</td>
<td>for open collector sensors: max 2000 imp/s</td>
</tr>
<tr>
<td>Weight</td>
<td>28.22 oz - Bravo without hydraulic controls</td>
</tr>
<tr>
<td></td>
<td>40.21 oz - Bravo with hydraulic controls (without harness)</td>
</tr>
<tr>
<td>Protection against polarity inversion</td>
<td>*</td>
</tr>
<tr>
<td>Protection against short-circuit</td>
<td>*</td>
</tr>
</tbody>
</table>
17 END-OF-LIFE DISPOSAL

Dispose of the system in compliance with the established legislation in the country of use.

18 GUARANTEE TERMS

1. ARAG s.r.l. guarantees this apparatus for a period of 360 days (1 year) from the date of sale to the client user (date of the goods delivery note).
   The components of the apparatus, that in the unappealable opinion of ARAG are faulty due to an original defect in the material or production process, will be repaired or replaced free of charge at the nearest Assistance Center operating at the moment the request for intervention is made. The following costs are excluded:
   - disassembly and reassembly of the apparatus from the original system;
   - transport of the apparatus to the Assistance Center.
2. The following are not covered by the guarantee:
   - damage caused by transport (scratches, dents and similar);
   - damage due to incorrect installation or to faults originating from insufficient or inadequate characteristics of the electrical system, or to alterations resulting from environmental, climatic or other conditions;
   - damage due to the use of unsuitable chemical products, for spraying, watering, weedkilling or any other crop treatment, that may damage the apparatus;
   - malfunctioning caused by negligence, mishandling, lack of know how, repairs or modifications carried out by unauthorized personnel;
   - incorrect installation and regulation;
   - damage or malfunction caused by the lack of ordinary maintenance, such as cleaning of filters, nozzles, etc.;
   - anything that can be considered to be normal wear and tear;
3. Repairing the apparatus will be carried out within time limits compatible with the organizational needs of the Assistance Center. No guarantee conditions will be recognized for those units or components that have not been previously washed and cleaned to remove residue of the products used;
4. Repairs carried out under guarantee are guaranteed for one year (360 days) from the replacement or repair date.
5. ARAG will not recognize any further expressed or intended guarantees, apart from those listed here. No representative or retailer is authorized to take on any other responsibility relative to ARAG products. The period of the guarantees recognized by law, including the commercial guarantees and allowances for special purposes are limited, in length of time, to the validities given here. In no case will ARAG recognize loss of profits, either direct, indirect, special or subsequent to any damage.
6. The parts replaced under guarantee remain the property of ARAG.
7. All safety information present in the sales documents regarding limits in use, performance and product characteristics must be transferred to the end user as a responsibility of the purchaser.
8. Any controversy must be presented to the Reggio Emilia Law Court.
Conformity Declaration

ARAG s.r.l.
Via Palladio, 5/A
42048 Rubiera (RE) - Italy
P.IVA 01801480359

Dichiara

che il prodotto

descrizione: Computer

modello: Bravo 180S
serie: 46718xxxx

risponde ai requisiti di conformità contemplati nelle seguenti Direttive Europee:

2004/108/CE
(Compatibilità Elettromagnetica)

Riferimenti alle Norme Applicate:

UNI EN ISO 14982
(Macchine agricole e forestali - Compatibilità elettromagnetica
Metodi di prova e criteri di accettazione)

Rubiera, 22 aprile 2013

Giovanni Montorsi

(Presidente)
Only use genuine ARAG accessories or spare parts to make sure manufacturer guaranteed safety conditions are maintained in time. Always refer to ARAG spare parts catalogue.