



bravo350

**BRAVO 350 SERIES COMPUTER
ORCHARD SPRAYER
DIRECT CONNECTION**

CE

467354XXXX

Software rel. 1.3.x

INSTALLATION, USE AND MAINTENANCE

 = Generic danger

 = Warning

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• MANUAL FOREWORD AND USE

This manual provides instructions to assemble, connect and set the computers of the BRAVO 350 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.

INSTALLATION MUST BE CARRIED OUT ONLY BY AUTHORIZED AND SPECIFICALLY TRAINED PERSONNEL. THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY OPERATION SPECIFIED IN THIS MANUAL CARRIED OUT BY UNAUTHORIZED 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 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.**

2 INTENDED USE

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.

 **This device is designed to work on agricultural machinery for spraying and crop spraying applications. The equipment is designed and manufactured in compliance with UNI EN ISO 14982 standard (Forestry and farming machines - Electromagnetic compatibility - Test methods and acceptance criteria), harmonized with EMC - 2014/30/EU Directive.**

3 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 350 and disconnect the power cables.
 - Only use ARAG genuine spare parts and accessories.

4 PACKAGE CONTENT



Fig. 1

- 1 Bravo 350 direct connection / Bravo 350 direct connection with bulkhead actuators
- 2 Power cable length 3m
- 3 Power supply connector
- 4 Connection cable for:
BRAVO 350 - Sensors - Ultrasonic sensors - Control unit (main valve + control valve) - Control unit with solenoid or motorized section valves - Bulkhead actuators (if provided)
- 5 Seals for valve connectors
- 6 Fixing kit

Sensors, control units and accessories must be ordered separately (Ref. ARAG general catalog).

5 SYSTEM RECOMMENDED COMPOSITION

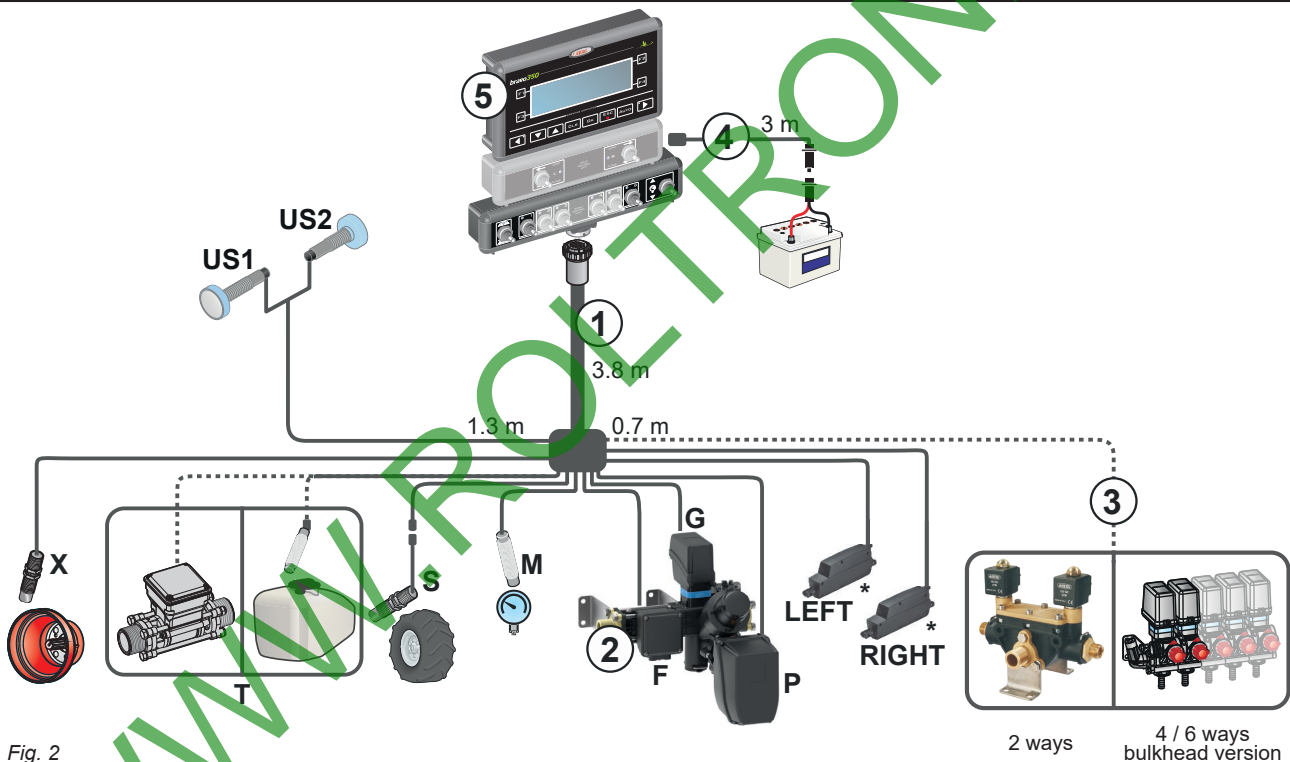


Fig. 2

Legend:

- 1 Connection cable for:
BRAVO 350 - Sensors - Ultrasonic sensors - Control unit (main valve + control valve) - Control unit with solenoid section valves
- 2 Control unit (**G** main valve + **P** control valve)
- 3 Control unit (**1 + 6** solenoid section valves) / (**1 + 6** motorized section valves)
- 4 Power cable for Bravo 350
- 5 Bravo 350 with direct connection

Sensors:


- X** RPM sensor (in the version with bulkheads there is no RPM sensor)
- T** Filling flowmeter or Level sensor
- S** Speed sensor
- M** Pressure sensor
- F** Flowmeter
- US1+US2** Ultrasonic sensors

VERSION WITH BULKHEADS:

- LEFT** Left bulkhead actuator
- RIGHT** Right bulkhead actuator

5.1 Monitor position

BRAVO 350 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 (chap. 5), the cable length, and make sure there is enough space for connectors and cables.

Next to each connector there is the symbol identifying the function performed. For any reference to system configuration, see chap. 5.

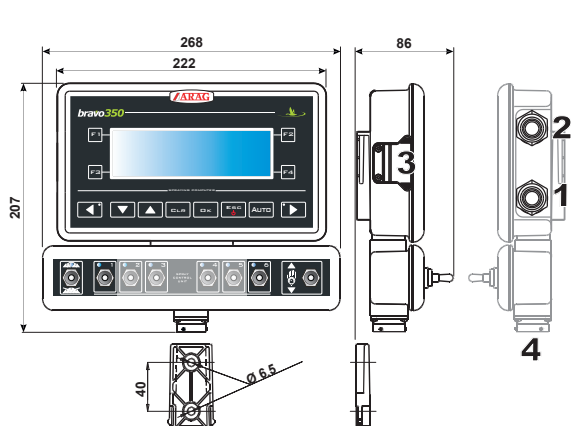


Fig. 3

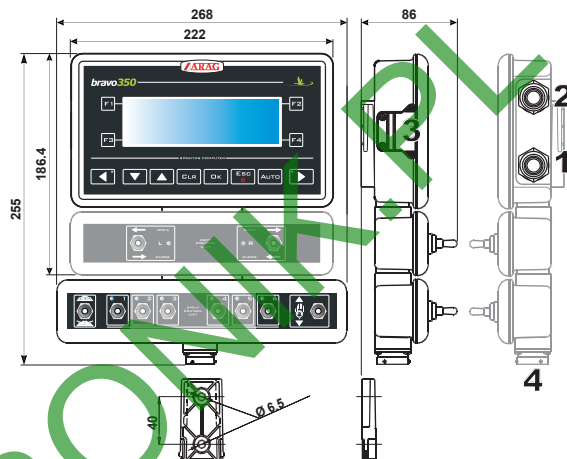


Fig. 4

No.	Monitor connection points
1	Monitor power supply
2	Auxiliary connections
3	USB
4	Control units - sensors - bulkhead actuators (if provided)

5.2 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. 5) 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).

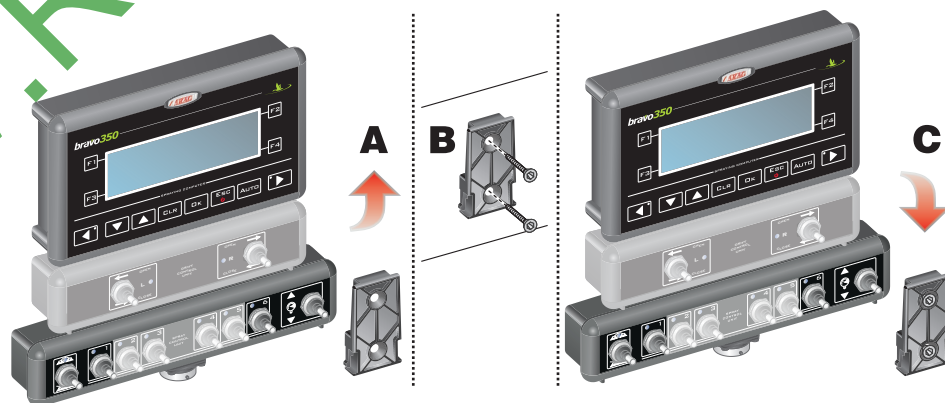


Fig. 5

5.3 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.

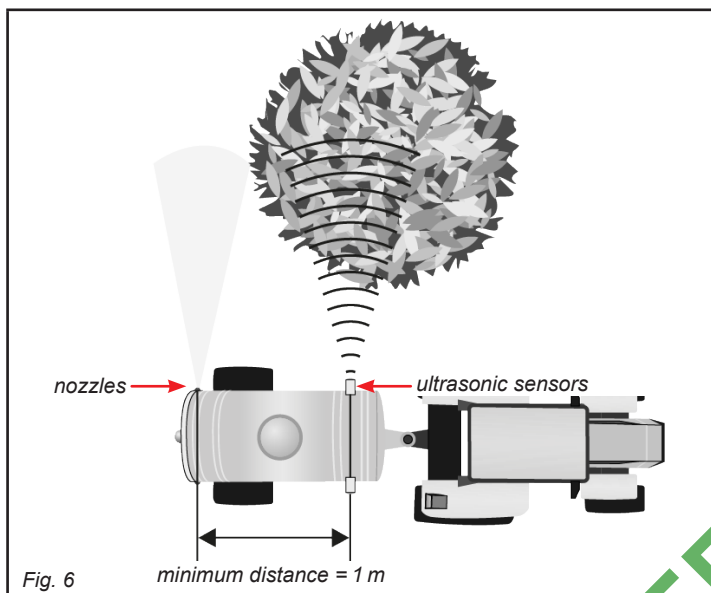
 **MAKE SURE TO FOLLOW ALL THE SAFETY INSTRUCTIONS GIVEN IN THE CONTROL UNIT'S MANUAL.**

5.4 Installation of ultrasonic sensors

The computer does not include the ultrasonic sensors; if you wish to install them, purchase two sensor kits code 46738000.500. Each kit includes an ultrasonic sensor and an adapter cable.

Computer correct operation is ensured only if ARAG-distributed sensors are used: use of unsuitable sensors not provided by ARAG automatically voids the warranty. ARAG is not liable for any damage to the equipment, persons or animals caused by failure to observe the above indications.

-  **WE RECOMMEND INSTALLING SENSORS AT A MINIMUM DISTANCE OF 1 M FROM NOZZLES:**
- TO AVOID THAT PLANT DETECTION IS DISTORTED BY THE SPRAYED FLUID.
 - TO ALLOW OPENING VALVES WITH THE CORRECT ADVANCE, IN ORDER TO ACCURATELY SPRAY THE PLANT.

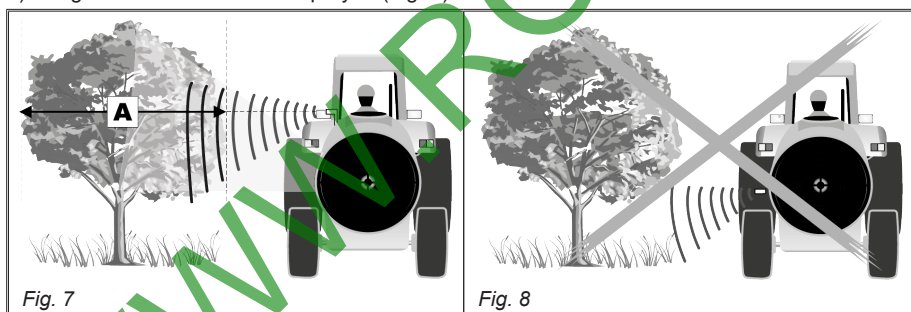


Based on system configuration, on your computer and on the height of the plants to be sprayed, agree with the user whether sensors have to detect the foliage or the trunk of the plant.

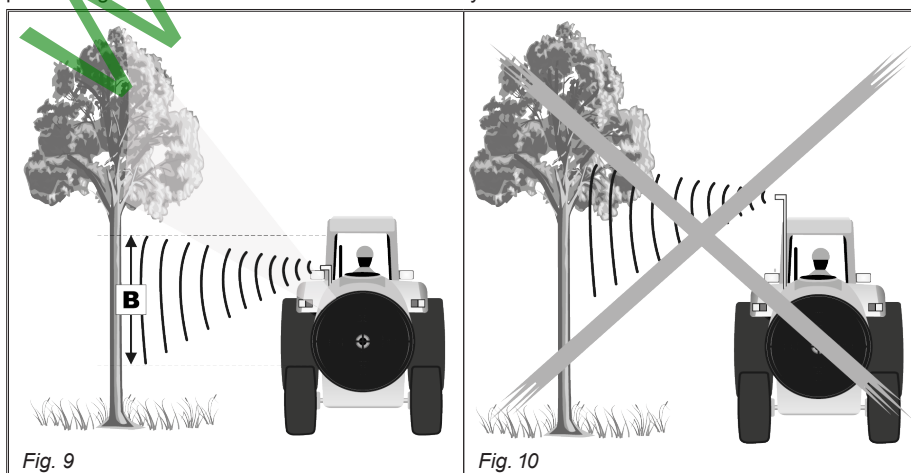
Whenever possible, it is recommended to always position sensors in front of the foliage, at a height allowing them to detect its widest part (**A**, Fig. 7); should this not be possible, sensors will have to detect the trunk, hence their positions will have to ensure trunk correct detection (**B**, Fig. 9), excluding brushwood (Fig. 8, too low position) or part of the foliage (Fig. 10, too high position).

Based on the type of crop and on the expected result, the machine can be configured in different ways:

1) foliage can be detected and sprayed (Fig. 7).



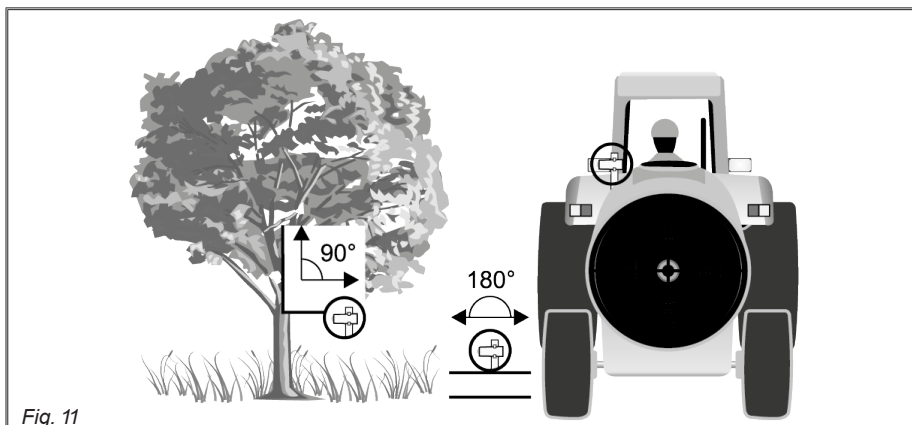
2) trunk only can be detected, hence it will be possible to spray only based on whether the plant is present or not (Fig. 9); this situation occurs when plant foliage is much taller than the machine and you do not want to build a scaffold for sensor correct positioning.



6.4.1 Fixing of sensors on the machine

After having located sensor position, based on the height of the plants you wish to spray, select the fixing point on the machine and fix sensors by following the instructions provided by the manufacturer.

WARNING: sensors must be always fixed parallel with the ground and at a right angle to the plant to be sprayed (Fig. 11).



6 WIRING CONNECTIONS

- ⚠ • 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 any damage to the equipment, persons or animals caused by failure to observe the above instructions.

🖐 Use ONLY the cables and accessories indicated in the catalog, having technical features suitable for the use to be made of them.

6.1 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 facing down (Fig. 13).



Fig. 13

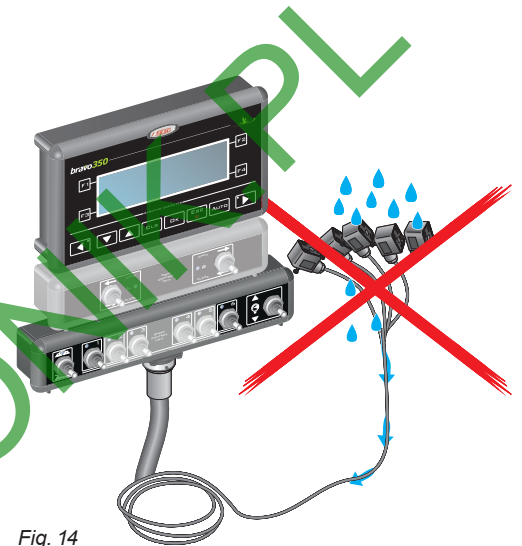


Fig. 14

6.2 Power supply connection

Connect the multicore connector to the monitor, check it is correctly connected, and turn the ring nut clockwise until connector blocking.

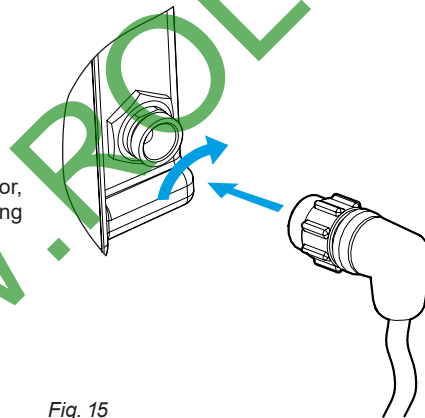


Fig. 15

6.3 Connection to the control unit valves and to the solenoid section valves

Fix the connectors to the relevant valves according to the indicated initials.

- Remove the protective cap (1) from the 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.

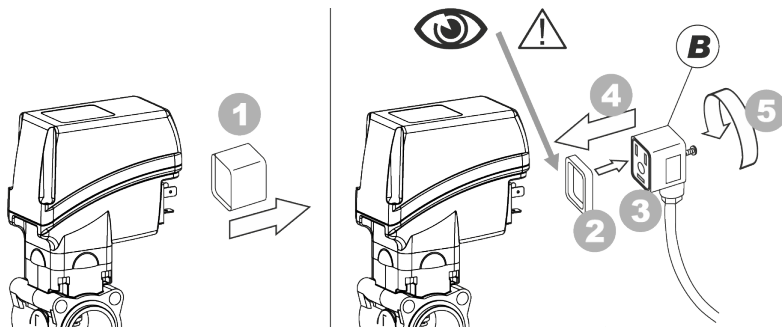


Fig. 16

! All connectors used for connection to valves must be equipped with a seal before the connection is carried out. Check that the seal is properly positioned to prevent water infiltrations when using the control unit.

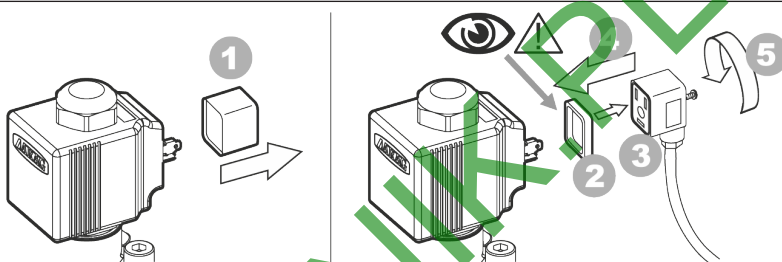


Fig. 17

• CONTROL UNIT

LABEL	CONNECTION
G	Main valve
P	Control valve

• SOLENOID SECTION VALVE UNIT

LABEL	CONNECTION
1	Solenoid section valve no.1
2	Solenoid section valve no.2

• MOTOR-DRIVEN SECTION VALVE UNIT

LABEL	CONNECTION
1	Motor-driven section valve no.1
2	Motor-driven section valve no.2
3	Motor-driven section valve no.3
4	Motor-driven section valve no.4
5	Motor-driven section valve no.5
6	Motor-driven section valve no.6

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

No. of section valves	Switches to be used	Cables to be connected to the valves
2	3 - 4	1 - 2
4	2 - 3 - 4 - 5	1 - 2 - 3 - 4
6	1 - 2 - 3 - 4 - 5 - 6	1 - 2 - 3 - 4 - 5 - 6

! ONLY FOR 4- / 6-WAY VERSIONS WITH MOTORIZED VALVES:
USE THIS TYPE OF VALVES ONLY AND EXCLUSIVELY FOR ESPALIER CROPS.

6.4 Connection of ultrasonic sensors

Connect the ultrasonic sensor connectors: after having made sure that they are duly inserted, turn ring nut **A** until it locks in place.

WARNING: always check the correspondence between sensors (cable marking) and sections, in order to spray exactly in the point detected by the sensor.

The table below shows the correspondences between sensors and sections.

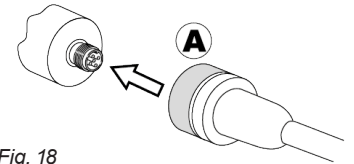


Fig. 18

Sensor position	Configuration	Marking of corresponding	Section sensor cable	Section position
<p>US1 US2</p>	<p>2 SENSORS 2 SECTIONS</p>	US1	1	<p>1 2</p>
		US2	2	
<p>US1 US2</p>	<p>2 SENSORS 4 SECTIONS</p>	US1	1	<p>2 3 1 4</p>
			2	
		US2	3	
			4	
<p>US1 US2</p>	<p>2 SENSORS 6 SECTIONS</p>	US1	1	<p>3 4 2 5 1 6</p>
			2	
			3	
		US2	4	
			5	
			6	

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6.5 Connection of sensors and available functions

ARAG sensors feature a Tyco Superseal® connector. Insert the connector fully home until the locking tab clicks into place. The single products are supplied with the sensor connecting instructions.



Fig. 19



Fig. 20

LABEL	CONNECTION
F	Flowmeter
S	Speed sensor
M	Pressure sensor
T	Filling flowmeter or Level sensor
X	RPM sensor (not available in bulkhead version)

Connection of bulkhead controls:

LABEL	CONNECTION
LEFT	Left bulkhead actuator
RIGHT	Right bulkhead actuator

6.6 Power supply connection

The package includes the power connector (component 3, Fig. 1) to be connected to the farming machine battery; Fig. 23 shows the drilling template of the power connector. Connect the power connector to the battery wires using two 6-mm faston connectors, as indicated in Fig. 21 and Fig. 22. Use the cable provided with the package (component 2, Fig. 1) to connect the computer to the power supply.



Fig. 21

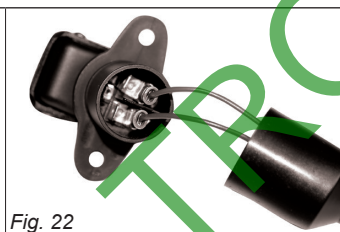


Fig. 22

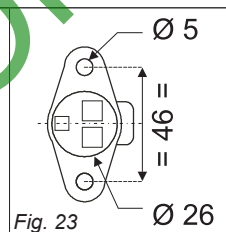


Fig. 23

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 350 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 350 remains on for a long time with 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. 24: the computer must be connected directly to the farming machine battery. Do NOT connect the computer to key-on power (15/54).

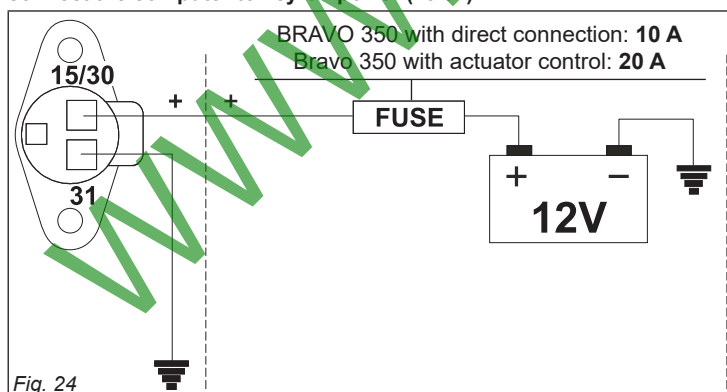


Fig. 24

WARNING:

- The power circuit shall ALWAYS be protected by a fuse like the ones for automotive applications: 10 Amperes / 20 Ampere for version with bulkhead actuator control.
- All cables connected to the battery shall have a minimum cross-section of 2.5 sq. mm. To avoid short-circuits, connect the power cable connector only after completing installation.
- Use cables with suitable terminals ensuring correct connection of all wires.

7 SETTING

7.1 Tests and checks before setting

Before computer setting, 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.

7.2 Computer switching on/off

• Ordinary switching on

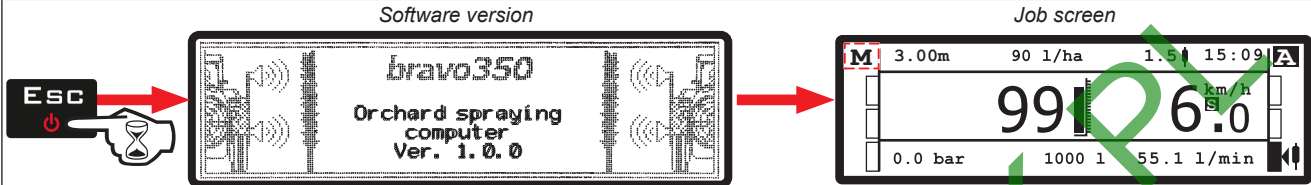


Fig. 25

Keep key **ESC** pressed until switching on the display: after the software version, BRAVO 350 displays the job screen (Fig. 25).

NOTE: The starting screen changes according to the model you have purchased.

• Switching on to activate the advanced setup

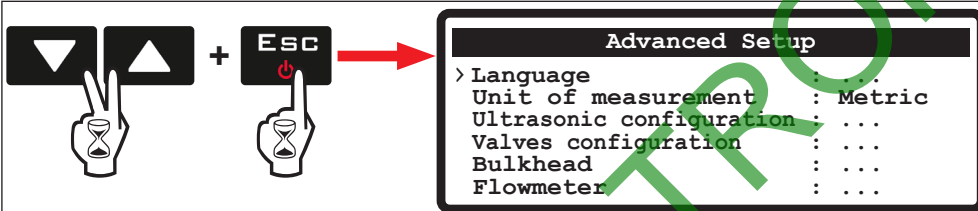


Fig. 26

Press the key sequence simultaneously until switching Bravo on. Release key **ESC** keeping pressed the arrow keys until the display shows the menu **Advanced Setup** (Fig. 26).

• Switching off




Fig. 27

Keep key **ESC** pressed until the display shows the message **WAIT: saving data**. Release the key and wait for the saving process to complete (Fig. 27); after a few seconds the computer turns off.

During switching off do **NOT** press any other key and do **NOT** disconnect the power supply until BRAVO 350 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.

7.3 Use of keys for setting

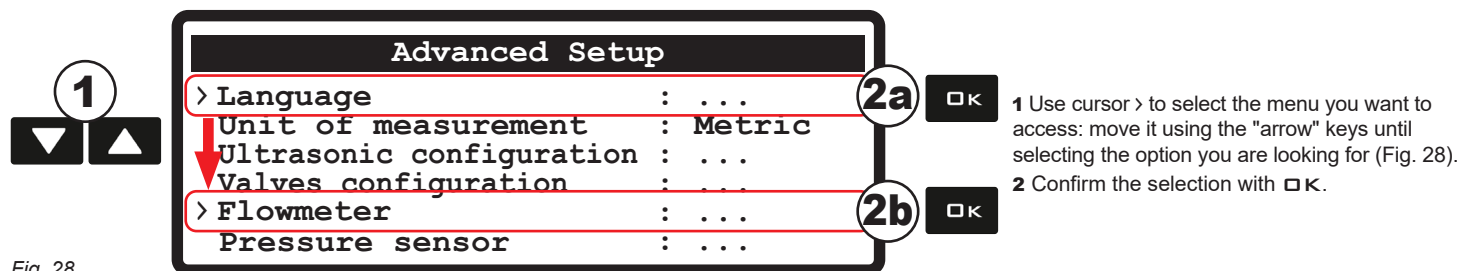


Fig. 28

DATA SELECTION

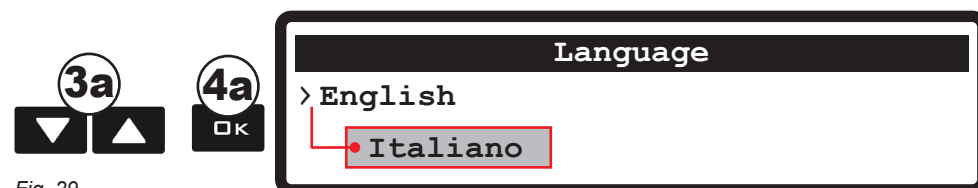


Fig. 29

When it is about a simple selection of data, BRAVO 350 displays the active value (2a, Fig. 28).

3a Press the arrow keys one after the other to select another item; the display will show the selected item.

If it is possible to disable the data press **CLR**: in this case the display will show the item **Disabled**.

4a Confirm with **OK**.

Item quick scrolling: keep one of the arrow keys pressed.

*Exit without confirming the change: press **ESC**.*

ACCESS TO A SUBMENU

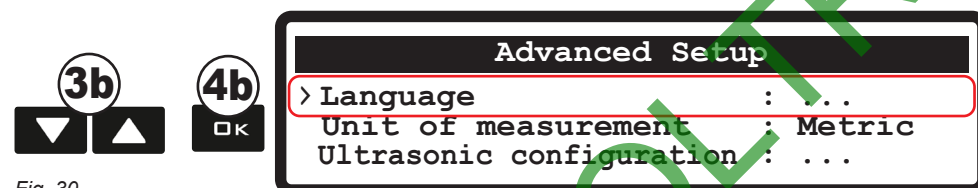


Fig. 30

In case of a submenu BRAVO 350 displays three dots "... " (2b, Fig. 28).

3b Press the arrow keys in succession to move across the menu items. The cursor > will move onto the selected one.

4b Press **OK** to access the submenu.

Item quick scrolling: keep one of the arrow keys pressed.

*Exit without confirming the change: press **ESC**.*

ENTERING A NUMERICAL VALUE

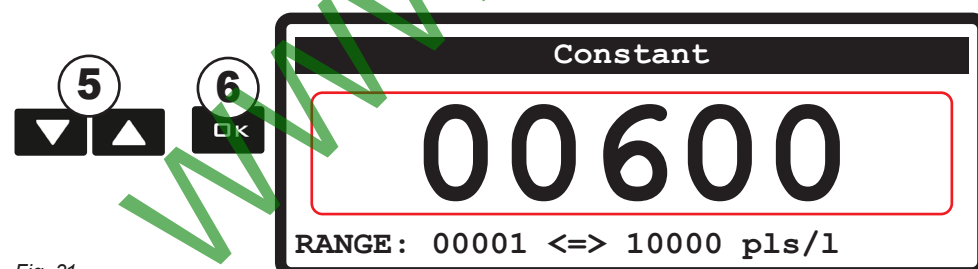


Fig. 31

5 Press the arrow keys in succession to change the value.

To reset the data press **CLR**.

6 Press **OK** to confirm the data.

Quick increase/decrease of the value: keep one of the arrow keys pressed.

*Exit without confirming the change: press **ESC**.*

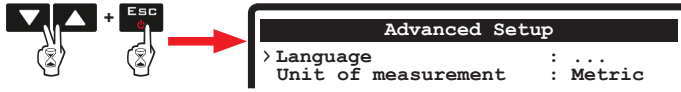
8 ADVANCED SETUP



This operation must be done once only, when installing the computer.

ACCESS TO ADVANCED SETUP (WITH COMPUTER OFF)

- Press the key sequence simultaneously until switching Bravo 350 on.
- Release the key **ESC** by keeping the arrow keys pressed until the menu is displayed



For a correct use of the keys during setting, refer to Par. 7.3.

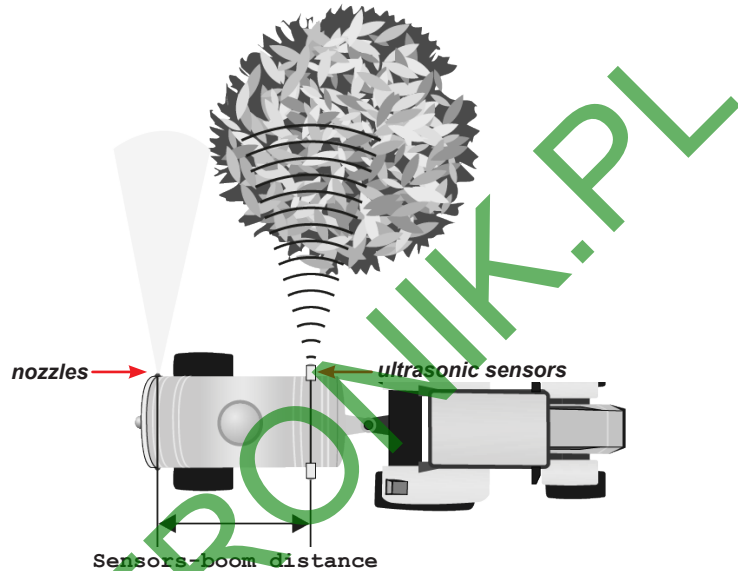
	Menu	Default	Min	Max	Other values that can be set / Notes
	Language	English	---	---	Italiano - English - Español - Deutsch - Français - Português - Ελληνικά
	Unit of measurement	Metric (l/h, km/h, bar)	---	---	US (GPA, mil/h, PSI) - Metr. L/100m
Par. 8.1	Ultrasonic configuration				
	Sensors-boom distance	2.50 m 8.20 ft	00.01 m 00.03 ft	30.00 m 98.43 ft	---
Par. 8.2	Sections configuration				
	Sections number	4/6	2	6	4/6
	Boom Type	Single	---	---	Double
	Booms configuration	...	---	---	Item active only if selected as follows: Boom Type > Double
	Section 1 ÷ 6	1st boom	---	---	2nd boom
Par. 8.3	Valves configuration				
	Master	2 ways	---	---	3 ways - None
	Pressure regulator	3 ways	---	---	2 ways
	Section	2 ways	---	---	3 ways
	Automatic switch-off	Yes (M mode)	---	---	No (P mode)
Par. 8.4	Bulkhead				
	Bulkhead mode	Manual	---	---	Boom status - Half boom status
Par. 8.5	Flowmeter				
	Type	Orion 4621XA3XXXX	---	---	See Tab. A on page 19
	Min. flowrate alarm	5.0 l/min 1.32 GPM	000.0 l/min 000.0 GPM	999.9 l/min 264.14 GPM	Disabled
	Max. flowrate alarm	100.0 l/min 26.42 GPM	000.0 l/min 000.0 GPM	999.9 l/min 264.14 GPM	Disabled
	Constant	600 pls/l 2271 pls/gal	00001 pls/l 00004 pls/gal	10000 pls/l 37850 pls/gal	---
Par. 8.6	Pressure sensor				
	Type	Disabled	---	---	ARAG 466113.200 - ARAG 466113.500 - Other...
	Maximum pressure	---	000.1 bar 001 psi	150.0 bar 2175 psi	Item active only if a sensor is selected
Par. 8.7	Delivery cal. sensor	Flowmeter	---	---	Pressure - Either
Par. 8.8	Tank level				
Par. 8.8.1	Mode	---	---	---	SELECTED MODE: MANUAL
	Capacity	2000 l 528 gal	00001 l 528 gal	10000 l 40 gal	---
	Minimum level alarm	150 l 40 gal	00001 l 00000 gal	02000 l 00528 gal	---
Par. 8.8.2	Mode	---	---	---	SELECTED MODE: LEVEL SENSOR
	Capacity	1000 l 246 gal	---	---	---
	Minimum level alarm	150 l 40 gal	00001 l 00000 gal	01000 l 00264 gal	---
	Calibration	...	---	---	See 8.8.2 Tank level - Level sensor mode on page 20
	Zero calibration	4.000 mA	---	---	---
	Load/Save calibr.	...	---	---	---
Par. 8.8.3	Mode	---	---	---	SELECTED MODE: FILLING FLOWMETER
	Capacity	2000 l 528 gal	00001 l 00000 gal	10000 l 02642 gal	---
	Minimum level alarm	150 l 40 gal	00001 l 00000 gal	02000 l 00528 gal	---
	Type	Orion 462XXA4XXXX	---	---	See Tab. C on page 21
	Constant	300 pls/l 1136 pls/gal	00001 pls/l 00004 pls/gal	10000 pls/l 37850 pls/gal	---
	Minimum flowrate	10.0 l/min 2.64 GPM	---	---	See Tab. C on page 21
	Maximum flowrate	200.0 l/min 52.83 GPM	---	---	See Tab. C on page 21



Par. 8.9	External device	None	---	---	Serial LOG - B400S / D80 - IBX20
Par. 8.10	Access level	Technician	---	---	Operator - Manager - Technician - ARAGTech
Par. 8.11	Rev counter	Not present in the bulkhead version			
	Constant	Disabled	00000 pls/rev	10000 pls/rev	---
	Minimum speed alarm	100 rpm	00000 rpm	10000 pls/rev	Items only visible if the constant is activated
	Maximum speed alarm	500 rpm	00000 rpm	00000 rpm	

8.1 Ultrasonic configuration

> **Sensors-boom distance:** enter the value of the distance between nozzles and ultrasonic sensors as indicated in the figure on the side.



8.2 Sections configuration

> **Sections number:** set the number of installed section valves (2 ÷ 6).
 > **Boom Type:** set the type of boom (single or double).



The **Boom Type** function is enabled **ONLY** after having previously set the value of the menu item **Sections number** to 4 or 6.

> **Booms configuration:** match each section valve with the required boom.



The **Booms configuration** function is enabled **ONLY** after having previously set the double boom in the menu item **Boom Type**.

Booms configuration	
> Section 1	: 1st boom
Section 2	: 2nd boom
Section 3	: 2nd boom
Section 4	: 1st boom

Section valves are matched in a mirror-like manner. The example on the side shows that 4 section valves had been previously set in the menu **Sections number**.

When the 1st boom is assigned to Section 1, Section 4 is automatically assigned to the 1st boom. The procedure is the same for Sections 2 and 3.

Only the first 2 sections can be changed.

The procedure is the same for the configuration with 6 section valves. In this case only the first 3 sections can be changed.

Fig. 32

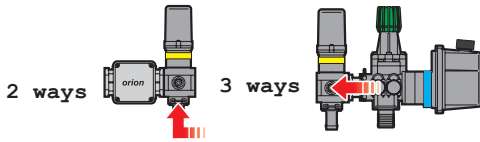
8.3 Valves configuration

Set the type of valves installed on the system and the relevant data.

> **Master:** indicate the type of installed main control valve.

- 2 ways: drain valve
- 3 ways: main valve
- None

> **Pressure regulator:** indicate the type of installed control valve.



ITEM AVAILABLE ONLY FOR 4- / 6-WAY BRAVO 350 WITH MOTORIZED VALVES

> **Section:** indicate the type of installed motorized section valves.

- 2 ways: valves without metered by-passes
- 3 ways: valves with metered by-passes

> **Automatic switch-off**

Indicate the section valve operation mode. especially if the section automatic switch-off is active when the main control valve is closed.

- Yes (M mode)
- No (P mode)



It is compulsory to set the M mode (option Yes) when None main valve is present in the system.

• **"M" operation mode (option Yes):**

The section valves are closed or opened by acting on the main switch, provided that the switch relating to section valves is properly positioned:
 - if the switches of sections are set to OFF (lever down), sections will not be controlled by acting on the main switch.
 - If one or more section valve switches are set to ON (lever up), opening or closing the main switch opens or closes the section valves as well.

• **"P" operation mode (option No):**

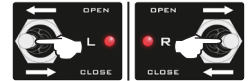
The section valves are controlled independently.
 Main switch control functions do not affect section valve opening or closing.



8.4 Bulkheads

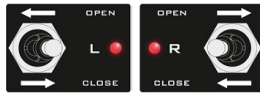
Bulkhead mode: indicate the type of bulkhead operation.

Manual: The bulkhead status only depends on the position of the relevant switches (L/R - OPEN/ CLOSE).



Boom status: The bulkhead status, when the switches are in the “CLOSE” position, depends on the spraying status.

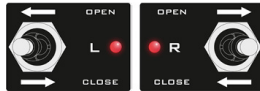
Spraying enabled



With bulkhead switches in “CLOSE” position:

The bulkheads are both open (LEDs on) if spraying is in progress, i.e. at least a section of the boom is spraying. There is always the possibility to open the bulkheads manually, independently from each other, by using the relevant switch.

Spraying NOT enabled



The bulkheads are both open (LEDs on) regardless of spraying.

Half boom status:

The status of the left bulkhead depends on the spraying status of the left half boom (sections 1-2 spraying / not spraying).

The status of the right bulkhead depends on the spraying status of the right half boom (sections 3-4 spraying / not spraying).

Spraying is active only in the RIGHT half boom



With bulkhead switches in “CLOSE” position:

The bulkheads are open (LEDs on) if spraying is in progress, i.e. at least a section of the half boom (left 1-2 for left bulkhead/right 3-4 for right bulkhead) is spraying. There is always the possibility to open the bulkheads manually, independently from each other, by using the relevant switch.

Spraying NOT enabled



The bulkheads are both open (LEDs on) regardless of spraying.

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8.5 Flowmeter

Set the installed flowmeter and the relevant data. Tab. A indicates the value that will be automatically set by selecting the flowmeter code. However such data can be modified.

> **Type**: indicate the type of installed flowmeter (Tab. A).

> **Min. flowrate alarm**

> **Max. flowrate alarm**

The flowrate alarms (minimum or maximum) activate when, during the spraying, the flowmeter rate does not respect the set limits.



For the procedure to be followed in case of alarms, please refer to Par 11.2 Operation errors.

> **Constant**: indicate the constant of the installed flowmeter.

ORION FLOWMETERS

TYPE	METRIC UNITS OF MEASUREMENT - METR. l/100 m			US UNIT OF MEASUREMENT		
	Constant (pls/l)	Min. flowrate (l/min)	Max. flowrate (l/min)	Constant (pls/gal)	GPM min. flowrate	GPM max. flowrate
Orion 4621xA0xxxx	6000	0.5	10.0	22710	0.13	2.64
Orion 4621xA1xxxx	3000	1.0	20.0	11355	0.26	5.28
Orion 4621xA2xxxx	1200	2.5	50.0	4542	0.66	13.21
Orion 4621xA3xxxx	600	5.0	100.0	2271	1.32	26.42
Orion 462xA4xxxx	300	10.0	200.0	1136	2.64	52.83
Orion 4622xA5xxxx	150	20.0	400.0	568	5.28	105.67
Orion 4622xA6xxxx	100	30.0	600.0	378	7.93	158.50
Orion 4622xA7xxxx	75	40.0	800.0	284	10.57	211.34



The default values can be modified.

WOLF FLOWMETERS

TYPE	METRIC UNITS OF MEASUREMENT - METR. l/100 m			US UNIT OF MEASUREMENT		
	Constant (pls/l)	Min. flowrate (l/min)	Max. flowrate (l/min)	Constant (pls/gal)	GPM min. flowrate	GPM max. flowrate
Wolf 462x2xxx	1015	2.5	50.0	3842	0.66	13.21
Wolf 462x3xxx	625	5.0	100.0	2366	1.32	26.42
Wolf 462x4xxx	250	10.0	200.0	946	2.64	52.83
Wolf 462x5xxx	132	20.0	400.0	500	5.28	105.67
Wolf 462x7xxx	60	40.0	800.0	227	10.57	211.34



The default values can be modified.

Tab. A

Other...	625	10.0	200.0	2366	2.64	52.83
----------	-----	------	-------	------	------	-------

8.6 Pressure sensor

The pressure sensor has a different use according to the situations.

• **Flowmeter enabled** (Par 8.7 Delivery cal. sensor > **Either**): displays the working pressure when the machine operates within the flowmeter limits. When the flowmeter works out of the limits, the measured pressure is used to calculate the application rate.

• **Flowmeter disabled** (Par. 8.7 Delivery cal. sensor > **Pressure**): the pressure sensor is always used to calculate the application rate

Set the type of installed pressure sensor and the relevant full scale.

> **Type**: indicate the type of installed sensor (available models indicated in Tab. B).

> **Maximum pressure**

Indicate the full scale of the pressure sensor installed on the system.



When the option Disabled (Default) is active, the item Maximum pressure is no longer displayed.

The table below indicates the values that are automatically set selecting the sensor code:

ARAG PRESSURE SENSOR

TYPE	Max pressure	
	bar	PSI
ARAG 466113.200	20.0	290
ARAG 466113.500	50.0	725



The default values can be modified.

Tab. B

Other...	50.0	725
----------	------	-----

8.7 Delivery cal. sensor

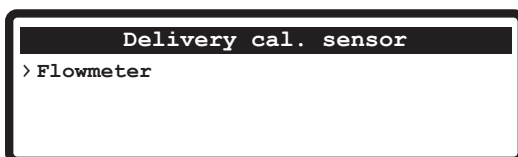


Fig. 33

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

> **Flowmeter**

The Flowmeter is the only sensor used to read the flowrate.

> **Pressure**

The Pressure sensor is the only sensor used to read the flowrate.

Set nozzles par. 9.5

> **Either**

Within the working limits, the computer uses the flowmeter, otherwise it uses the pressure sensor (ONLY if properly configured).

8.8 Tank level

First of all configure the submenu **Mode** and the selected option data.
 The tank filling will be managed in different ways according to the preset mode.
 Possible options:
 > **Manual**: par. 8.8.1
 > **Level Sensor**: par. 8.8.2
 > **Filling flowmeter**: par. 8.8.3

8.8.1 Tank level - Manual Mode

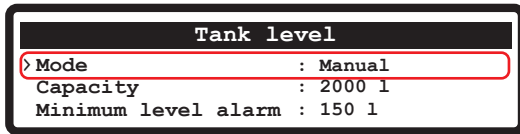


Fig. 34

> **Capacity**: indicate the rated capacity.
 > **Minimum level alarm**: indicate the range value.
 The tank alarm activates when during the spraying the tank level falls below the set value (Par. 10.6 Display).

8.8.2 Tank level - Level sensor mode

The level sensor installed in the system allows displaying the tank level in real time (Par. 10.6 Display).



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

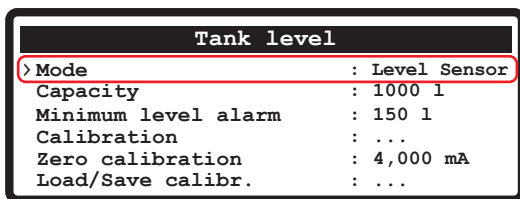


Fig. 35

> **Capacity**: the computer displays the tank capacity calculated after the calibration.
 > **Minimum level alarm**: indicate the range value.
 The tank alarm activates when during the spraying the tank level falls below the set value (Par. 10.6 Display).
 > **Calibration**: enters the calibration procedure of the level sensor.



The level sensor calibration is ONLY possible if the system is provided with a flowmeter.
 Before starting the procedure carry out the following operations:



Fig. 36



1 Make sure the main switch is in position OFF (Fig. 36).

2 Fill the tank with clean water WITHOUT ADDING ANY CHEMICAL SUBSTANCE. The tank must be full. Visually check the level reached.

3 From the job screen, check that manual operation is active (the display shows the indication **Man. Reg.**). If it is not active, activate it by pressing the key **AUTO** (Par. 10.8.2).

4 Adjust the output keeping the switch of the control valve (Fig. 36) pressed upwards, **being careful not to exceed the maximum flowrate of the selected flowmeter.**

5 Switch the computer off and on again in advanced setup mode ("Advanced setup" on page 15).

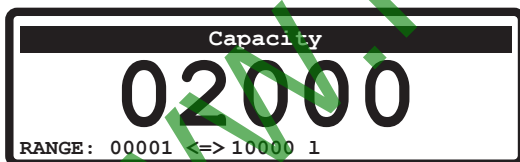


Fig. 37

6 Enter the **Tank level** menu, activate the **Level sensor mode** (Fig. 35) and select the **Calibration** item.
 BRAVO 350 requests to enter the tank capacity (Fig. 37): enter the value.

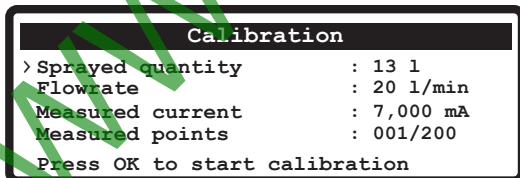


Fig. 38

7 Immediately afterwards the computer passes to the calibration start screen (Fig. 38): the message **Press OK to start calibration** blinks on the display.

8 Press **OK**: calibration starts.

The message **Enable spraying command!** blinks on the display.

9 Start the spraying system: open, in succession, all section valves and the main control (Fig. 36, switches in position **ON**).

10 The display will show in real time the quantity of sprayed water and the calibration status. The message **CALIBRATION: [OK] to save/ [ESC] to exit** will flash on the display.

Press **OK** to manually stop the calibration (and save it), and press **ESC** to interrupt it without saving.

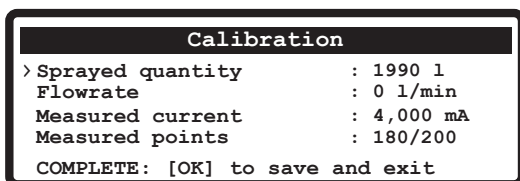


Fig. 39

11 If the calibration has not been manually ended, when the flowrate value reaches zero (Fig. 39) and remains so for at least 10 s, BRAVO 350 automatically finishes the procedure and displays the message **COMPLETE: [OK] to save and exit.**

Press **OK**: the calibration is complete.



After having completed the calibration and checked the sensor correct operation, we recommend to memorize the calibration on USB pendrive.

> **Zero calibration:** it accesses the "zero" calibration of the level sensor.
 The level sensor zero must be calibrated when:
 - the presence of fluid inside the tank is displayed, even when it is empty.
 - a calibration curve already made with the same tank by means of another Arag computer is loaded. **The tank must be empty.**

Press **OK** to reset the sensor residual signal.

> **Load/Save calibr.:** the level sensor calibration can be loaded or saved on USB pendrive to reconfigure the device if necessary, solve problems, or configure another BRAVO 350 without having to repeat all operations.

After having completed the calibration and checked the sensor correct operation, we recommend to memorize the calibration on USB pendrive.

Before any other operation, insert the USB pendrive in its slot.

> **Save tank profile from USB:** select this option and press **OK**.

The confirmation message **Successfully completed! (TANK.TKL)** is displayed once the saving process is completed. Press **ESC**.

> **Load tank profile from USB:** select this option and press **OK**.

The confirmation message **Successfully completed! (TANK.TKL)** is displayed once the configuration process is completed. Press **ESC**.

8.8.3 Tank level - Filling flowmeter mode

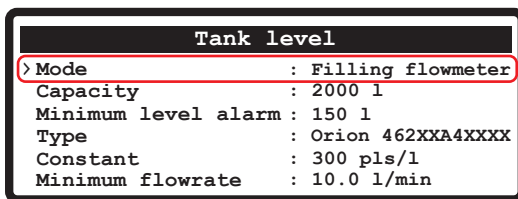


Fig. 40

The filling flowmeter installed in the system allows displaying the tank filling data in real time.

> **Capacity:** indicate the rated capacity.

> **Minimum level alarm:** indicate the range value.

> **Type:** indicate the filling flowmeter installed and the relevant data.

Tab. C indicates the values that will be automatically set by selecting the flowmeter code. However the constant can be modified.

> **Constant:** indicate the constant of the installed filling flowmeter.

ORION FLOWMETERS

TYPE	METRIC UNITS OF MEASUREMENT - METR. l/100 m			US UNIT OF MEASUREMENT		
	Constant (pls/l)	Min. flowrate (l/min)	Max. flowrate (l/min)	Constant (pls/gal)	GPM min. flowrate	GPM max. flowrate
Orion 462xxA4xxxx	300	10.0	200.0	1136	2.64	52.83
Orion 4622xA5xxxx	150	20.0	400.0	568	5.28	105.67
Orion 4622xA6xxxx	100	30.0	600.0	378	7.93	158.50
Orion 4622xA7xxxx	75	40.0	800.0	284	10.57	211.34



The default values can be modified.

WOLF FLOWMETERS

TYPE	METRIC UNITS OF MEASUREMENT - METR. l/100 m			US UNIT OF MEASUREMENT		
	Constant (pls/l)	Min. flowrate (l/min)	Max. flowrate (l/min)	Constant (pls/gal)	GPM min. flowrate	GPM max. flowrate
Wolf 462x4xxx	250	10.0	200.0	946	2.64	52.83
Wolf 462x5xxx	132	20.0	400.0	500	5.28	105.67
Wolf 462x7xxx	60	40.0	800.0	227	10.57	211.34



The default values can be modified.

Other...	325	10.0	100.0	2366	2.64	26.42
----------	-----	------	-------	------	------	-------

Tab. C



8.9 External device

Enable / disable any connection to an external device.
The **None** item is enabled by default.

> **None**

> **Serial LOG**

It returns on the serial port a string of job-related data (par. 9.16 on page 35) to be sent by cable or transmission to an equipment being used.

> **B400S / D80**

It allows Bravo 350 to:

- receive the speed data from a connected device. The speed source must be set as **GPS** (9.10 on page 32).

- to manage the automatic closing/opening of the sections and the main valve via the connected device.

This avoids overlapping already covered areas.

Function only available in AUTO mode (par. 10.8.1 on page 41).



To connect Bravo 400S or Delta 80 to Bravo 350, please order the appropriate connection cable separately from the Arag general catalog and consult the relevant instructions.

> **IBX20**

It allows connecting IBX20 to Bravo 350.

The connection allows:

- Automatically closing the sections (TC-SC)
- Using variable application rate (TC-GEO)
- Recording job's data (TC-BAS)
- Enabling/disabling the external general control via Auxiliary Function (AUX-N)
- Receiving the speed data from a connected device. It is needed to set the speed source as **Tractor wheel / Tractor radar**

Request ARAG the activation code to enable the additional function, which can be purchased separately.

- Enter the supplied code and confirm.

For specifications on the use of IBX20 refer to the relevant manual.

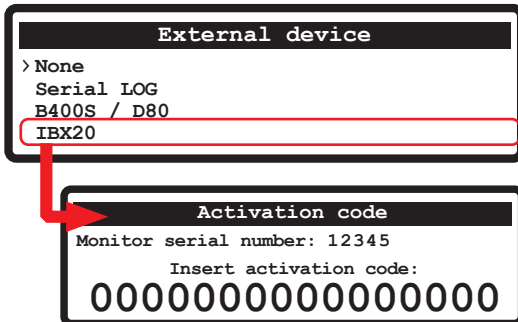


Fig. 41

8.10 Access level

It allows setting the user access level and password.

> Operator

The operator can only view the following:

Job selection / Current Job data / Jobs setup / Tank / Totalizers / Test / User preferences / Data logger.

> Manager

The operator can only view the following:

Job selection / Current Job data / Jobs setup / Working parameters / Tank / Flowrate correct. factor / Totalizers / Test / User preferences / Data logger / Load/save setup.

You can set an access PIN code.

> Technician

It allows configuring all monitor parameters: you can set an access PIN.

> ARAGTech

Reserved to ARAG personnel.

PIN ENTRY (Manager AND Technician USERS)

- Select the user level for which you want to enter the PIN (symbol > Fig. 43) and press and hold the button ▶.

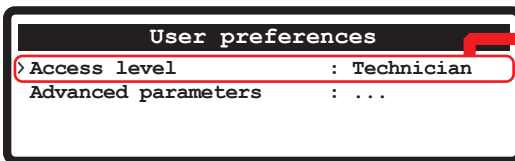


Fig. 42

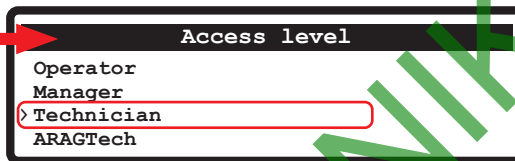


Fig. 43

The monitor displays the PIN entry page (Fig. 44):



Fig. 44



Fig. 45

- Enter the 5-digit PIN (Fig. 44).

- Enter it again to confirm (Fig. 45).

- Press **OK** to enable the entered PIN. The display shows the message: **PIN code changed**

- Press **ESC** to stop the operation.

PIN DELETION (Manager AND Technician USERS)

- Select the user level for which you want to delete the PIN (symbol > Fig. 47) and press and hold the button ▶.

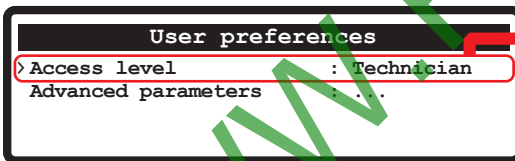


Fig. 46

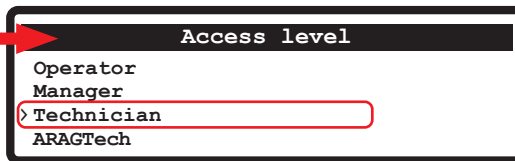


Fig. 47

The monitor displays the PIN entry page (Fig. 48):



Fig. 48

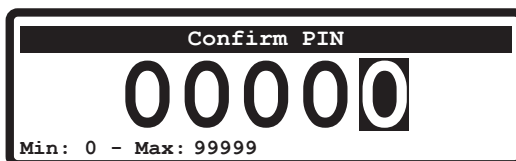


Fig. 49

- Enter 00000 as new PIN (Fig. 48).

- Enter 00000 again to confirm the deletion of the PIN code (Fig. 49).

- Press **OK** to complete the PIN deletion operation. The display shows the message: **PIN code changed**

- Press **ESC** to stop the operation.

8.11 Rev counter

Set the data of the RPM sensor (if installed in the system).
The sensor is **Disabled** by default.

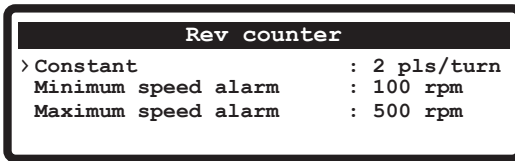


Fig. 50

Enable the RPM sensor and indicate the **Constant**.
The display shows the editable items related to alarms:
> **Minimum speed alarm**
> **Maximum speed alarm**

The speed alarms (minimum or maximum) activate when the measured RPM exceed the set limits.

The control is active only when the spraying is active (main switch ON).



If the RPM sensor is not installed press **CLR**: in this case the display will show the message **Disabled**; the alarms **Minimum speed alarm** and **Maximum speed alarm** (Fig. 50) will no longer be displayed

8.12 Setup check after Advanced setup end

This screen is displayed only in case of errors when exiting the **Advanced setup**:

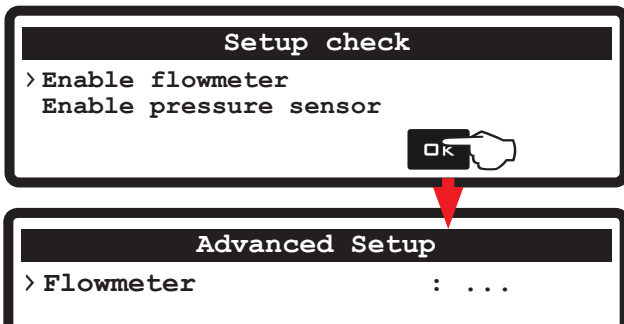


Fig. 51

In case of more error messages, select the message and press **OK**. BRAVO 350 automatically switches to the **Advanced Setup** and directly positions on the value to be modified.

Lower the display shows the mismatching data.

PAR.	ERROR MESSAGE	SET VALUES
 > Enable flowmeter Par. 8.7 The setting for the rate calculation requires the flowmeter, which is disabled though. Par. 8.5	Delivery cal. sensor: > Flowmeter or > Either	+ Flowmeter: > Disabled
 > Enable pressure sensor Par. 8.7 The setting for the rate calculation requires the pressure sensor, which is disabled though. Par. 8.6	Delivery cal. sensor: > Pressure or > Either	+ Pressure sensor: > Disabled

9 USER SETTING

ACCESS TO USER SETTING (WITH COMPUTER ON)

Keep the **OK** key pressed until the menu is displayed.

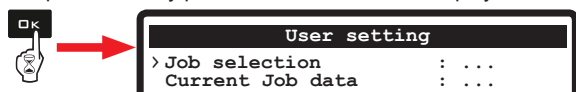


Fig. 52

For a correct use of the keys during setting, refer to Par. 7.3.

	Menu	Default	Min	Max	Other values that can be set / Notes
Par. 9.1	Job selection	---	---	---	See 9.1 Job selection on page 27
Par. 9.2	Current Job data	Job's data (R01-0001.RPT)	---	---	---
Par. 9.3	Jobs setup	1	1	40	Jobs 2 + 39 (See relevant table)
	Rate type	Constant	---	---	Variable - Disabled
	Target rate	---	0001 l/ha 0000.1 GPA	9999 l/ha 1068.9 GPA	See relevant table
	Row width	---	00.10 m 00.33 ft	99.99 m 328.05 ft	See relevant table
	Boom	---	---	---	A + J
Par. 9.4	Booms setup	A	---	---	B + J (See relevant table)
	Section's data	1	1	6	2 + 5
	Nozzle number	4	00	99	00 + 99
	Nozzle type	ATR White	---	---	ATR White + ATR Blue + ISO01 Orange + ISO20 Black + HCC White + HCC Blue - Type A + J
Par. 9.5	Nozzles setup				
	Flowrate	---	00.01 l/min 00.003 GPM	99.99 l/min 26.417 GPM	See relevant table
	Pressure	10.0 bar 145 PSI	---	---	---
Par. 9.6	Intervention sensibility				
	Opening advance	0 cm 0.0 in	0 cm 0.0 in	200 cm 78.7 in	0 + 200 cm 0.0 + 78.7 in
	Closing delay	0 cm 0.0 in	0 cm 0.0 in	200 cm 78.7 in	0 + 200 cm 0.0 + 78.7 in
Par. 9.7	Working parameters				
	Task Controller TC	---	---	---	---
	TC-BAS	Disabled	---	---	Enabled
	TC-SC	Disabled	---	---	Enabled
	TC-GEO	Disabled	---	---	Enabled
	Nozzles wear check	Disabled	00 %	50 %	00 + 50 %
	Min. spraying speed	Disabled	00.0 km/h 00.0 MPH	99.9 km/h 62.1 MPH	00.0 + 99.9 km/h 00.0 + 62.1 MPH
	Regulation lock type	Disabled	---	---	Speed - Pressure
	Min. regulation speed	2.0 km/h 1.2 MPH	00.1 km/h 00.1 MPH	99.9 km/h 62.1 MPH	Regulation lock type: Speed
	Min. regulation pressure	1.0 bar 15 psi	00.1 bar 01.5 psi	99.9 bar 1448.8 psi	Regulation lock type: Pressure
Par. 9.8	Rate controller				
	Display cut-off (rate)	3.0 %	1.0 %	99.9 %	---
	Regulation cut-off (rate)	1.5 %	1.0 %	99.9 %	---
Par. 9.9	Tank				
	Filling	2000 l 528 gal	---	---	ONLY WITH SELECTED MODE: MANUAL / FILLING FLOWMETER (Par. 8.8)
	Level	0 l 0 gal	00000 l 00000 gal	02000 l 00528 gal	00000 + 02000 l 00000 + 00528 gal
	Filled quantity	0 l 0 gal	---	---	---
	Estimated quantity need	----- l ----- gal	000.001 ha 000.001 ac	100.000 ha 100.000 ac	ONLY WITH FILLING CALC. ACTIVATED (Par. 9.15.5)

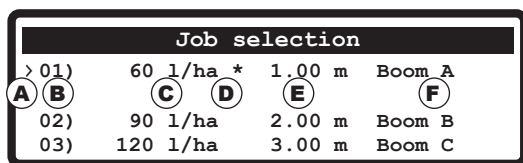
CONTINUES

Par. 9.10	Speed	Source	Wheel sensor	---	---	GPS, Tractor wheel / Tractor radar
		Selected wheel type	1	1	3	2
		Wheels setting	...	---	---	---
		Constant calculation	Manual	---	---	Automatic
		Wheel constant 1 ÷ 3	50.00 cm/pls 19.68 in/pls	0.01 cm/pls 0.00 in/pls	150.00 cm/pls 59.06 in/pls	Wheel constant 1
Par. 9.11	Flowrate correct. factor		1.00	00.01	10.00	---
Par. 9.12	Press. sensor zero value		---	---	---	Only with enabled pressure sensor
Par. 9.13	Totalizers	Job's data (Txx-0001.RPT)	---	---	---	T02-0001.RPT ÷ T40-0001.RPT
Par. 9.14	Test	Flowmeter	---	---	---	Pressure - Either
		Speed simulation	No	---	---	Yes
		(S) Speed	---	---	---	---
		(F) Flow	---	---	---	---
		(T) Filling flowm.	---	---	---	Tank level sensor Items available only if the following is selected in the menu Advanced Setup > Tank level
		(X) Rev. counter	---	---	---	Not present in the bulkhead version
		(M) Pressure	---	---	---	---
		Battery voltage	---	---	---	---
		Display	...	---	---	---
		Keyboard & Switches	...	---	---	---
		Ultrasonic sensors	...	---	---	---
		GPS data	...	---	---	---
		Constant press. mode	No	---	---	Yes
		Monitor serial number	XXXXXXXX	---	---	---
		Monitor hardware version	X.X.X	---	---	---
		Monitor software version	X.X.X	---	---	---
Par. 9.15	User preferences	Sound alarm	Disabled	---	---	Enabled
		Sound keyboard	Disabled	---	---	Enabled
		Date & Time	---	---	---	---
		Modification locking code	No	0000	9999	0000 ÷ 9999
		Date	dd/mm/yy	---	---	---
		Time	hh:mm:ss	---	---	---
		Display contrast	5	01	10	02 ÷ 09
		Filling calc.	Disabled	---	---	Enabled
		Displayed data	...	---	---	---
		Left	Pressure	---	---	Covered area - Tank data - Flowrate - RPM
		Middle	Tank data	---	---	Pressure - Covered area - Flowrate - RPM
		Right	Flowrate	---	---	Pressure - Covered area - Tank data - RPM
		Tank data	Level (l) Level (gal)	---	---	Either (l-ha) - Either (l-km) Either (gal-ac) - Either (gal-miles)
		Show trees counter	Yes	---	---	No
Par. 9.16	Data logger		Disabled	---	---	1 sec. - 2 sec. - 5 sec. - 10 sec.
Par. 9.17	Ext. device log		5 sec.	1 sec.	10 sec.	2 sec.
Par. 9.18	Load/save setup		...	---	---	---
		Load configuration from USB	---	---	---	---
		Save configuration from USB	---	---	---	---

Fig. 53

9.1 Job selection

Select > the job to enable *.

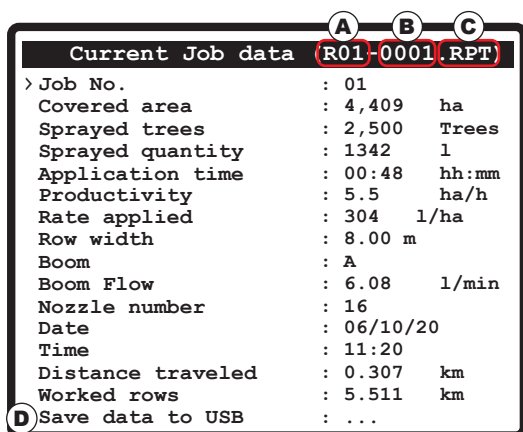


- A > Selected job
- B 01) Job number
- C 60 l/ha Target rate
- D * Active job
- E 1.00 m Row width
- F Boom A Selected boom

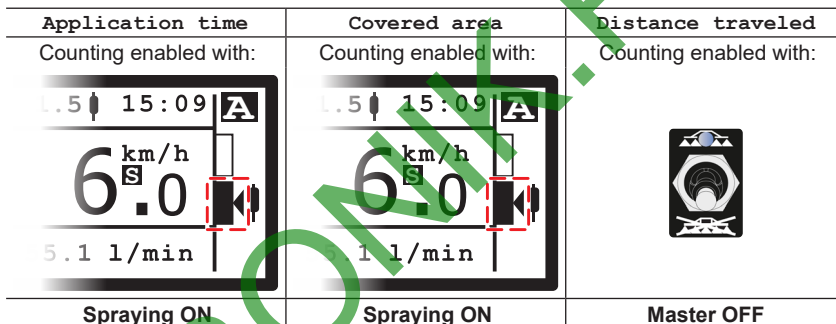
Fig. 54

9.2 Current Job data

Displays the data of the current spraying (active job).



- A R01 Job number
- B 0001 Progressive number of saved file
- C .RPT Extension of saved file



Select the item **D** > Save data to USB and press **OK**.

Bravo 350 saves a file containing all the displayed data to the USB e.g.: R01-0001. RPT.

Bravo 350 will increase the report number upon each subsequent saving e.g.: R01-0002. RPT.

Data in the file can be displayed on PC with a text editor.

Fig. 55

9.3 Jobs setup

In this menu it is possible to set 40 different types of treatments.

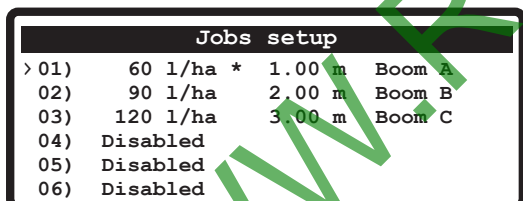


Fig. 56

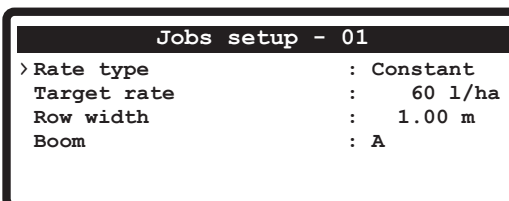


Fig. 57

First of all select the job to be set (Fig. 56) and enter the features (Fig. 57). Repeat the setup for each job (set the used types and disable the others).

FEATURES TO BE SET FOR EACH JOB:

> **Rate type**: Allows setting the type of output, or disabling the selected treatment.

> **Constant**

BRAVO 350 carries out the spraying by keeping the output constant. The quantity of sprayed fluid depends on the **Target rate**.

> **Variable**

BRAVO 350 varies the output according to the data sent by the Bravo400S and Delta80 satellite navigator (suitably connected), indicating the precise quantity of fluid to be sprayed in each point of the field. The item **Target rate** will no longer be displayed.

> **Disabled**

The selected job is disabled, therefore it cannot be used. No other settings are necessary.

> **Target rate**: Set the application rate for the selected treatment.

> **Row width**: Set the row width for the selected treatment.

> **Boom**: Select the boom type for the selected treatment.

Par. 9.4 Booms setup.

9.4 Booms setup

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

Booms setup			
>A) *	9.12 l/min	16	Nozzles
B)	12.00 l/min	16	Nozzles
C)	16.08 l/min	16	Nozzles
D)	24.72 l/min	16	Nozzles
E)	33.36 l/min	16	Nozzles

Fig. 58

SINGLE BOOM			
Section's data (Boom A)			
>1)	(1)	4	ATR White
2)	(1)	4	ATR White
3)	(1)	4	ATR White
4)	(1)	4	ATR White

Fig. 59

DOUBLE BOOM			
Section's data (Boom A)			
>1)	(1)	4	ATR White
2)	(2)	4	ATR Lilac
3)	(2)	4	ATR Lilac
4)	(1)	4	ATR White

Fig. 60

Nozzles (Section 1 (1) - Boom A)			
>G)	Nozzle number	:	4
	Nozzle type	:	ATR White

Fig. 61

- A Boom profile
- B Active boom
- C Reference total flowrate
- D Total nozzle number
- E Boom section number
- F Boom type (1: single / 1-2: double)
- G Nozzle type and number of boom section

First of all select the boom to be set (Fig. 58). The asterisk next to the letter indicates which boom is being currently used.

Each boom is divided into sections (Fig. 59 - Fig. 60): select one boom and set the total number and type of used nozzles (Fig. 61). The flowrate of the nozzles being used allows BRAVO 350 to calculate the pressure without a pressure sensor.

9.5 Nozzles setup

This menu allows setting four categories of nozzles: ATR, ISO, HCC and User.

Nozzles setup			
>HCC Black	: 2.29 l/min	10.0 bar	
HCC Blue	: 3.65 l/min	10.0 bar	
Type A	: 1.00 l/min	10.0 bar	
Type B	: 2.00 l/min	10.0 bar	
Type C	: 3.00 l/min	10.0 bar	

Fig. 62

Type A	
>Flowrate	: 1.00 l/min
Pressure	: 10.0 bar

Fig. 63

- A Nozzle type
- B Reference flowrate
- C Reference pressure
- D Reference /Pressure / Flowrate

First select the nozzle to be set (Fig. 62) and enter the flowrate (Fig. 63).

The flowrate of the nozzle being used allows BRAVO 350 to calculate the pressure without a pressure sensor.

Repeat the setup for each available "user" nozzle.

Pressure CANNOT BE CHANGED.

Flowrate can be changed ONLY for nozzles of TYPE A-J (User nozzle)

NOZZLES

Nozzle color	Unit of measurement METRIC METR. l/100m		Unit of measurement US	
	Flowrate (l/min)	Pressure (bar)	Flowrate (GPM)	Pressure (PSI)
ATR White	0.38	10.0	0,100	145
ATR Lilac	0.50	10.0	0,132	145
ATR Brown	0.67	10.0	0,177	145
ATR Yellow	1.03	10.0	0,272	145
ATR Orange	1.39	10.0	0,367	145
ATR Red	1.92	10.0	0,507	145
ATR Grey	2.08	10.0	0,549	145
ATR Green	2.47	10.0	0,652	145
ATR Black	2.78	10.0	0,734	145
ATR Blue	3.40	10.0	0,898	145

Nozzle color	Unit of measurement METRIC METR. l/100m		Unit of measurement US	
	Flowrate (l/min)	Pressure (bar)	Flowrate (GPM)	Pressure (PSI)
HCC White	0.35	10.0	0,092	145
HCC Lilac	0.55	10.0	0,145	145
HCC Brown	0.73	10.0	0,193	145
HCC Yellow	1.10	10.0	0,291	145
HCC Orange	1.46	10.0	0,386	145
HCC Red	1.83	10.0	0,483	145
HCC Grey	2.19	10.0	0,579	145
HCC Green	2.56	10.0	0,676	145
HCC Black	2.92	10.0	0,771	145
HCC Blue	3.65	10.0	0,964	145

Nozzle color	Unit of measurement METRIC METR. l/100m		Unit of measurement US	
	Flowrate (l/min)	Pressure (bar)	Flowrate (GPM)	Pressure (PSI)
ISO01 Orange	0.73	10.0	0,193	145
ISO015 Green	1.10	10.0	0,291	145
ISO02 Yellow	1.46	10.0	0,386	145
ISO025 Lilac	1.83	10.0	0,483	145
ISO03 Blue	2.19	10.0	0,579	145
ISO04 Red	2.92	10.0	0,771	145
ISO05 Brown	3.65	10.0	0,964	145
ISO06 Grey	4.38	10.0	1,157	145
ISO08 White	5.84	10.0	1,543	145
ISO10 Light blue	7.30	10.0	1,928	145
ISO15 Light green	10.95	10.0	2,893	145
ISO20 Black	14.61	10.0	3,860	145

User nozzle	Unit of measurement METRIC METR. l/100m		Unit of measurement US		User data:	
	Flowrate (l/min)	Pressure (bar)	Flowrate (GPM)	Pressure (PSI)	Flowrate (l/min)	Flowrate (GPM)
Type A	1.00	10.0	0,264	145	00.01 ÷ 99.99	00,003 ÷ 26,417
Type B	2.00	10.0	0,528	145		
Type C	3.00	10.0	0,793	145		
Type D	4.00	10.0	1,057	145		
Type E	5.00	10.0	1,321	145		
Type F	6.00	10.0	1,585	145		
Type G	7.00	10.0	1,849	145		
Type H	8.00	10.0	2,113	145		
Type I	9.00	10.0	2,378	145		
Type J	10.00	10.0	2,642	145		

Tab. D

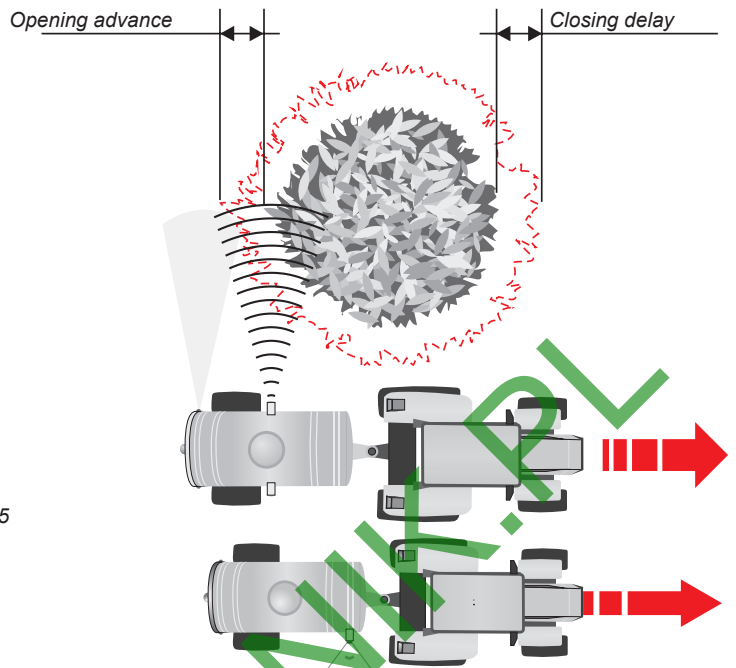
9.6 Intervention sensibility

Intervention sensibility	
> Opening advance	: 0 cm
Closing delay	: 0 cm

Fig. 64

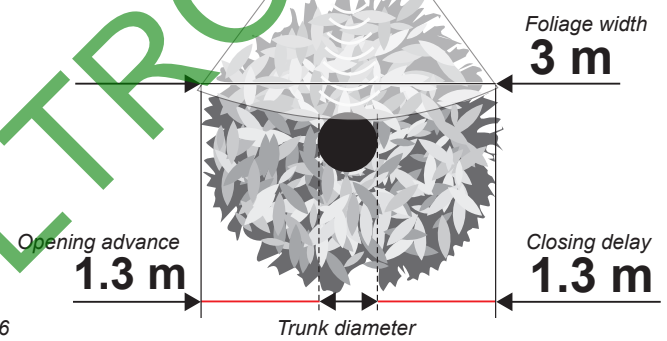
The parameters **Opening advance** and **Closing delay** allow compensating for any difficulty encountered by the sensor when detecting the shape of the tree, anticipating the opening and delaying the closing of the boom.

Fig. 65



If there are only two ultrasonic sensors and their position is such as to detect only the trunk of the plant (Fig. 9 / Fig. 10) these two parameters must be set so that the foliage is correctly sprayed over its entire width.

Fig. 66



WWW.ROLTRONLINE.IT

9.7 Working parameters

From this menu it is possible to set the farming machine working parameters.

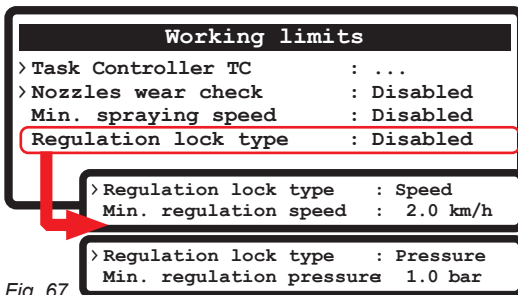


Fig. 67



The set limits are active ONLY during the AUTOMATIC OPERATION (Par. 10.8.1).

9.7.1 Task Controller TC

Menu visible only if the item External device > IBX20is enabled.

With the connection to IBX20 Task Controller (enabled in par. 8.9), the computer can activate the following work functions and display them on the work screen:

- > TC-BAS
Job's data recording
- > TC-SC
Automatic section closing
- > TC-GEO
Variable application rate

9.7.2 Nozzles wear check

This alarm can be activated ONLY if the system features both flowmeter and pressure sensor. BRAVO 350 compares the effective rate read by the flowmeter and the one calculated by the pressure sensor. When the difference between the two rate values exceeds the set percentage, the alarm is activated.

9.7.3 Min. spraying speed

BRAVO 350 interrupts the spraying, by disabling the main valve, when the detected speed is lower than the set one.

9.7.4 Regulation lock type

BRAVO 350 interrupts the automatic regulation of the proportional valve when the detected speed or pressure are lower then the set limits. The menu items change according to the set data (Fig. 67).

9.8 Rate controller

From this menu it is possible to set the farming machine rate controller.

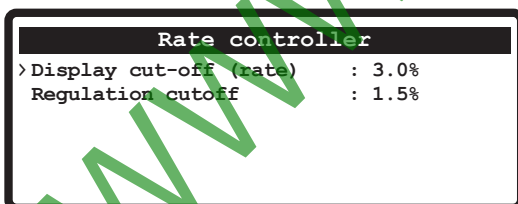


Fig. 68



> Display cut-off (rate):

Indicate the rate display tolerance percentage beyond which the alarm is triggered and the system displays the actual rate value.

Within the set percentage, the system continues displaying the preset rate even if different from the actual one.

> Regulation cutoff:

Indicate the percentage of tolerance relative to the application rate target beyond which the control valve no longer regulates because it considers it to have been reached.

The set limits are active ONLY during the AUTOMATIC OPERATION (Par. 10.8.1).



9.9 Tank

It activates the tank filling procedure.

The filling will be managed in different ways according to the mode preset in the menu **Tank level** (Par. 8.8).

Tank level - Manual Mode (Par. 8.8.1)

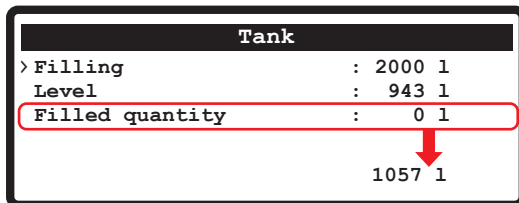


Fig. 69

> **Filling**

BRAVO 350 displays the tank rated capacity: the value has been set in **Advanced setup > Tank level > Capacity**.

> **Level**

BRAVO 350 displays the quantity of fluid inside the tank, calculated according to the job data. It offers the possibility to manually fill the tank by editing the value of the filled fluid volume.

> **Filled quantity**

It is the difference between the value of the tank level and that of the fluid level actually filled.

Negative and positive values can be displayed.

Tank level - Level Sensor Mode (Par. 8.8.2)

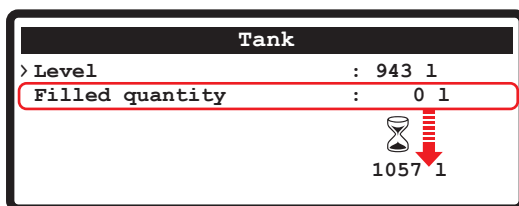


Fig. 70

> **Level**

BRAVO 350 displays the real quantity of fluid inside the tank, detected by the level sensor.

> **Filled quantity**

Start the filling pump and stop it at the end of the filling procedure. The display shows the fluid filling data in real time.

Tank level - Filling Flowmeter Mode (Par. 8.8.3)

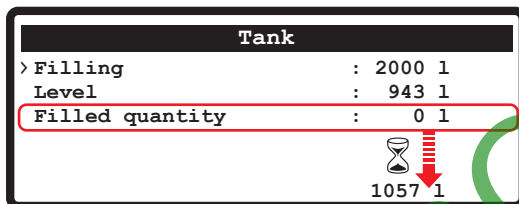


Fig. 71

> **Filling**

BRAVO 350 displays the tank rated capacity: the value has been set in **Advanced setup > Tank level > Capacity**.

> **Level**

BRAVO 350 displays the quantity of fluid inside the tank, calculated according to the job data.

> **Filled quantity**

Start the filling pump and stop it at the end of the filling procedure. The display shows the filling data in real time.

For all the described modes if the following item is active: **User setting > User preferences > Filling calc. > enabled** in the menu **Tank** the display will show the message **> Estimated quantity need** (par. 9.15.5).

9.10 Speed

Usually the computer calculates the information concerning the speed thanks to pulses received by the sensor installed on the wheel. As an alternative, you can use a GPS receiver connected directly to BRAVO 350 or a Bravo400S or Delta80 satellite navigator (properly connected). This menu allows you to select the speed data provided by the GPS signal as an alternative speed source.

In this menu carry out all settings to calculate the speed.

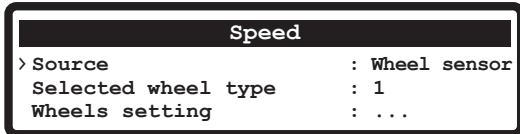


Fig. 72

First of all select the source used by BRAVO 350: set the submenu **Source** and the data concerning the selected option.

Possible options:

> **Wheel sensor**: Par. 9.10.1

> **GPS**: Par. 9.10.2

> **Tractor wheel**: the menu appears **ONLY IF External device > IBX20 par. 8.9 on page 22 is selected in advanced settings.**

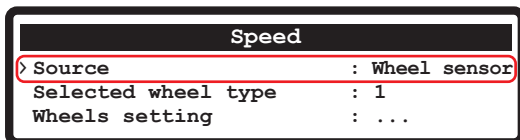
The IBX20 control unit receives the vehicle travel speed via the ISOBUS line. The speed value is provided by the Tractor-ECU according to the rotation speed of the wheel or a mechanical part.

> **Tractor radar**: the menu appears **ONLY IF External device > IBX20 par. 8.9 on page 22 is selected in advanced settings.**

The IBX20 control unit receives the vehicle travel speed via the ISOBUS line. The speed value is provided by the Tractor-ECU that detects the data sent by the radar installed on the tractor.



9.10.1 Source - Wheel sensor



> **Selected wheel type:** select the type of wheel (3 types available).
 > **Wheels setting:** set the wheel constant (3 available).
 The constant can be inserted with two different procedures (manual or automatic), described below.

Fig. 73

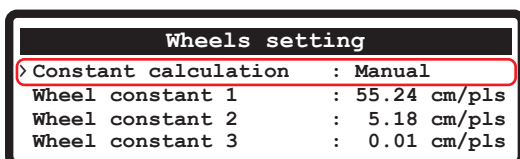


Take measurements with tires at the operating pressure.
This test must be performed on medium-hard terrain; for application to very soft or very hard terrain, rolling diameter may vary, leading to inaccurate output calculation; when this is the case, repeat the procedure.
During the test, cover the distance with the tank filled up to half capacity with water.

Constant calculation: Manual

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

$$K_{wheel} = \frac{\text{distance traveled (cm)}}{\text{no. of detection points} \times \text{wheel rpm}}$$



<**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.

Fig. 74

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).

Select the **Wheel constant 1, 2 or 3** and enter the calculated value.

Constant calculation: Automatic

It allows to calculate and save the wheel constant with the formula below:

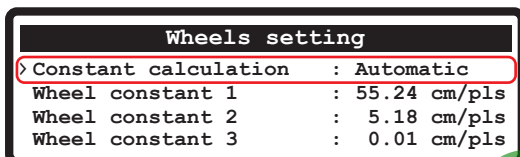


Fig. 75

- Measure a straight path at least 100 m (300 feet) long.
 (The longer the distance traveled, the more accurate wheel constant calculation).
- Select a constant (**Wheel constant 1, 2 or 3**) and press **OK** to access automatic setup.
- Set the value of the **Reference distance** to be covered (**A**).
- Select the item **Start counting** and press **OK** to confirm.
- Travel the requested distance: the number of pulses will increase during the path. At the end of the distance, stop the tractor.
- Press **OK** to end the calculation. The computer will indicate the calculated constant. Wheel constant has been saved.

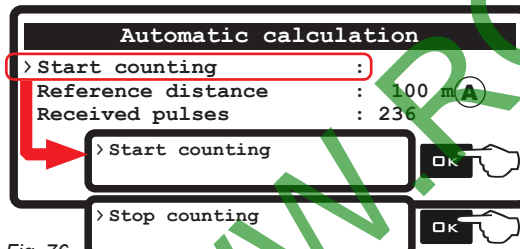


Fig. 76

9.10.2 Source - GPS



Fig. 77

The computer receives the speed data from the GPS receiver or from the Bravo400S or Delta80 satellite navigator directly connected to the auxiliary port.
 No other settings are necessary.

9.11 Flowrate correct. factor

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.

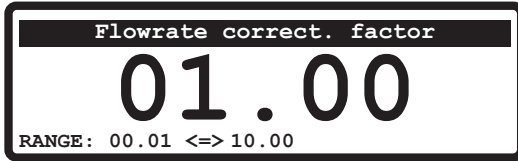


Fig. 78

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.

9.12 Press. sensor zero value

Menu visible only if the pressure sensor is enabled in the menu **Advanced Setup**.

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:

Before carrying out any operation disable the pump.

Make sure that the pump is correctly disabled, then open the main valve and all section valves.

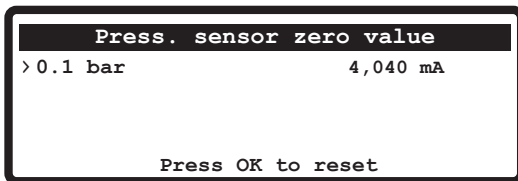


Fig. 79

- Press **OK** to reset the pressure sensor residual signal.

Bravo 350 automatically quits the procedure and displays the job screen with the pressure value of 0.0 bar

9.13 Totalizers

This menu allows displaying the job TOTAL data of the computer.

Consider that:

- There is a totalizer for each preset job (40 available): upon access the display shows the active job totalizer.
- You can scroll the totalizer referred to the job number by pressing **F1** and **F2**.
- The current job data are summed to the relevant totalizer each time you select a new job (Par. 9.1).
- It is possible to save the totalizer reports on USB pendrive using the relevant function **Save data to USB** (Fig. 80).
- It is possible to delete all job's data (Fig. 81).

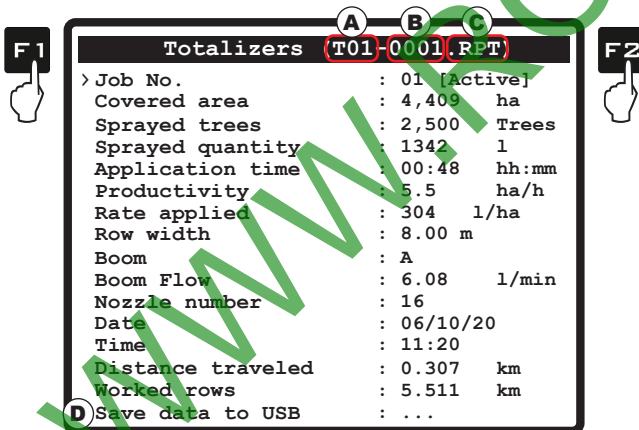


Fig. 80

- A** T01 Job number
- B** 0001 Progressive number of saved file
- C** .RPT Extension of saved file

• **SAVING THE TOTALIZER ON USB PENDRIVE**

Select the item **D** > **Save data to USB** and press **OK**: at the end of the saving process the display will show the message **Successfully completed!**.

Bravo 350 saves a file containing all the displayed data to the USB.

e.g.: T01-0001.RPT.

Bravo 350 will increase the report number upon each subsequent saving

e.g.: T01-0002.RPT.

Data in the file can be displayed on PC with a text editor.

• **TOTALIZER RESET**

WARNING: IN THIS WAY ALL JOB (TOTAL) DATA SAVED SO FAR WILL BE LOST. WE RECOMMEND SAVING THEM ON USB PENDRIVE BEFORE PROCEEDING.

- Select item **Job No.** (Fig. 80) and press **CLR**.

- The screen of Fig. 81 will be displayed: select **Yes** and press **OK**.

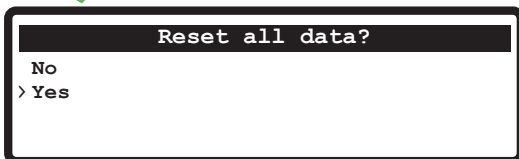


Fig. 81

9.14 Test

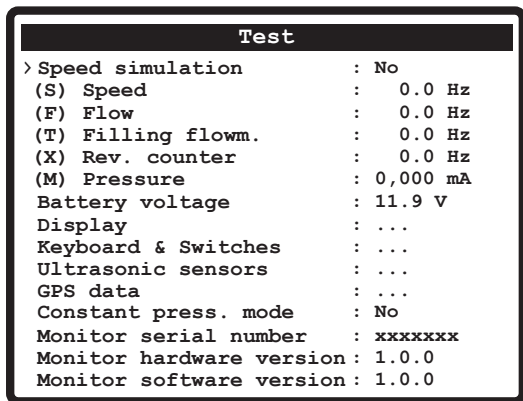



Fig. 82

It allows checking the correct operation of BRAVO 350.

 All items are read-only

9.14.1 Speed simulation

Allows enabling **Yes** /disabling **No** speed simulation.

The simulation allows carrying out regulation tests also with stopped machine: simulation set at 6 km/h (3.7 MPH).

Simulation speed modification:

Once the speed simulation has been enabled, press **OK** on the job screen to edit the speed value: **S** the symbol will flash.

Press the key **▲** to increase the simulated speed and the key **▼** to decrease it.

Press **OK** to confirm the value: **S** the symbol is steady on.

9.14.2 Signal test

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

9.14.3 Battery voltage

BRAVO 350 displays the supply voltage.

9.14.4 Display

The computer switches on each string of the display progressively to check that all pixels turn on.

After the test, press **ESC** to quit.

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9.14.5 Keyboard & Switches

Press all keys or switches one at a time: if the operation is correct, the display will show the name of the relevant control.



Fig. 83

Keyboard:
 F1 / F2 / F3 / F4
 LEFT
 DOWN / UP / CLR / OK / ESC / Auto
 RIGHT

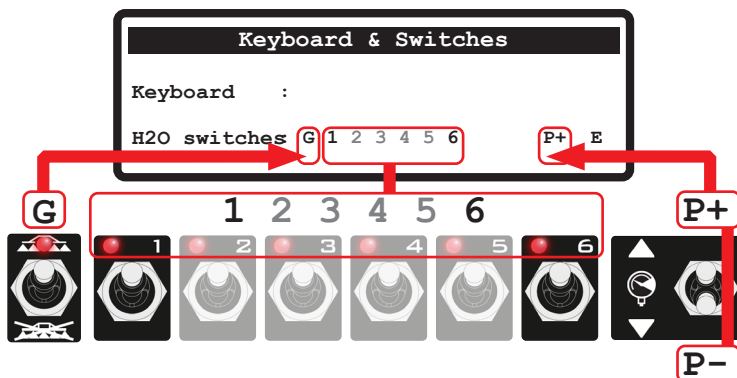


Fig. 84

H2O switches:
 G Main control ON
 1 / 2 / 3 / 4 / 5 / 6 Section valves ON
 P+ / P- Proportional regulation (+ increase / - decrease)
 E Presence of an external main control to start the spraying.

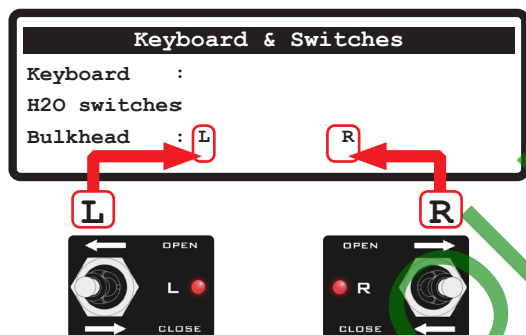


Fig. 85

Bulkhead:
 L Left bulkhead
 1 / 2 / 3 auxiliary controls
 R Right bulkhead

9.14.6 Ultrasonic sensors

The computer displays the number corresponding to the active sensors.

9.14.7 GPS data

If you connect a satellite receiver, BRAVO 350 displays the received GPS data.

Displayed data:

- Latitude
- Longitude
- Number of satellites
- HDOP
- DGPS
- Update frequency

9.14.8 Constant pressure mode

Enable **Yes** /disable **No** constant pressure mode.

When the constant pressure regulator mode is active (Yes) during automatic operation, BRAVO 350 considers the pressure value (bar), which can be set using the control valve switch, as the rate parameter to be kept constant.

9.14.9 Monitor hardware version - Monitor software version

BRAVO 350 displays the hardware and software version of the device.

9.15 User preferences

This menu allows setting the BRAVO 350 audio and display preferences.

9.15.1 Sound alarm

Enables or disables the sound when alarms are triggered.

9.15.2 Sound keyboard

Enables or disables keytones.

9.15.3 Date & Time

Allows setting the computer clock.

> **Modification locking code**

Allows locking the modification of date and time set on the computer to obtain real reports.

• **HOW TO USE THE LOCKING CODE**

- Enter the number to enable the locking;
- Enter the same number if you want to disable the data modification locking.

> **Date**

> **Time**

Set the BRAVO 350 date and time.

• **HOW TO SET DATE AND TIME**

- Select the items **Date** or **Time** and press **OK** to access the edit mode; now press the keys **▲▼** to change the digits and **◀▶** to scroll through the fields. Press **OK** to confirm.
- Once all fields have been set, BRAVO 350 automatically quits the menu.

9.15.4 Display contrast

Allows adjusting the display contrast.

9.15.5 Filling calculation

It allows enabling / disabling the estimated quantity needed for the spraying (par. 9.9 Tank).

By specifying the extension of the area to be sprayed, Bravo 350 will be able to estimate the fluid quantity needed for the spraying considering the quantity of fluid present in the tank and the target rate.

9.15.6 Data display

It allows selecting the data displayed in the lower part of the job screen.

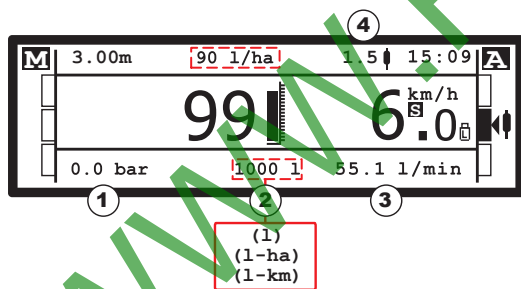


Fig. 86

- 1 Left
- 2 Middle
- 3 Right
- 4 Show trees counter

1 - 2 - 3 Available options for each data:

- RPM
- Pressure
- Covered area
- Flowrate
- Tank data

TC icons: TC-GEO , TC-SC , TC-BAS  functions.

For all the enabled functions related to the **User setting > Working parameters > Task Controller TC** menu (par. 9.7.1), it is possible to select the item **TC icons** in one of the **Left / Middle / Right** menus.

The work screen will display the icons in the desired position.

Available options for **Tank data** (2, Fig. 86):

- Level (1) or (gal)**: the display indicates the tank level in real time.
- Either (l-ha) or (gal-ac)**: the display shows the tank level and range on surface alternatively (ha or ac according to the set units of measurement).
- Either (l-km) or (gal-miles)**: the display shows the tank level and range in rows alternatively (km or miles according to the set units of measurement).



In case the item *Either* is set, the values on the spraying screen are displayed alternatively.

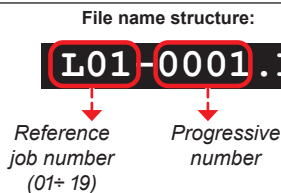
4 It allows enabling the display of the counter of sprayed trees in the job screen.

9.16 Data logger

It allows enabling / disabling the job data saving on the USB pendrive.
Set a saving interval (1, 2, 5, 10 seconds) to enable data logger.

If you connect a satellite receiver or a navigator, the **Data logger** (correctly enabled) allows recording also the latitude and longitude of the machine at any moment of the spraying.

DATA RECORDING FILE



When the data logger is enabled, BRAVO 350 saves a "LOG" file to the USB pendrive, inside which job's data are stored*. The recording is started when the main control is set to ON, and is performed at the frequency set in the menu **Data logger**. Any time you select a job, a new "LOG" file will be saved and its name (Fig. 87) will bear a progressive number according to the number of savings (i.e.: 00001→ 00002). Data in the file can be displayed on Personal Computer with a text editor. They consist of a header followed by data strings.

Fig. 87

Example:

B350_DIR,1.0.0,O,1,11/11/2019,09:50:25,44.64226197,10.78941207,0,3.1,3.00,910.411,60,0.15,2.7,2,660,1982,0,0.00,0.00,M,M,0,1,2.0.,A,J1

DATA	HEADERS	DESCRIPTIONS	AVAILABLE OPTIONS
B350_DIR	Device	Device	
1.0.0	FwVersion	Firmware version	
O	SwType	Software type	O= orchard sprayer
1	GPSQ	GPSQ	
11/11/2019	Date	Date	
09:50:25	Time	Time	
44.64226197	Lat	Latitude	
10.78941207	Lon	Longitude	
0	MUnit	Unit of measurement	0: metric / 1: US / 2: metr. L/100m
3.1	Speed	Speed	
3.00	BoomWidth	Row width	
910.411	CoveredArea	Covered area	
60	TargetRate	Target rate	
0.15	ApplRate	Rate applied	
2.7	Flow	Flowrate	
2	Press	Pressure	
660	SprQnty	Sprayed quantity	
1982	TankLevel	Tank level	
0	Sections	Section status	0: closed / 1: open
0.00	LeftBoomWidth	Left semi-row width	
0.00	RightBoomWidth	Right semi-row width	
M	LeftUSmode	Left side operating mode	M: manual / A: automatic
M	RightUSmode	Right side operating mode	M: manual / A: automatic
0	BulkHead-Aux	Bulkhead	0: disabled / 1: enabled
1	RegType	Regulation type	
2.0	Trees	Sprayed trees number	
	RPM	Rotation speed	(not available for the bulkhead version)
A	ActBoomType	Boom	
J1	SelectedJob	Job number	

* Data are just indicative data and represent a mere example: in real facts they will always be different according to the type of spraying.

9.17 Ext. device log

Menu only visible if a menu item 8.9 External device on page 22 has been set in the **Advanced setup**.
Used to set the seconds of the sampling period transmitted through the serial port.

9.18 Load/save setup

The BRAVO 350 settings can be loaded or saved on USB pendrive so as to reconfigure the device if necessary, solve problems or configure another BRAVO 350 without repeating all operations manually.



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

To use the menu items insert the USB pendrive in the suitable slot.

9.18.1 Load configuration from USB

It allows selecting a configuration file saved on the USB pendrive and to set BRAVO 350 again.



WARNING: BY LOADING THE B350ORC.BIN FILE CONTAINED IN THE USB MEMORY TO BRAVO 350, ALL SETTINGS CARRIED OUT SO FAR WILL BE LOST.

- Select **Load configuration from USB** and press **OK**;

The confirmation message **Successfully completed! (B350ORC.BIN)** is displayed once the configuration process is completed.

- Press **ESC**.

9.18.2 Save configuration to USB

It allows saving the BRAVO 350 configuration on the USB pendrive: then it will be possible to load it any time it is necessary to repeat the same settings.

- Select **Save configuration to USB** and press **OK**;

The confirmation message **Successfully completed! (B350ORC.BIN)** is displayed once the saving process is completed.

- Press **ESC**.



WARNING: if you save two different Bravo 350 configurations on the same USB pendrive, the second one will overwrite the first one.



10 USE

10.1 Controls on computer



Fig. 88

Legend:

- 1 Keys to manage the boom sections
- 2 Keys to select data or modify parameters
- 3 Keys to open / close the boom right or left side
- 4 Switches to control bulkhead actuators
- 5 Switches for the operation of valves

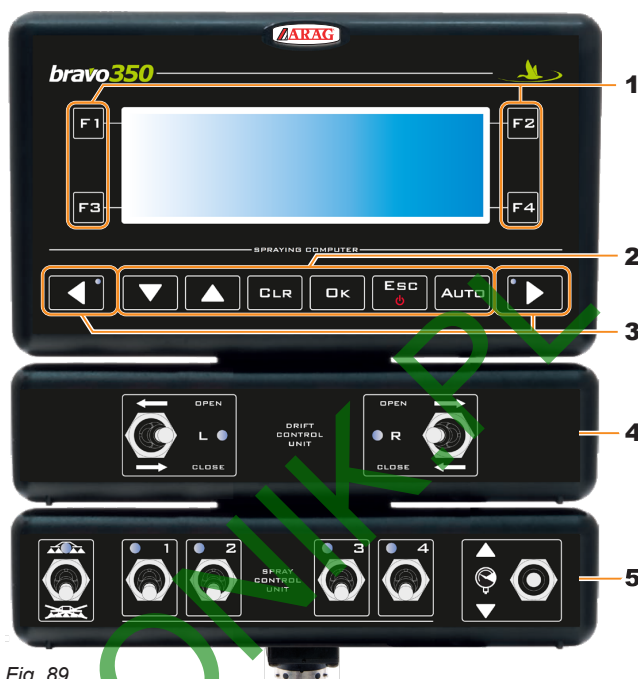


Fig. 89

10.2 Keys to manage the boom sections (1 Fig. 88)

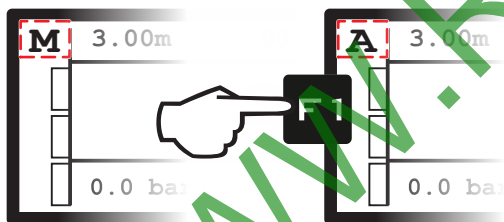
F1 / F2 They select the operating mode of the two sides of the boom (F1 left side / F2 right side).

Available operating modes:

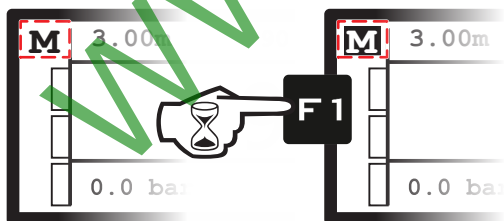
M Manual Operation (sections are opened and closed manually using the relevant switches)

Always select this mode if the ultrasonic sensors are not installed.

A Automatic Operation (each ultrasonic sensor detects the presence or absence of the parts to be sprayed and automatically opens and closes the corresponding section).



Example:
Press **F1** to scroll through the operating modes (**M** Selected mode)



Example:
Keep **F1** pressed to confirm the selected mode (**M** Active mode)

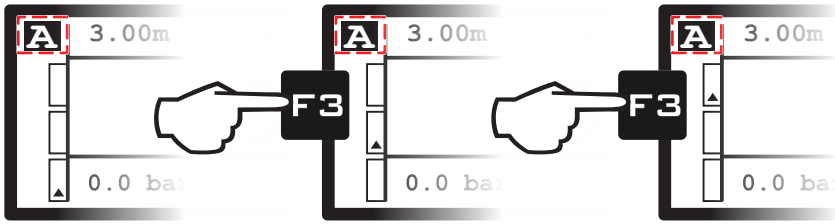
Selected mode

Mode confirmed / enabled

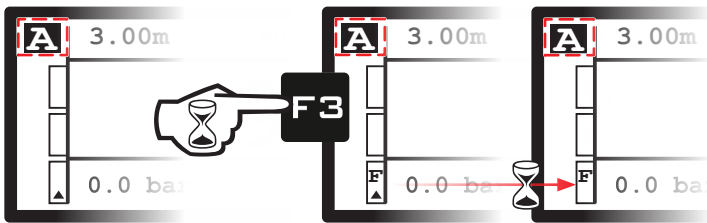
CONTINUES

F3 / F4 : NOT ENABLED IF THE MANUAL OPERATION **M** OF THE BOOM SECTIONS IS ACTIVE

F When the **Automatic Operation (A)** is selected, it is still possible to force the manual mode for single sections to be directly controlled with the relevant switch.
The other sections automatically open and close according to ultrasonic sensors detection.



Example:
Press **F3** to scroll through the sections from bottom to top (▲ Selected section)



Example:
Keep **F3** pressed to force manual mode **F**.

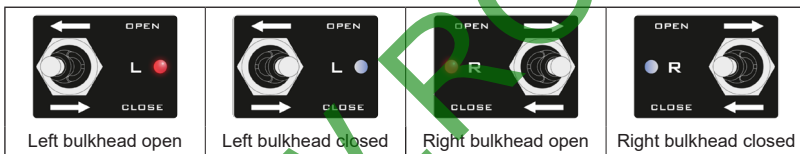
Selected section Section enabled in **F** mode (manual operation)

10.3 Control, selection or modification keys (2 - 3 Fig. 88)

LEFT side Opening/Closing	Decrease / scroll data	Increase / scroll data	Data reset	Data confirmation	ON/OFF Quit data modification	Output Manual / Automatic	RIGHT side Opening/Closing

10.4 Switches to control bulkhead actuators and auxiliary devices (4 Fig. 88)

The opening/closing of bulkheads and the enabling/disabling of auxiliary outputs depends on the configuration selected in par. 8.4 Bulkheads on page 18 .



10.5 Switches to operate valves in the control unit (5 Fig. 88)

If the main control is set to ON, the message **Disable spraying command!** will be displayed: no function can be accessed until the main control is set to OFF.

Main control ON	Main control OFF	Enabled section	Disabled section	Increase of output	Decrease of output

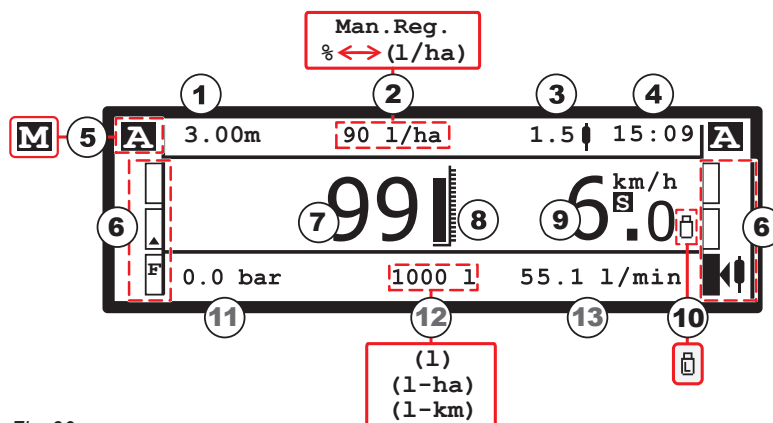













Fig. 90

- 1 Preset row width
- 2 Manual Operation / Application rate setup (Automatic Operation)
- 3 Trees counter
- 4 Clock
- 5 Management mode of boom sections: Automatic Operation **A** / Manual Operation **M**
- 6 Status of boom sections:

	Section is disabled.		Section is active and ready for spraying.
	Tree detected.		Section valve open.
	Section has been selected through function keys F3 and F4 , but is not active.		Section has been selected through function keys F3 and F4 and is active.
	Section can be activated in manual mode through the relevant switch.		Section is in manual mode and has been activated through the relevant switch.

- 7 Detected output
- 8 Tank level graphic indicator
- 9 Speed (simulated) **S** / detected
- 10 USB pendrive correctly detected:
when the data logger is enabled (**User setting > Data logger**) the letter **L** is shown inside the icon.
- 11 - 12 - 13 Customizable data display:
RPM / Pressure / Covered area / Tank data / Flowrate / TC icons (can be activated separately **TC-GEO** , **TC-SC** , **TC-BAS** ).

Example:

- 11 Pressure
- 12 Tank data: tank level (*text and graphic*), alternated with
 - Range on surface (*ONLY if set among the user preferences, Par. 9.15*)
 - Range in rows (*ONLY if set among the user preferences, Par. 9.15*)
- 13 Flowrate

10.7 Treatment preliminary settings

	SET	Par.
TO BE CARRIED OUT UPON FIRST USE OF THE COMPUTER	Speed	9.10
	Jobs setup	9.3
	Nozzles setup	9.5
	Booms setup	9.4
	Working limits	9.7
	Flowrate correction factor	9.11
	User preferences	9.15
	Date & Time	9.15.3
	Data logger	9.14
	Save settings to USB pendrive	9.18.2
TO BE CARRIED OUT BEFORE EACH TREATMENT	Type of wheel	9.10.1
	Flowrate correction factor	9.11
	Type of job	9.1
	Tank parameter	9.9
	Intervention sensibility	9.6



After having carried out the indicated settings start the treatment selecting MANUAL (Par. 10.8.2) or AUTOMATIC (Par. 10.8.1) modes.

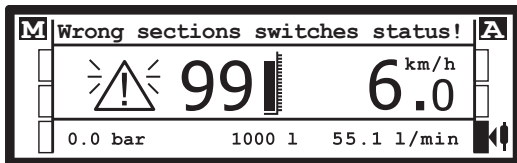


Fig. 91

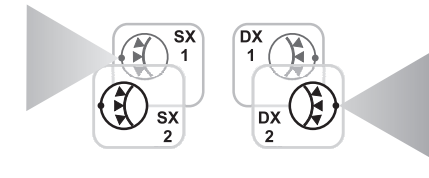
In case of double boom configuration (not available for the solenoid version), it is possible to perform the spraying using a boom section on the left side while simultaneously using a section on the right side.

It is not possible, instead, to keep two different boom sections opened at the same time on the same side.

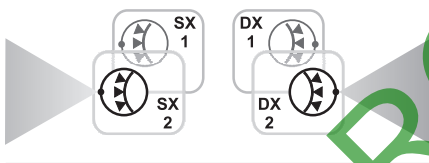


If you attempt to simultaneously activate two different boom sections on the same side (Fig. 91), the following message is displayed.

OK



OK



NO!

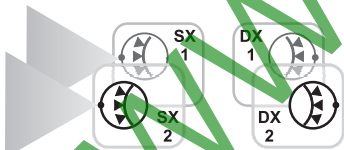


Fig. 92

10.8 Application rate regulation

BRAVO 350 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.

10.8.1 Automatic operation






Fig. 93

BRAVO 350 keeps the target 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 **6** to adjust output to crop conditions, increasing or decreasing momentarily the application rate up to $\pm 50\%$.

- 1 Enable the automatic operation.
- 2 Activate 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 spraying.
- 6 Use the control valve switch to temporary change the application rate.

If **IBX20** is enabled (par. 8.9), pressing the **AUTO** button will **ACTIVATE** both the TC enabled (TC-GEO , TC-SC , TC-BAS ) in par. 9.7.1, and the application rate target.

Par. 10.3 Control, selection or modification keys (2 - 3 Fig. 88) on page 41

Par. 10.5 Switches to operate valves in the control unit (5 Fig. 88)

Par. 10.6 Display





10.8.2 Manual operation (DEFAULT)



Fig. 94

Application rate shall be adjusted manually using the suitable **6** switch.

- 1 Enable the manual operation.
- 2 Activate 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 spraying.
- 6 Use the control valve switch to adjust the desired quantity.

If **IBX20** is enabled (par. 8.9), pressing the **AUTO** button will **DEACTIVATE** both the TC enabled (TC-GEO , TC-SC , TC-BAS ) in par. 9.7.1, and the application rate target. If enabled, the TC-BAS  function switches to manual mode.

Par. 10.3 Control, selection or modification keys (2 - 3 Fig. 88)

Par. 10.5 Switches to operate valves in the control unit (5 Fig. 88)

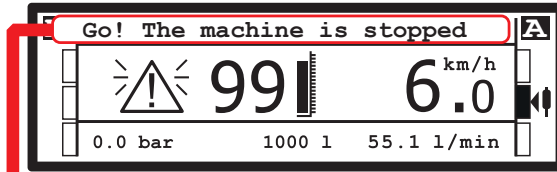
Par. 10.6 Display

11 MAINTENANCE / DIAGNOSTICS / REPAIRS

11.1 Cleaning rules

- Clean only with a soft wet cloth.
- DO NOT use aggressive detergents or products.
- Do not clean the monitor with direct water jets.

11.2 Operation errors



Par.	OPERATING MODE	MESSAGE ON DISPLAY / CAUSE	SOLUTION
8.8.2 9.18	MAN. + AUTO	USB device not detected! USB device not connected! The USB pendrive is not inserted correctly	• Check the insertion of the USB pendrive.
8.8.2 9.18	MAN. + AUTO	USB memory full! The USB pendrive has no free space	• Space needed for new information: delete the unnecessary files from the USB pendrive.
9.18	MAN. + AUTO	File not found! (B350ORC.BIN) The computer configuration has not been saved	• Save the data.
9.18	MAN. + AUTO	File format error! (B350ORC.BIN) The file relevant to the computer configuration is faulty.	• Try to save the data again.
8.8.2	MAN. + AUTO	File not found! (TANK.TKL) The tank configuration has not been saved	• Save the data.
8.8.2	MAN. + AUTO	File format error! (TANK.TKL) The file relevant to the tank configuration is faulty.	• Try to save the data again.
9.9	MAN. + AUTO	ATTENTION! Maximum level reached You have reached the maximum capacity of the tank	• Stop the loading pump: you have reached the maximum capacity of the tank
8.5	MAN. + AUTO	Flowmeter out of range Flowrate out of the limits allowed by flowmeter	• Regulate the operating pressure so as to respect the previously set limits for nozzles in use. • Check that the flowmeter constant value has been set correctly.
9.3	AUTO	Go slow! Insufficient flowrate The flowrate does not reach the value required for output	• Decrease the farming machine speed. • Check that the flowmeter constant value has been set correctly.
9.3	AUTO	Go fast! High flowrate The flowrate exceeds the value required for output	• Increase the farming machine speed. • Check that the flowmeter constant value has been set correctly.
8.11	MAN. + AUTO	Reduce rotation speed! RPM exceeds the maximum allowed value	• Decrease the rotation speed of the moving part.
8.11	MAN. + AUTO	Increase rotation speed! RPM does not reach the minimum value	• Increase the rotation speed of the moving part.
9.10.1	MAN. + AUTO	Error: inadequate number of pulses The automatic calculation of the constant for the wheel sensor is not valid	• Repeat the automatic calculation procedure of the constant for the wheel sensor.
8.8.2	MAN. + AUTO	Signal out of range! Check sensor Faulty pressure values have been detected	• Check the pressure sensor status and make sure there is no residual pressure in the system.
8.8.2	MAN. + AUTO	Signal out of range! Check sensor Anomalous values have been detected	• Check the correct operation of the level sensor. • Check for residual fluid in the tank.
10.5	MAN. + AUTO	Disable spraying command! Main switch ON upon computer switching on	• Move main switch downwards (position OFF).
10.5 10.8.1	MAN. + AUTO	Go! The machine is stopped Main switch ON with machine stopped	• Start the farming machine. • Move main switch downwards (position OFF).
10.6	AUTO	Wrong sections switches status! Simultaneous operation of two different boom sections on the same side	• Disable one of the two sections.
10.8.1	AUTO	Start pump! No flowrate Main switch ON with machine stopped but rate at zero	• Start the pump and move the farming machine.
10.8.1	AUTO	Automatic regulation locked Pressure does not reach set value	• Increase driving speed.
9.14.7	MAN. + AUTO	GPS not valid or not available No connection available or reception problems.	• Check connection and operation of receiver.
9.7	AUTO	Check nozzles! Highly worn Difference between measured and calculated flowrate (according to selected nozzle data) higher than set value	• Check that the selected nozzle coincides with the one installed. • Replace nozzles.

11.3 Troubleshooting

PROBLEM	CAUSE	SOLUTION
The display does not switch on	No power supply	• Check power supply cable connections (Par. 6.2).
	Computer is OFF	• Press the ON key.
Valve controls take no effect	Valves not connected	• Connect the connectors (Par. 6.3).
One valve does not open	No power supply to valve	• Check valve electric connection and operation.
The display no longer shows the speed	Wrong setup	• Check the setup of the wheel constant (Par. 9.10.1).
	No signal coming from the speed sensor	• Check connections to speed sensor (Chap. 5).
The displayed speed is not precise	Wrong setup	• Check the setup of the wheel constant (Par. 9.10.1).
Output volume readout inaccurate	Wrong setup	• Check the coverage setup and the row width (Par. 8.3 - 9.3).
		• Check the setup of the flowmeter constant (Par. 8.5).
		• Check the setup of the wheel constant (Par. 9.10.1).
		• Check the setup of the type of section valves (Par. 8.3).
Covered area count displayed does not match actual distance covered	Wrong setup	• Check connections to speed sensor (Chap. 5).
		• Check the row width (Par. 9.3).
Distance traveled count displayed does not match actual distance covered	Wrong setup	• Check the setup of the wheel constant (Par. 9.10.1).
		• Check connections to speed sensor (Chap. 5).
Sprayed fluid count displayed does not match liters/gpm actually sprayed	Wrong setup	• Check the setup of the flowmeter constant (Par. 8.5).
	Use of three-way section valves without setting metered by-passes	• Check the setup of the type of section valves (Par. 8.3).
Unable to reach output volume value set for the automatic operation	Wrong setup	• Perform setting.
	System not adequately sized to provide required flowrate	• Check the setup of the application rate (Par. 9.3).
	Control valve malfunction	• Check the row width (Par. 9.3).
Instantaneous pressure readout inaccurate	Wrong setup	• Check maximum pressure valve adjustment.
	Pressure sensor wrong installation	• Make sure control valve is adequate for specific system.
Instantaneous pressure is not displayed	Wrong setup	• Check valve operation.
	Computer does not receive signals from pressure sensor	• Check the setup of the full scale for pressure sensor (Par. 8.6).
	Pressure sensor wrong installation	• Check connections to pressure sensor (Chap. 5).
Rpm readout inaccurate	Wrong setup	• Check connections to pressure sensor (Chap. 5).
Rpm value not displayed	Computer does not receive signals from RPM sensor	• Check the setup of the pressure sensor (Par. 8.6).
	Rpm sensor wrong installation	• Check connections to pressure sensor (Chap. 5).
The displayed tank level is not precise	Level sensor not calibrated	• Check setting of the constant for RPM sensor (Par. 8.11).
	Level sensor wrong installation	• Check connections to RPM sensor (Par. 8.11).
During the tank calibration procedure, the sprayed quantity is always steady on zero	Wrong installation / no flowmeter installed.	• Perform the calibration (Par. 8.8.2).
	Section valves and main control set to OFF.	• Calibrate the level sensor again (Par. 8.8.2).

12 ACCESSORIES

12.1 Pendrive

The pen drive may be used to exchange data with the BRAVO 350 Detect.



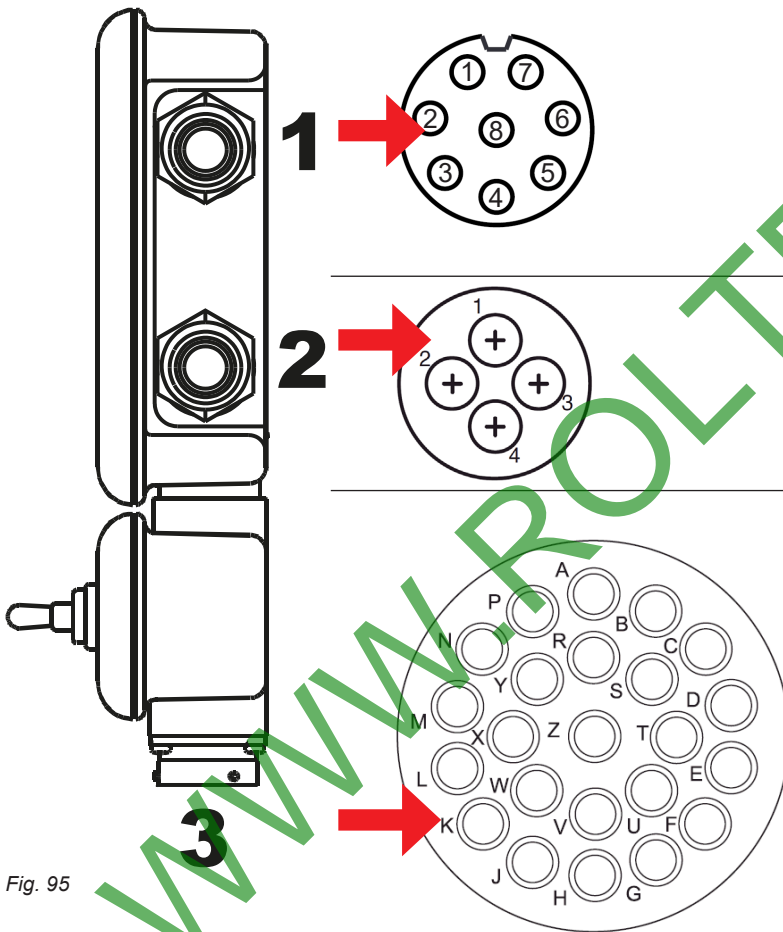
Before using the pendrive, format it in FAT 32 mode; make sure that it is not protected and can be read by the system. Most pendrives with up to 8 Gb memory are compatible.

13 TECHNICAL DATA

13.1 Computer technical data

Description	
Display	Graphic LCD, 240 x 64 pixels, white back-lighting
Power supply voltage	9 ÷ 16 Vdc
Consumption (valves excluded)	3.3W
Max. switchable current for each output (section)	100mA
Max. switchable current for each output (guard actuators)	3A continuous
Operating temperature	-20 °C ÷ +70 °C -4 °F ÷ +158 °F
Storage temperature	-30 °C ÷ +80 °C -22 °F ÷ +176 °F
Digital inputs	For open collector sensors: max 2000 pls/s
Analog input	4 ÷ 20 mA
Weight (without cables)	From 900g to 1250g depending on the versions
Protection against polarity inversion	.
Protection against short-circuit	.

13.2 Pin-out of Bravo 350



PIN	Signal
1	GPS GND
2	GPS +12 V
3	GPS RX
4	GPS TX
5	External Main Input
6	Secondary speed signal input
7	CAN L
8	CAN H

PIN	Signal
1	GND power supply
2	+ 12V power supply

PIN	VERSION 2 SECTIONS	VERSION 4 / 6 SECTIONS	VERSION 4 SECTIONS 2 BULKHEADS
	Signal	Signal	Signal
A	12V sensor power supply	12V sensor power supply	12V sensor power supply
B	GND sensor power supply	GND sensor power supply	GND sensor power supply
C	Main valve	Main valve	Main valve
D	12V valve power supply	12V valve power supply	12V valve power supply
E	-	Section valve 6	GND right bulkhead power supply
F	Section valve 1	Section valve 1	Section valve 1
G	-	-	12 V right bulkhead power supply
H	-	Section valve 4	Section valve 4
J	Proportional valve (1)	Proportional valve (1)	Proportional valve (1)
K	Proportional valve (2)	Proportional valve (2)	Proportional valve (2)
L	GND valve power supply	GND valve power supply	GND valve power supply
M	Section valve 2	Section valve 2	Section valve 2
N	Level sensor / Filling flowmeter	Level sensor / Filling flowmeter	Level sensor / Filling flowmeter
P	RPM sensor	RPM sensor	GND left bulkhead power supply
R	Ultrasonic sensor 1	Ultrasonic sensor 1	Ultrasonic sensor 1
S	Ultrasonic sensor 2	Ultrasonic sensor 2	Ultrasonic sensor 2
T	Flowmeter	Flowmeter	Flowmeter
U	12V valve power supply	12V valve power supply	12V valve power supply
V	-	Section valve 5	12 V left bulkhead power supply
W	GND valve power supply	GND valve power supply	GND valve power supply
X	-	Section valve 3	Section valve 3
Y	Speed sensor	Speed sensor	Speed sensor
Z	Pressure sensor	Pressure sensor	Pressure sensor

Fig. 95

14 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. Exception is made for the costs relating to:
 - 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.

15 END-OF-LIFE DISPOSAL

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

16 EU DECLARATION OF CONFORMITY

The declaration of conformity is available at the website www.aragnet.com, in the relevant section.

WWW.ROLTRONIK.PL

Only use genuine ARAG accessories or spare parts to make sure manufacturer guaranteed safety conditions are maintained in time. Always refer to the website www.aragnet.com.

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