

BELROBOTICS

Multizone Option Manual



English version

BELROBOTICS 
THE GRASS MASTERS

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1. INTRODUCTION

This manual describes the use of the Multizone option on the Bigmow, Parcmow, Greenmow and Ballpicker robots from Belrobotics. This manual is a complementary document to the general instruction manual for the robots and reading/understanding the general instruction manual is a prerequisite for the correct use of the multizone option. This manual also refers to specific SMS commands which are described in the 'Track&Trace' manual.

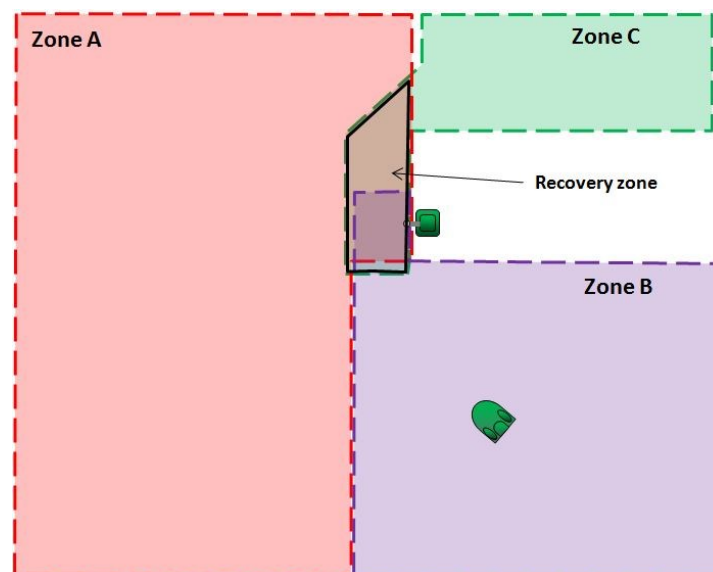
Your installation must contain the following elements if you wish to use the multizone option:

- A multizone station including multiple blue cards (2 or 3) to generate a multi-zone signal across multiple magnetic loops.
- Multiple (2 or 3) peripheral wire loops corresponding to the different work zones set up during the installation process
- A robot (BM, PM, GM or BP) with multizone software which you can download from the Belrobotics extranet based on the hardware configuration of your robot. (Please contact your Belrobotics reseller if you cannot find the software for your robot hardware).

2. DESCRIPTION OF THE MULTIZONE OPTION

The multizone option allows you to define multiple zones (maximum of three zones) corresponding to multiple peripheral wire loops in which the robot will work. The different zones possible are identified in the software as ZoneA, ZoneB and ZoneC.

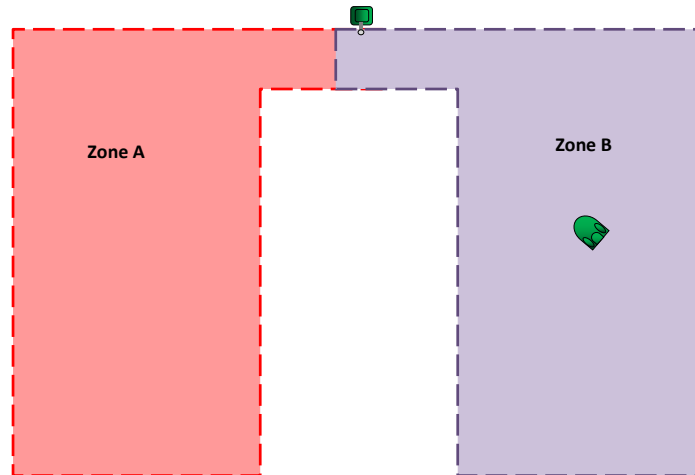
The station must be placed on the 2 or 3 peripheral loops such that the robot can return to the station from each of the work zones. This means there must be an area of ground which is inside all 2 or 3 peripheral loops. This is called the recovery zone.



Thanks to the Multizone option, it is possible to improve the overall cutting quality across the area by:

- considering complex installations where the use of multiple peripheral loops of wire makes the installation simpler or even possible at all.

Example: a case where there are 2 distinct zones as illustrated below. Using the Multizone option allows controlled distribution of work between the two zones and also reduces the time taken to return to the station by reducing the distance to travel for each return to the station.



- Guarantee the distribution of work you want between zones A, B and C by means of parameters and options (see later in the document) and allow the robot to work more efficiently overall. This allows, for example:
 - o Consideration of the restrictions on occupying the area and not necessarily having to put the robot in the rest station (backhome) if part of the area (one zone) is occupied, instead the robot can work in the other zones.

Example:

- Zone A = main football pitch occupied for competitions during the weekend
- Zones B and C = training areas
- With the multizone option, it is possible to set the system up so that the robot can continue to work on Zones B and C during the competitions at the weekends. Or vice versa, it can work on Zone A during mid-week training sessions.
- o Considering different cutting or ball collection objectives for the different sub-zones and guarantee the presence of a robot in the different sub-zones in order to achieve these objectives.

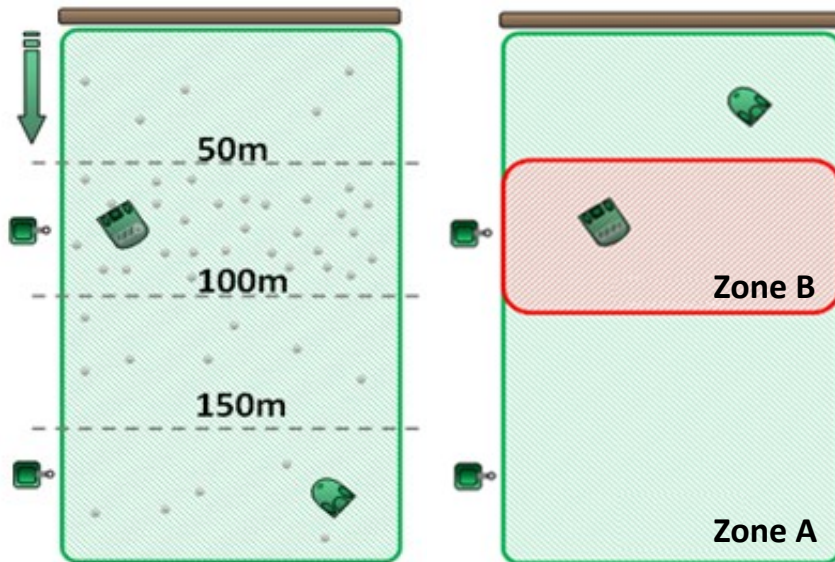
Example 1: for a lawn-mower robot, the grass grows at different rates in the two zones because of the nature of the soil or exposure to sunlight. It is possible to arrange for the robot to spend more time in the zone where the



grass grows more quickly.

Example 2: Golf driving range as illustrated below. The ball-picker can be configured so that it spends most time collecting in zone B where there are more balls and only spends a shorter amount of time in the overall area.

Note: in the illustration below, zone B is entirely included in zone A. If the machine is working in zone A, it will therefore also spend some of its time in zone B.



3. CHOICE OF WORK ZONE

3.1. AUTOMATIC ALGORITHM

The Figure 1 illustrates the global algorithm for choosing the zone and the way in which the user can influence the algorithm by means of commands, parameters and options which can be given to/programmed on the robot.

In automatic mode (normal operating mode), the robot chooses a work zone for each cycle, i.e. each time it leaves the station to go and work (steps 4 and 5 of the Figure 1). During a cutting cycle (steps 0, 1, 2 of the Figure 1-), the robot never changes zone but still sometimes passes through the recovery zone included in the selected work zone.

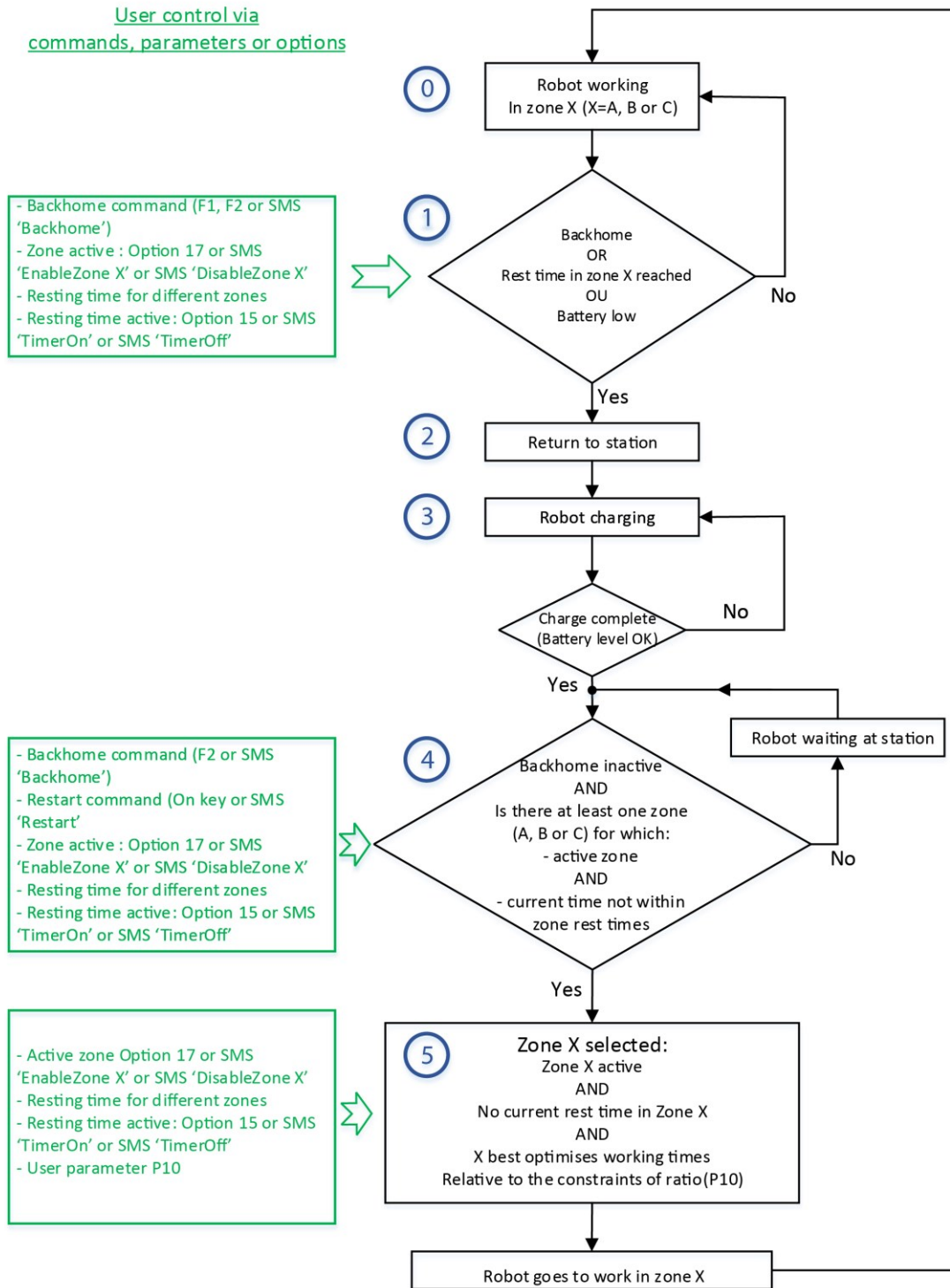


Figure 1: Robot operating algorithm in Multizone mode

Below, we will describe the parameters/options which allow the user to control the algorithm used by the robot to define its work zone. The other parameters/options and the menu navigation method are described in chapters 4, 5 and 7.

3.1.1 Rest at station for several cycles (Backhome option 2, F2 button)

Station rest (backhome = on charge) has priority over all other options and a robot for which option O2 has been enabled will rest at the station permanently until a new order is received from the user. (see general manual for more information on this option). So this option applies globally across all zones (A, B and C).

Sending a 'Backhome' SMS (Track&Trace manual) enables the O2 option and forces the robot to stay at the station.

Sending a 'Restart' SMS disables the O2 option and allows the robot to work. It is the other parameters/options described below which affect how the multizone robot behaves.

3.1.2 "Active zone" option (Option 17)

A machine never works in a zone if the zone has been disabled. This option O17 is considered as a 2nd priority (after option O2 backhome) in the algorithm which decides which zones the robot will work on.

- If the machine is working in a zone and a user disables it, the machine returns directly to the station. This amounts to a return to station. (Step 1 of the Figure 1)
- If the machine is in the station and decides to leave, it will never select a zone which has been disabled by the user (step 5 of the Figure 1).

The possible values for option 17 are:

- **Option 17 (Zone X) = 0: Zone X (X=A, B or C) is disabled.** The machine does not work in zone X. Even if a zone is disabled, all the parameters, options and resting times relative to this zone are stored in the robot's memory. So when the zone is re-enabled (Option 17 =1), there is no reprogramming to do.
Sending a 'Disablezone X' SMS (X = A, B or C) is equivalent to setting option 17 to a value of 0.
- **Option 17 (Zone X) = 1: Zone X (X=A, B or C) is enabled.** Sending an 'Enablezone X' SMS (X = A, B or C) is equivalent to setting option 17 to a value of 1.

3.1.3 Rest time and "Rest time disabled" option (Option 15)

A machine never works in zone X (X= A, B or C) if:

- The current time is part of a rest time programmed for zone X. It should be noted that the rest times can be programmed for each zone and verified via DTS (DTS5.x or DTS6.X) that the rest times are those required for each of the zones.
- **AND** the rest times for zone X are enabled (Option 15 (ZoneX)=0).

The active periods of time are considered as a 3rd priority (after option O2 backhome and option O17 zone active) in the algorithm which decides which zones the robot will work on.

If the machine is working in a zone and an active period for this zone is about to start, the

machine returns to the station.

If the machine is due to leave the station and an active period for the zone is under way (or due to start within 10 minutes), the machine will not select this zone for the next mowing cycle.

The possible values for option 15 are:

- **Option 15 (Zone X) = 0: The rest times programmed for zone Z are active, i.e. the robot takes them into consideration and cannot work in zone X during these periods.** Sending a 'TimerOn' text is equivalent to setting option 15 to 0 for all the zones (A, B and C). Sending a 'TimerOn X' SMS (X = A, B or C) is equivalent to setting option 15 0 for Zone X alone.
- **Option 15 (Zone X) = 1: The rest times programmed for zone X are disabled, i.e. the robot does not take into consideration the rest times for zone X and can work in this area at any time.** Even if the periods are disabled, the programming is stored in the robot's memory and all that is required to reactivate them is to set option 15 to 0. The periods do not need to be programmed again.

Sending a 'TimerOff' text is equivalent to setting option 15 to 1 for all the zones (A, B and C). Sending a 'TimerOff X' SMS (X = A, B or C) is equivalent to setting option 15 1 for Zone X alone.

Example use of rest time in multizone mode:

Let's consider a multizone installation with 2 zones: zone A and zone B.

Using the keyboard, the user has programmed options 15 and 17 as follows (DTS6.X screen capture):

	A	B	C
O10 - Retour antihorlogique:	☒	☒	☒
O11 - Retour alterné:	☐	☐	☒
O13 - Retour en U:	☒	☒	☒
O14 - Retour sur fil:	☐	☐	☐
O15 - Timer Off:	☐	☐	☐
O17 - Zone active:	☒	☒	☐

The two zones A and B are active (Option 17 = 1) and the rest times for the two zones A and B are active (Option 15 = 0). The time periods for the two zones in question have been programmed using the keyboard based on the system below (DTS6.x screen capture):



	00h	01h	02h	03h	04h	05h	06h	07h	08h	09h	10h	11h	12h	13h	14h	15h	16h	17h	18h	19h	20h	21h	22h	23h
Lundi																								
Mardi																								
Mercredi																								
Jeudi																								
Vendredi																								
Samedi																								
Dimanche																								

Every day, between 14:00 and 20:00, a rest period has been defined for zone A (red bars above). Given that the periods are activated for this zone (Option 15 (zoneA)=0), the robot will not go into zone A between 14:00 and 20:00. During this period, it will work continuously in zone B which does not have an active period between 14:00 and 20:00.

In the same way, between 20:00 and 14:00, the robot will only work in zone A because it cannot work in zone B (rest time and option 15 (ZoneB) = 0).

In the example above, the time periods are mutually exclusive. So at any time, the robot can only choose one of the two zones to work in and applying P10 parameters (the value of P10 parameters) has no influence on where the robot works.

3.1.4 P10 parameters: working time ratio

The P10 parameter is a multi-zone parameter, i.e. each zone (A, B and C) has its own P10 value. This parameter is used as the lowest priority (after Option 02, O17, O15 and rest time) to select a zone for the robot to work in.

The values for P10 for the active zones determine the distribution of working time across these zones. P10(Zone X) corresponds to a “weighting” which influences the algorithm for selecting the work zone: the higher P10(Zone X) is, the greater the probability that the robot will go to Zone X (providing the zone is active).

Nevertheless, the P10 parameters for Zones A, B and C must be considered on a relative and global basis, we could say that P10(Zone X) divided by Total(P10 active zones) is the percentage of time that the robot will spend in Zone X.

Authorised P10 values are between 1 (min) and 10 (max).

Example 1:

There are three active zones with no rest period constraints on these zones. Choose the P10 parameters for each of the zones as indicated in the table below:



Identification: (screen)	Significance	Zone A	Zone B	Zone C
P10	Working time ratio	2	1	1
O017	Active zone	(v)	(v)	(v)

Total (P10(Zone A) + P10(Zone B) + P10(Zone C)) = 2 + 1+1 = 4 (Active zones only)

Overall, the robot will therefore select work zones as follows:

Working time ratio for Zone A = $P10(\text{ZoneA})/\text{Total} = 2/4 = 50\%$

Working time ratio for Zone B = $P10(\text{ZoneB})/\text{Total} = 1/4 = 25\%$

Working time ratio for Zone C = $P10(\text{ZoneC})/\text{Total} = 1/4 = 25\%$

At the beginning of each cycle, the robot looks at the zones in which it is authorised to work (O17, O15, resting time) and for these zones it compares the percentage time spent in these areas (historically over the last 3 to 4 days) and selects the zone in which the working time ratio is lowest relative to the P10 command.

Example: over the last 3 to 4 days, the robot has spent 55% of its time in zone A, 30% in zone B and 15% in zone C. Based on the example P10 values in the table above, the robot will then go to zone C for the next cycle.

Example 2:

The same example, BUT zone C is deactivated.

Identification: (screen)	Significance	Zone A	Zone B	Zone C
P10	Working time ratio	2	1	1
O017	Active zone	(v)	(v)	(-)

In this case, total P10 for active zones: $P10(\text{zoneA}) + P10(\text{zoneB}) = 2 + 1 = 3$.

Overall, the robot will therefore select work zones as follows:

Working time ratio for Zone A = $P10(\text{ZoneA})/\text{Total} = 2/3 = 67\%$

Working time ratio for Zone B = $P10(\text{ZoneB})/\text{Total} = 1/3 = 33\%$

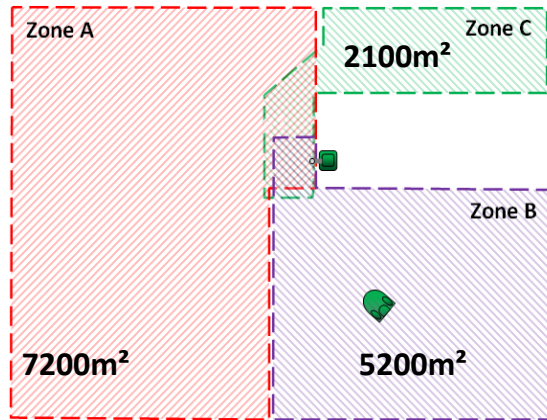
Working time ratio for Zone C = $P10(\text{ZoneC})/\text{Total} = 0 = 0\%$ (zone disabled)

How do you define the P10 values for the different zones?

A good rule of thumb is to define the values of P10 as a function of the relative areas of zones A, B and C because the time that a robot needs to spend in each zone to obtain an even cut is proportional to the area of the zone. However, this rule is only correct if the user does not bias the robot's behaviour by assigning different rest times for the zones.

Example: An installation with 3 zones, the areas of which are shown in the diagram below:





In order to determine the P10 for an zone, we take the area of the zone, divide it by 1000m² and round the result:

$$P10(\text{ZoneA}) = \text{rounded}(7200\text{m}^2/1000\text{m}^2) = \text{rounded}(7.2) = 7$$

$$P10(\text{ZoneB}) = \text{rounded}(5200\text{m}^2/1000\text{m}^2) = \text{rounded}(5.2) = 5$$

$$P10(\text{ZoneC}) = \text{rounded}(2100\text{m}^2/1000\text{m}^2) = \text{rounded}(2.1) = 2$$

This would give a relative working time in each zone as follows:

$$\text{Zone A: } 7 / \text{total (P10)} = 7/(7+5+2) = 50\%$$

$$\text{Zone B: } 5 / \text{total (P10)} = 5/(7+5+2) = 36\%$$

$$\text{Zone C: } 2 / \text{total (P10)} = 2/(7+5+2) = 14\%$$

If the formula above give P10 values which are outside the authorised limits (1 to 10) the values for the 3 zones must be divided or multiplied by a common factor.

!!! Remember that the P10 parameter is the last priority in the algorithm for selecting a zone and the robot takes the history of the last 3 to 4 days into consideration.

In certain cases, the P10 values may have no influence if the rest behaviour is entirely determined by the active zones and rest periods. See example in chapter 3.1.3.

If the user modifies the active zones, the active rest periods or the P10 values, there will be a period of transition (which can be up to 3 to 4 days) before the way the robot works reflects the programmed P10 ratio. During this transition period, the robot may not work in one zone or another. Once the ratio of time passed in the different zones corresponds to the new user configuration, the transition period ends and the robot starts working in the authorised zones again with the working time ratio corresponding to the P10 values.

3.2. MANUAL CHOICE OF WORK ZONE

When the robot is working in one zone, the robot can be forced manually to change zone and go and work in another given active zone. This method is particularly useful on installation in order to check the installation is correct (wires, station, etc.) and properly programmed (options, parameters) for each of the zones.

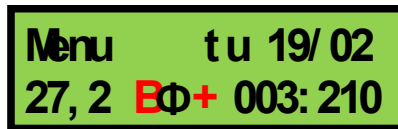
The manual choice of the work zone is valid for one cycle, i.e. the robot completes the cutting



cycle in the selected zone and at the start of the next cycle, the automatic selection algorithm takes over again.

The procedure for changing the work zone manually is as follows:

- Stop the robot and remove the hood (user mode).
- Move the robot to the desired zone. If you attempt to restart the robot when it is outside its zone (negative phase), the robot will first carry out a few manoeuvres to attempt to find a positive phase and then trigger a “Blocked on wire” alarm.
- Press **F3** on the keyboard several times until you see the zone on which you wish the robot to work - Example below: Zone B selected and positive phase



- Once the correct zone is displayed, press **F1** on the keyboard in order to activate a return to the station. This operation records the new work zone for the robot.
- Press **F1** again to deactivate the return to station.
- Press ON and close the hood. The robot works in the new work zone.

4. USER PARAMETERS

For the multizone option, all the user parameters (table below) are defined for each zone. **Each zone (A, B and C) has its own user parameters (except parameter P005 (robot speed) which is a global parameter which is identical for all zones).**

When the robot chooses a zone to work in, it uses the parameters linked to this work zone. This means you can configure the installation really flexibly if you consider that **the multizone robot works in each individual zone in exactly the same way as a single zone robot using the parameter settings for the zone.**

Identification: (screen)	Significance	Default value
P000	Signal sensitivity	30
P001	Length of peripheral wire (x10m)	BM: 60 PM: 35 GM: 23
P002	Maximum distance to follow trackborder on leaving the station (x10m)	10
P003	Trackborder: minimum segment	0
P004	Trackborder: line	120
P005	Nominal speed	BM: 50 PM: 40 GM: 29
P006	Minimum distance to follow trackborder on leaving the station (x10m)	1
P007	Sensitivity to signal phase	30
P008	Signal frequency channel	0
P009	Distance to follow wire on leaving station (x1m)	3
P010	Multizone working time ratio	1

Refer to chapter 7 to find out how to change the parameter settings using the keyboard.

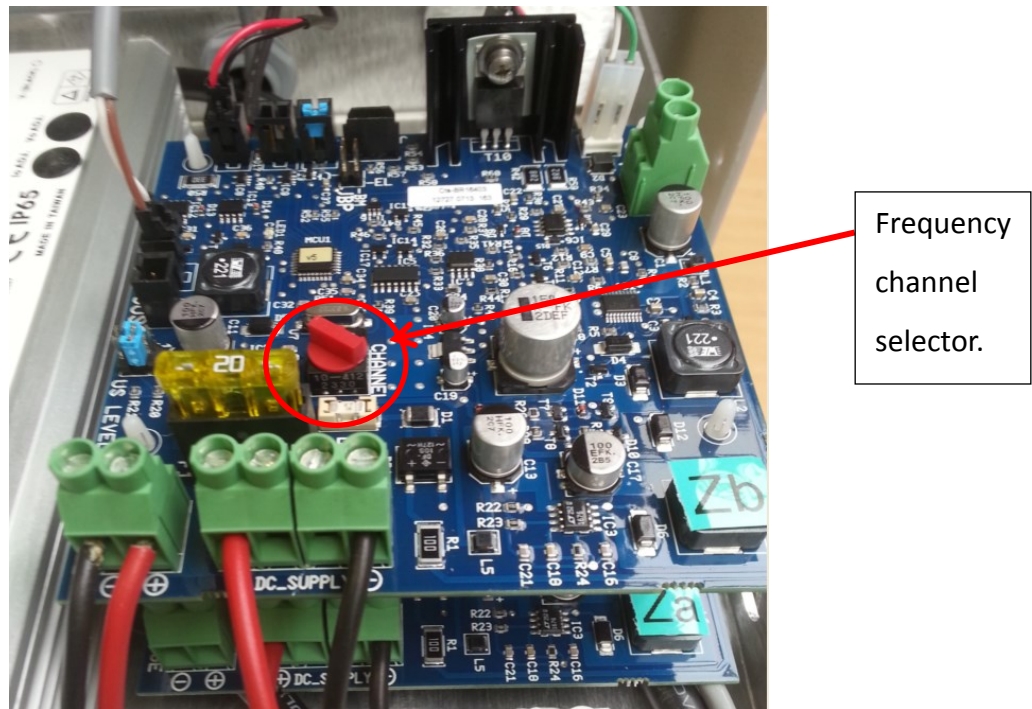
Only user parameters P008 and P010 have specific details which are linked to the multi-zone functionality and are described in more detail below. The other user parameters are the same as for a single zone robot and are not detailed further in this document.

4.1. P008: FREQUENCY CHANNEL

The robot can synchronise itself on the correct peripheral signal channel sent via the cable from the station using parameter P008.

For a multizone installation, each zone has its own loop of wire connected to a specific board in the station, and for each board, the channel is selected using the red channel selector

switch (photo below). In order for the multizone installation to work, you need to select different values (0,1,2,3,4,5) for each zone, A, B and C.



Parameter P008 allows you to synchronise the robot relative to the values programmed in the station.

- P008(Zone A) = you have to program the same setting (0,1,2,3,4 or 5) as the channel selector in the station board which is connected to the loop around Zone A.
- P008(Zone B) as above with the board connected to loop B.
- P008(Zone C) as above with the board connected to loop C.

4.2. P010: WORKING TIME RATIO

See chapter 3.1.4.



5. OPTIONS

Using the user parameters (chapter 4), there are options which allow the behaviour of the robot to be configured. For a robot with multizone software, there are two major categories of options:

- **Global options:** these apply to all the zones (A, B and C) and have a unique value which is valid for each zone and each cycle of work. They are listed in the table below (for BM, PM, GM robots) with their default values: (–) option not activated, (v) option activated. The options for Ballpicker robots are not described in this document.

Identification: (screen)	Significance	Zone A	Zone B	Zone C
O000	Multi-robots	Global: (–)		
O001	Return to station (button F1)	Global: (–)		
O002	Rest at station (button F2)	Global: (–)		
O003	Demo mode	Global: (–)		
O004	Silent charge	Global: (v)		
O008	Phase inversion	Global: (–)		
O009	Change of direction of cutting heads	Global: (v)		
O016	Multizone	Global: (–)		
O018	Keyboard block (SW 2014)	Global: (–)		

Table 5-1

- **Zone-specific options:** for each zone (A, B and C), you can configure a different setting for a specific option and the robot's behaviour during a work cycle in the given zone depends on the settings for the options in this specific zone.

Identification: (screen)	Significance	Zone A	Zone B	Zone C
O010	Anti-clockwise return	(–)	(–)	(–)
O011	Return in both directions	(v)	(v)	(v)
O013	Return in 'U' shape	(v)	(v)	(v)
O014	Return following the wire (SW2014)	(–)	(–)	(–)
O015	Rest time disabled	(–)	(–)	(–)
O017	Active zone	(v)	(v)	(v)

Table 5-2

Refer to chapter 7 to find out how to change the parameter settings using the keyboard.

Only user parameters O08, O15, O16 and O17 have specific details which are linked to the multi-zone functionality and are described in more detail below. The other options are the

same as for a single zone robot and are not detailed further in this document. Options 0005, 0006, 0007 and 0012 no longer exist in the latest version of the software and are not described.

5.1. OPTION 0008: PHASE INVERSION

Inside the peripheral wire loop, i.e. in the zone where the robot is to work, the robot always has to “see” a positive signal phase (via the coil). When the robot “sees” a negative phase, it stops working and triggers a “Blocked on wire” alarm. On installation, it should be checked that this is the case.

To do this, the robot indicates the phase of the signal it can see on the screen. We will start by considering a single zone robot or a multizone robot in zone A. Put the robot inside its work zone and make sure that the P008 parameter for this zone is correctly programmed. Starting from the topmenu, press **F3** (possibly several times) until the display on the screen is similar to one of the 2 screens below:

Menu t u 19/ 02
27, 2 AΦ- 001: 139

Negative phase: **NOT OK**

Menu t u 19/ 02
27, 2 AΦ+ 001: 139

Positive phase: **OK**

Solution 1: Reverse the connections for the loop on the station board for the zone.

Solution 2: Change the setting for option 0008.

For a multizone installation, the robot can only work in each of the zones/loops if the phase is positive inside each loop. Place the zone in the recovery zone (inside all the loops installed), for example one metre opposite the station and check that the P008 parameters (zoneA, zoneB, zoneC) have been programmed correctly. Press **F3** a number of times to check the value of the phase in each of the zones. This must be positive for all the zones.

Let us consider a multizone example where the 3 zones A, B and C are activated.

Menu t u 19/ 02
27, 2 AΦ+ 001: 139

Menu t u 19/ 02
27, 2 BΦ+ 003: 210

Menu t u 19/ 02
27, 2 CΦ+ 001: 047

Positive phase in zones A, B and C: **OK**

Menu t u 19/ 02
27, 2 AΦ- 001: 139

Menu t u 19/ 02
27, 2 BΦ- 003: 210

Menu t u 19/ 02
27, 2 CΦ- 001: 047

Negative phase in zones A, B and C: **NOT OK**
Solution: Change the setting for option 0008.

Menu t u 19/ 02
27, 2 A Φ + 001: 139

Menu t u 19/ 02
27, 2 B Φ - 003: 210

Menu t u 19/ 02
27, 2 C Φ + 001: 047

Positive phase in zones A and C but negative phase in zone C: **NOT OK**
Solution: Reverse the connections for the loop on the station board connected to it.
(Changing option 0008 is not a solution as the phase of zone B would go positive but the phases of zones A and C would turn negative)

5.2. OPTION 0016: MULTIZONE

This option activates or deactivates multizone mode.

If it is deactivated (-) (default setting), the robot can only work in a single zone. It reverts to being a single zone robot. Even if the installation contains multiple wire loops, the robot will always go to zone A. So it is the user parameters, options and rest times for zone A which are taken into consideration.

If the option is deactivated (-), the screen and the keyboard navigation only give access to the global parameters/options and those for zone A. Pressing **F3** will not allow you to see/modify the settings for zones B and C.

If it is activated (V), the robot can work in multiple zones. The robot's behaviour is determined by the automatic station selection algorithm (Chapter 3.1) (and the associated options/parameters).

5.3. OPTION 0015: REST TIME DISABLED

This option is specific for each of zones A, B and C. See chapter 3.1.3 for a description of this option.

5.4. OPTION 0017: ACTIVE ZONE

This option is specific for each of zones A, B and C. See chapter 3.1.2 for a description of this option.



6. PERIODS OF REST TIME

For a multizone robot, the rest times are specified/defined for each of the possible work zones and the rest times are taken into consideration by the automatic algorithm selecting the work zone (Chapter 3.1).

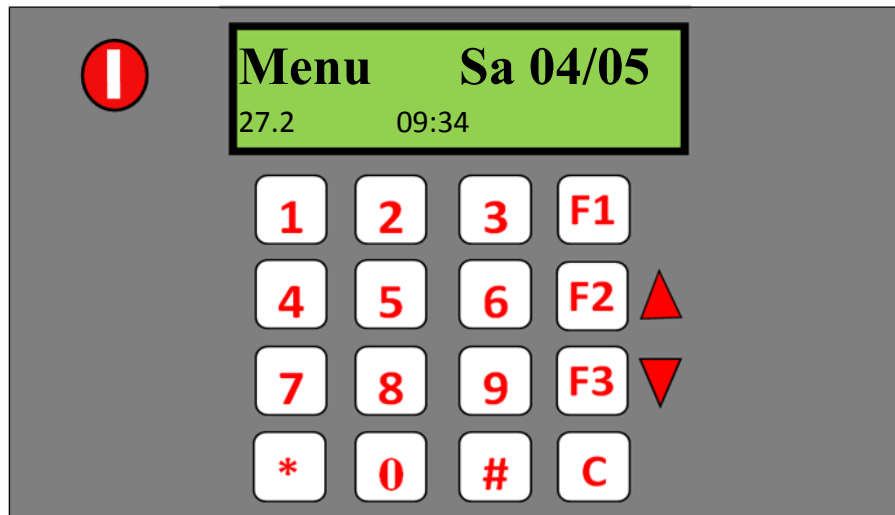
Up to 5 rest times can be defined for each of the zones (A, B and C). Access to the menu for defining rest periods via the screen/keyboard is described in Chapter 7.

7. KEYBOARD/SCREEN NAVIGATION VIA THE MENUS.

7.1. GENERAL INTRODUCTION

The keyboard has a total of 17 buttons. 10 number buttons and 7 action buttons.

When it is switched on, the display shows the system time and date, plus the battery level in Volts.



Buttons	Actions
I	Switch on and start the robot
F1	Make the robot return to the charging station. Once the battery is charged, the robot will automatically resume its mowing cycle.
F2	Go up in the menus and sub-menus
	Make the robot return to the charging station. The robot will remain at its station, even if the battery is charged. The user must press the “I” button to make it resume mowing.
F3	Go down in the menus and sub-menus
	Indicate the “magnetic distance” of the robot relative to the peripheral wire (instead of the time). This function is useful for after-sales service.
#	Access the menus and sub-menus and (de)select an option
C	Go back in the menus and sub-menus
	Delete robot alarm messages shown on the screen.
*	Enter a robot code or parameters and (de)select rest days.

7.2. MULTIZONE SOFTWARE

For software with a multizone option, the meaning of the buttons described in chapter 7.1 is valid, but navigation through the menus is more complex than for single zone software as there are more parameters and options to define. The navigation system using the menus from the keyboard for a multizone system is described in Figure 2.

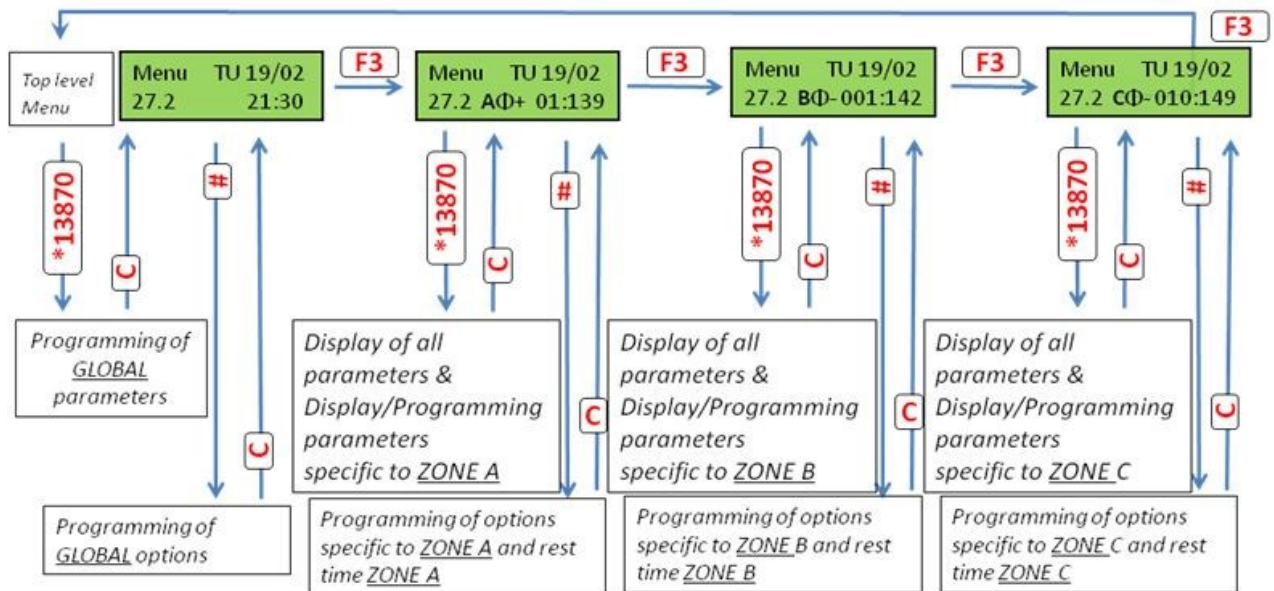


Figure 2: Navigation menus

7.2.1 Topmenu

The topmenu is the menu displayed when you switch on the robot. You can also return to the top level menu by pressing the **C** button several times (as many times as necessary).

The topmenu is identified by the message "Menu" and the date programmed in the robot.

The topmenu contains four possible different screens (see Figure 2) and you press the **F3** button to move from one screen to another. The four possible screens are:

- "Global menu" identified by the presence of the time.

```
Menu    t u 19/ 02
27, 2   13: 24
```

- "Menu Zone A" identified by the characters "AΦ"
- "Menu Zone B" identified by the characters "BΦ"
- "Menu Zone C" identified by the characters "CΦ"

```
Menu    t u 19/ 02
27, 2   CΦ+ 003: 210
```

!!! If option "0016 Multizone" is not activated, only "Global Menu" and "Menu Zone A" are visible. Option 0016 can be activated from the "Global Menu".

7.2.2 Global sub-menu

When the "Global menu" is displayed, you can:

- Display and modify the global user parameters (in fact, only P005 is global) by pressing the keyboard sequence : *13870 and the # character if you wish to change the parameter
- display and modify global options (Table 5-1) by pressing the keyboard sequence ###, then selecting the option with buttons F2 or F3 and then pressing the # character to change the setting for the option.
- Display the robot's operating data: "Data" sub-menu: # F3
 - o Use F2 and F3 to access the "Statistics", "History", "Version" or "Serial no." sub-menus and enter the sub menu by pressing #.
- Display and modify the robot controls: "Controls" sub-menu: #
 - o Use F2 and F3 to access the "Options", "Clock", "New code", "Language", "Cancel rest period" and "Programmed rest" sub-menus and enter the sub menu by pressing #.
 - o Note: as the programmed rests are specific to each zone, it is not possible to modify them from the Global sub-menu. You need to access them from the specific sub-menu for the zone for which you wish to program the rest time.

7.2.3 Menu zone X (X=A, B or C)

From the zone X menu (identified by "Aφ", "Bφ" and "Cφ" respectively for zones A, B and C), you can:

- display and modify the user parameters specific to this zone by pressing the keyboard sequence: *13870, then selecting the parameter to be modified using buttons F2 or F3 and pressing the # character to modify the setting for a parameter
- display and modify the options specific to this zone (Table 5-2) by pressing the keyboard sequence ###, then selecting the option with buttons F2 or F3 and then pressing the # character to change the setting for the option.
- display and modify the rest time periods specific to this zone by pressing the keyboard sequence ## F2 # which gives access to the "Programmed rest" sub-menus



8. GROUND INSTALLATION RULES

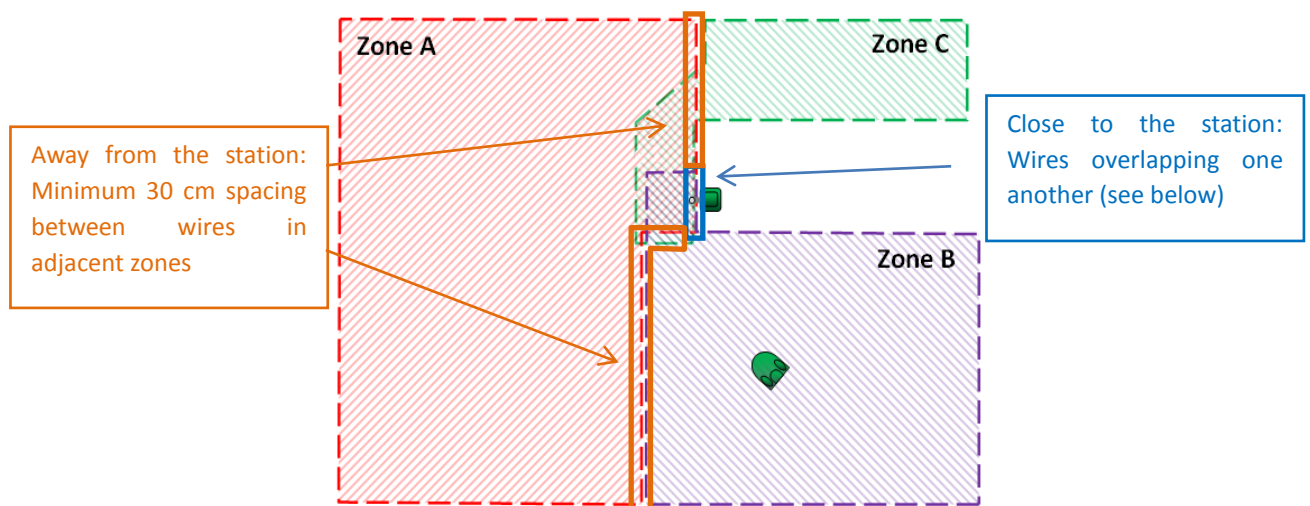
The traditional installation rules must be strictly adhered to for each of the zones individually.

The additional rules linked to the multizone option are:

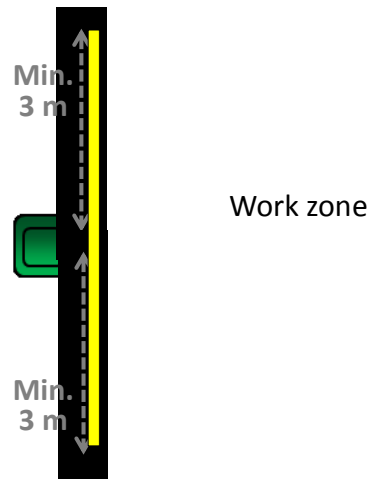
- Aim to **minimise the recovery area** (see definition in chapter 2). This zone is where there is significant overlap between the different signals, and minimising the area is recommended in order to reduce magnetic interference.

If you notice 'No signal' alarm problems near the recovery zone, especially in line (above) one of the wires forming a magnetic loop, please contact Belrobotics. Installing an additional supply in the station may resolve the problem.

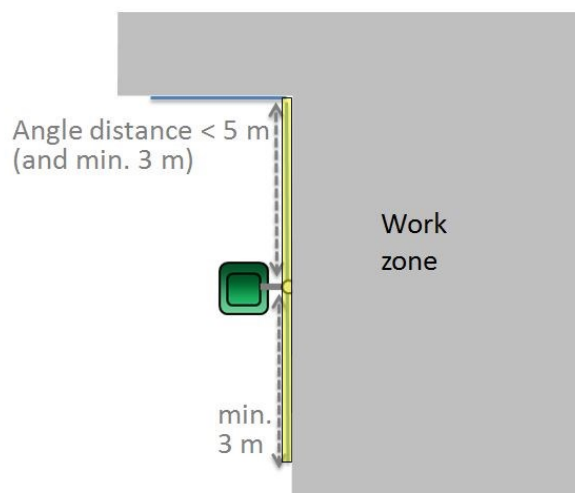
- In the station, the connections between the different loops of wire and their respective boards must be as short as possible and couplings between wires should be avoided, making sure that each pair of wires are "twisted wire".
- In the station, the connection of the different loops of wire must be made such that the phase is positive inside each of the loops (see chapter 5.1). It may be necessary to swap over the two wires connecting the loop.
- The distance between wires in adjacent zones must be at least 30 cm. (except near the station as described below).



- Near the station (distances indicated in the diagrams below, depending on configuration), the wires for adjacent zones must overlap i.e. they must be in the same duct.
 - o Case #1: in all cases, the section of straight wire on one side and the other of the station must be at least 3m (on each side) and in this area, the wires from the different zones must overlap (yellow area in the diagram below).



- Case #2 (diagram below): the wire in one of the loops takes an angle outside a distance of less than 5m from the station. In this case, there are areas where the robot could see the station (via the sonar) too early which would trigger incorrect station return manoeuvres if the configuration (wires, sonar station, options, robots) is not adjusted correctly.



In this case, there are two acceptable configurations for the area where the wire turns:

- Return in 'S' shape: Option O013 = (-)
Return anticlockwise: Option 0010 = (-) and in one direction: Option 011=(-)
Sonar for station pointing south
- Return in 'U' shape: Option O013 = (v)
Return anticlockwise: Option 0010 = (-) and in one direction: Option 011=(-)
Sonar for station pointing north

Near the station (yellow zone extending over a minimum distance of 3m to the left

and as far as the turn (at 3 to 5m) to the north), the wires for the different zones must be overlapping.