TORO®

Operator's Manual

Range Pro™ 100 Robotic Ball Picker

Model—Serial Range

30931ANZ—325000000 and Up
30931CAN—325000000 and Up
30931EU—325000000 and Up
30931JP—325000000 and Up
30931US—325000000 and Up

3472-861B

Original Instructions (EN)

3472-861

Disclaimers and Regulatory Information

⚠ WARNING

CALIFORNIA
Proposition 65

This product contains a chemical or chemicals known to the State of California to cause cancer, birth defects, or reproductive harm.

Electromagnetic Compatibility Certification

Domestic: This device complies with FCC Rules Part 15. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference that may be received, including interference that may cause undesirable operation.

FCC ID: 2AJYU-8PYA007, TFB-1004

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

IC: 23761-8PYA008, 5969A-1004

Australia



New Zealand

R-NZ

Japan



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Introduction

⚠ WARNING ⚠

Failing to follow the operating instructions or to receive training from an authorized Toro distributor may result in death or serious injury.

- **To maximize the safety, performance, and proper operating of this machine, carefully read and fully understand the content of this *Operator's Manual*.**
- **For more information on safe operating practices, including safety tips and training materials, go to www.Toro.com.**

Intended Use

This robotic ball picker is intended to be used by professional, hired operators for autonomous, programmable range picking. It is designed primarily for collecting golf balls on a golf course. This robotic ball picker is commonly used in combination with a robotic lawnmower to manage a golf course. Using the ball picker, battery, charging station, and base station for purposes other than their intended use could endanger you and bystanders.

Read this information carefully to learn how to operate and maintain your product properly and to avoid injury and product damage. You are responsible for operating the product properly and safely.

Getting Help

Visit www.Toro.com for product safety and operation training materials, accessory information, help finding a dealer, or to register your product.

Whenever you need service, genuine Toro parts, or additional information, contact an Authorized Service Dealer or Toro Customer Service and have the model and serial numbers of your product ready. These numbers are located on the serial plate on your product. Write the numbers in the space provided.

IMPORTANT

With your mobile device, you can scan the QR code on the serial number decal (if equipped) to access warranty, parts, and other product information.

Model Number:		**Serial Number:**	

Manual Conventions

This manual identifies potential hazards and has safety messages identified by the safety-alert symbol, which signals a hazard that may cause serious injury or death if you do not follow the recommended precautions.



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This manual uses 2 words to highlight information. **Important** calls attention to special mechanical information and **Note** emphasizes general information worthy of special attention.

Safety Alert Classifications

The safety-alert symbol shown in this manual and on the machine identifies important safety messages that you must follow to prevent accidents.

Safety-alert symbol appears above information that alerts you to unsafe actions or situations and is followed by the word **DANGER**, **WARNING**, or **CAUTION**.

⚠ DANGER ⚠

Danger indicates an imminently hazardous situation which, if not avoided, *will* result in death or serious injury.

⚠ WARNING ⚠

Warning indicates a potentially hazardous situation which, if not avoided, *could* result in death or serious injury.

⚠ CAUTION ⚠

Caution indicates a potentially hazardous situation which, if not avoided, *may* result in minor or moderate injury.

General Safety

- The operator/supervisor of the machine is responsible for any accidents or hazards occurring to others or their property.
- Read, understand, and follow all these instructions and warnings before using the machine.
- Improperly using or maintaining the machine could result in serious injury or death. To reduce this potential, follow all safety instructions.
- Do not allow children or untrained people to operate or service this machine. Allow only people who are responsible, trained, familiar with the instructions, and physically capable to operate or service the machine.

Operation Safety

- Before operating the machine, ensure that there is a physical barrier (e. g., a low fence or a boundary wire) or that the boundary of the operating area is set at least 8 m (26 ft) away from hazards.
- Keep bystanders and children away from the machine and charging station during operation.
- Wear appropriate clothing, including long pants and substantial, slip-resistant footwear, whenever you manually operate the machine.
- Do not operate the machine without all safety protective devices in place and working properly.
- Inspect the area where you will use the machine and remove all objects that could interfere with the operation of the machine.
- Press the stop button and wait for all moving parts to stop before unclogging, servicing, or transporting the machine.
- Keep your hands and feet away from moving parts on and under the machine.
- Do not overreach. Keep proper footing and balance at all times. This enables better control of the machine in unexpected situations. Walk, never run when training the machine.
- Do not stand, sit, or ride on the machine or allow others to do so.
- If the machine strikes an object and/or starts to vibrate abnormally, immediately shut off the machine and wait for all movement to stop before examining the machine for damage. Make all necessary repairs before resuming operation.
- Press the stop button on the machine, wait for all movement to stop, and disable the machine in the following situations:
  - Before clearing blockages on the machine

  - Before checking, cleaning, or maintaining the machine, and the charging station
  - After the machine strikes a foreign object, is in an accident, or breaks down; examine the machine for damage and make repairs before resuming operation
  - If the machine begins to vibrate abnormally; examine the machine for damage and make repairs before resuming operation
- Do not place any object on either the machine or the charging station.
- Do not modify the machine, software, charging station, or base station.
- Do not modify or override the machine controls or safety devices.
- Do not use a modified machine, charging station, or base station.
- We recommend not using the machine while watering or irrigating the operating area.
- Use only accessories approved by Toro to avoid the risk of fire, electric shock, or injury.
- Press the stop button on the machine before handling the machine.
- Do not connect a damaged power cord. Do not touch a live damaged cord.
- Do not use the charging station power supply during severe weather.

Maintenance Safety

- Before servicing the machine, turn the power switch underneath the machine to the OFF position.
- Do not allow children to clean and maintain the machine.
- Keep your hands and feet away from moving parts on and under the machine.
- Contacting the moving parts can result in serious personal injury. Shut off the machine before servicing it.
- Inspect the machine often to ensure that the collecting roller is not worn or damaged.
- Maintain or replace safety and instruction labels as needed.
- For best performance, use only genuine Toro replacement parts and accessories. Other replacement parts and accessories could be dangerous.

Battery and Charging Station Safety

- Clean the charging terminals on the machine and/or charging station using a nonconductive tool (cloth or soft brush); otherwise, damage may occur.
- Wipe the charging terminals on the charging station and machine using a clean, dry cloth if they are dirty.
- When servicing the battery, do not wear jewelry and tie back long hair.
- Do not dismantle or open the battery.
- Keep the battery clean and dry.
- Do not use or charge the machine if it is unusually hot or emits smoke or an unusual smell.
- Leaking battery fluid can cause skin and eye irritation or chemical burns.

- If the battery leaks, do not allow the liquid inside the battery to contact skin or eyes. If there is contact, wash the affected area with a large amount of water and seek medical advice.
- Use an inert absorbent such as sand to clean up spilled battery fluid.
- Dispose of a used battery properly.
- Do not dispose of the battery in a fire. The cell may explode. Check with local codes for possible special disposal instructions.
- A mistreated battery may present a risk of fire, explosion, or chemical burn.
- Do not disassemble the battery.
- Replace the battery with an approved battery only; using another type of battery may cause a fire or risk of injury.
- Keep the battery out of the reach of children.
- Use only the battery approved by the manufacturer for the machine. Do not use any battery that is not designed for use with the machine.
- Do not use a damaged or modified battery, which may exhibit unpredictable behavior that results in fire, explosion, or risk of injury.
- Avoid using the machine in bad weather conditions, especially whenever there is a risk of lightning.
- Do not use or charge a damaged, deformed, or excessively hot battery. A damaged battery may generate heat, rupture, leak, ignite, or explode.
- Use the battery only for the application for which it was intended.
- The battery could emit explosive gasses if it is significantly overcharged.
- Do not subject the battery to mechanical shock.
- Do not use or operate a damaged or improperly functioning charging station.
- Do not plug the charging station into a power strip or an extension cord.
- Do not operate a charging station that has received a sharp or heavy blow.
- Do not use a charging station other than that designed for the machine.
- Disconnect the charging station from the electrical outlet before performing maintenance on or cleaning it to reduce the risk of electric shock.
- Do not attempt to repair, open, or disassemble the charging station unless you are authorized to do so.
- Take the charging station to an Authorized Service Dealer for service or repair. Do not disassemble the charging station.

Storage Safety

- When you are not using the machine, store it indoors in a dry, secure place out of the reach of children or other unauthorized users.

Safety and Instructional Decals

Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or missing.

Decal Part: 163-3955



s_decal163-3955

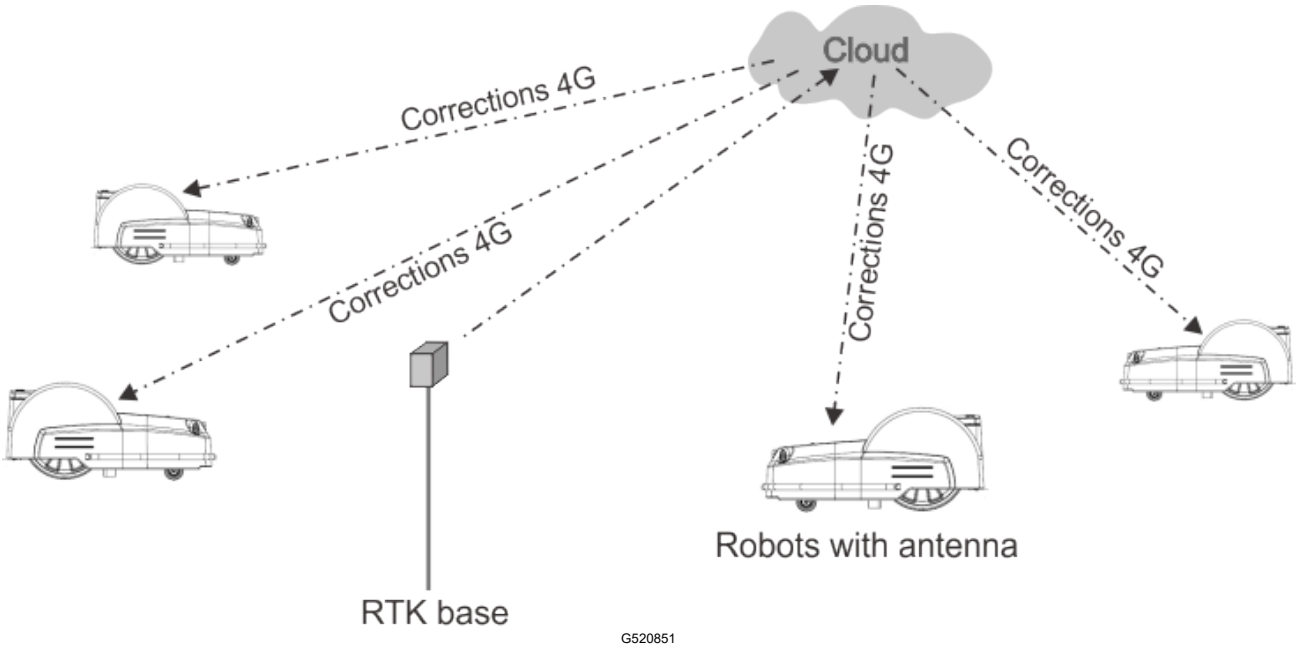
1. Warning—read the *Operator's Manual*.
2. Cutting/dismemberment hazard of hands and feet —shut off the machine before performing maintenance.
3. Thrown object hazard—keep bystanders away.
4. Cutting/dismemberment hazard of hands and feet —do not ride on the machine.
5. Keep pets and animals away from the machine.
6. Do not spray the machine with water.
7. The machine is protected by an access code.
8. Keep bystanders away and keep children supervised.
9. Wear protective gloves when servicing the blades.
10. The machine is equipped with an anti-theft system.

Overview of the RTK GPS

- Standard GPS positioning data retrieved from satellites using GNSS (Global Navigation Satellite System) is accurate to between 5m and 10m. This is because the signal received from a satellite is distorted due to atmospheric and environmental conditions. Higher precision positioning can be achieved by using an RTK (Real-Time Kinematic) technique.
- This technique involves the use of an RTK base placed in a fixed position, which receives GNSS signals from satellites. Since the base is fixed, the data it receives relates to its precise location.
- The robots are also fitted with antennas, which receive GNSS signals from satellites in order to determine their position. Both the RTK base and the robots receive the GNSS signals from satellites in different constellations (GPS, GLONASS, Galileo, BeiDou). Since the robots are moving however, the evaluation of their position is less precise that that of the fixed base.
- The RTK base computes correctional data for each of the satellites and sends these to the robot. The robot is then able to use these corrections to achieve a positional accuracy of between 2cm and 3cm. With such accurate positioning, the robot is able to follow a defined pattern and cover the field in a series of straight lines.

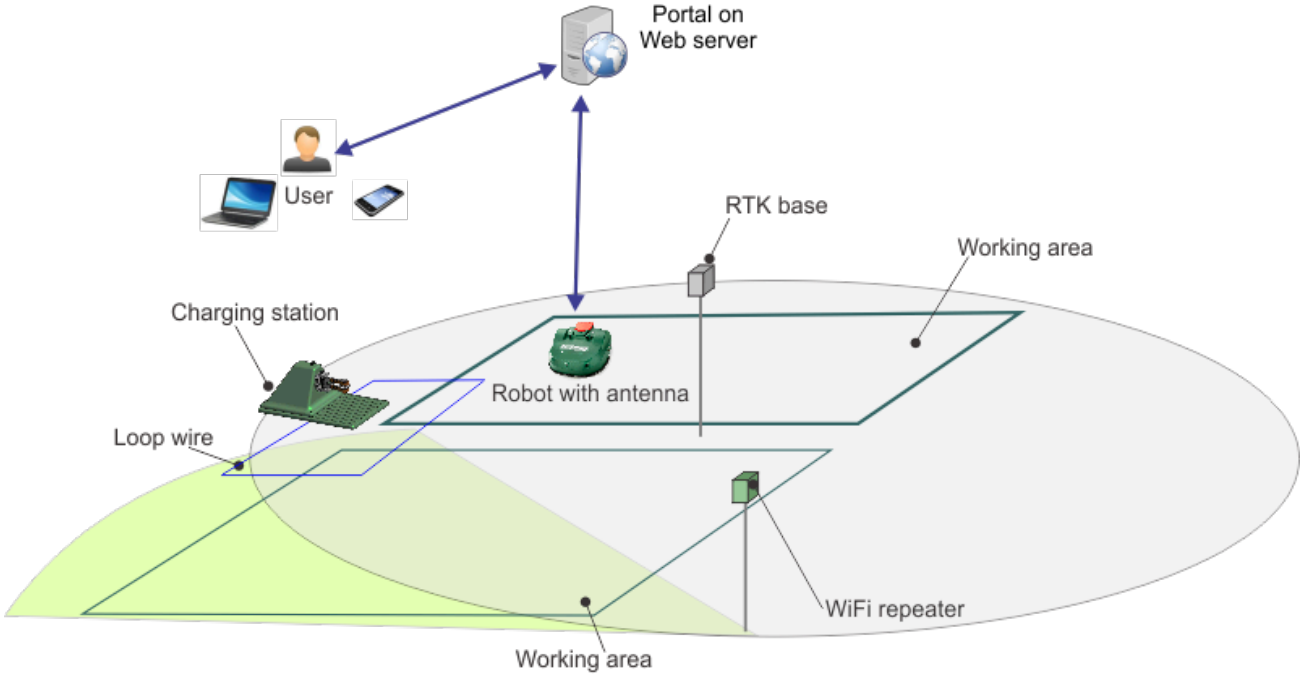
Corrections can also be made via the cloud using 4G. In this case, obstacles do not impede the transfer of correctional data and the base can connect to an unlimited number robots at distances of up to 15km.

Transfer of corrections using 4G



One base station can feed corrections to multiple robots, but each robot must receive corrections from only 1 base station to keep corrections consistent.

Basic components of the RTK GPS mowing system



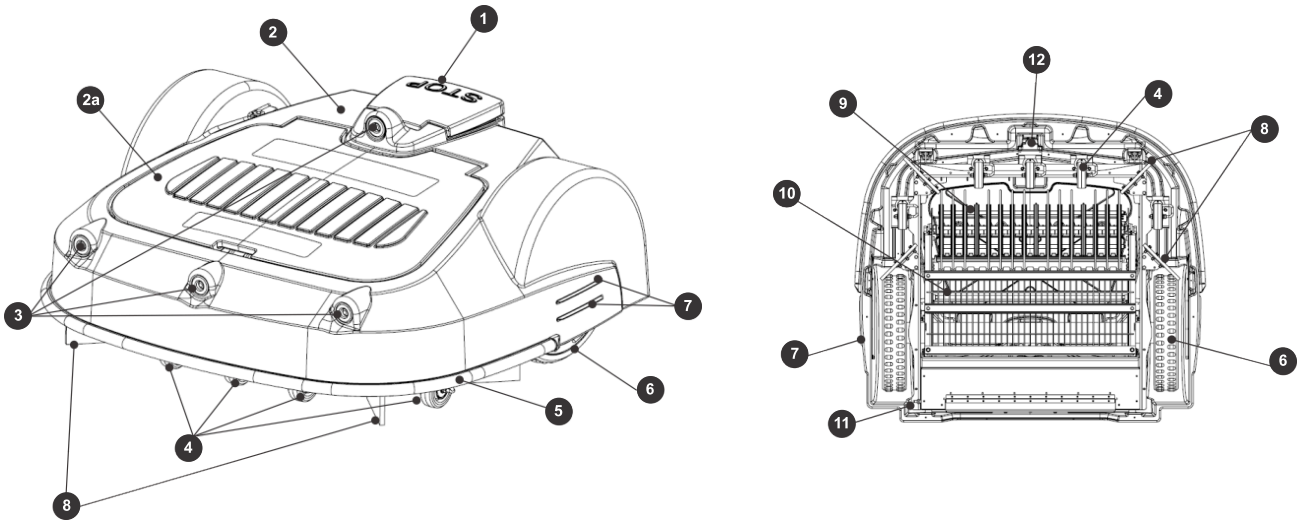
This topic describes the mechanical characteristics of the robot.

A user can exercise direct control over the robot using the User Interface. Once a robot is registered on the portal running on a web-server:

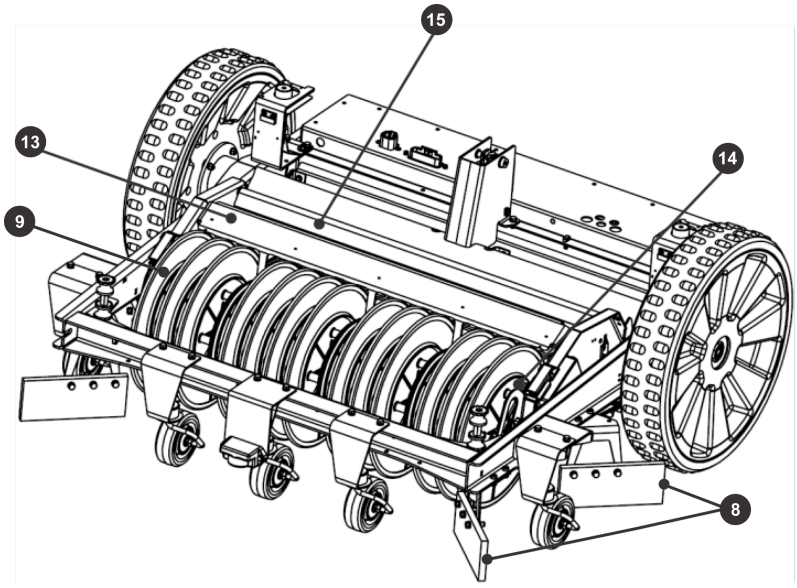
- The robot can send information to this server which can be seen by the user.
- The user can issue commands to the robot, assess its performance and adjust the configuration.

Range Pro 100 Product Overview

Top view



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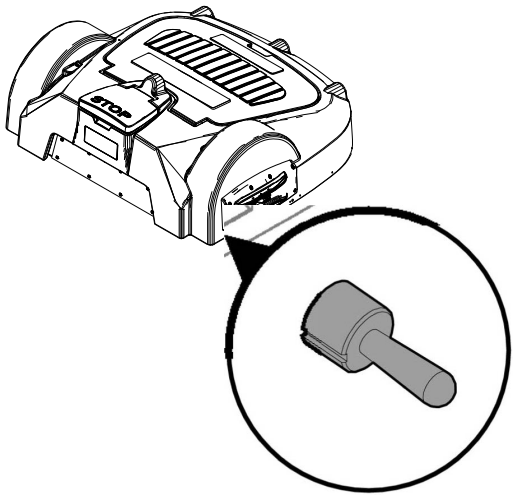
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1. Stop button
2. Body

2a: Basket lid

3. Obstacle detection sonars
4. Front wheels
5. Bumper
6. Rear wheels
7. Charge contacts
8. Ball deflectors
9. Collecting roller
10. Collecting basket
11. Power switch
12. Coil
13. Ball counting band
14. Rotational speed detector
15. Full basket detector

Power switch

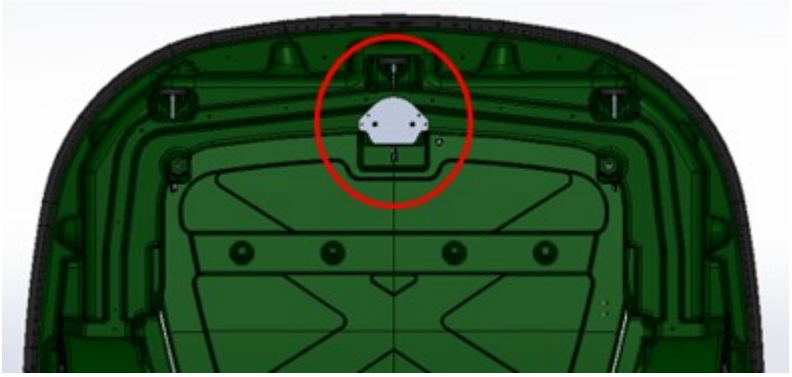


The power switch is located under the shell on the right-rear of the robot.

Move the power switch toward the front of the machine (to the ON position) to operate the robot.

Move the power switch toward the back of the machine (to the OFF position) for extended idle time or winter storage.

RTK GPS antenna

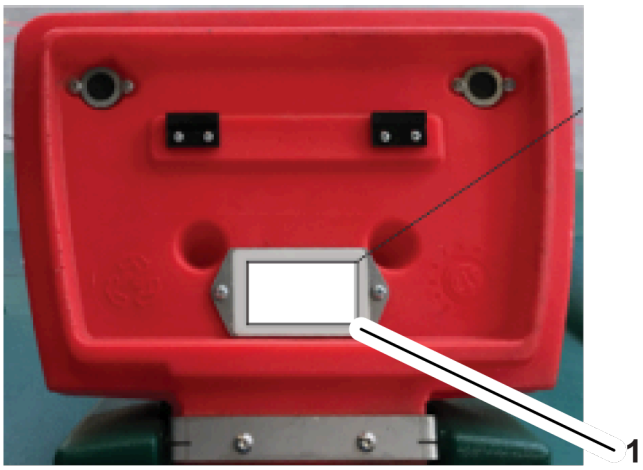


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This is a specific GNSS antenna installed at center front of the shell. It is used to receive data about the robot's global position from satellites.

Serial decal

The identification label can be found on the inside of the Stop button lid as shown below.



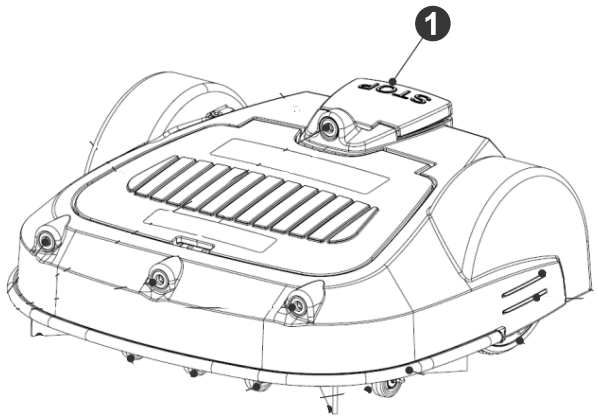
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(1) Serial decal

Sensor Overview

The machine is equipped with a comprehensive set of sensors that ensure its safe operation. These sensors ensure that the robot can detect and react if an obstacle lies in its path.

Stop Button



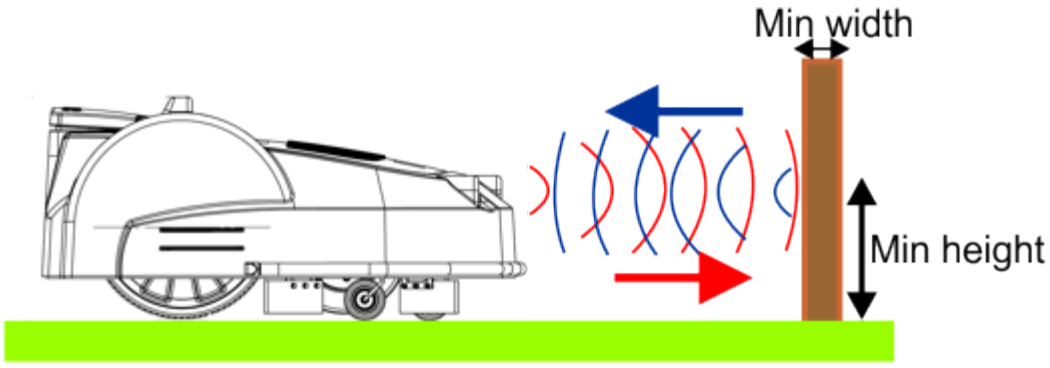
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The stop button (1) is easily visible, situated on the top of the robot. Pressing this button will cause the robot to stop moving and cutting. The stop button also acts as a lid, which when lifted, provides access to the robot's control user interface. An instruction must be issued using this control interface in order to restart the robot.

Obstacle Detection Sonars

The robot is equipped with a set of sonar sensors to detect obstacles. The robot will reduce speed if the sonar detectors detect an obstacle.

Detection of obstacles by sonar sensors



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The robot gently touches the obstacle at low-speed. The robot moves backwards and chooses a random direction between 60° and 120°.

These sensors can detect objects that are:

- At least 400 mm (15.75 inches) high

Sensor Overview (continued)

- At least 50 mm (2 inches) wide (from all angles)

If the robot is always moving at a slow speed, even if there are no obstacles in view, it indicates a problem with the sensors. In this case you should contact the service team for help in analyzing the problem. There are several potential causes, such as condensation inside the sonar casing, a cable connector is loose, or the sonar electronics are damaged. The problem can be analyzed using **Technician's menu (9) > Service > Sonars** and **Technician's menu (9) > Service > Tests > Sonars**.

Bumper

The bumper is a pressure sensor which senses when the robot touches an obstacle. When the bumper touches the obstacle, the robot will move backwards and then rotate through an angle until it can avoid the obstacle.

Coil

The induction coil detects the intensity of the magnetic field that is generated within the peripheral wire. The maximum intensity is located on the wire, which causes the robot to stop, rotate, and continue mowing in a new direction.

Tilt Sensor

The tilt sensor detects the angle of the slope on which the robot is working. An alarm is raised and the robot stops moving if the angle is exceeded.

Rollover Sensor

The rollover sensor detects whether the robot has been tipped upside down or whether someone is trying to start the motor when the robot is upside down.

Temperature Sensor

The temperature sensor measures the ambient temperature and will prevent the robot from operating if this temperature is too low. The minimum temperature at which the robot can operate is set as an operating parameter.

Attachments/Accessories

A selection of Toro approved attachments and accessories is available for use with the machine to enhance and expand its capabilities. Contact your Authorized Service Dealer or authorized Toro distributor or go to www.Toro.com for a list of all approved attachments and accessories.

To ensure optimum performance and continued safety certification of the machine, use only genuine Toro replacement parts and accessories.

Specifications

Note: Specifications and design are subject to change without notice.

Capacity

Maximum working area	30,000 m^2 (7.4 acres)
Recommended working area	24,000 m^2 (5.9 acres)
Working speed	3.6 km/h (2.2 mph)
Standard maximum slope	30% (17°)
Balls/day	Average=15,600. Maximum=19.500.
Picking width	956 mm (37-5/8 inches)
Basket capacity	320-350 balls
Maximum noise level	61 dB(A) at 1 m (39-3/8 inches). 52 dB(A) at 5 m (196-7/8 inches)

Battery

Type	LIFePo4
Nominal voltage	25.6 V
Nominal capacity	19.2 Ah
Energy	491.5 Wh
Time to fully charge (minimum)	80 minutes
Average working time per charge	240 minutes
Average annual consumption	620 kWh (based on use during 11 months of the year)

Weight and Dimensions

Weight [kg]	85 kg (187 lb)
Length [mm]	118 cm (46.46 inches)
Width [mm]	134 cm (52.75 inches)
Height [mm]	54 cm (21.25 inches)

Software and Monitoring

Security PIN code	Yes
GPS positioning	RTK
Robot management via server and app.	Standard

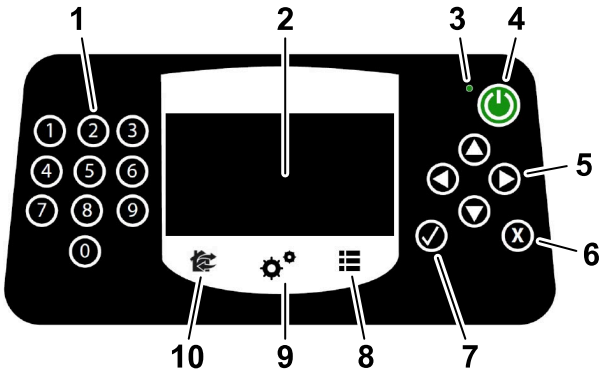
Intelligence

Sonar detection of obstacles	4
Return to station via GPS	Yes
Multiple starting zone	Yes
Multi fields	Yes, more than 2
Multi robots/station	Maximum 2 robots using the drop pit station.
Lift sensors	No
Reverse sensors	Yes. Causes the robot to change direction.
Safety bumper	Electronic
Tilt sensors	Yes. Causes the robot to stop when tilted more than 41°.

User Interface Display

A smart box, which contains the on-board computer to manage the operations of your robot, is located under the Stop button lid.

This interface enables you to see the current status, modify the settings, and issue particular instructions.



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(1) Numeric buttons

These are used to select menu choices and enter numeric values.

(2) LED screen

Displays current situation.

(3) LED

Light indicating that the user interface is switched **ON**.

(4) ON button

Switches the user interface on.

(5) Navigation buttons

The arrow buttons allow you to highlight menu options.

(6) Back button

Exits a menu and returns you to the previous level.

(7) Accept button

Accepts an operation or setting.

(8) Service menu button

Provides a number of commands used most commonly by the service personnel. See the Service Settings menu.

(9) Settings menu button

Allows you to define operational settings. See the Settings menu.

(10) Action menu button

Allows you to issue a number of operating instructions. See the Actions menu.

The LED Screen



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Name

The name of the robot. You can change the robot name under **Service Settings menu > Device > Device info > Robot name**.

Cloud

Indicates that the robot is connected to the web portal.

GPS

Indicates that the robot can detect at least 4 satellites and that it knows its current location. If the GPS indication is blinking, it indicates that the robot cannot detect enough satellites. To see the number of satellites detected, select **Service Settings menu > Device > Device info**.

Mobile signal level

Indicates the robot has a mobile signal.

No mobile connection

This icon indicates that there is no mobile connection.

WiFi/mobile connection

Indicates that the robot is connected as WiFi client. When it is blinking it is trying to connect. When it is steady, it is connected.

No WiFi

Indicates that the WiFi setting is OFF.

The LED Screen (continued)

WiFi access point (AP)

Indicates that the robot is configured as WiFi access point and is waiting for a client to connect.

Battery charge level

Percentage of battery charge.

Golf balls in basket



Shows the number of golf balls currently in the basket.

Message

Shows the current status of the robot or alarm.

User Interface Commands

Commands area available from 3 menus.

Actions

Provides a number of direct missions for the robot.

Settings

Defines parameters controlling the operation of the robot.

Service settings

Provides a set of commands most commonly used by operators and technicians.

The table below lists all the commands available from these 3 menu choices.

Command/parameter	Route
Activation code	Service settings > Device
APN	Service settings > Device > Device info
Ball count cond.	Service settings > Unloading conditions
Bootloader ver.	Service settings > Device > System version
Brain version	Service settings > Device > System version
Brake on idle	Service settings > Operations
Change pin code	Service settings > Security > PIN code

User Interface Commands (continued)

Command/parameter	Route
Charge & stay	Actions
Date format	Service settings > Regional parameters
Device info	Service settings > Device
Edit parcels percentage	Service settings > Operations
Enable pin code	Service settings > Security > PIN code
Go charge	Actions
IP address	Service settings > Connections
Language	Service settings > Regional parameters
Latitude	Service settings > Device > Device info
Longitude	Service settings > Device > Device info
MAC address	Service settings > Device > Device info
Max short cycles allowed	Service settings > Operations
Min temp	Service settings > Operations
Mode	Service settings > Connections
PIN code	Service settings > Security
Robot name	Service settings > Device
Schedule	Settings
Search for networks	Service settings > Connections
Serial number	Service settings > Device > Device info
Software version	Service settings > Device > System version
SSID	Service settings > Connections
Stay in station after charge	Actions
System locking	Settings
System version	Service settings > Device
Time zone	Service settings > Regional parameters
Unit system	Service settings > Regional parameters
Version	Service settings > Device > System version
Visible satellites	Service settings > Device > Device info

Actions Menu

The operations provided in this menu depend on the current state of the machine.

- when the robot is in the field
- when the robot is at the charging station

Executing the Operations

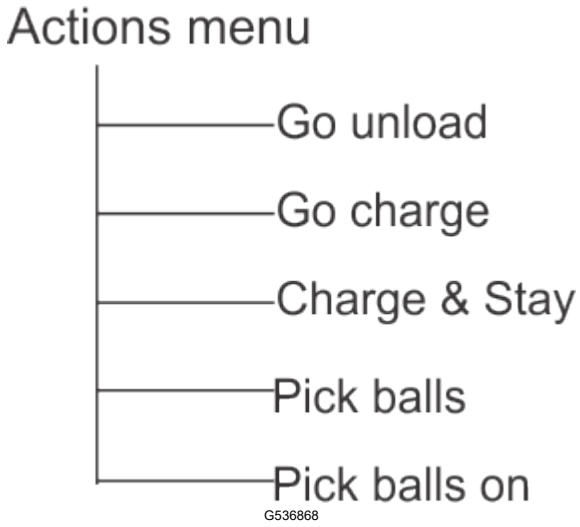
1. Click .
2. Press the up and down arrows to highlight the required command, or press the numeric key that appears in front of the command.
3. Press ☑.
4. Close the lid.

   Note: If the lid is not closed within 10 seconds, the operation is canceled and you will need to repeat this procedure.

   Note: If the operation does not start even if the lid appears to close the contact; refer to the *Service Manual*.

Operations when the Robot is in the Field

Overview of actions menu in the field



These operations can be performed on the robot when it is not in the charging station.

IMPORTANT

Always stop the robot first by pressing the stop button.

These operations would be performed if the robot has been stopped during its normal operation schedule, or if it has stopped because an alarm has been raised. If an alarm has been raised, you need to correct the problem before executing the operations.

Actions Menu (continued)

- **Go unload**

  Go to the station and unload the balls.
- **Go charge**

  Return to the charging station, charge the battery, and then resume mowing.
- **Charge & stay**

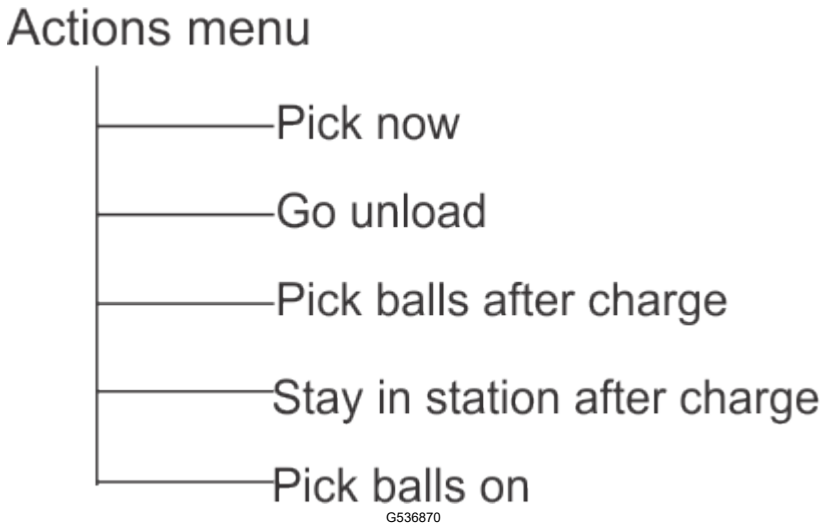
  Return to the charging station and stay there until a new instruction is issued.
- **Pick balls**

  Continue the working schedule after an interruption.
- **Pick balls on**

  This option appears when there is more than one parcel defined. It allows you to choose the parcel in which the robot will work. The parcels must be neighbours and have a working percentage time of more than 0%.

Operations when the Robot is at the Charging Station

Overview of actions menu at the station



Use these operations to override the regular operating schedule.

- **Pick now**

  Leave the charging station and continue working.
- **Go unload**

  Go to the drop pit, unload the balls and then continue working.
- **Pick balls after charge**

  Remain at the charging station until the battery is charged, then continue working.
- **Stay in station after charge**

  Remain in the charging station until a command is issued.
- **Pick balls on**

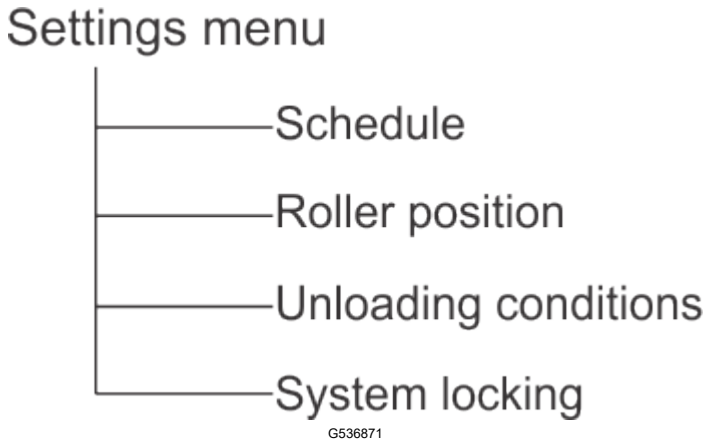
Actions Menu (continued)

Continue working in the selected parcel.

Settings Menu

These commands enable you to define settings that control the operation of the robot.

Overview of settings menu



See also: LCD settings.

Schedule

This command enables you define the working schedule for the robot. It defines the times when the robot can or cannot enter a parcel or GPS zone to work.

Note: A schedule can also be defined using the web portal, and is the preferred method for scheduling.

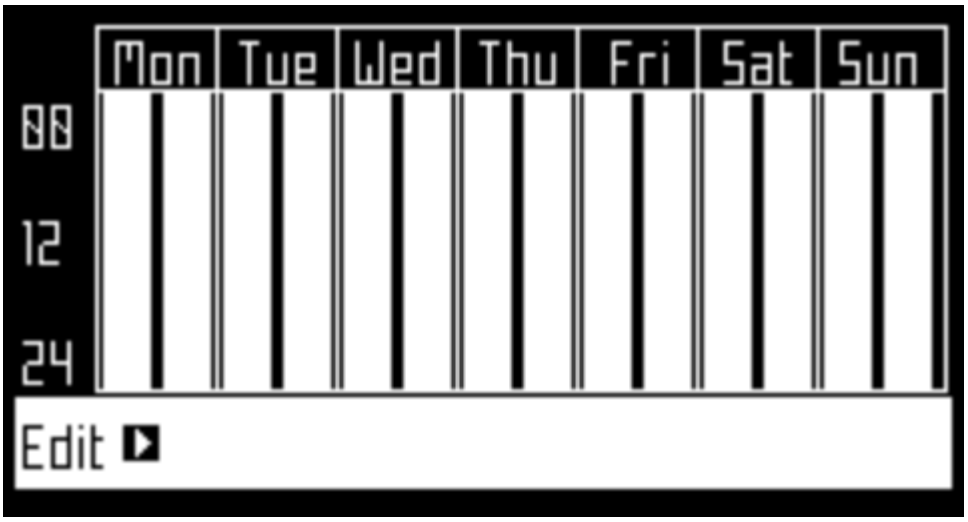
- A working schedule can be defined for each day of the week.
- A number of working periods can be defined for each day, each parcel, and each GPS.
- Each defined period can be active (implemented) or inactive (ignored).
- A schedule for one day, and for one parcel, can be copied to other days of the week.
- The complete schedule can be ignored and the robot set to work at all times.

Defining Working Schedules

Note: By default when the robot is delivered, the schedule is set to work continuously.

1. Press .
2. Press the up and down arrows to highlight Schedule, then press ☑. A screen like the one below will appear. In the example below, there are two columns for each day because two parcels that have been defined. This shows the current schedule, where the white blocks represent the time when the robot will be operating in one parcel.

Settings Menu (continued)



G525111

Note: By default all the time periods will appear white, meaning the robot will work continuously.

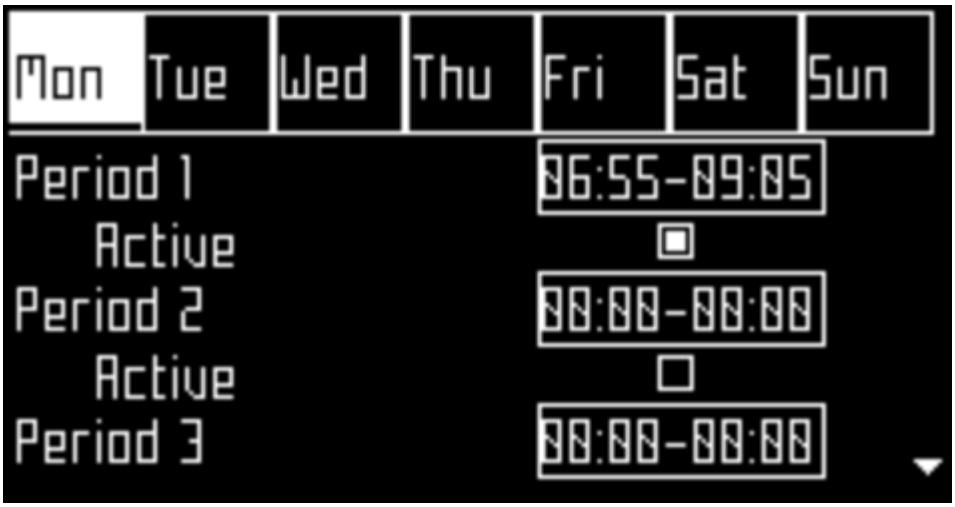
3. Use the arrow keys to highlight Edit and press ☑.



G525112

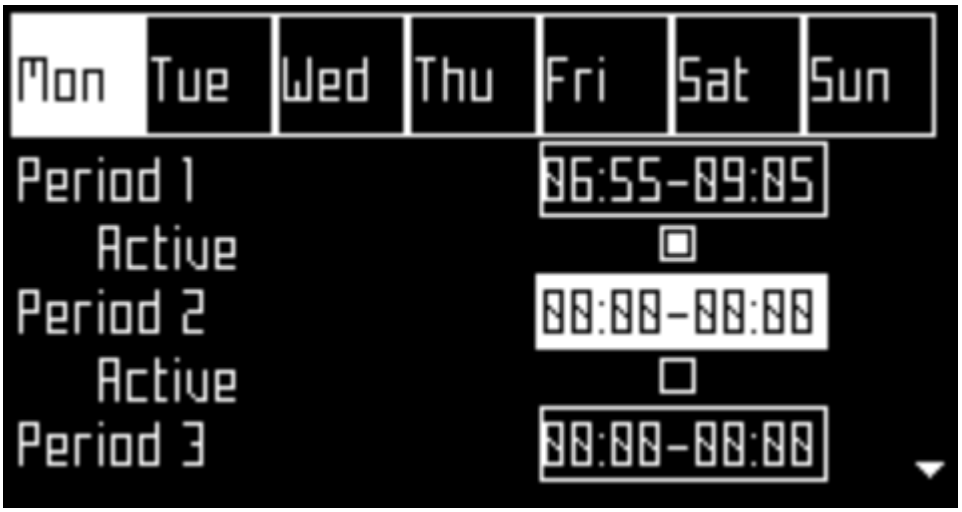
4. To edit the schedule, highlight the parcel and press ☑.
5. Use the left and right arrows to select the required day of the week, then press ☑.

Settings Menu (continued)



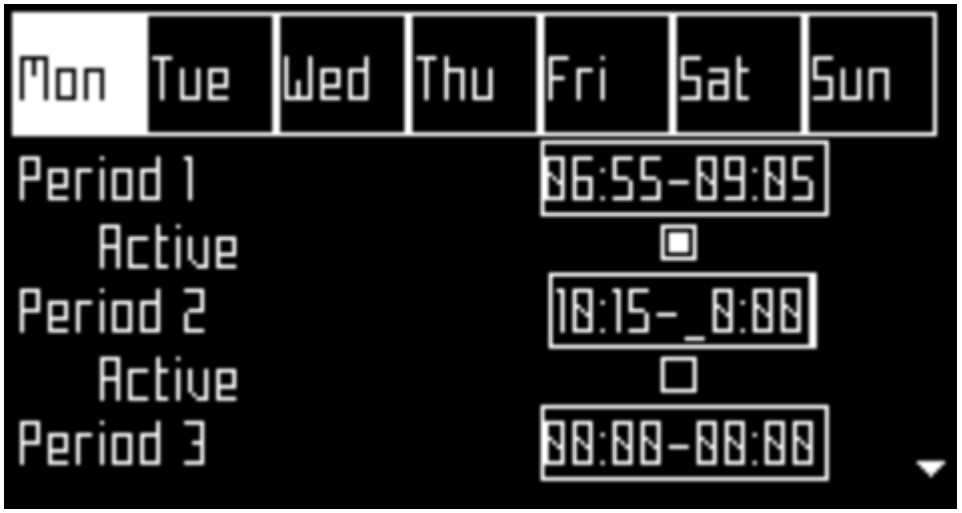
G525113

6. Use the down arrows to select the required period in the day, and press ☑.



G525114

7. Use the numeric keyboard to enter the start and end time values where the cursor is flashing, then press ☑.



G525116

Settings Menu (continued)

8. Press the down arrow key to select the active check box.
9. Press ☑ to activate the defined session.

   Note: In the figure above, Period 1 is active and Period 2 is inactive.
10. Repeat the process for all the days and the time periods required.

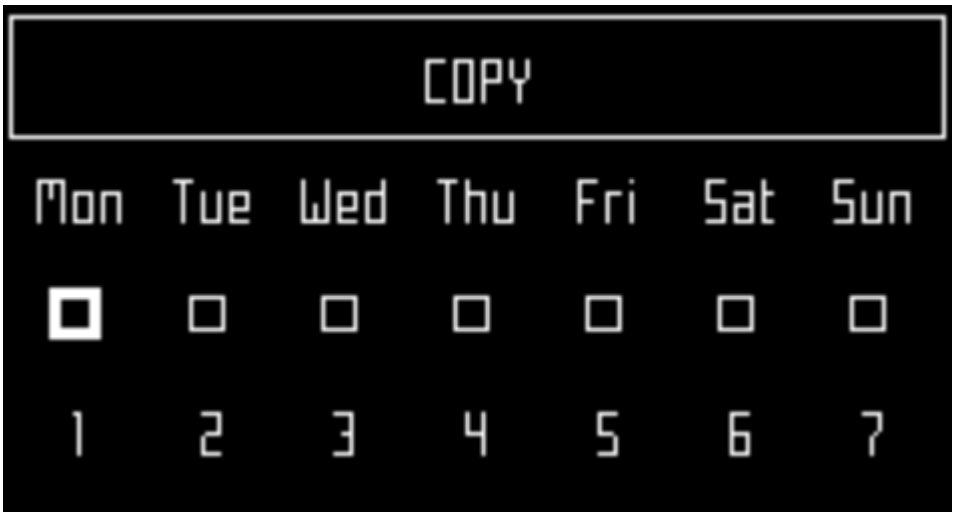
    Note: You can copy the defined schedule to another day.
11. Press ✖ to return to the Parcel Schedule screen shown above.
12. Use the arrows to select Follow sched. . Press ☑ to check the button ON to ensure that the robot follows the defined schedule. When unchecked, the robot will ignore the timetable and work continuously.

IMPORTANT

When creating a schedule for GPS zones, the schedule for the wired parcel associated with the zones must be set to continuous, i.e. shown as solid white.

Copying Schedules from One Day to Another

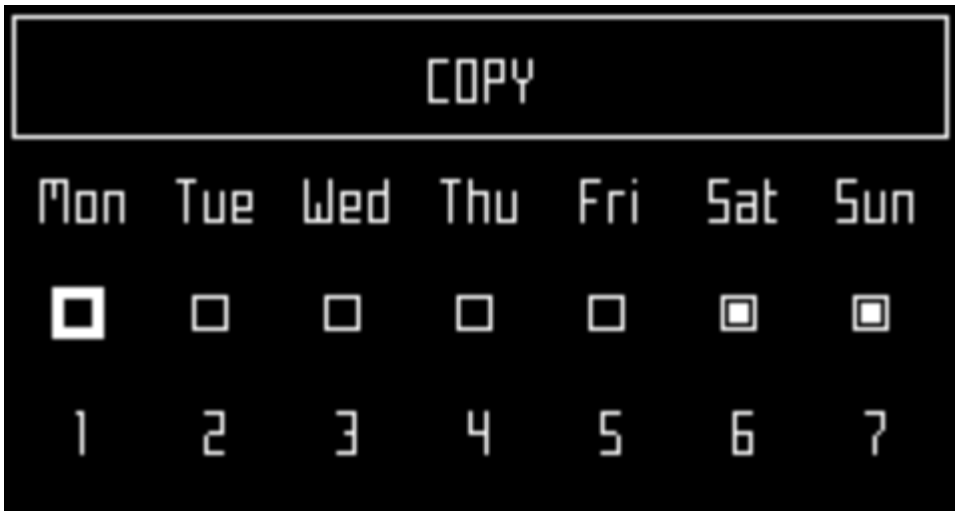
1. Follow the procedure above to define the mowing schedule for one day.
2. When all the required periods have been defined, use the down key to highlight Copy. Press ☑.



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3. Press the number key that corresponds to the day to which the schedule is to be copied. More than one day can be selected.

Settings Menu (continued)



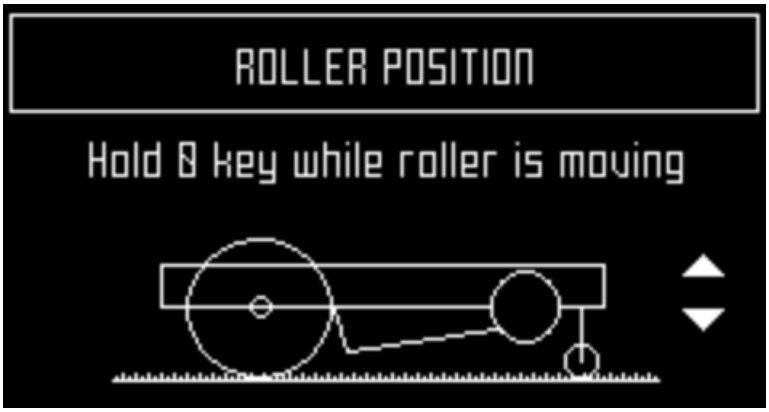
G525119

4. Press ☑.
5. Press ✕ to return to the overview of the schedule.

Ignoring the Working Schedule

1. Press ☰.
2. Highlight Edit.
3. Press ☑.
4. Use the arrow keys to highlight Follow sched. and press ☑ to uncheck the button.

Roller Position



G536879

The image shows the current roller position; low, intermediate or high.

Press and hold the **0** key, then press the up or down arrow on the keyboard to move the roller.

Unloading Conditions

The robot can be instructed to unload the balls in its basket using three conditions.

Settings Menu ⚙ (continued)

Note: Combinations of conditions can be used.

Unload time period

When this condition is used, the robot will unload the balls after the specified time period.

Select **Unload time period** and enter the required time in minutes. Press ☑.

If you do not want to use this condition, set the value to 0 minutes.

Balls count cond.

When this condition is used, the robot will unload the balls when the defined number of balls are in the basket.

Select **Balls count cond.** and enter the required number of balls. Press ☑.

Note: The maximum number of balls that can be contained in the basket is 350.

If you do not want to use this condition, set the value to 0.

Full tank detect.

When this condition is used, the robot will unload the balls when the basket is full (i.e. contains 350 balls).

Select **Full tank** detect and press ☑.

Note: Combinations of conditions can be used.

- If **Unload time period** AND **Balls count cond.** conditions are used, the robot will unload the balls when one of the conditions is satisfied.
- The **Full tank detect** condition can be used in combination with the **Balls count cond.** to ensure that the balls are unloaded if the ball count is not correct.
- The **Full tank detect** condition can be used in combination with the **Unload time period** to ensure that the balls are unloaded, when the basket is full before the time period has elapsed.

System locking ▶

This command enables you to block the use of the robot. This is useful if the field area is in use during the time when the robot is scheduled to be working. The robot will remain inactive until the system is unlocked.

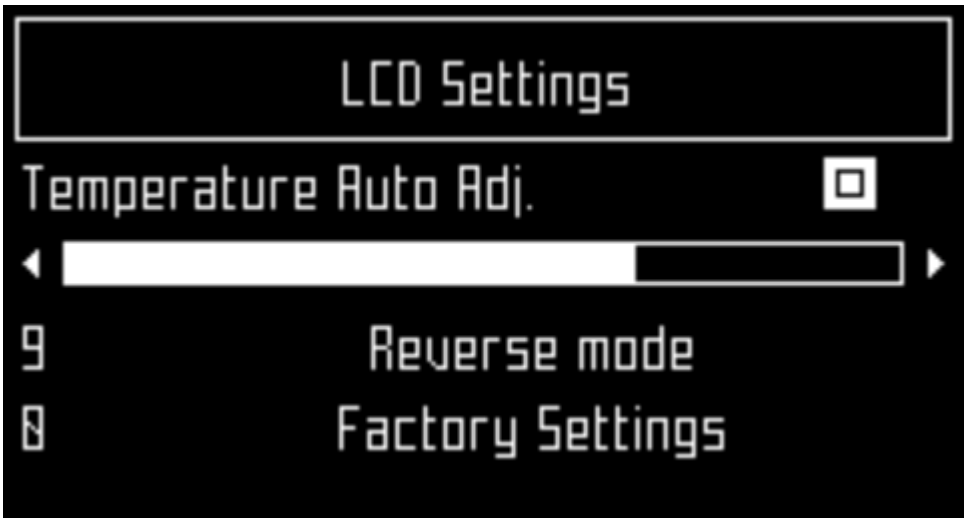
Note: It is also possible to enable a PIN code which must be entered before a specific commands can be issued.

Settings Menu (continued)

LCD Settings

Modifying the LCD Settings

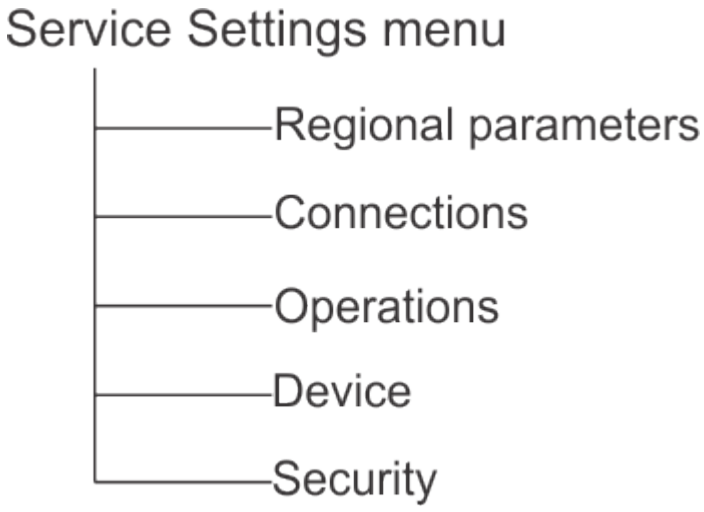
1. Press for a few seconds.



G525132

2. Press the right and left arrow buttons to change the contrast.
3. Press the up and down arrows to highlight Temperature Auto Adj. When this option is checked ON, the LCD contrast is automatically adjusted according to the ambient temperature. Press ☑ to check or uncheck this option.
4. Press the 9 key to invert the colors black and white.
5. Press the 0 key to revert to the factory settings.
6. Press ✕ to exit this menu.

Service Settings Menu



G525136

Service Settings Menu (continued)

Regional Parameters

This menu enables you to set the date format, the robot time zone, the language used in the menus and the unit system.

Date format

The date format can be set to be DD/MM/YYYY (Day/Month/Year) or MM/DD/YYYY (Month/Day/Year).

Time zone

Use the left and right arrow keys to scroll to the required time zone.

Language

Use the left and right arrow keys to select the required language.

Unit system

Use the left and right arrow keys to select the required unit system. The unit of any displayed value is shown.

Connections

It is necessary to connect with the robot for the following reasons:

- Enabling the robot to communicate with the portal on the web-server allows users to monitor the state of the robot.
- Updating the robot software version allows the robot to connect with the remote server on a regular basis to check if a new software version is available. If an update is available, the robot starts to download it as a background task while it continues to work as usual. At the end of the next charging period, the newly downloaded software will have been installed on the robot.

IP address

This displays the current IP address of the robot, depending on the mode in which the robot is operating. Modes include mobile, vpn, and WiFi.

Mode

Allows you to set the mode in which the robot is to operate. This can be OFF, Client, Access point, Search for networks, and SSID.

OFF

The robot will not be connected to a network

Service Settings Menu (continued)

Client

The robot will connect to the selected network as a client.

Access point

The robot will use its inbuilt modem to generate its own WiFi network to which you can connect.

Search for networks

This option appears when the robot is not connected or cannot detect a WiFi network.

SSID

This displays the name of the WiFi network to which the robot is connected, and allows you to modify it. Highlight {network name} and press ☑.

A list of networks appears.

Network Overview

- Entries in bold text are ones that the robot has connected to.
- Entries in normal text are available but which have not been used.
- [*] indicates the actual network to which the robot is connected.
- [!] indicates that the network to which the robot is connected, is not encrypted using either WPA or WPA2 technologies. This is therefore an insecure network and the [!] indicates a warning.
- [-] indicates that the network has been disabled.

Connecting to a Different Known Network

1. To connect to a different known network, highlight the network, press ☑, and select **Enable Network**.
2. To modify the current network, highlight the network and press ☑. The following operations are available:
   - Disable Network: disconnects the robot from this network. This will be indicated by [-] preceding the name of the network in the list.
   - Change Password: allows you to modify the password to access the network from this machine.
   - Forget Network: removes the recognition of this known network from this robot.

Service Settings Menu (continued)

Using the Robot as a Client

For normal operation, it is recommended that you set up the robot as a WiFi client. This will enable it to communicate with the portal on the web-server.

1. Press .
2. Highlight Connections and press ☑.
3. Highlight Mode and set it to Client. If the robot has not been connected to a WiFi network, selecting the option Search for networks will search for networks and present a list of those available.
4. Highlight the WiFi network required and press ☑.
5. Enter the password for the network using the keyboard.
6. Highlight V and press ☑.

Operations

This menu enables you to set a number of operating parameters:

Min temp

Sets the lowest temperature that the robot will operate at.

Edit parcels percentage ▶

This option enables you to view and modify the percentage values assigned to each of the parcels that have been defined. The percentage value assigned to a parcel determines the proportion of times the robot will start working in the parcel. A defined schedule for the robot to work in specific parcels will take priority over these percentage values.

Detect roller block

When checked, this detects whether the roller is rotating at a suitable speed; i.e. more than 1 rev/second. A reduction in the rotational speed is usually caused because there are balls in the stuck in the roller. If the robot continues to work while the roller is blocked, there is a risk of damaging the grass. If this arises, the robot tries to unblock the roller by going at full speed and then putting the roller on the ground to release the balls. It will try this 2 or 3 times, and if it can not unblock the roller, it will go to the station and issue an alarm.

Brake on idle

When this option is checked ON, at least one brake will be applied when the robot is stationary. This ensures that the robot does not slide down a slope if:

- the robot has stopped because of an alarm
- the user has manually stopped the robot
- the stop cover lid is open

Service Settings Menu (continued)

Brake on idle (continued)

If the brakes have been applied due to this option, you can disable them (or re-enable them again) by pushing 5. The brakes will also be released when the robot starts to work again normally.

This option need **not** be set if the working terrain is flat, and it is set OFF by default.

Max short cycles allowed

This parameter sets the maximum number of times that the robot will return to the station, after executing a very short cycle, before triggering an alarm.

The parameter is of most use for a ball picking robot. If a ball becomes trapped and prevents the "full basket detector" flap from closing, the robot thinks its basket is always full and so just keeps going around the loop and returning to the drop pit station.

Device

This menu displays the characteristics of the device and enables you to change the robot's name.

Changing the Robot Name

By default the name of the robot corresponds to the serial number.

1. Press .
2. Press the arrow keys to highlight DEVICE INFO then press ☑.
3. Highlight ROBOT NAME and press ☑.
4. Highlight the back arrow to delete the current name.
5. Use the alpha-numeric keyboard to enter the new name. Highlight each character required and press ☑ to select it.
6. Highlight V in the bottom row and press ☑.
7. Press ☑ to accept the new name.
8. Press ✖ to return to the main menu.

Activation Code

The activation code is a four-figure code provided on the registration card supplied with each robot.

Accessing Device Info

1. Press .
2. Press the arrow keys to highlight DEVICE then press ☑.

Service Settings Menu (continued)

3. Highlight DEVICE INFO and press ☑.
4. Use the arrows ▲,▼ to scroll through the list.

Device Info Options

Robot name

The name of the robot.

Serial number

Serial number of the robot.

Latitude

Current latitude of the robot position.

Longitude

Current longitude of the robot position.

Visible satellites

Number of satellites that the device can currently detect.

APN

Id. of the Access Point Network.

MAC Address

MAC address.

System Version

Software version

The current software version.

- Details

Brain version

Current Artificial Intelligence (AI) version. Use this when reporting a problem.

- Bootloader details

This displays a list of software components. The values displayed here should be used when reporting a problem.

Service Settings Menu (continued)

Brain version (continued)

- Firmware details

This displays a list of software components. The values displayed here should be used when reporting a problem.

Security

The security menu enables you to enable/disable the use of a PIN code.

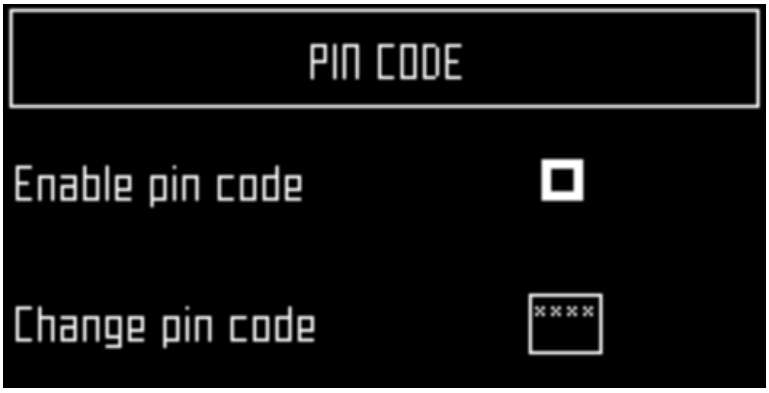
Note: By default the pin code is 0000. To obtain the menu below you need to enter 0000.

PIN code ▶

This enables you to define and implement a PIN code which must be entered before specific commands can be issued.

If a pin code has already been enabled, you need to enter it. You will then see the following screen.

Note: If you have forgotten the pin code, you need to contact a service technician.



G536886

Enabling the PIN code

1. Highlight the check box. Press ☑ to toggle the setting.

   Enable PIN code OFF ■

   Enable PIN code ON ⧈

2. Press ☑ to accept the new setting.

From now on certain commands will require the PIN code to be entered before they can be executed.

Service Settings Menu (continued)

Changing the PIN code

Allows you to change the pin code.

Enter the required numbers and press .

Maintenance Overview

- Maintenance refers to a set of tasks that should be carried out regularly throughout the mowing season.
- The service interval depends to some extent on the operational load of your robot, but it is recommended that it is serviced by an authorized technician at least once a year.
- Whilst maintaining your robot for optimum performance, do not attempt to make any changes to your robot. You risk disturbing its operation, causing an accident, and damaging parts.

  Note: If you notice any unusual behavior or damage, call a technician.
- When carrying out these maintenance procedures the following safety regulations should be observed:
  - Stop the machine: Always switch off the power and wait for the all moving parts to stop before handling the machine.
  - Operate the disabling device before the following:
    - Before working on or lifting the machine.
    - Before clearing a blockage.
    - Before checking, cleaning or working on the machine.
    - After striking a foreign object to inspect the machine for damage.
    - If the machine starts to vibrate abnormally.
    - Keep all nuts, bolts, and screws tight to be sure the machine is in safe working condition.
    - Use gloves: Protective gloves must be worn whenever handling the machine.
    - Always use OEM (Original Equipment Manufacturer) parts. In addition to the risk of accidents, the use of any non-OEM parts will result in the annulment of the guarantee for any resulting damage.

Recommended Maintenance Schedule

Note: These procedures should be carried out at the recommended frequency by the regular user of the robot.

Note: Throughout the mowing season, you should regularly check that all screws, nuts, and bolts are properly tightened. Tighten any that are loose, and if there is damage or evidence of a problem, contact an authorized Toro distributor.

Maintenance Service Interval	Maintenance Procedure
Before each use or daily	Regular cleaning (during wet weather)
Every 40 hours	Clean the charge contacts
	Clean the bumper
	Clean the sonar sensors
	Clean the front wheels
	Clean the front wheel axle
	Clean the rear wheels
Every 6 months	Check the wiring
Yearly or before storage	Battery service
	Storage

Cleaning

Cleaning the Machine

During periods of wet weather it is necessary to ensure that mud and grass do not accumulate on the moving parts, which are the wheels and the cutting heads. These should be inspected and cleaned daily.

1. Press the red button to stop the robot.
2. Turn the machine onto its rear side.
3. Turn the machine off.
4. Remove any accumulations of grass and dirt using a blower, compressed air, and/or a wire brush.
5. Rub the body with a soft, damp cloth or sponge.
6. If the body is very dirty, use a soapy solution.

IMPORTANT

Never use solvents.

Cleaning the Charge Contacts

Rub the charge contact surfaces with sandpaper (280 grade) until they appear clean.

Cleaning the Bumper

1. Check that the bumper material is intact. If there are cuts or tears, contact an authorized Toro distributor.
2. Clean the bumper with a damp cloth.

IMPORTANT

Do not use water.

Cleaning the Sonar Sensors

The sonar sensors need to be kept clean if they are to operate properly. All sensors need to work properly. If any of the sensors are not operating properly, an alarm is issued.

Remove any mud, grass, or dirt and wipe with a damp cloth.

Cleaning the Sonar Sensors (continued)

IMPORTANT

Do not use water.

Cleaning the Front Wheels

1. Remove any mud and grass with a wire brush or a cloth.
2. Check that the wheels rotate easily and that there is not too much play. If there is too much play, replace the wheels.

Cleaning the Front Wheel Axle

1. Clean the front wheel axle with a brush and/or a cloth.
2. Visually inspect the axle. If there is a problem, replace the axle.



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Cleaning the Rear Wheels

Remove any mud and grass using a wire brush.

Electrical System Maintenance

Checking the Wiring

Visually inspect the wiring under the robot. If any problems are detected, contact an authorized Toro distributor.

Battery Service

The automatic (programmed) operation of the robot optimizes battery life. It is advisable to allow the robot to manage its working cycles. If these work cycles seem unusually short, contact an authorized Toro distributor to check the condition of the battery.

Note: It is possible to monitor these cycles using the portal.

Storing the Machine

1. Fully charge the machine.
2. Turn the machine off.
3. Clean the machine.
4. Store the machine in a dry, protected, and frost-free environment.

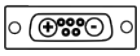
   Note: Protect the charging station with a shelter or a tarpaulin.

   It is not necessary to turn the charging station off.

Removing the Machine from Storage

1. Turn on the machine.
2. Connect the power to the charging station.
3. Check the battery voltage. The battery level can be seen on the user interface screen.
4. Start the robot and verify it returns to the charging station.

Notices

	Your robot meets European standards.
	Recycle: Waste electrical and electronic equipment is subject to selective collection. Please recycle your robot according to the standards in force.
Icons on the battery	
	Make sure you are familiar with the documentation before handing and using the battery.
	Do not allow the battery to come into contact with water.
	Caution–Take care when handling and using the battery. Do not crush, heat, incinerate, short circuit, dismantle, or immerse in any liquid. Risk of leakage or rupture. Do not charge below 0°C (32°F). Only use the charger specified in the user's manual.
	Recycle your battery. Refer to the user's manual for battery recycling instructions.
	Indicates the battery polarity.

Chapter 8

Abbreviations

APN	Access Point Name (GSM)
BMS	Battery Management System
LFP	Lithium Ferrous Phosphorous
UWB	Ultra Wide Band
CPU	Central Processing Unit
GPS	Global Positioning System
AP	Access Point (WiFi)
RTK	Real Time Kinematic
GNSS	Global Navigation Satellite System
PoE	Power over Ethernet
RTCM	Radio Technical Commission for Maritime Services (a Real-Time GNSS Data Transmission Standard)

Glossary

Border mode

When the robot cuts the grass at the very edge of the field. This is done a number of times per week.

Cycle

A cycle is a working session of the robot. It starts when the robot leaves the station and ends when it returns to the station or there is an problem that halts the working cycle.

Entity

A collection of robots and users that operate within a site. Information about the robots in an entity can be viewed on the web portal.

GPS navigation zone

This is an RTK GPS zone that is defined by the border discovery process. it encompasses the entire working area. Sub-zones can then be created by copying and editing this zone to optimise the efficiency of the robot.

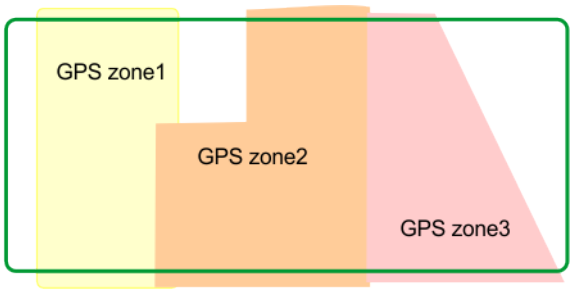
GPS point

A specific point within a parcel that the robot uses to return to or leave a station. The point is defined by its latitude and longitude. The robot takes a direct route to this point then follows the trackborder and the loop wire to return to the station.

GPS zone

A GPS zone is defined by set of GPS coordinates. It allows a wired parcel to be subdivided without having to use additional wires and channels.

GPS zones in a wired parcel



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This provides greater flexibility in defining working areas since the robot can be scheduled to work with optimum efficiency over the zones.

Idle

A robot will enter idle mode, if the current mission has been ended using the Stop button. By default the robot will enter the sleep mode after 15 minutes.

Island

A loop in the peripheral wire specially installed to prevent the robot working inside it. The peripheral wire is taken around the obstacle and the approach and return wires laid next to each other.

Map

Map of the robots routes on the portal.

Mapping

The information built up by the robot using GPS data.

NoGo zone

GPS-defined No-Go zones are regions on the field defined by GPS coordinates where the robot can never enter during any of its autonomous operating states. GPS-defined No-Go zones are used to exclude zones from the working area of the robot that cannot be detected during border discovery. Use of GPS-defined No-Go zones allows the robot to calculate the most efficient mowing pattern in advance. GPS-defined No-Go zones are used to exclude obstacles, typically done by islands and pseudo islands.

Obstacle

An object in the field that the robot must avoid. Obstacles can be permanent (e.g., trees, furniture) or transitory, (e.g., animals). Obstacles are detected by sensors. Permanent obstacles can be avoided by making loops in the peripheral wire to form "islands" or "pseudo-islands".

Parcel

An area to be mowed within a peripheral wire. At least one parcel is associated with one wire. Several parcels can be defined.

Percentage

This represents the proportion of time that the robot will spend working a particular parcel. If there is only one parcel, the robot will spend 100% of its time there.

Peripheral wire

A wire laid below the surface of the field which defines the area in which the robot works. The area defined by the peripheral wire is termed a "parcel".

Pseudo-island

The peripheral wire is taken around the obstacle, maintaining a specific distance between the approach and the return wires.

Robot status values

- Off

  Robot has been switched off.
- Off after alarm

  Robot has switched itself off after an alarm.
- Alarm

  Robot is in a state of alarm.
- Staying

  Robot is waiting at a charge station.
- Charge

  Robot is charging the battery.
- Heading for unload station

  Robot is going to the drop pit station to unload balls. This status starts when a robot decides to return to the station.
- Heading for charge station

  Robot is going to the charging station. This status starts when the robot decides to return to the station.
- Leaving station

  Robot is leaving the station and starting to work.

RTK GPS zone

The working area for a robot performing pattern mowing. The RTK GPS zone is defined by the robot making a tour of the peripheral wire.

Site

The entire area which includes the area in which the robot works.

Sleep

A robot will enter sleep mode 15 minutes after an alarm has occurred which has not been cleared. After 2 days in sleep mode, the robot will enter the OFF mode. This will also occur if the battery charge level reaches a low level. When in sleep mode the robot uses minimal power to reduce the risk of the battery.

The robot can be brought out of sleep mode by:

- clearing the alarm and switching the robot on, using the button on the LED screen
- pushing the robot to the charging station, if the battery is flat
- sending a remote wakeup command via the web portal

Start zone

A defined position within a parcel which determines where the robot will start working.

Station loop

A station loop is a short wire around a charging station which is used to guide the robot into the station. When the robot detects that it is in the station loop, it follows the wire until it arrives in the station.

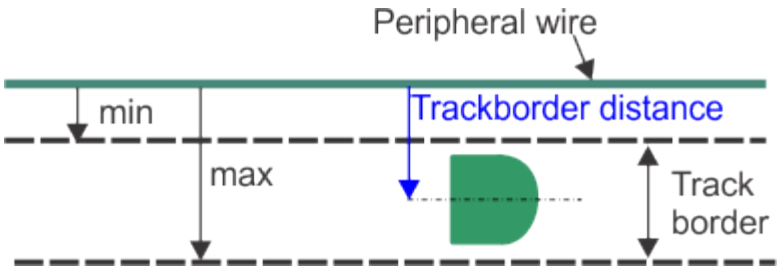
Terrain

An area of grass surrounding the field that is not to be mowed.

Track border

A width of grass around the edge of the parcel in which the robot works. The robot follows the track border when leaving or returning to a station unless it is using GPS. There is no track border specified for a wire that acts as a "return to station loop".

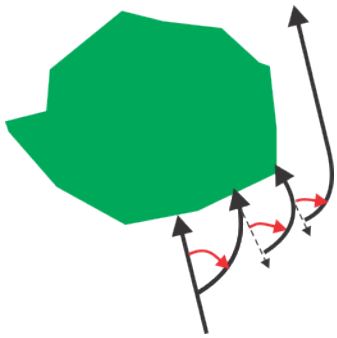
Track border



G525155

The track border lies next to the peripheral wire, and is defined by minimum and maximum dimensions set as installation parameters. It is wider than the robot. The path taken by the robot within the track border is selected in a random manner. This ensures that the robot does not repeatedly move along the same path and so create ruts in the field. If the robot encounters an obstacle whilst in the track border, the sensors will cause it to reverse and then rotate through a random angle in order to proceed. This may be repeated a number of times if necessary.

Maneuvers to avoid an obstacle within the track border


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California Proposition 65 Warning Information

What is this warning?

You may see a product for sale that has a warning label like the following:

 **WARNING:** Cancer and Reproductive Harm—www.p65Warnings.ca.gov.

What is Prop 65?

Prop 65 applies to any company operating in California, selling products in California, or manufacturing products that may be sold in or brought into California. It mandates that the Governor of California maintain and publish a list of chemicals known to cause cancer, birth defects, and/or other reproductive harm. The list, which is updated annually, includes hundreds of chemicals found in many everyday items. The purpose of Prop 65 is to inform the public about exposure to these chemicals.

Prop 65 does not ban the sale of products containing these chemicals but instead requires warnings on any product, product packaging, or literature with the product. Moreover, a Prop 65 warning does not mean that a product is in violation of any product safety standards or requirements. In fact, the California government has clarified that a Prop 65 warning “is not the same as a regulatory decision that a product is ‘safe’ or ‘unsafe.’” Many of these chemicals have been used in everyday products for years without documented harm. For more information, go to https://oag.ca.gov/prop65/faqs-view-all.

A Prop 65 warning means that a company has either (1) evaluated the exposure and has concluded that it exceeds the “no significant risk level”; or (2) has chosen to provide a warning based on its understanding about the presence of a listed chemical without attempting to evaluate the exposure.

Does this law apply everywhere?

Prop 65 warnings are required under California law only. These warnings are seen throughout California in a wide range of settings, including but not limited to restaurants, grocery stores, hotels, schools, and hospitals, and on a wide variety of products. Additionally, some online and mail order retailers provide Prop 65 warnings on their websites or in catalogs.

How do the California warnings compare to federal limits?

Prop 65 standards are often more stringent than federal and international standards. There are various substances that require a Prop 65 warning at levels that are far lower than federal action limits. For example, the Prop 65 standard for warnings for lead is 0.5 µg/day, which is well below the federal and international standards.

Why don’t all similar products carry the warning?

- Products sold in California require Prop 65 labelling while similar products sold elsewhere do not.
- A company involved in a Prop 65 lawsuit reaching a settlement may be required to use Prop 65 warnings for its products, but other companies making similar products may have no such requirement.
- The enforcement of Prop 65 is inconsistent.
- Companies may elect not to provide warnings because they conclude that they are not required to do so under Prop 65; a lack of warnings for a product does not mean that the product is free of listed chemicals at similar levels.

Why does Toro include this warning?

Toro has chosen to provide consumers with as much information as possible so that they can make informed decisions about the products they buy and use. Toro provides warnings in certain cases based on its knowledge of the presence of one or more listed chemicals without evaluating the level of exposure, as not all the listed chemicals provide exposure limit requirements. While the exposure from Toro products may be negligible or well within the “no significant risk” range, out of an abundance of caution, Toro has elected to provide the Prop 65 warnings. Moreover, if Toro does not provide these warnings, it could be sued by the State of California or by private parties seeking to enforce Prop 65 and subject to substantial penalties.