



SPRAYTRAC II GPS TRACK GUIDANCE SYSTEM

**Operator's Manual
and
Parts Catalogue**



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Operator's Manual and Parts Catalogue

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1. INTRODUCTION

The Micronair Spraytrac GPS track guidance system is designed specifically for use on vehicle mounted sprayers used for the control of locusts and other migrant pests. The purpose of the system is to provide precision guidance to enable the operator to follow parallel spray tracks and also to record the position of the vehicle and the area sprayed. Spray jobs can be exported as shape files to allow access on an office or laptop computer. Spray jobs are suitable for upload and use in FAO's RAMSES software.

All parts of the system have been designed for maximum simplicity and ease of use.

The equipment installed on each spray vehicle consists of:

- A GPS antenna. This is secured to the roof of the vehicle cab by a magnetic mounting and can be removed and disconnected when not in use.
- An electronic controller interface (black box) that communicates via Bluetooth to the display interface and houses the GPS receiver, power inputs, USB interface, sprayer interface and processor.
- A wiring loom to connect power input from the vehicle battery to the black box, USB connections, sprayer connections and charging connections for the display unit.
- A USB drive to download log files from the guidance unit and to transfer this to an office PC or laptop computer. Data can also be transferred via android tablet or phone through PC, Bluetooth, or email transfer.
- An optional Spraytrac tablet display with touch screen interface positioned in view of the driver. The software can be run on any android compatible phone or tablet device and secured with a suction mounting bracket. The Spraytrac II software is designed to provide a very simple familiar user interface as found on smart phone and tablet devices. Operation of the system is by an on/off switch and the device's touch-sensitive screen. During operation the operator can view an artificial horizon with parallel spray tracks to indicate the correct spray path to avoid under- or over-dosing of product. The position of the vehicle is continuously logged during the spray operation. The log file is retained in the memory of the unit or can be stored on an external USB drive (if connected). Text on the Spraytrac display is available in English, French, Arabic, Russian and other languages by menu selection.

2. SPECIFICATION

2.1. Electronic Controller Unit ('Black box')

Dimensions:	134mm W x 130mm H x 41mm D
Weight:	0.3kg
Main unit mounting:	2x M6 bolts
Voltage input:	8 –16 Vdc
Voltage output @ 12V:	12 Vdc \pm 0.4
USB voltage output:	5 Vdc \pm 0.4
Operating temperature:	-40°C – +85°C
Environmental protection:	IP67
Connections:	30 Way Cinch (1x A-K Block Key) SMA (1x GPS)
Sprayer interface:	Optional connection to Micron vehicle-mounted sprayers to allow geospatial recording of spray treatments

2.2. GNSS Receiver

Dimensions:	23mm W x 25mm H x 13mm D
Cable length:	3m
Receiver mounting:	Magnetic
Power supply:	From black box unit (no separate power supply connection required)
Differential correction:	GPS (WAAS, EGNOS) and GLONASS
Update rate:	10 Hz

2.3. Optional Touch Screen Display Unit

Dimensions:	235mm W x 146mm H x 13mm D
Weight:	0.56kg
Mounting:	By adjustable bracket on suction pad
Power supply:	USB connection power supply
Operating temperature:	-20°C – +60°C
Environmental protection:	IP67
Operating system:	Android
Storage:	32 GB
Display:	IPS LCD capacitive touch screen. Full colour display Screen optimised for viewing in direct sunlight and low light

Controls:	Power on/ off switch, home button, back button, volume control, app list button
Display languages:	English, French, Arabic, Russian, German, Italian, Bulgarian

2.4. Wiring Loom

Power connections:	12 V cigarette lighter connection, fitted with 8 amp fuse USB power connection for Android device
Data connections:	Sprayer interface connection Black box 30 Way Cinch connection (1x A-K Block Key) USB storage device connection

3. SPRAYTRAC SYSTEM

3.1. Installation

IMPORTANT:	DO NOT fit near to the vehicle alternator or other potential sources of Electromagnetic Interference (EMI)
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3.1.1. Fitting the Wiring Loom

IMPORTANT:	DO NOT connect the power cable at this point
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Fig. 1 – Spraytrac Wiring Loom (top) and black box (bottom)

1. Insert the connector block of the loom into the 'Main Interface' socket of the Spraytrac black box unit as indicated on the label (as shown in **Fig. 1**)



2. Use a ¼ inch socket to tighten the connector block centre bolt to ensure the connector is firmly in place.



3.1.2. Mounting the GPS Antenna

The GPS antenna must be installed on the vehicle only when required. It should be removed when the system is not in regular use.

The antenna's cable should be connected to the 'GPS Antenna' SMA connector on the Spraytrac black box controller unit as indicated on the label.

The antenna has a magnetic base which attaches directly to a flat steel surface. If the antenna is to be mounted on a non-metallic cab surface, a round or square piece of plate approximately 100 mm across and at least 1 mm thick can be fitted to provide a mounting for the antenna. This plate can either be attached with screws or can be bonded to the underlying surface with an epoxy adhesive. If screws are used, these must either have countersunk heads or be positioned outside the diameter of the antenna casing so as to provide a flat surface for attachment. The exact position on the roof is not important, provided that the surface is horizontal and that the antenna faces directly upwards. There may be a need to make a mounting bracket to achieve clearance if the only possible mounting point could cause the signal to be blocked. The receiver should not be installed on the bonnet (hood) or on the rear bed of the vehicle as the cab would obstruct the antenna's view of the sky.

The cable from the antenna to the vehicle cab must be protected from damage due to contact with sharp edges, by pinching or by excessive movement. Under no circumstances should the cable be routed through a cab door opening or through the window in a door. The preferred routing is through a window at the rear of the cab or through a hole in the cab structure. If a new hole is drilled, it should have a diameter

large enough to accommodate the connector on the antenna cable (8mm) and care must be taken to ensure that the hole is positioned so as to minimise the entry of dust or rain. Any sharp edges at the point of entry must be protected by fitting a plastic or rubber grommet to the hole.

The cable should be routed so as to minimise any slack length outside the vehicle and to avoid movement or chafing whilst driving at speed. Also, the cable should be positioned inside the vehicle so as to avoid accidental damage from being entangled by the occupants of the cab.

In some vehicles the antenna will perform satisfactorily if it is mounted above the dashboard of the vehicle inside the windscreen. This can be done using the supplied metal mounting plate using its self-adhesive pads. However, if the Spraytrac status section shows poor or no GPS data continuously after it is switched on, this indicates that the strength of the GPS signal inside the vehicle is insufficient and the antenna should be mounted on the upper surface of the roof of the vehicle cab.

3.1.3. Mounting the Display

The Android tablet (if supplied) comes with a mounting kit for fitting to the windscreen of the vehicle.

The screen should be mounted on the windscreen of the vehicle, using the suction mount provided. The position should be chosen so as to be in the direct line of sight of the driver without obstructing their view ahead of the vehicle. The position should also allow easy access for operation of the touch sensitive screen. The screen should be as close to perpendicular to the driver's line of sight as possible and it may be preferable to mount the unit at an angle to the line of the dashboard (see **Fig 2**). It is important to allow adequate clearance between the display and any surfaces to avoid the risk of damage due to movement of the unit and contact with surfaces when driving over rough terrain.

The procedure to mount the tablet is as follows:

1. Clean the area of the windscreen where the suction mount is to be fitted.
2. Push the suction mount base onto the windscreen and turn the lever to lock it into place.
3. Attach the ram arm onto the suction mount and insert the display ram ball into the ram arm
4. Attach the display and position as required. Tighten the thumb screw to fix it in place.



Fig. 2 – Android Tablet Mounted in Vehicle Using Ram Ball Mount

It is advised that the suction mount is removed from the windscreen when the unit is not in operation and reattached when needed.

For a more permanent fixing, please detach the ram ball from the suction mount and secure down in the vehicle.

Spraytrac can be used on any Android device running Android 4.0 onwards. This includes smartphones and the eLocust Panasonic toughbook tablet as shown in **Fig. 3.**



Fig. 3 – Spraytrac on Android smart phone (left) and eLocust tablet (right)

3.2. Connecting to the Power

Before connecting to the power supply please ensure that all previous instructions have been followed and completed.

The unit will come with a standard cigarette lighter power connection on the power cable. Once this has been connected to the cigarette lighter socket, connect the 2-way plug of the power cable into the 2-way power socket of the wiring loom. Once the power supply is connected the black box will be active and will boot up.

3.3. Connecting the Display

1. Take the supplied tablet charging cable and insert into the USB charge socket on the wiring loom.
2. Insert the other end into the USB charge socket on the tablet.
3. This will cause the tablet to power on. Alternatively press and hold the power button until the display illuminates.
4. The tablet will load to the Spraytrac launcher as shown in **Fig. 4** and the wireless connection between the black box and the tablet and the GPS signal are automatically acquired.

If the Bluetooth or GPS signal are not acquired, then please refer to the Troubleshooting section of this handbook.



Fig. 4 – Spraytrac II Launcher on optional Android tablet

3.4. Wiring Loom Connection Layout

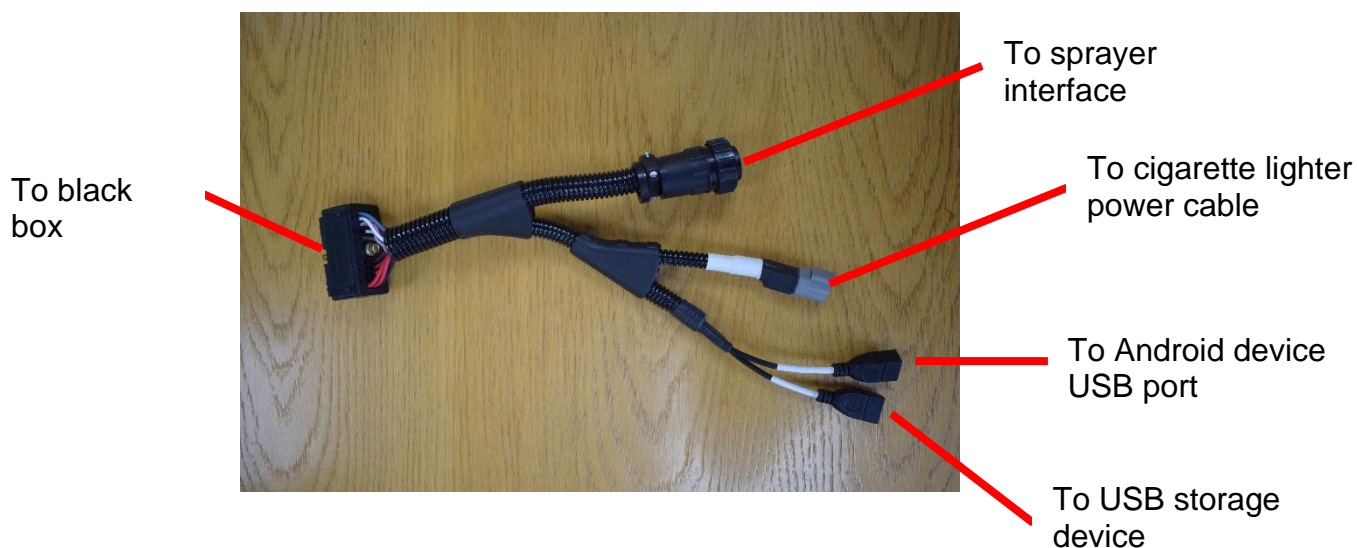


Fig. 5 – Wiring Loom

3.5. Sprayer Interface Connection

3.5.1. Overview

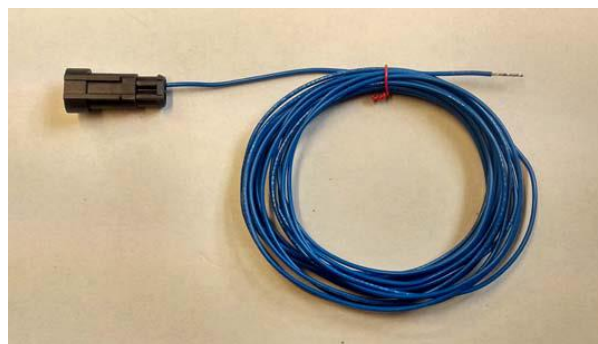
There are two options for Spraytrac II to display and record the area sprayed from the vehicle on which it is installed

- Manual input by the operator via the Spray On/ Off button on the screen of the Android device.
- Automatic input when the Spraytrac II black box is interfaced with the sprayer. In this case Spraytrac II displays and records the sprayed area downwind of the vehicle when the sprayer pump is operating.

Spraytrac II is compatible with all models of Micron Ulvamast (V3 and V4, M and E versions) and AU 8115 (M, E and MS) sprayers.

3.5.2. Connection

Insert the connector on the blue interface wire supplied with the kit into the switch socket on the Spraytrac II wiring loom. Route the wire to the end of the flexible conduit carrying the cable from the in-cab sprayer control box to the sprayer. Ensure that the wire is clear of occupants of the cab and any sharp edges etc.



Open the junction box at the sprayer end of the flexible conduit and thread the wire through the conduit and into the junction box.

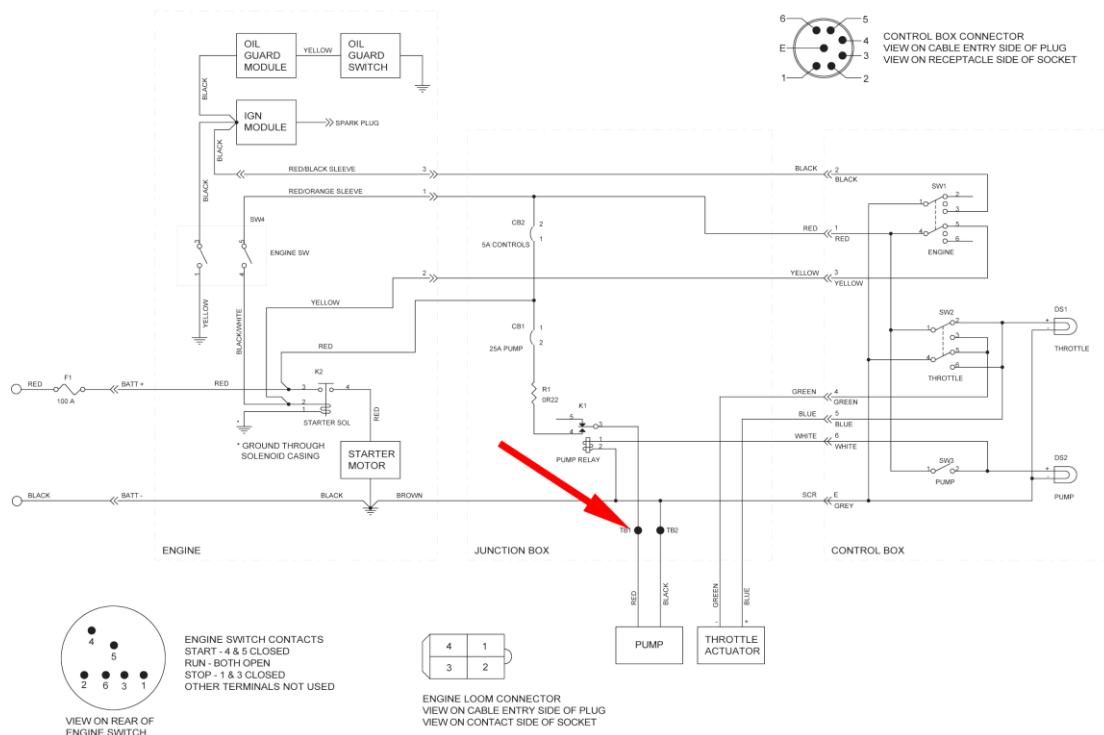
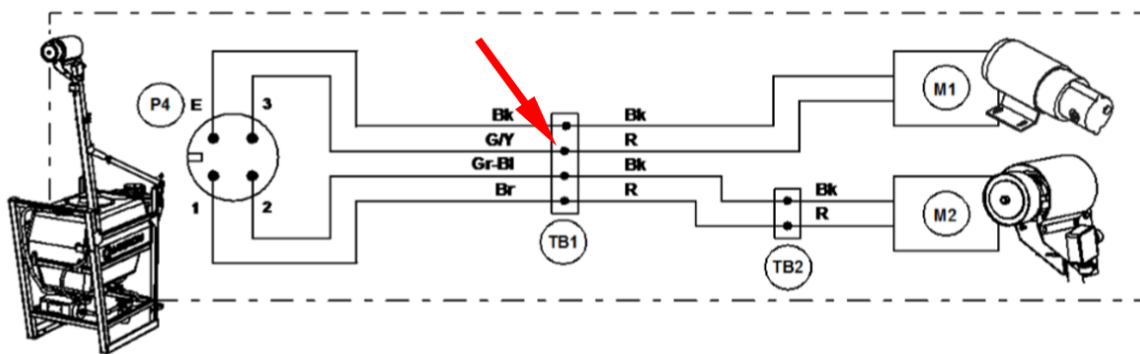
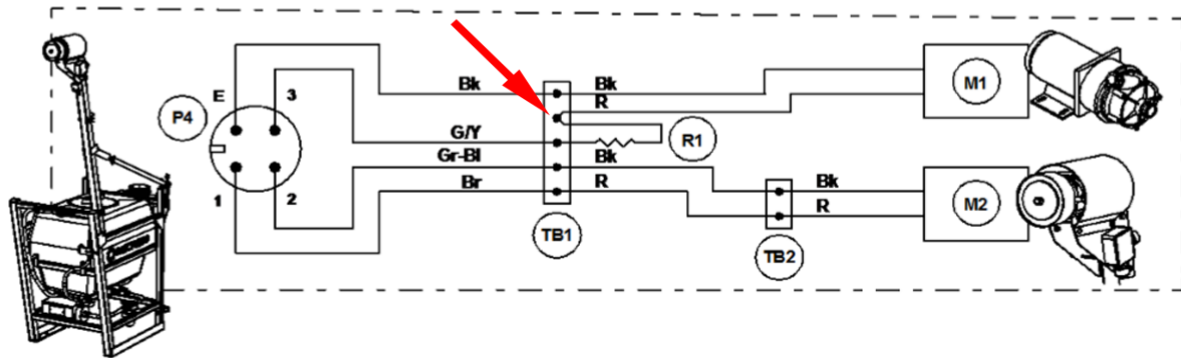


Fig. 6 – Sprayer interface wiring connection point for Ulvamast V3/V4 M (top),
Ulvamast V3/ V4 E (middle) and AU 8115MS (bottom)

Identify the red (positive) wire from the pump of the sprayer inside the junction box. Either cut off any excess length of the blue wire or coil it inside the junction box. Connect the blue wire to the red wire from the pump at the terminal block inside the junction box (as shown in **Fig. 6**) and replace the lid.

Choose the 'Switch' option for On/ Off control as shown in **section 4.4.1- Guidance Setup**.

4. INITIAL CONFIGURATION

4.1. Spraytrac II Launcher

By default, the tablet will launch into the Spraytrac II launcher (**fig. 7**) when the power is turned on.

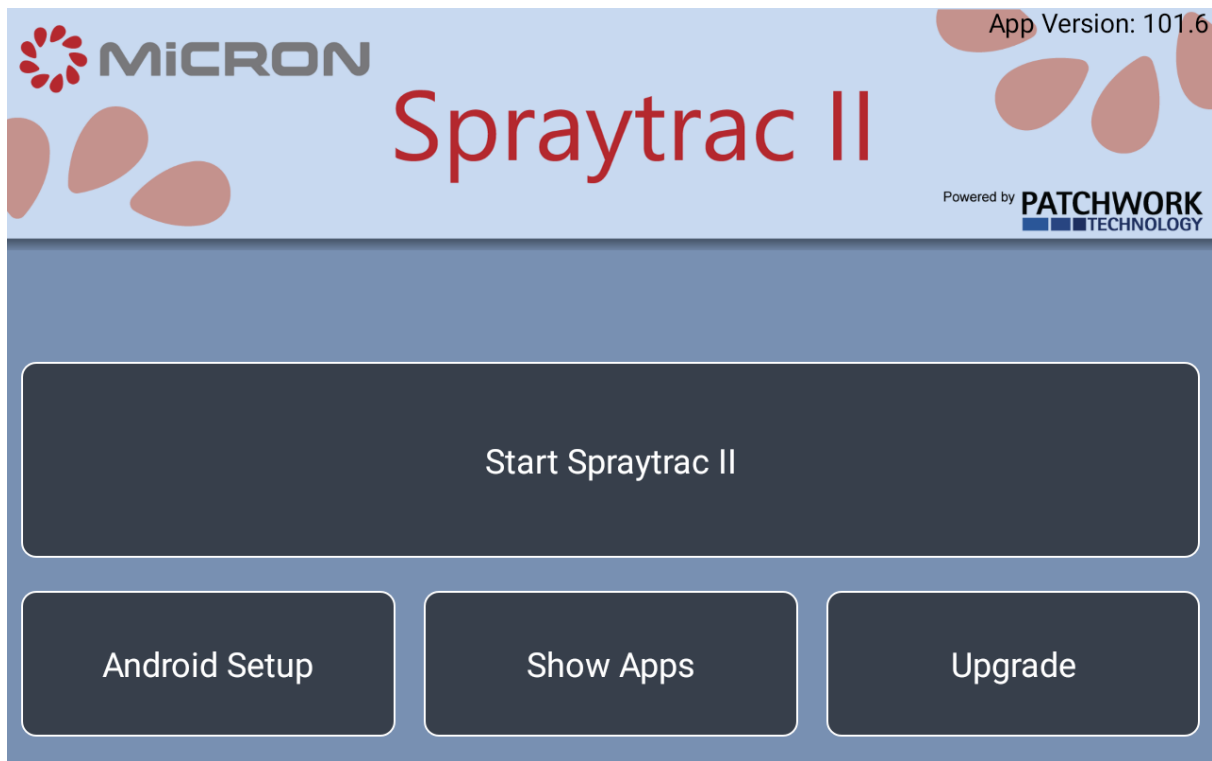


Fig. 7 – Spraytrac II launcher screen

Start Spraytrac II–	Launches the Spraytrac II software
Android Setup–	Opens the setup screen where WiFi and Bluetooth connections can be configured
Show Apps–	Shows the list of installed applications on the Android device
Upgrade–	When connected to the internet this is used to download and install the latest Spraytrac II software on the tablet

4.2. Spraytrac II Home Screen

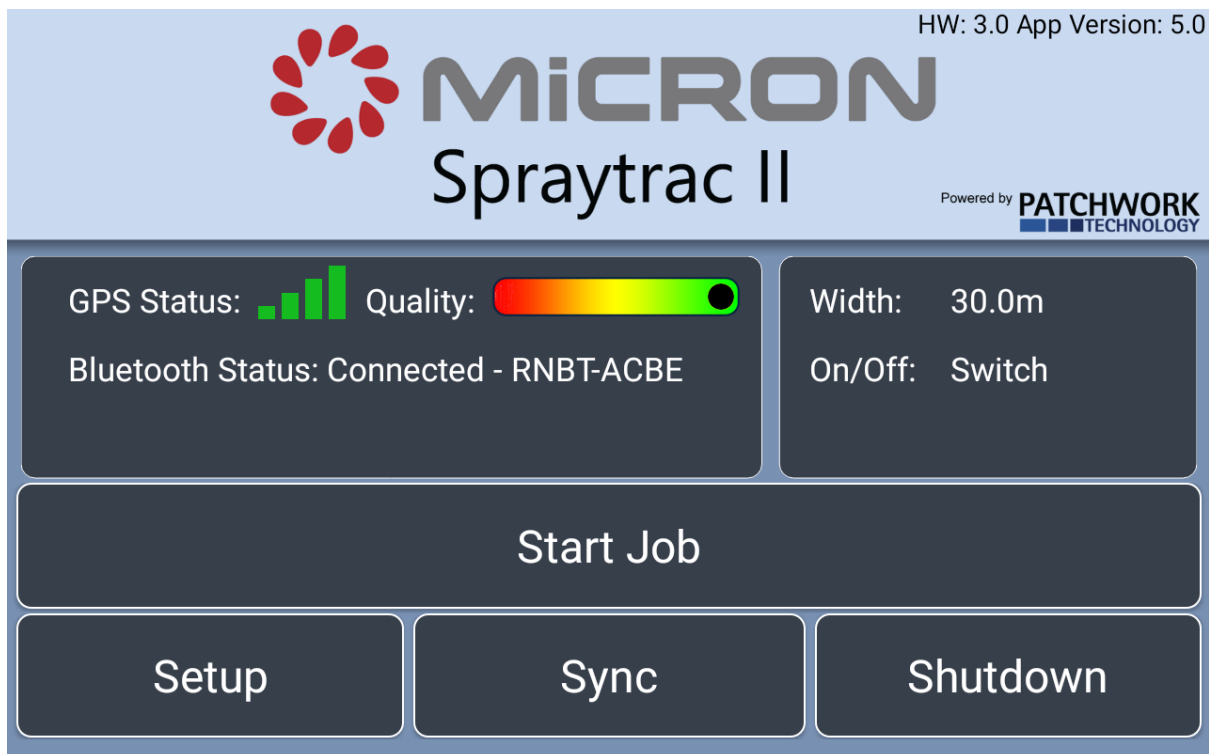


Fig. 8 – Spraytrac II home screen

The home screen (**fig. 8**) is the main menu for setting up and accessing the various parts of the Spraytrac II software.

Start Job–	Launches a Start Up wizard to access the 3D guidance job screen. This screen is used for guidance and recording. <i>Before beginning a job it is important that setup is completed- see section 4.4- Setup Menu.</i>
Setup–	Opens a setup menu for the unit. Before starting a job, it is important that the unit is setup for your operation (see section 4.4- Setup Menu) for details
Shutdown–	Closes the software and re-opens the Spraytrac II launcher
Status screen–	Displays GPS and Bluetooth status

4.3. Spraytrac II Status Screen

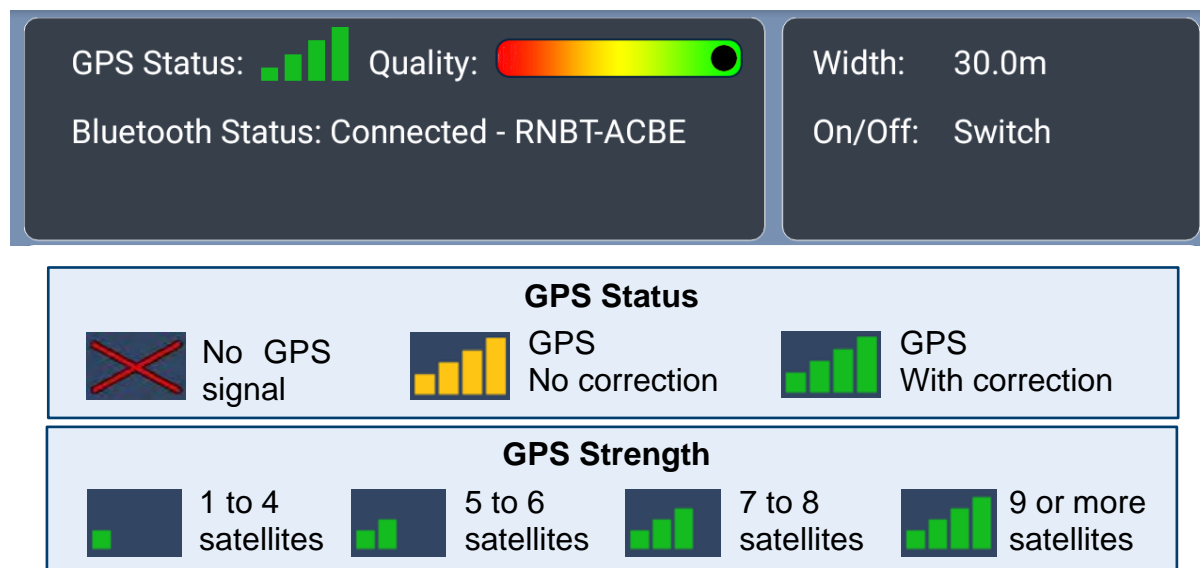
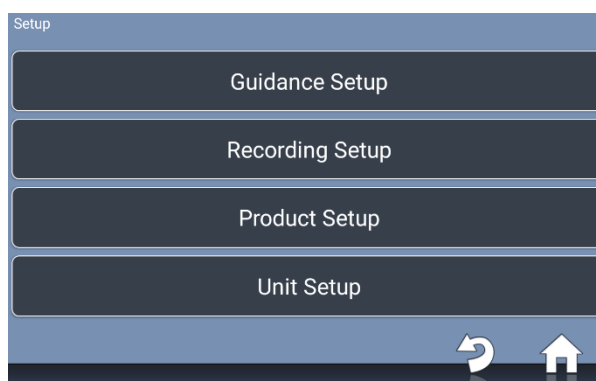


Fig. 9 – Spraytrac II status screen

GPS Status–	Displays the signal strength/ status and the GPS source
Quality–	After the GPS satellites and correction signals have been acquired there is a short period of time before the signal becomes fully stable. The signal has become stable when the dot has moved into the green area of the quality bar.
Bluetooth status–	Displays Bluetooth connection status and name of the device connected to
Width–	Currently selected track spacing (see section 4.4.1- Guidance Setup for details)
On/Off–	Displays the current On/Off method selected for recorded coverage (see section 4.4.2- Recording Setup for details)

4.4. Setup Menu

The setup menu is used to configure the Spraytrac II system for the operation and region where it will be used.



Guidance Setup– Allows setup of track spacing, On/Off mode selection

Recording Setup– Allows setup of job recording options

Product Setup– Allows setup for recording product being applied

Unit Setup– Allows for country configuration, units selection, language selection, UTC offset and factory reset

Return Button– Returns user back to the previous setup screen

Home Button– Returns user back to the home screen

4.4.1. Guidance Setup

The guidance setup screen allows operators to setup the track spacing (Width) and to select the On/Off setting for spray recording.

By selecting the 'Width' button, a new track spacing (in metres) can be entered using the numerical pad. Pressing 'OK' confirms the new track spacing.

By selecting the 'On/Off' button, the method of logging spray coverage can be chosen.

Selecting 'Switch' enables logging of the sprayer pump operation if the optional sprayer interface is connected to the wiring loom. Selecting 'On Screen' requires the user to press a button in the job screen to turn coverage area recording on and off.

4.4.2. Recording Setup

The recording setup allows the user to enter operational details to identify spray records. It also allows data to be stored locally on an external USB drive. Ensure the recording setting is 'On'.

The 'Recording Setup' screen displays four input fields: 'Recording: On', 'Vehicle:', 'Operator:', and 'USB Storage:'. At the bottom right, there are two icons: a circular arrow and a house icon.

By selecting 'Vehicle:', a vehicle registration can be entered or selected from existing records on the tablet.

New vehicle registrations can be entered by selecting '*NEW*' and using the keyboard to enter a new vehicle registration.

The 'Select Vehicle' screen shows a list with '*NEW*' at the top and a list of existing records below. To the right are 'Up', 'Down', 'OK', and 'Cancel' buttons. The 'New Vehicle' screen shows a 'VEHICLE REGISTRATION' field with a QWERTY keyboard overlay. The keyboard includes a backspace key and an 'OK' button. A 'Cancel' button is also present at the bottom left.

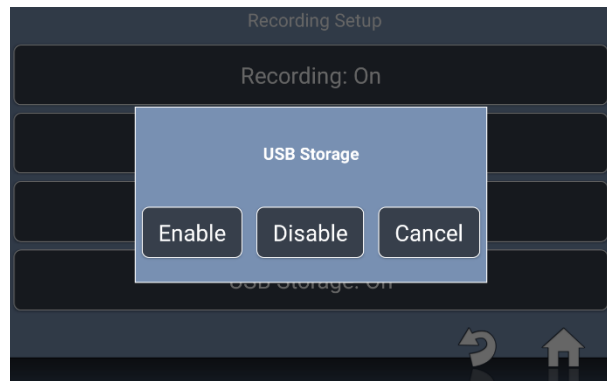
By selecting 'Operator:', an operator name can be entered or selected from existing records on the tablet.

New operators can be entered by selecting '*NEW*' and using the keyboard to enter a new vehicle registration.

The 'Select Operator' screen is similar to the 'Select Vehicle' screen, showing a list with '*NEW*' at the top and existing records below. To the right are 'Up', 'Down', 'OK', and 'Cancel' buttons.

By selecting 'USB Storage:' the USB storage option can be chosen.

If enabled, the tablet will store job files on an external USB drive connected to the USB data connector on the wiring loom. If this is disabled, job files will be stored locally on the tablet (at folder location Black Box\ shapeasapplied).

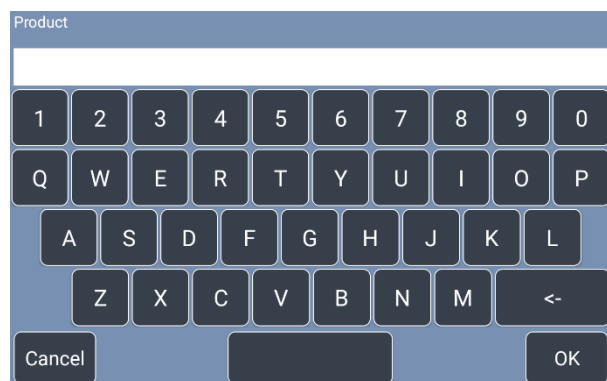


4.4.3. Product Setup

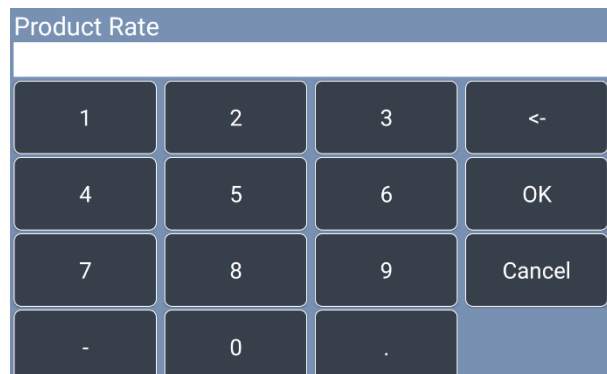
The product setup screen allows the user to enter the product being applied and the application rate.



By selecting 'Product:' the name of the product being applied can be entered using the keyboard.



By selecting 'Product Rate:' the rate of the applied product mix in l/ha can be entered using the keypad.



By selecting 'Active Ingredient:' the name of the active ingredient in the product being applied can be entered using the keyboard.

By selecting 'Active Ingredient Rate' the rate of the active ingredient in the product mix in g a.i./ ha can be entered using the keypad.

4.4.4. Unit Setup

The unit setup screen allows the user to setup the tablet for different countries, create a passcode for the tablet, restore the device to factory settings or to register new black boxes on the Android device.

For information on registering a new black box device please see **section 4.5- Registering and Selecting a Black Box**.

By selecting 'Local Setup' the menu for changing country-specific details of the operation can be accessed.

By selecting 'Country:' the country of operation can be selected from a list of countries.

Country	
Australia	Up
Canada	
France	
Holland	
Northern Ireland	Down
Republic of Ireland	
South Africa	OK
United States	
United Kingdom	Cancel
Denmark	
Sweden	

By selecting 'Units:' units can be changed between Imperial and Metric.

Units	
Imperial	Up
Metric	
	Down
	OK
	Cancel

By selecting 'Language:' the language used on the tablet can be chosen. The available choices are English, Arabic, French, Russian, German, Italian or Bulgarian.

Language	
Arabic	Up
Bulgarian	
English	Down
French	
German	OK
Italian	
Russian	Cancel

Important- If the wrong language (particularly Arabic) is selected then please follow the below steps:

1. Select the bottom left hand button on the Spraytrac home screen.
2. Select the bottom of the four options now presented.
3. Select the top of the four options now presented.
4. Select the third button down of the four options now presented.
5. Then select the preferred language from the list of languages and select the third button down on the right hand side of the screen to revert the language.

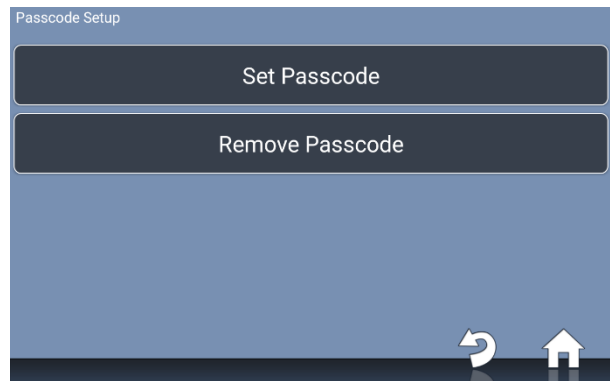
If any of these steps don't work as expected then return to the Spraytrac home screen and restart from step 1.

By selecting 'UTC Offset:' the time difference to UTC can be entered using the keypad.



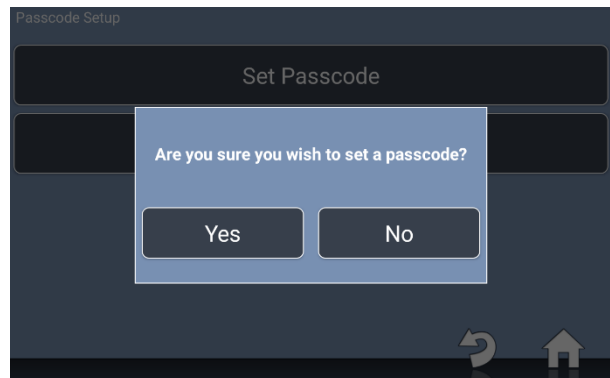
The screenshot shows a keypad interface titled "UTC Offset". It features a numeric keypad with buttons for digits 1 through 9, 0, a decimal point, and a backspace key (<-). Additionally, there are buttons for "OK" and "Cancel".

A passcode can be entered onto the device to prevent unauthorised modification of any settings. To do this select 'Passcode Setup' and then 'Set Passcode'.



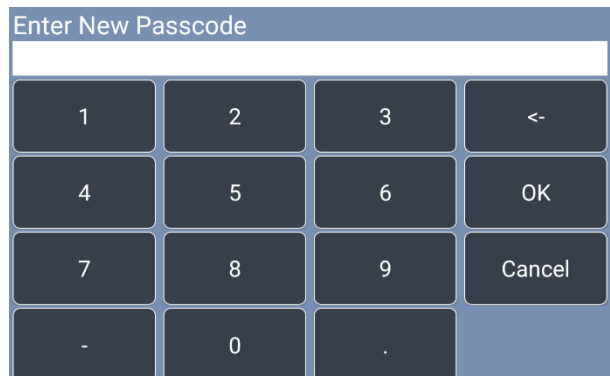
The screenshot shows the "Passcode Setup" screen. It has two main buttons: "Set Passcode" and "Remove Passcode". At the bottom right, there are navigation icons: a back arrow and a home icon.

A prompt will appear to check whether you want to set a passcode. Select 'Yes'.



The screenshot shows the "Passcode Setup" screen with a confirmation dialog box in the center. The dialog box asks "Are you sure you wish to set a passcode?" and has two buttons: "Yes" and "No". The background screen shows the "Set Passcode" button and navigation icons at the bottom.

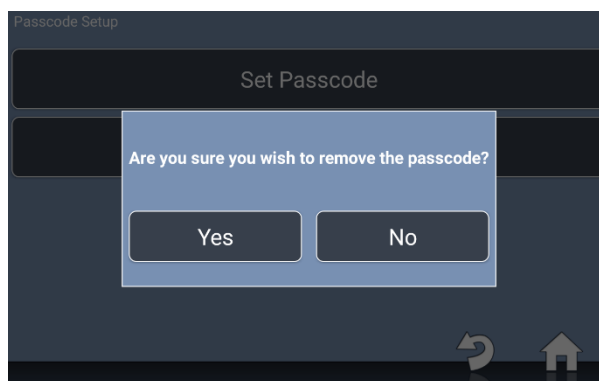
Then enter a new passcode on the keypad and select OK. A prompt to re-enter the passcode so repeat the process again.



The screenshot shows a keypad interface titled "Enter New Passcode". It features a numeric keypad with buttons for digits 1 through 9, 0, a decimal point, and a backspace key (<-). Additionally, there are buttons for "OK" and "Cancel".

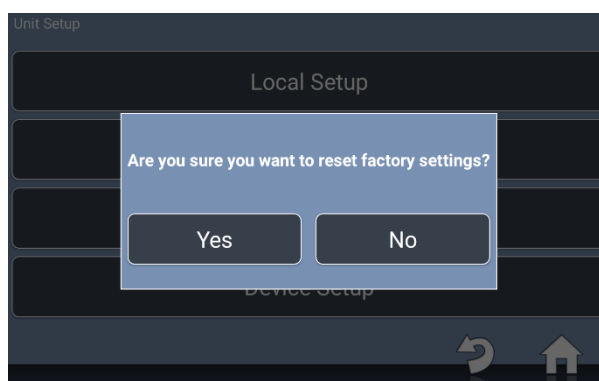
Once this is done and you have returned to the home screen, this passcode will be required to enter any of the Setup options on the unit.

To remove the passcode enter 'Setup' (entering your passcode when prompted) and navigate back to 'Passcode Setup'. Select 'Remove Passcode' and a prompt will appear asking if you're sure you want to remove the passcode. Select 'Yes' and the passcode will no longer be required on the unit.



To reset the device to Factory settings select the 'Reset to Factory Settings' option from the 'Unit Setup' menu. A prompt will appear asking if you're sure you want to reset to factory settings.

NB- It is not recommended to reset the device to factory settings as this could cause issues with the functionality of the device.



4.5. Registering and Selecting a Black Box

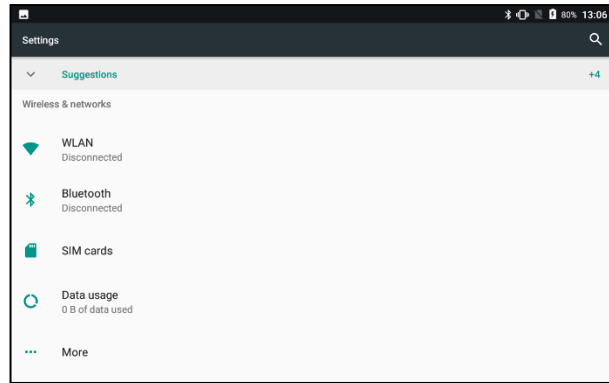
If you have more than one black box used with a single Android device, or more than one Android device using a single black box then it will be necessary to follow the procedure below to register the black box on the Android device:

Select Android Setup from the Spraytrac II home launcher.

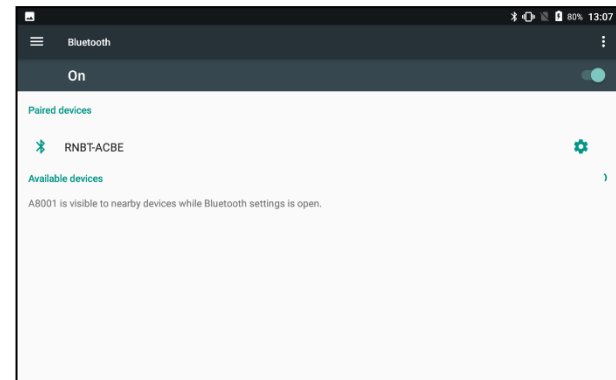


Press Bluetooth and ensure Bluetooth is turned on.

NB- sometimes the top menu will display 'disconnected' even when Bluetooth is operating correctly. Press the Bluetooth button to ensure it is on

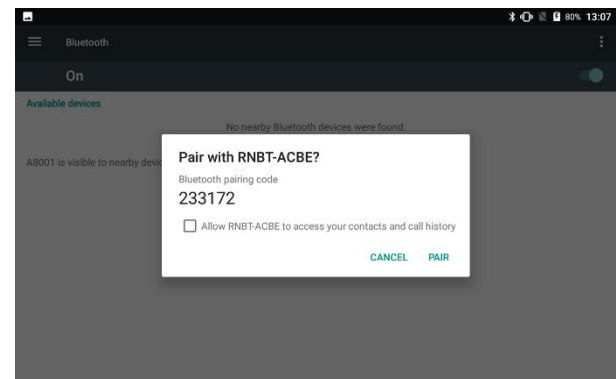


Check if the black box device is listed in the 'Paired Devices' list. To check this look at the last four digits of the Mac ID code on the serial label of the black box. If these match the last four digits of the RNBT (Mac ID) in the list then the tablet and black box are connected via Bluetooth and you can skip the following pairing step.



If the black box Mac ID is listed in 'Available Devices' but not paired, then select the RNBT (Mac ID) name and when prompted press PAIR.

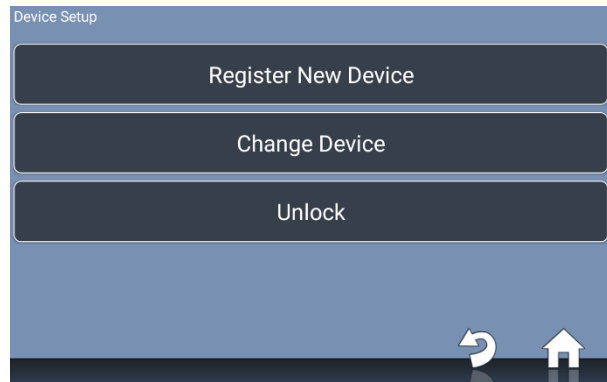
After a pause the RNBT (Mac ID) will appear under the PAIRED DEVICES list. The tablet and black box are now connected via Bluetooth. Select the Android Home button to return to the Spraytrac launcher



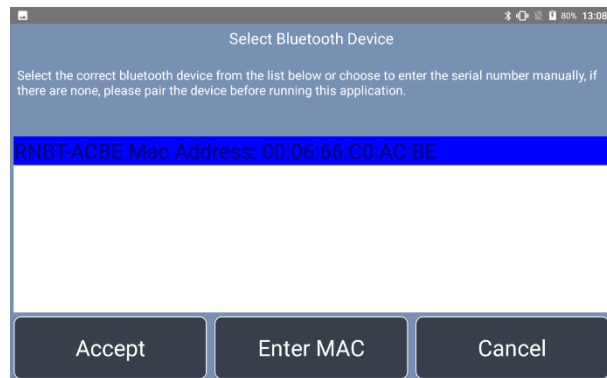
Select start Spraytrac II and then press the box containing GPS and Bluetooth status.



Select register new device.



Highlight the RNBT (Mac ID) name in the list and select accept.



Select home and the Bluetooth status will now show connected alongside the RNBT (Mac ID) name.



5. OPERATION

5.1. General Principles

The Spraytrac GPS track guidance system is intended to enable the driver of a spray vehicle to follow parallel tracks in a spray block and to record spray operations. The layout of a typical spray block is shown in **fig. 10**. The key features are:

- **Track spacing** – the spray tracks must be parallel and at a constant distance apart. This distance is defined as the track spacing and will depend upon the type of sprayer being used and spray swath covered. **See section 5.2-Incremental Spray Technique.**
- **A-B line.** The A-B line determines the downwind edge of the spray plot and the orientation of all subsequent parallel tracks. When setting the A-B line the vehicle is driven from a point at the beginning of downwind edge of the block to be sprayed (point A) to a point at the end of the downwind edge (point B). If setting the A-B line on the downwind edge then the spray during transit between the two points **MUST** be off., These points may be marked by flags if required as a further aid to drivers. For some experienced users they may prefer to set the A-B line on the first spray run in which case the A-B line should be set one track space upwind of the downwind edge of the spray block. First spray run will then be recorded as T0.
- **Spray runs** –the spray tracks should be aligned at approximately 90° to the direction of the wind and the first spray track must **ALWAYS** be offset (upwind) one track width from the downwind edge of the spray block.
- **Ends of block** – if the spray block is rectangular, the ends of the block are defined by lines projected from the A & B points at 90° to the first track. The shape of the block can be a polygon with parallel spray tracks between by simply extending or reducing the run length according to the presence or absence of locusts.
- **Return point** – it may be necessary to leave the spray block to re-fill the pesticide tank or to refuel etc. In this case it is important that the vehicle should return to the point where spraying stopped so that it can continue along its original track. The point where the vehicle stops spraying before leaving the area is defined as the return point.

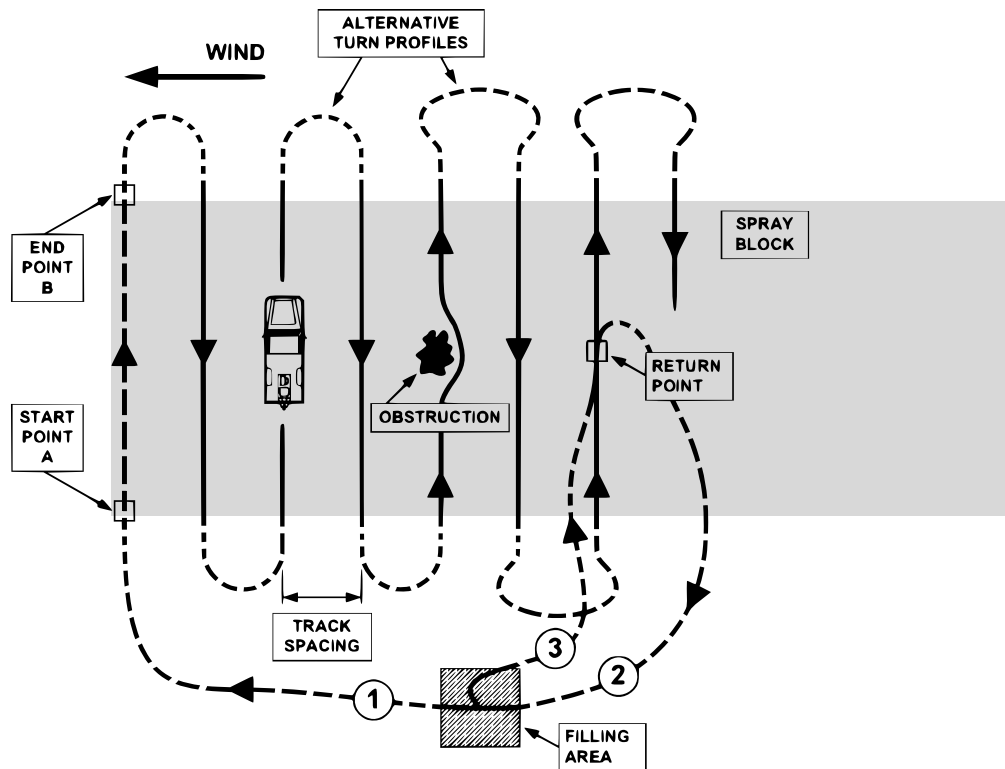


Fig. 10 – Layout of typical spray block

5.2. Incremental Spray Technique

The track spacing is the distance between successive spray passes of the vehicle. Spray passes should always be made with the wind at right angles to the direction of travel of the vehicle. Although the peak spray deposit is likely to occur at a point downwind of the vehicle some spray will be carried more than twice this distance. Spray coverage of the target area is evened out by accumulating spray deposits from overlapping swaths. This is known as an incremental spraying technique.

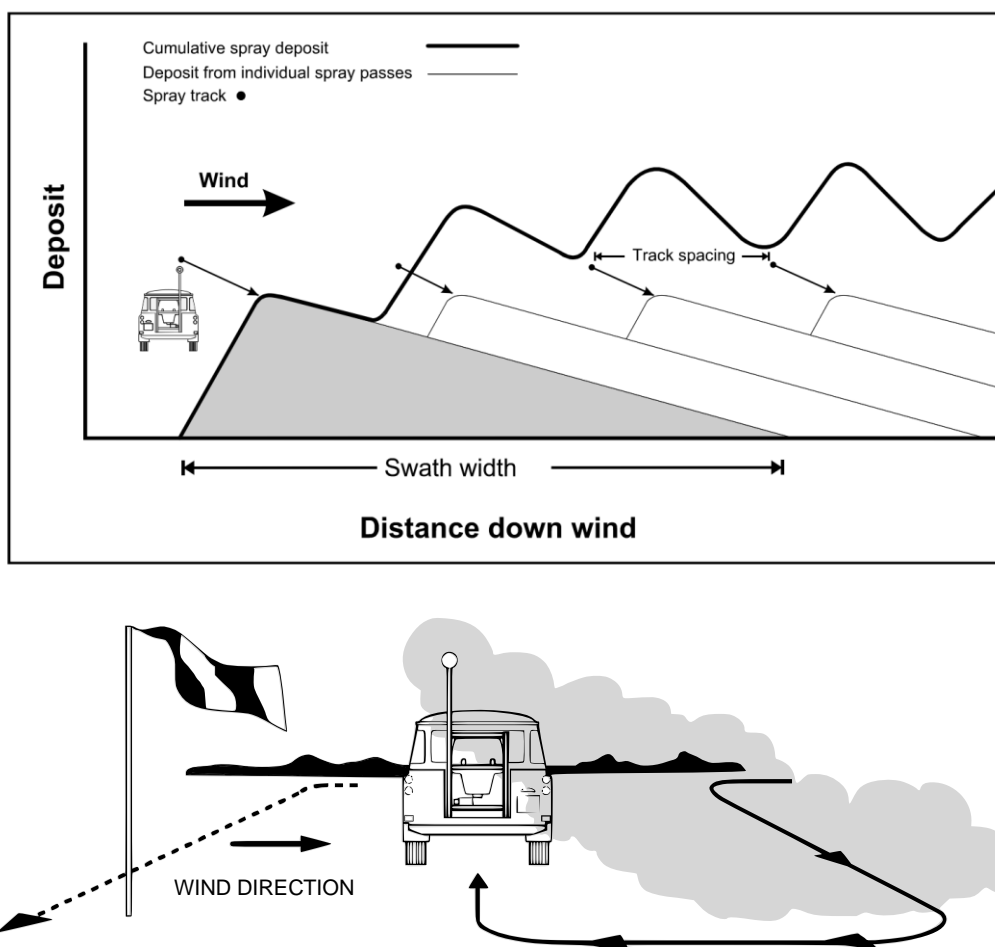


Fig. 11 – Incremental spray technique illustration

5.3. Starting a Job

To switch the unit on, press the power button. The display should illuminate and open the Spraytrac II launcher.

Select Start Spraytrac II and wait for the GPS receiver to acquire satellites and the Bluetooth link to the black box to be established.



Once the GPS receiver has acquired all satellites in view, the status should display as shown in **fig. 9**.

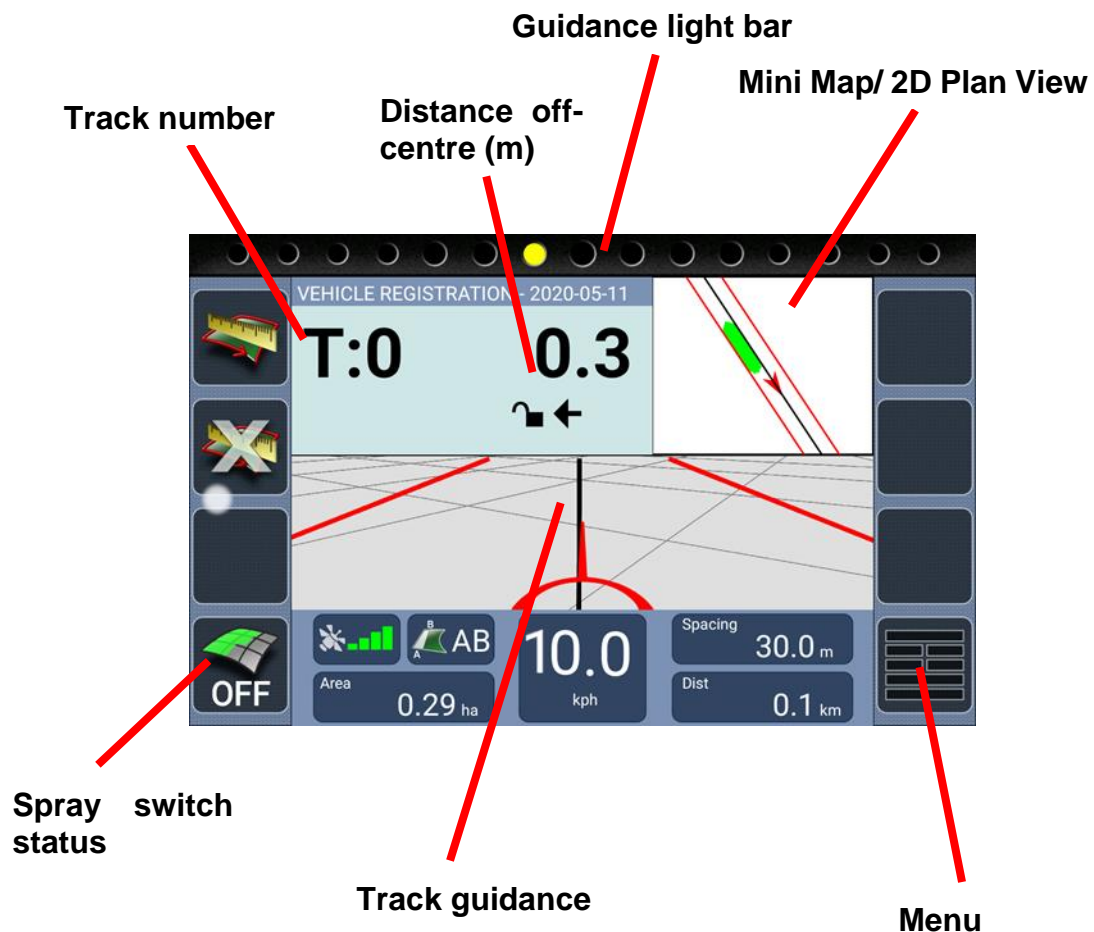
Operational details such as vehicle and product should be added as described in **section 4.4- Setup Menu**.

Start job can then be selected which will open the job screen.



5.4. Job Screen Overview

The job screen (**fig. 12**) is what the driver will see during a spray operation.



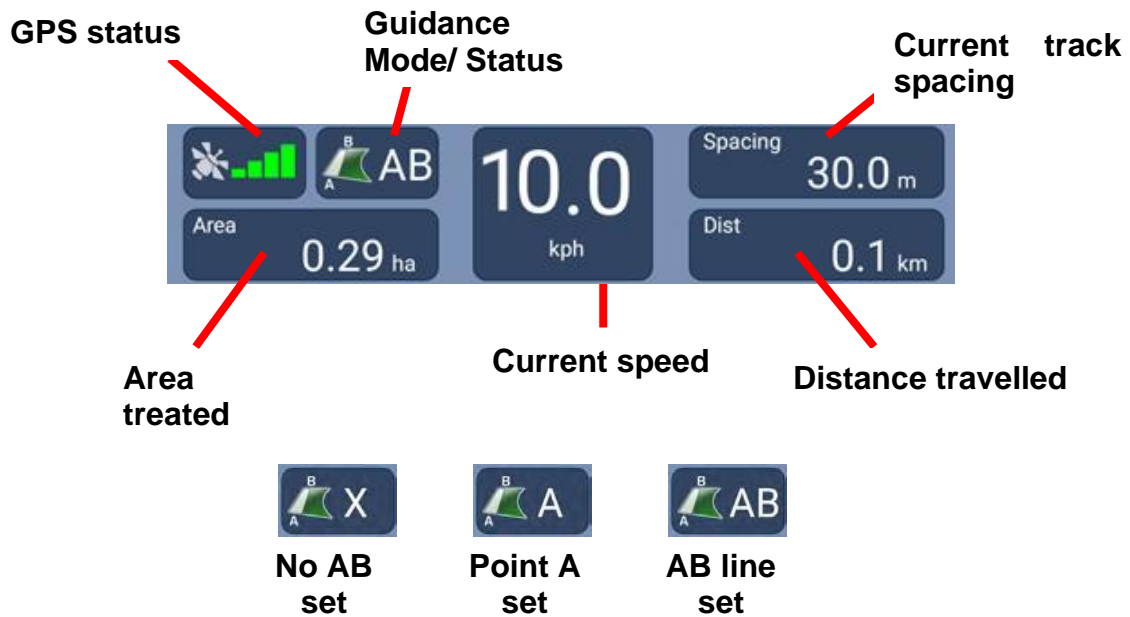


Fig. 12 – Job screen overview

5.5. Setting A-B line



Fig. 13 – Initial job screen view

The A-B line is defined by a line between a point at the beginning of the downwind edge of the spray block (point A) and a point at the end of this edge (point B) – see **fig. 10**. The procedure to set this A-B line in the Spraytrac software is as follows:

1. Drive the vehicle to the beginning of the downwind edge of the block (point A). Your screen should look similar to **fig. 13**.
2. Touch the guidance mode/ status button – see **fig.12**. A prompt will appear on screen to select the wind direction. The icon alongside the guidance mode/ status button will change to A.
3. Drive the vehicle with the spray OFF to the end of the downwind edge (point B). Whilst driving the display will show the speed and heading of the vehicle and the distance from the beginning of the track (point A). This information can be used to locate the B point if there is no physical marker.
4. At the end of the downwind edge (point B) press the guidance mode/ status button again. The icon alongside the button will change to AB. Note that the vehicle can be moving or stationary when the button is touched.

After setting the B point at the end of the track, the display will change to track guidance mode, with a series of parallel lines to the set A-B line – see **fig. 12**.

In case of an error after setting the A point, the procedure can be aborted and restarted as follows:

1. Drive back to the selected A point.
2. Press the AB button twice which will open a prompt asking whether guidance is to be reset.
3. Select yes and run through the steps 2- 4 above on setting the A-B line.

5.6. Spray Runs

After the A-B line has been set, the system displays parallel tracks set at the user-defined track spacing.

The display will show the track guidance mode as shown in **fig. 12**. This shows the parallel tracks ahead of the vehicle in a forward-looking 3D horizon. The display shows the following information:

- **The current spray track** – shown as a solid black line
- **Adjacent spray tracks** – the parallel spray tracks on either side of the current track are shown as solid red lines.
- **Position cursor** – the position of the vehicle relative to the tracks is shown as a red arrow pointing upwards at the bottom of the display. The objective for the driver is to keep the black line (denoting the current track) aligned with this arrow.
- **Track number** – shown next to the T on the screen. The first track (A-B line) is shown as 0 and subsequent tracks upwind are numbered incrementally (1, 2, 3, 4, 5...).
- **Distance off-centre** – distance deviated from the currently defined track. An arrow indicates which direction to drive in order to return to the parallel track.

- **Guidance light bar** – Coloured lights which indicate to the driver which direction to drive in order to return to the parallel track
- **Track spacing** – the current user-defined track spacing in m
- **Vehicle speed** – the current speed in km/h
- **Distance** – the distance travelled
- **Area** – the area treated
- **Spray switch status** – this represents whether the spray is being recorded as on or off. This can be set to be operated on the screen or via the sprayer pump connection depending on the option selected in **section 4.4.1- Guidance Setup**.

The procedure to follow tracks parallel to the A-B line is as follows:

1. After setting the B point at the end of the downwind edge, continue driving in a straight line (if possible) for about 20m (this distance can be reduced as the driver gains experience).
2. Turn the vehicle in the direction of next spray track (T1), this should be upwind of the initial A-B line at the track spacing selected.
3. As the heading of the vehicle changes relative to the first track, the track number on the guidance display will increment from 0 to 1 and the next track to be followed will change colour from red to black as the driver crosses the mid-way point between consecutive tracks.
4. Continue turning in the direction of the next track which should now be a black line on the display (after crossing the mid-point from the A-B line and the next track). Steer the vehicle so that the position arrow aligns with the black line and the black line appears vertical on the display. Avoid making sudden changes of direction and do not attempt to intercept the black line at too great an angle as this will result in over-steering and overshoot the line. Best practice is to start turning onto the black line at 5m out.
5. Before switching on the sprayer, the driver should select a point in the distance that corresponds to the direction of the vehicle when correctly aligned. This point could be a tree or another feature on the landscape. This is the same method typically practised in locust control. The driver should then switch on the sprayer and steer using the landscape feature identified rather than trying to continuously follow the Spraytrac display. This will ensure a more even spray run and avoid the driver constantly monitoring the display when they should be looking at where they are driving. Any corrections to the spray line can be made by a simple occasional glance at the display. It is not necessary to always drive exactly on the spray line as incremental spray technique allows for variations in vehicle position to some extent. Occasionally drivers will have to deviate from the spray line because of obstacles or ruts and holes in the ground.
6. With the spray on and the vehicle following the spray line the display will show the spray band in green offset to the side of the vehicle in the direction of the wind. Proceed along the line using the landscape feature as selected until the end of spray block or area of infestation. At the end of the spray run switch off the spray and proceed to make a 180 degree turn into wind to spray the next

spray track using the Spraytrac guidance system to assist in setting the precise track distance required and orientation of the next spray line.

7. Continue as before by selecting a landscape feature on the horizon outside the vehicle to aim for, using the Spraytrac to assist and drive as normal while making occasional adjustment as required using the Spraytrac guidance display.
8. With each consecutive spray pass the track number on the guidance display will increment and the next track to be followed will change colour from red to black.
9. Continue turning and follow steps (4)-(10) until the area of infestation has been treated.

5.7. Obstacles

In many spray areas it will be necessary to deviate from the desired track to avoid obstacles such as trees, bushes, rocks, uneven ground etc. In these cases, the procedure is as follows:

1. Before reaching the obstacle, begin steering to the upwind side to avoid spray following the vehicle. Generally, the route around the obstacle should be chosen so as to minimise the deviation from the required track. However, it may be advantageous to pass on the upwind side if the obstacle is also a habitat for the pest being controlled (eg locusts in bushes).
2. Steer around the obstacle and back onto the original track (as shown on the display as a dashed line) so as to follow a smooth curve as shown in **fig. 10**. Do not make any sudden changes in direction and avoid passing over the halfway point between tracks. Passing over the halfway point would be interpreted as a turn to the end of the spray block and the track number would increment to the next line.

5.8. Returning to a Spray Job

It may sometimes be necessary to leave the current track during a spray job to re-fill the pesticide tank, refuel the vehicle etc. In these cases, it is necessary to stop spraying and proceed to the filling area as shown in **fig. 10**. Once this has been done, the operator can return to the end of the green treated area on the current track number and resume spraying and proceed as before.

5.9. Completing a Job

When a job is finished, press the menu button. The option 'Finish Job' should then be selected and the system will revert back to the Spraytrac home screen.

Depending on the storage method chosen the system will then either copy files to the attached USB drive or store them locally on the device. If selecting USB for data storage make sure there is a USB memory stick present in the correct slot on the wiring loom from the black box controller.

5.10.Powering Down

From the Spraytrac home screen press the Shutdown button and, when prompted, select yes.

Note- If file sync to an attached USB drive has not yet finished a prompt will prevent shutdown until sync has been completed.

Press and hold the tablet power button and after a short period the power down options will appear. Select Power Off and OK.

Disconnect the black box controller from the power source.

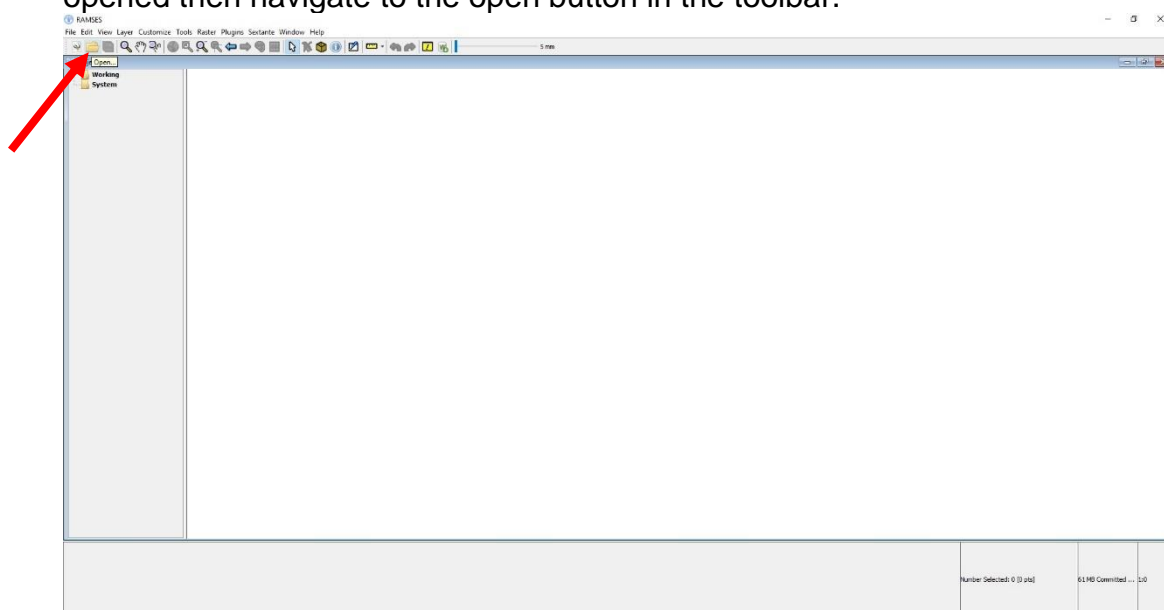
6. EXPORTING DATA

Each job will be recorded as a .SHP file to either to the tablet or the connected USB drive, as explained in **section 4.4.2- Recording Setup**.

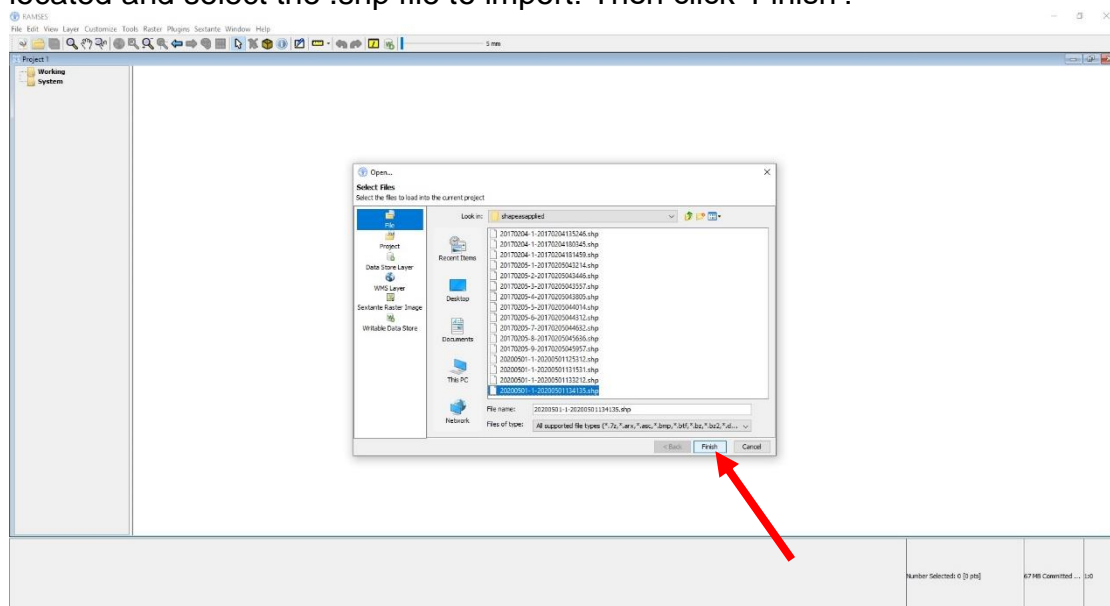
This file is then ready for import into FAO's RAMSES software for recording of spray control operations. This .SHP file will also contain both the vehicle and operator IDs. These can be changed as explained in **section 4.4.2- Recording Setup**.

The procedure to import files is as follows:

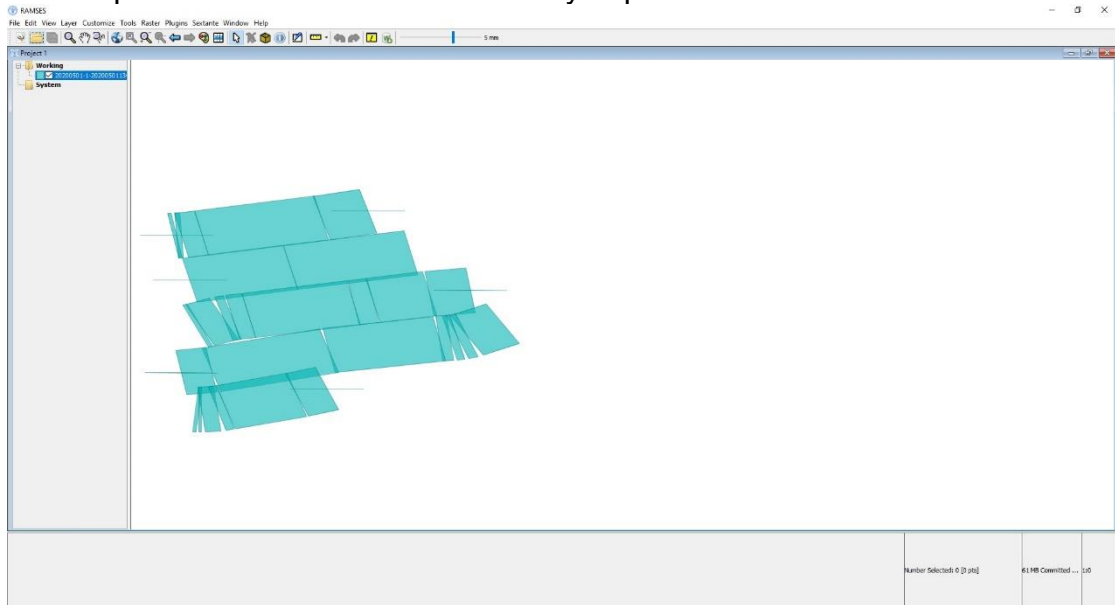
1. Open the RAMSES software and wait for any necessary updates.
2. Once updates have been installed/ checked and the RAMSES software has opened then navigate to the open button in the toolbar.



3. This will open a dialog box. Navigate to wherever your job .shp files are located and select the .shp file to import. Then click 'Finish'.



4. The .shp file should then be successfully imported into RAMSES.



7. TROUBLESHOOTING

Symptom	Cause	Solution
Bluetooth not connecting	No power to the black box unit	Ensure the unit is connected to a working power source
		Ensure the wiring loom is fitted to the power source with the correct continuity. Refer to section 3.2- Connecting to the Power
	Tablet and black box unit did not connect during start up	Disconnect black box unit from power source and power down the tablet. Re-power the black box unit.
	The tablet and the black box have become 'unpaired'	From the Spraytrac home screen, select 'Shutdown' then 'Yes'. Select Android setup, open Bluetooth options and ensure Bluetooth is enabled. Locate the black box under available devices (using the Mac-ID on the label) and select it followed by the option 'Pair'. Once re-paired press 'Home' and launch the Spraytrac software.
No GPS signal	No power to the black box unit	Ensure the unit is connected to a working power source
		Ensure the wiring loom is fitted to the power source with the correct continuity.
		Refer to section 3.2- Connecting to the Power
	GPS antenna not fitted/ damaged	Check the GPS connection to the black box unit.
		Ensure correct placement of the antenna. Refer to section 3.1.2- Mounting the GPS Antenna for details.
		Check the antenna cable for any damage.
	Obstructions are causing the antenna to not pick up signal.	Ensure the antenna in its current position has a clear view of the sky.
Screen powering down	Charge lead not connected	Ensure the USB charging lead is connected via the USB power socket of the tablet and the USB charging port on the wiring loom.
		Ensure the USB charge cable is not damaged.

8. PARTS LIST

CBP3880 Spraytrac II (complete unit with 8-inch ruggedized tablet)

CBP3881 Software support Package – 10 Year

GPS receiver with magnetic mount

Black box

Wiring loom

USB power cable

Power cable

Suction mount

8-inch ruggedized tablet

Manual

USB memory stick

9. CONVERSION FACTORS

1 yard	= 3 feet	= 0.91 metre
1 metre	= 39.37 inches	= 1.09 yard
1 statute mile	= 0.87 nautical mile	= 1.61 kilometre
1 nautical mile	= 1.15 statute mile	= 1.85 kilometre
1 kilometre	= 0.62 statute mile	= 0.54 nautical mile
1 statute mile	= 1760 yards	= 5280 feet
1 nautical mile	= 2027 yards	= 6081 feet
1 kilometre	= 1094 yards	= 3282 feet
1 metre/sec	= 2.237 miles per hr	= 196.9 ft/min
1 acre	= 43560 sq feet	= 4840 sq yards
1 acre	= 4047 sq metres	= 0.40 hectare
1 hectare	= 107600 sq feet	= 11955 sq yards
1 hectare	= 10000 sq metres	= 2.47 acres
1 sq mile	= 640 acres	= 259 hectares
1 sq kilometre	= 247 acres	= 100 hectares
1 US gal	= 0.83 Imp gal	= 3.78 litres
1 Imp gal	= 1.20 US gal	= 4.54 litres
1 litre	= 0.26 US gal	= 0.22 Imp gal
1 US pint	= 16 US fl ounces	= 0.47 litre
1 Imp pint	= 20 Imp fl ounces	= 0.57 litre
1 US gal/acre	= 8 US pints/acre	= 9.45 litres/hectare
1 Imp gal/acre	= 8 Imp pints/acre	= 11.35 litres/hectare
1 litre/hectare	= 0.11 US gal/acre	= 0.081 Imp gal/acre
1 pound	= 16 ounces	= 0.45 kilogram
1 kilogram	= 2.20 pounds	= 35.3 ounces
1 ounce	= 28.35 grams	
1 pound/sq inch	= 0.068 atmosphere	= 0.067 bar
1 atmosphere	= 14.70 pounds/sq in	= 1.01 bar
1 bar	= 14.50 pounds/sq in	= 0.98 atmosphere
1 kilopascal	= 0.01 bar	= 0.145 pound/sq in

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