



SPRAYTRAC GPS TRACK GUIDANCE SYSTEM AND SPRAYMAPS PROGRAM

Operator's Handbook and Parts Catalogue

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1. INTRODUCTION

The Micronair Spraytrac GPS track guidance system is designed specifically for use on ground vehicles used for the control of locusts and other migrant pests. The purpose of the system is to provide precision guidance to enable the driver to follow parallel spray tracks and also to record the position of the vehicle and the status of the sprayer. Spray jobs can be viewed, printed and archived on an office or laptop computer using Micronair Spraymaps software.

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

In addition to providing track guidance, the system displays GPS latitude and longitude coordinates. These can be used for survey purposes, thus eliminating the need for a separate hand-held GPS receiver.

The system consists of two main parts:

1.1 Spraytrac Vehicle Mounted Equipment

The equipment installed on each spray vehicle consists of:

- A Spraytrac guidance unit, installed above the vehicle dashboard in view of the driver. The unit incorporates a LCD display screen and operator controls and can easily be removed from its mounting bracket when not required. The Spraytrac software is designed to provide a very simple user interface and is suitable for use by personnel who may not have any prior experience of computers or more complex GPS devices. Operation of the system is by an on/off switch and four touch-sensitive buttons, one of which is dedicated to showing help messages on the screen. Whilst in the spray area, the screen shows a perspective image of the spray tracks and the driver need only follow a line on the display to remain on the correct track. The position of the vehicle is continuously logged without any operator intervention for the entire time that the Spraytrac unit is switched on. The log file is retained in the memory of the unit until it is downloaded for analysis and archiving by the Micronair Spraymaps program on an office PC or a laptop computer. Text on the Spraytrac display can be in English, French or Arabic.
- A self-contained GPS receiver and 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.
- A fixed installation kit for the vehicle. This consists of a mounting bracket for the Spraytrac unit and electrical wiring for the power supply from the vehicle battery etc. The wiring includes an optional connection to the sprayer to allow the Spraytrac log file to record the locations at which the sprayer pump is operating.
- An optional back-up battery pack to provide power to the Spraytrac unit during interruptions in the supply from the vehicle battery (eg during an engine start).
- A USB flash memory key to download the log file from the guidance unit and to transfer this to an office PC or laptop computer.

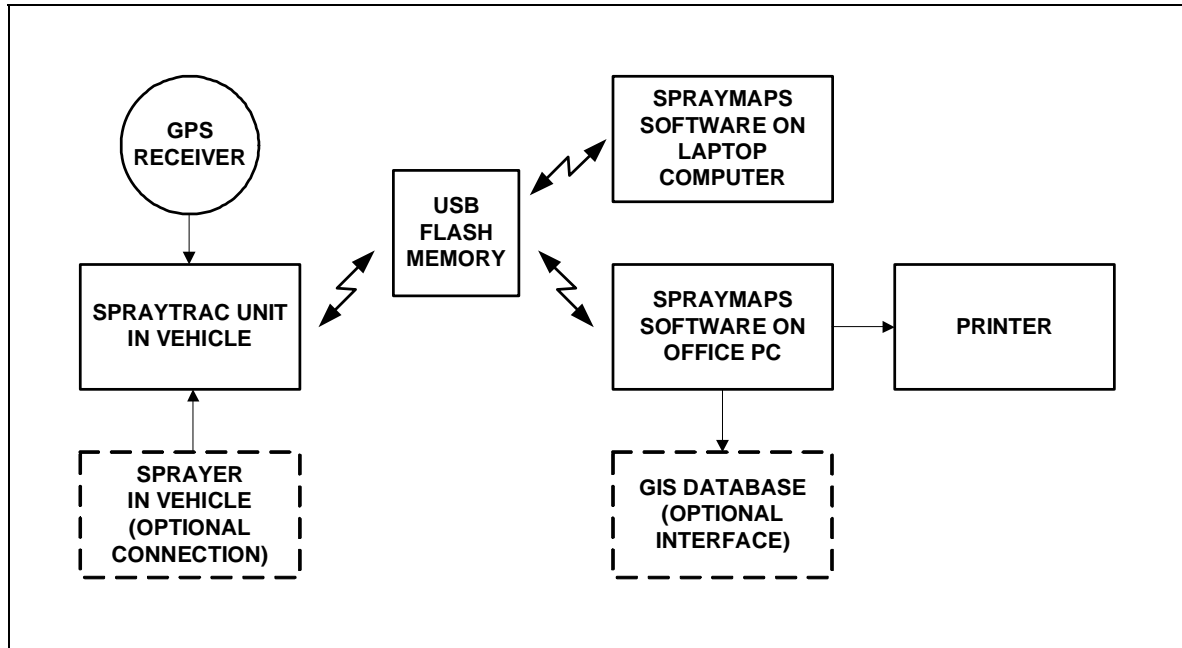


Fig. 1 – Components of System

1.2 Spraymaps Software

Micronair Spraymaps is a software package that can be installed on any desktop or laptop PC running a Windows operating system. The Spraymaps program is designed to:

- Transfer log files from Spraytrac units in vehicles, using a USB flash memory key.
- Analyse each log file and divide it into individual spray jobs, based on the date and time of the records.
- Store individual job records in an archive. This archive held on the hard disk of the PC or on a network file server. The archive is structured to allow easy retrieval of records for multiple spray vehicles by vehicle name, date and time.
- Enable entry of additional job data and notes in each job record.
- Retrieve, display or delete individual job records. The display shows both a visual representation of the vehicle track (together with spray on/off information, if applicable) and a summary of the job statistics.
- Print a job report comprising an image of the vehicle track and a summary of the job statistics.
- Convert job files to Shapefile and CSV format for import into a user's existing GIS database (optional).
- Create the configuration files used to upload set-up parameters (language, vehicle name etc) to individual Spraytrac units, using a USB flash memory key.

2. SPECIFICATION

2.1 System Unit

Dimensions:	135 mm W x 90 mm H x 60 mm D (less mounting bracket).
Weight:	0.6 kg.
Mounting:	By adjustable bracket secured to vehicle. System unit can be detached from bracket when not required in vehicle.
Operating temperature:	-10°C – +35° C ambient.
Input Voltage:	9 – 15 V DC.
Input Current:	350 mA max.
Operating system:	Linux.
Data (log file) memory:	2 GB.
Display:	Back-lit dot-matrix LCD with contrast control. Display optimised for viewing in both direct sunlight and low light conditions.
Controls:	Power on/off switch, display contrast adjustment and four touch-sensitive input buttons.
Display language:	English, French, Arabic with Hindi numerals or Arabic with Western numerals (operator selectable).
Sprayer interface:	Optional connection to Micron Ulvamast or Micronair vehicle-mounted sprayers to allow logging of operation of sprayer pump.
Environmental protection:	IP 51.

2.2 GPS Receiver

Dimensions:	61 mm diameter x 20 mm high.
Weight:	0.2 kg.
Cable:	5 m long with quick-disconnect connector.
Mounting:	By magnetic base or optional M3 screw fitting.
Power supply:	From Spraytrac unit (no separate power supply connection required).
Update rate:	5 Hz
Differential correction:	WAAS/EGNOS (where available)
Environmental protection:	IP 67.
Operating temperature:	-30°C – +80°C.

2.3 Spraymaps Software

Configuration:	One Spraymaps program can support an unlimited number of vehicle systems, although multiple copies of the software can be installed if required.
Software licence:	The software licence is granted per customer and does not limit the number of copies of the program installed by a single customer.
Language:	Program interface, job data display and job printouts in English or French (language chosen during program installation).
PC specification:	User-supplied desktop or notebook PC running Windows operating system (Windows 2000, XP, Vista or 7) with one available USB port.
Disk space required:	Minimum 1 MB free disk space for program and 1 GB per 1000 hours of total logged spray records (log files can be stored on the local hard disk or on a network server or NAS device).
PC monitor:	User-supplied monitor with minimum 1024 x 768 DPI resolution.
Printer:	User-supplied monochrome or colour printer (A4 page size).

3. SPRAYTRAC SYSTEM

3.1 Installation & Initial Configuration

3.1.1 Mounting of Spraytrac Unit

The Spraytrac unit should be mounted on the top surface of the dashboard of the vehicle, using the mounting bracket and hardware provided. The position should be chosen so as to be in the direct line of sight of the driver without obstructing his view ahead of the vehicle. The position should also allow easy access to the controls on the front panel. The front panel 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 back face of the unit and the windscreen to avoid the risk of damage due to movement of the unit and contact with the windscreen when driving over rough terrain.

The procedure to mount the Spraytrac unit is as follows:

1. Fit the mounting bracket to the unit by slackening the two knurled retaining knobs, sliding the threaded studs into the slots in the bracket until the retaining bushes snap into the circular cut-outs in the bracket and tightening the retaining knobs.

2. Identify the optimum position for the unit on the top face of the dashboard and mark around the outside of the bracket with a pencil.
3. Remove the bracket from the unit by reversing step (1).
4. Drill a minimum of two 4.5 mm diameter holes through the bottom face of the mounting bracket and into the top of the dashboard. The position of these holes must be chosen to allow easy access from the underside of the dashboard and to avoid any wiring, instruments etc underneath. Wherever possible, the existing holes in the bracket should be used. If this is not possible, the outermost holes should be drilled as close as possible to the vertical lugs of the bracket.
5. If the top surface of the dashboard is not sufficiently rigid to prevent vibration or movement of the unit, a stiffening plate should be installed under the dashboard. The pre-drilled plate supplied with the system should be used if possible. If an alternative arrangement is required, a plate should be cut from aluminium alloy or steel sheet with a minimum thickness of 1 mm. Drill 4.5 mm dia holes in the stiffening plate as necessary to align with the holes drilled in step (4).
6. Secure the bracket to the dashboard and stiffening plate (if fitted), using the M4 screws, nuts and washers provided. The nuts must be on the underside.
7. Install the unit on the bracket as described in step (1).



Fig. 2 – Typical Installation in Cab of Vehicle

3.1.2 Installation of Fixed Wiring in Vehicle

The wiring for the system must be permanently installed in the vehicle as shown in Fig. 3. The length and routing of the cables and connectors should allow for easy removal of the system unit and GPS receiver when not in use. The vehicle wiring loom is supplied pre-assembled and it should not be disassembled or modified.

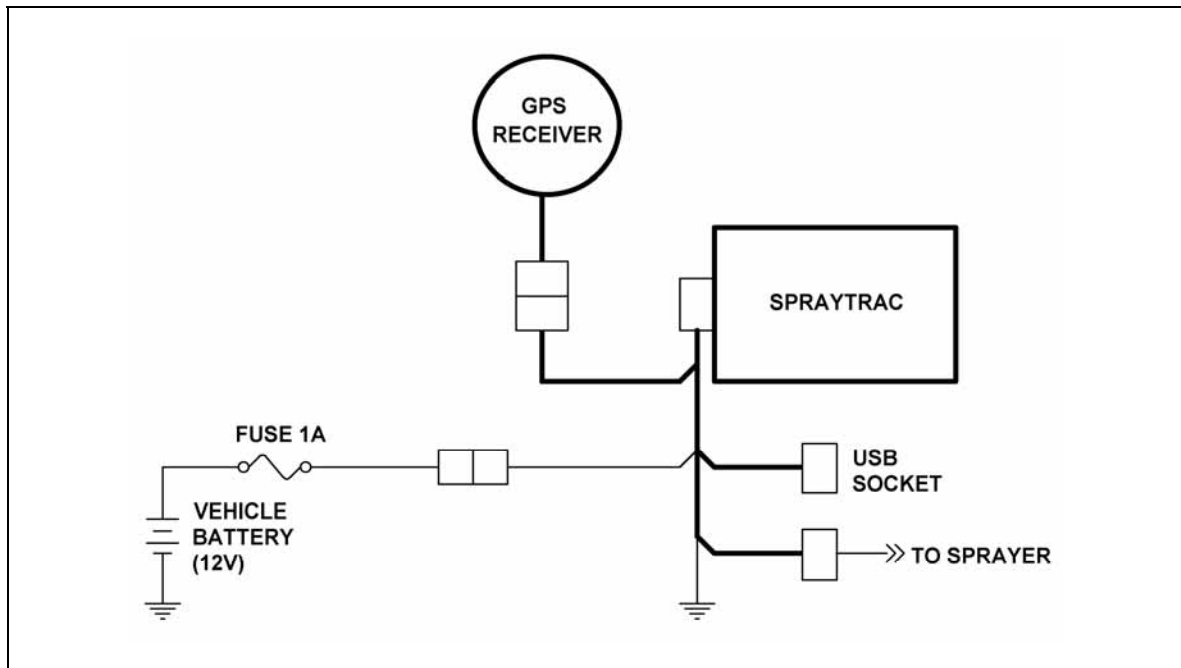


Fig. 3 – Schematic Diagram of Wiring (Without Battery Back-up)

In order to provide a neat installation and to prevent possible damage to cables, as much of the wiring as possible should be routed under the dashboard or behind trim panels. The installation procedure is as follows:

1. Identify a route for the cables from the 15 pin Spraytrac unit connector to the area behind the dashboard. If it is not possible to run these through an existing opening, it may be necessary to make a hole with a minimum diameter of 25 mm in an appropriate position. The cut edge of the hole should be protected with a length of the grommet strip provided. This should be secured in position with a suitable contact, epoxy or silicone adhesive.
2. Identify a suitable earth (ground) point on the vehicle structure. This must be part of the main structure of the vehicle and not be on a removable panel. If possible, use an existing hole; otherwise drill a new 4.5 mm dia hole in part of the main vehicle structure. Remove all paint within 5 mm of the hole and secure the tag on the black (negative supply) wire to the earth point, using either existing hardware or the M4 screw, nut and washer provided.
3. Identify both the red (positive supply) wire from the Spraytrac loom and the red battery wire assembly provided. Temporarily disassemble the two parts

of the in-line fuseholder on the battery wire and connect the ring tag on the wire from the fuseholder directly to the positive terminal of the vehicle battery. Route the red wire from the opposite part of the fuseholder from the battery compartment to the location of Spraytrac unit. Insert the connector blade on the red positive supply wire from the Spraytrac loom into the receptacle on the battery wire. Re-assemble the in-line battery fuseholder and fuse.

4. Route the GPS input cable and its blue connector to a position that provides protection but allows easy access to connect the cable from the GPS receiver when required. A parcel shelf or similar location under the dashboard is preferred.
5. Identify a suitable position for the USB socket. This should provide easy access to insert a USB memory key when required but should also provide protection from dust and moisture when the connector is not in use. The preferred location is in the glove compartment under the dashboard. If necessary, drill a 25 mm diameter hole for the cable and connector and protect this with grommet strip as described in step (1). Route the cable with the USB socket to its final position. Do not attempt to cut, join or extend the USB cable as this would impair its electrical properties and could cause errors during data transfer.
6. If the system is to be used to log the operation of the pesticide pump on the sprayer, it is necessary either to make a connection to the positive supply to the pump or to install a pressure switch to detect pressure in the feed to the spray atomiser when the pump is running. If a pressure switch is to be fitted, the appropriate installation kit must be ordered separately for the model of sprayer being used. Options for the connection to a sprayer are as follows:
 - i. **Direct connection to pump** – identify the white 3-pin plug housing and the white sprayer input wire provided. Insert the pin on the white wire into the centre hole (pin 2) of the plug housing. The pin must enter the housing from the narrow end and be pushed in until it snaps into place. Connect the plug to the corresponding 3-pin socket on the Spraytrac loom and route the free end of the white wire to the sprayer installed in the rear of the vehicle. Ensure that this wire is protected from damage along its entire length. Wherever possible, the wire should be routed alongside the existing sprayer cable and passed inside the flexible conduit to the junction box on the sprayer. Connect the wire to the main sprayer cable at the terminal block inside the sprayer junction box as follows:
 - Ulvamast V3M – To green/yellow wire
 - Ulvamast V3E – To green/yellow wire
 - Micronair AU8115M – To red wire
 - Micronair AU8115E – To red wire
 - ii. **Using a pressure switch** – identify the 3-pin plug housing and both the white and pink sprayer input wires provided. Insert the pin on the white wire into the centre hole (pin 2) and the pin on the pink wire into the hole adjacent to the V-shaped end (pin 1) of the plug housing. Connect the plug to the socket on the Spraytrac loom and route the free ends of the

wires to the sprayer as described above. Install the pressure switch on the sprayer and connect the pink and white wires to the switch terminals as described in the leaflet supplied with the pressure switch kit.

7. Secure all wires installed in steps (1) – (6) above, using the cable ties provided. Particular care must be taken to secure and protect wires inside the engine compartment, any exposed wires to the sprayer in the rear of the vehicle and wires adjacent to sharp edges. Any excess lengths of wire should be coiled up and secured with cable ties.

3.1.3 Installation of Optional Back-up Battery Pack

The Spraytrac unit requires a supply of at least 9 V to operate correctly. If the supply voltage from the vehicle battery falls below 9 V, the unit will shut down and then attempt to re-start. On some vehicles, the battery voltage will fall below 9 V whilst the engine starter is engaged (particularly if the battery is in poor condition). This will result in the termination of the current spray job and the starting of a new job if, for example, the vehicle engine stalls during a spray job and is re-started.

If this condition is encountered, it is recommended that the optional back-up battery pack (EX7136) should be installed. This is connected to the power supply input to the Spraytrac unit contains eight AA (LR6) size dry batteries to maintain a minimum supply of 12 V, even if the vehicle battery falls below this level for a short time. The batteries are isolated from the Spraytrac unit at all other times and are not, therefore, discharged during normal operation.

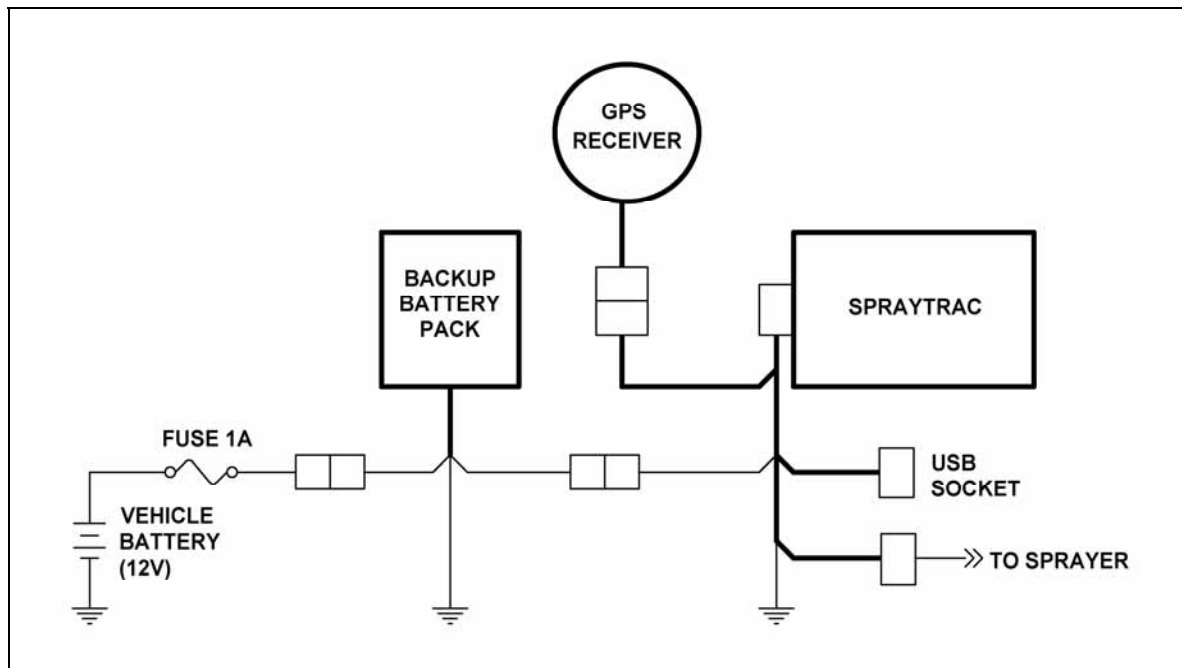


Fig. 4 – Schematic Diagram of Wiring (With Battery Back-up)

The battery pack should be installed in a convenient location that allows easy access to change the batteries when necessary. Suitable locations include the glove compartment or parcel shelf in the cab.

The battery pack is connected as shown in Fig. 4.

The battery pack is supplied without batteries. It must be fitted with eight AA (LR6) size alkaline cells before use. Only alkaline batteries should be used. Rechargeable batteries (NiCd or Ni-MH types) provide a lower voltage and are not suitable. Carbon-zinc batteries are unsuitable for long-term use and are prone to leakage.

The procedure to install batteries is as follows:

1. Remove the two knurled lid securing nuts and remove the lid.
2. Extract the battery holder and remove and discard any batteries already installed.
3. Fit eight new batteries, following the polarity markings on the battery holder.
4. Replace the battery holder, lid and securing nuts.

It is essential that all eight batteries are replaced at the same time.

The batteries should be removed from the battery pack if the system is not to be used for a prolonged time or if the vehicle battery is disconnected. The battery pack is *not* intended to power the Spraytrac unit continuously if the vehicle battery is not connected.

3.1.4 Mounting of GPS Receiver

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

The receiver has a magnetic base that attaches directly to a flat steel surface. If the receiver is to be mounted on a non-metallic cab surface, a round or square piece of steel plate approximately 100 mm across and at least 1 mm thick can be fitted to provide a mounting for the receiver. 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 receiver casing so as to provide a flat surface for the magnet.

In some vehicles the receiver will perform satisfactorily if it is mounted above the dashboard of the vehicle inside the windscreen. If the Spraytrac display shows **ACQUIRING GPS** continuously after it is switched on or **NO GPS DATA** during operation, this indicates that the strength of the GPS signal inside the vehicle is insufficient and the receiver should be mounted on the upper surface of the roof of the vehicle cab as shown in Fig. 5. The exact position on the roof is not important, provided that the surface is horizontal so that the receiver faces directly upwards. 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 receiver 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 cut, it should have a minimum diameter of 20 mm to accommodate the connector on the receiver cable 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 piece of the grommet strip provided.

After fitting the GPS receiver, its cable and connector must be routed to the 6 pin GPS input connector on the Spraytrac loom. After assembly, the two parts of the connector must be secured with the blue locking ring.

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

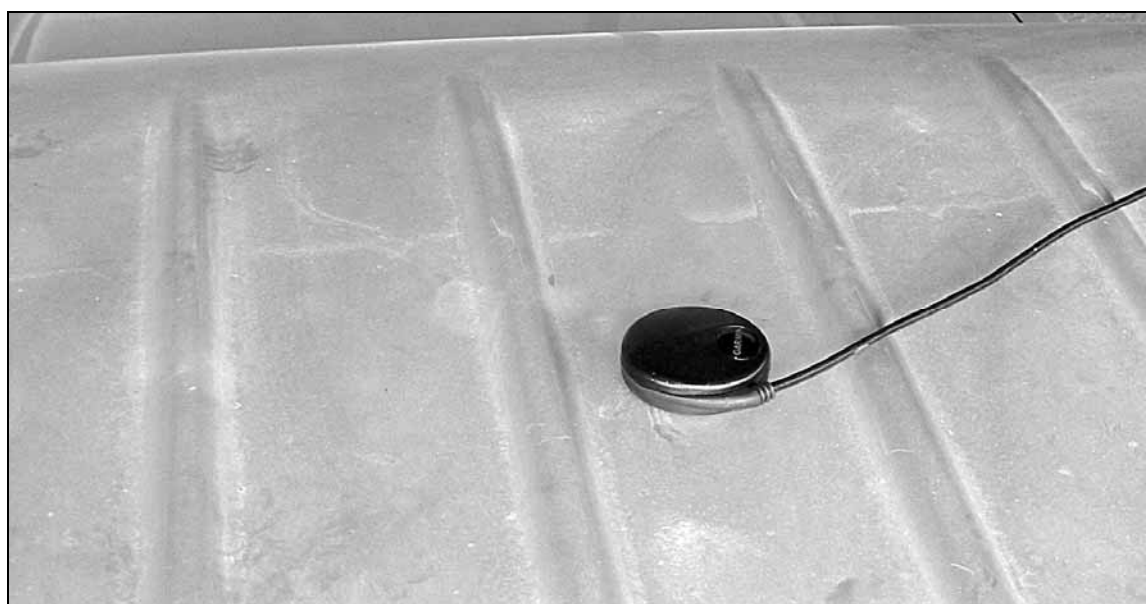


Fig. 5 – Typical Mounting of GPS Receiver on Cab Roof

3.2 Display & Controls

Throughout this handbook the names of controls and button icons on the Spraytrac unit are shown in CAPITALS and text on the display is shown in **BOLD ITALIC CAPITALS**.

The display and controls of the Spraytrac unit are all mounted on the front panel as shown in Fig. 6.

- **Display** – the liquid crystal display is designed for maximum clarity under a wide range of lighting conditions, including direct sunlight. The display is back-lit to ensure good visibility in a low light.
- **DISPLAY CONTRAST control** – adjusts the contrast of the display to suit the viewing angle and the ambient lighting conditions. Rotating the knob clockwise darkens the image on the display and rotating it anti-clockwise lightens the image. Note that the display can appear completely blank if the control is set to the extreme anti-clockwise position or completely black if the control is rotated fully clockwise.
- **Touch buttons** – the operation of the unit is controlled by four touch buttons to the right hand side of the display. The function of each button is indicated by the corresponding icon at the edge of the display; see section 3.3 for full details. These buttons are touch sensitive and do not require pressure to operate. In order to avoid accidental operation, there is a time delay between touching a button and the system responding. This delay can be changed by the user if required – see section 4.8. Note that the buttons require the close proximity of a finger to operate and they will not function if touched with a non-conducting object such as a pen or when wearing thick gloves.

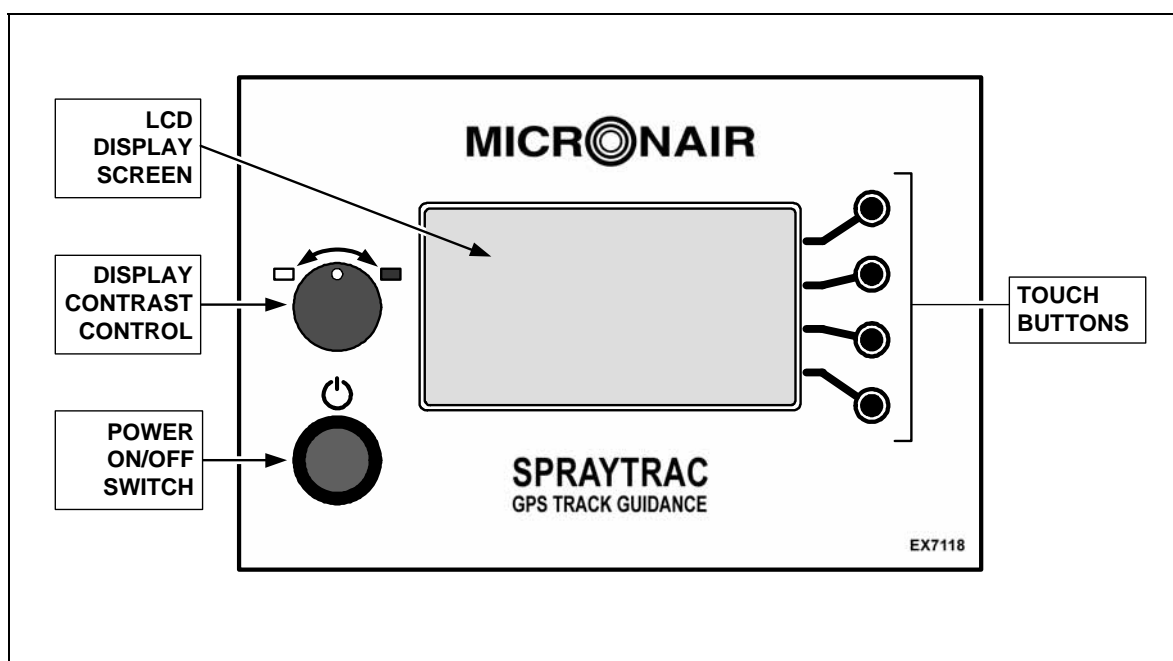




Fig. 6 – Front Panel of Spraytrac Unit

3.2.1 Initial Test & Configuration

After installation, carry out a functional test as follows:

1. Press the POWER  button once so that it latches in the IN position. The backlight of the display should illuminate.
2. After about 15 seconds the display should show the Micronair logo and then the message **ACQUIRING GPS** and a moving progress bar. Adjust the DISPLAY CONTRAST control for the clearest display.

3. Wait for the **ACQUIRING GPS** message to disappear and for the display to change to initial guidance mode (see Fig. 8). This may take 1 – 2 minutes if the GPS receiver is being used for the first time in a new location as it must acquire a new almanac of the GPS satellites and store this in its internal memory. Note that the GPS receiver must have an unobstructed view of the sky to function correctly. It will not receive signals from the GPS satellites if it is used under a metal roof or immediately adjacent to a tall building. In these cases, the display will show **ACQUIRING GPS** indefinitely.
4. Press the POWER  button once so that it latches in the OUT position. The display should change to **SHUTTING DOWN** and the display and backlight should extinguish after about 2 seconds.
5. If the GPS unit is being installed on a particular vehicle for the first time, it must be configured for the name or number of the vehicle on which it is being used and for the appropriate operating parameters. The configuration parameters are set using the Micronair Spraymaps software and transferred to the Spraytrac unit in the vehicle using a USB flash memory key. See sections 3.3.10 & 4.8 for full details.

3.3 Operation

3.3.1 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. The layout of a typical spray block is shown in Fig. 7. The key features are:

- **Spray tracks** – the spray tracks should be aligned at approximately 90° to the direction of the wind and the first track must be at the downwind edge of the spray block.
- **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 the wind speed.
- **First track** – the first spray track along the downwind edge of the block determines the orientation of all the subsequent parallel tracks. When spraying along the first track, the vehicle is driven from a point at the beginning of the block (point A) to a point at the end (point B). These points may be defined by physical features (a road, trees etc) or may be marked by flags etc. Because the first track is between points A & B it is also known as the A - B line.
- **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.
- **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.

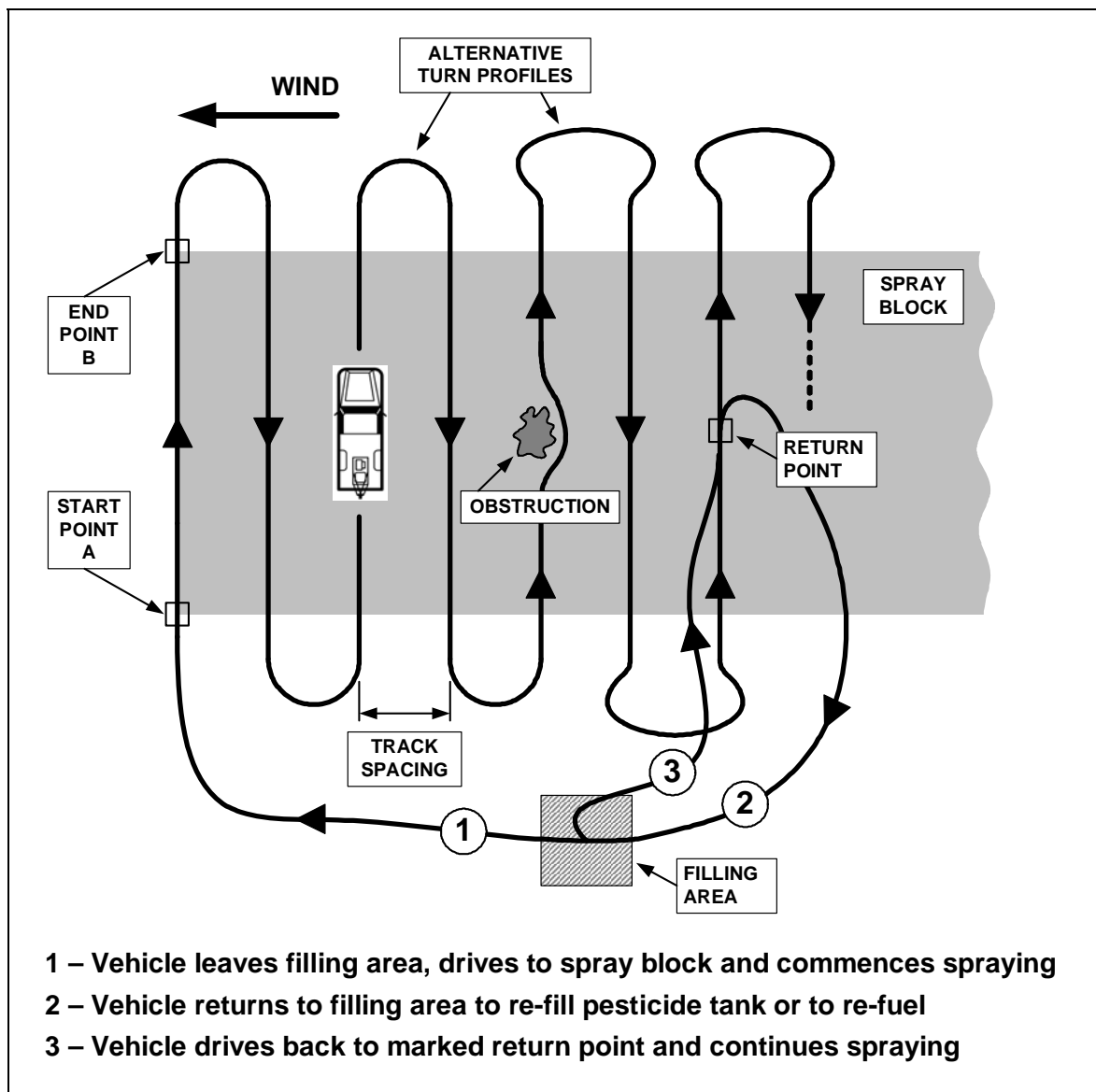



Fig. 7 – Layout of Typical Spray Block

3.3.2 Preparation for Use

The Spraytrac unit can be switched on either when the vehicle leaves its base or when the vehicle arrives in the spray area, before spraying commences. In both cases, the position of the vehicle is recorded (logged) in the Spraytrac memory for the entire time that the unit is switched on. The location at which the Spraytrac unit is switched on must be decided according to local requirements. Factors to consider are:

- **Switch on at base** – the track of the journey to the spray area is recorded in addition to the track within the area. This results in a larger log file and a longer track displayed by the Spraymaps program. However, it provides a full record of all the vehicle's movements. The start time shown on the Spraymaps job summary is the time at which the vehicle moves away from the base (see section 4.3).

- **Switch on in spray area** – the record of the track begins when the vehicle first starts to move in the spray area. This results in a smaller log file and a more compact Spraymaps track display. The start time on the job summary is the time at which the vehicle begins to move in the spray area.

To switch the unit on, press the POWER  button once so that it latches in the IN position. The display backlight should illuminate immediately and after about 15 seconds the display should show the Micronair logo, followed by the message **ACQUIRING GPS** and a moving progress bar. Adjust the DISPLAY CONTRAST control for the clearest display.

After the GPS receiver has acquired all satellites in view, the display will change to the initial guidance mode as shown in Fig. 8. This shows the following information:

- **Position** – latitude and longitude. This can be displayed in decimal degrees or in degrees, minutes and decimal seconds. The display format is determined by the configuration of the unit and can be changed – see section 4.8.
- **Speed and heading** – note that the heading is only valid whilst the vehicle is moving.
- **Track spacing** – this is the distance between spray tracks in metres. When the unit is switched on, the track spacing shown on the display is the same as that used for the previous spray job (or is the default value if the configuration has just been updated). If the spacing shown is correct for the current job, it is not necessary to change it. If necessary, the procedure to change the track spacing is as follows:
 - i. Touch the button alongside the TRACK SPACING numerals on the display. After a short delay, the display will change to show upward and downward pointing arrows ▲ ▼ above and below the track spacing – see Fig. 9.
 - ii. To increase the track spacing, touch the button alongside the upward pointing arrow ▲. A single touch will increment the spacing by 1 m. A prolonged touch will cause the track spacing to increment continuously. The rate at which the display increments can be changed in the Spraytrac configuration – see section 4.8. To decrease the track spacing, touch the button alongside the downward pointing arrow ▼.
 - iii. When the correct track spacing is shown, touch the TRACK SPACING button again until the ▲ and ▼ arrows disappear.
- **HELP button (?)** – touching this button at any time will display a short help message explaining the actions that can be taken in the current context. The message disappears when this button is released.

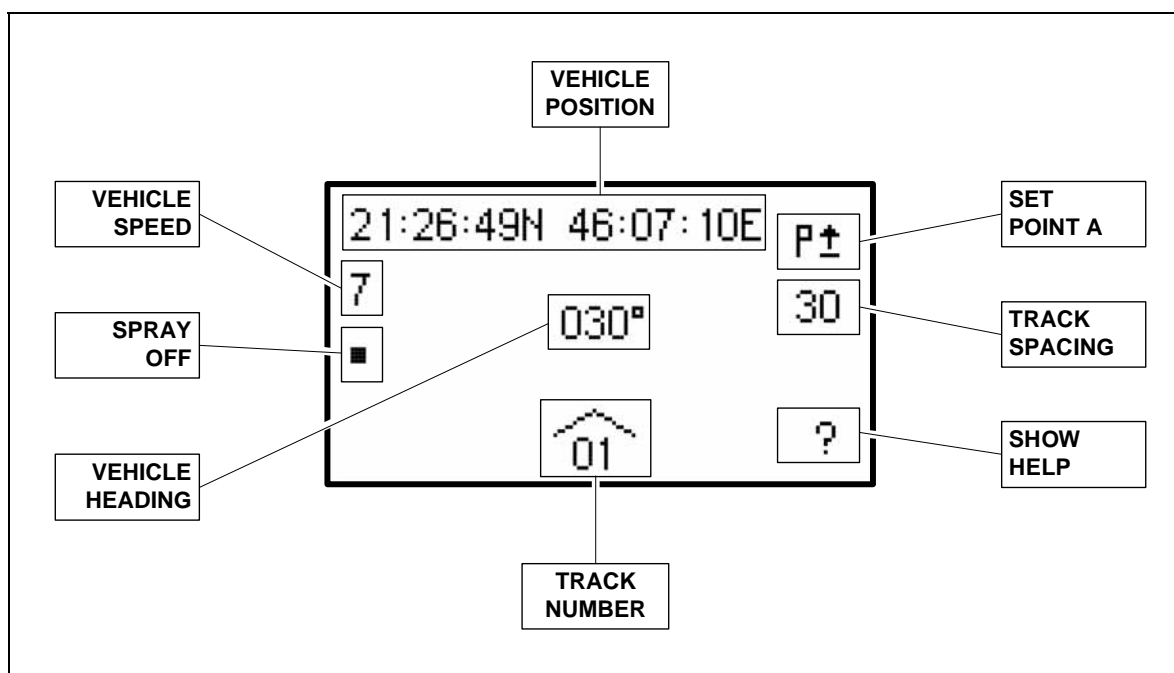


Fig. 8 –Initial Guidance Display

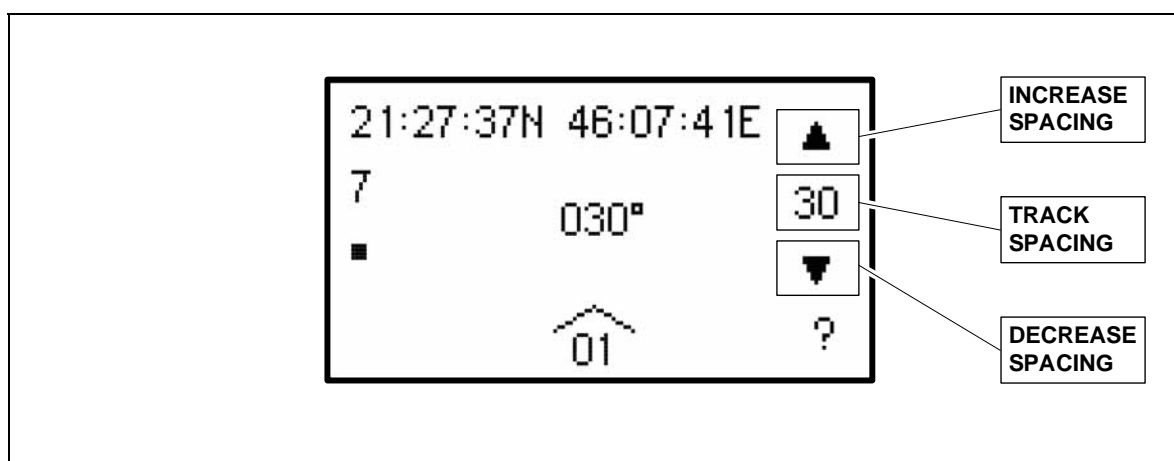


Fig. 9 – Setting of Track Spacing

3.3.3 Setting the First Spray Track

The first spray track is defined by a line between a point at the beginning of the block (point A) and a point at the end of the block (point B) – see Fig.7. The procedure to set this track in the Spraytrac unit is as follows:

1. Drive the vehicle to the beginning of the first track (point A).
2. Touch the BEGINNING OF TRACK button **P**↑ (denoting a flag at the start of the block) – see Fig. 8. The icon alongside this button will change to **P**↑ (denoting a flag at the end of the block – see Fig. 10). Note that the vehicle can be moving or stationary when the button is touched.

3. Drive the vehicle to the end of the first track (point B), with the sprayer operating as required. Whilst driving, the display will show the speed and heading of the vehicle and the distance from the beginning of the track (point A) as shown in Fig. 10. This information can be used to locate the B point if there is no physical marker.
4. At the end of the first track (point B), touch the END OF TRACK button **P** with a right arrow. The icon will change to **P** with a left arrow. Note that the vehicle can be moving or stationary when the button is touched. In order to prevent an accidental touch of the button from setting the B point in the same place as the A point, the vehicle must move a minimum distance from the A point before the B point can be set. The default distance is 20 m, but this can be changed – see section 4.8. If the button is pressed before the minimum distance is reached, the display will show **INSUFFICIENT DISTANCE FROM FIRST POINT** and the point will not be set.

After setting the B point at the end of the track, the display will change to track guidance mode – see Fig. 11.

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

1. Touch the ABORT JOB **X** button until the display returns to the initial guidance mode. Note that the delay before the system responds to this button is four times longer than the Button Delay configured for other buttons. This is to reduce the risk of an operator aborting a job by touching this button accidentally.
2. Drive the vehicle back to the beginning of the first track (point A) and repeat steps (1) – (4) above.

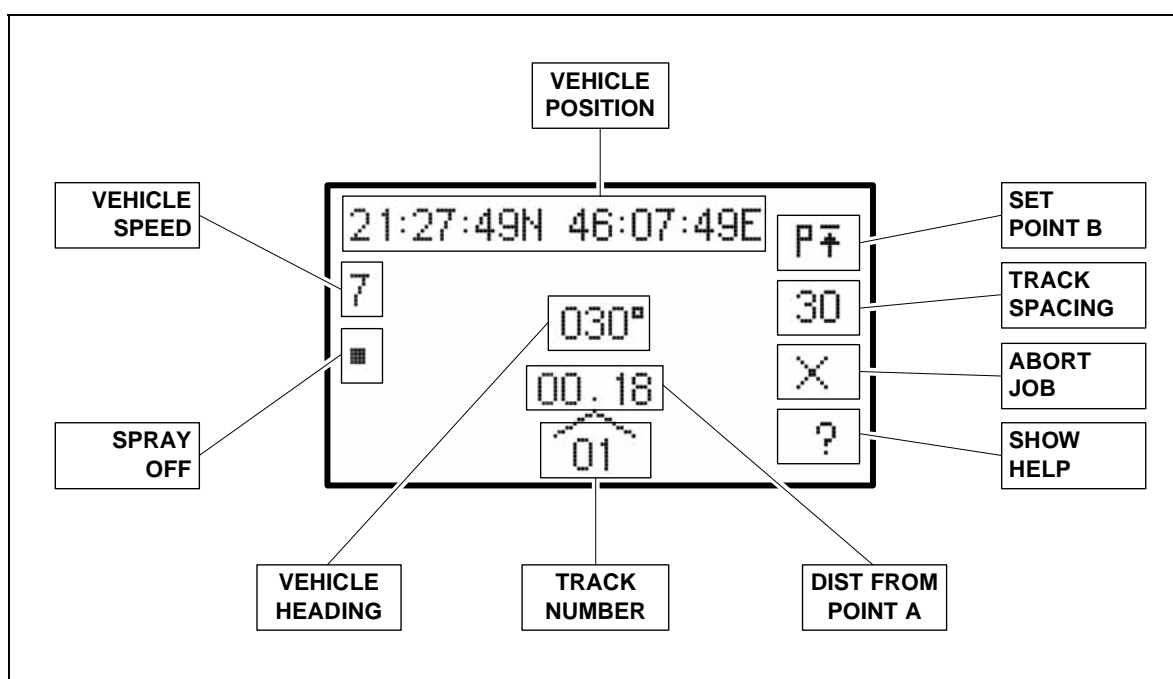










Fig. 10 – Display Whilst on First (A-B) Track

3.3.4 Subsequent Spray Tracks

After the first spray track has been defined, the system provides guidance along subsequent parallel tracks, which may be either to the left or to the right of the first track.

Whilst in the spray area, the display is in track guidance mode as shown in Fig. 11. This shows the spray tracks ahead of the vehicle in a perspective view, with each track appearing as a line for the driver to follow. The display shows the following information:

- **The current spray track** – shown as a dashed line.
- **Adjacent spray tracks** – the five parallel tracks on each side of the current track are shown as solid lines.
- **Position arrow** – the position of the vehicle relative to the tracks is shown as an upward pointing arrow  at the bottom of the display. The objective of the driver is to keep the dashed line (denoting the current track) aligned with this arrow.
- **Track number** – shown under the position arrow. The first track (A-B line) is shown as 01 and subsequent tracks are numbered incrementally (02, 03, 04, 05...).
- **Track spacing** – the current spacing in m.
- **Ends of block** – the beginning and end of the spray block (as defined by lines projected from the A & B points perpendicular to the A-B line) are shown by dotted lines perpendicular to the tracks on the display. Note that these lines come into view only when the vehicle is about 150 m from the end of the block. When the vehicle is further away from the ends of the block, its location relative to the block is shown by the in/out of block indicator – see below.
- **In/out of block indicator** – when the vehicle is inside the spray block and is close to the current track (within ± 1 track width), the indicator at the left hand edge of the display shows two solid arrows . If the spray block is ahead of the vehicle the indicator shows a single arrow pointing upwards . If the spray block is behind the vehicle the indicator shows a single arrow pointing downwards .
- **Turn direction indicator** – a horizontal arrow  or  at the left hand edge of the display shows the direction of the turn onto the next track relative to the current track of the vehicle. If the arrow is pointing to the left, the next turn will be to the left and vice-versa. Note that this arrow is only shown when the vehicle is close to the current track (within ± 1 track width) and is following the track to within $\pm 10^\circ$. The indicator disappears when the vehicle begins to turn so as to avoid confusion for the driver.
- **Vehicle speed** – the current speed in km/h.
- **Spray on/off indicator** – this represents the spray atomiser and appears as a square  when the spray is off and as a square with spray droplets  when the sprayer is operating. Note that this indicator will only show SPRAY ON when the Spraytrac unit is connected to the sprayer (optional).

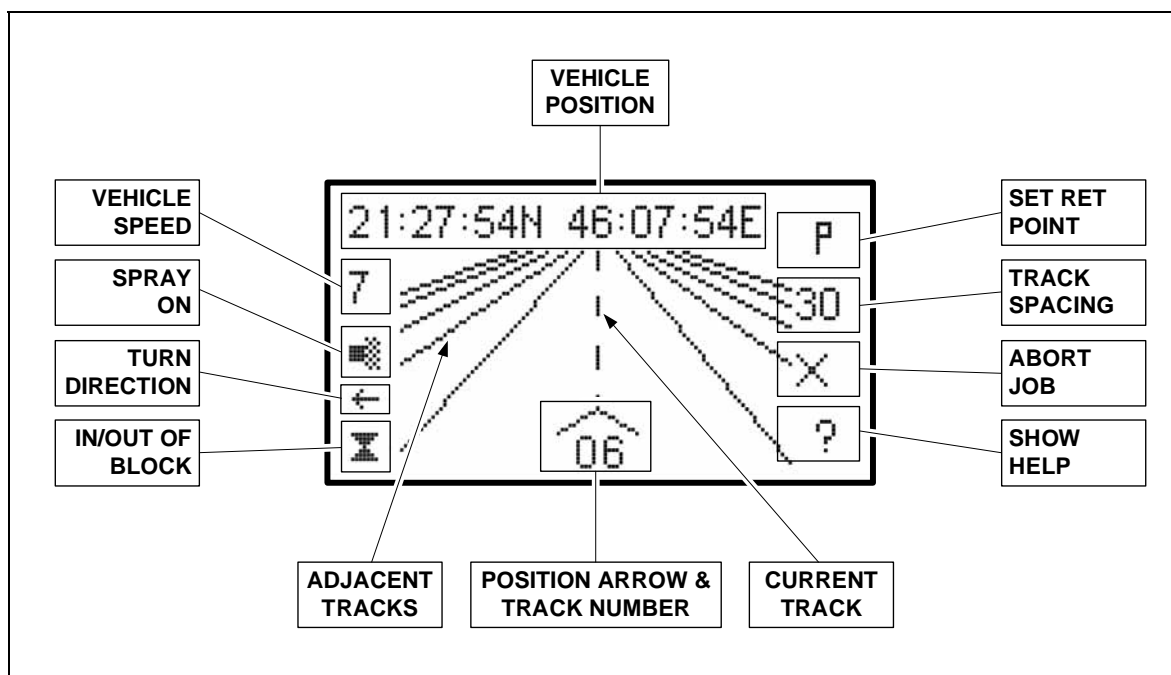


Fig. 11 – Track Guidance Display

The procedure to follow tracks parallel to the first track is as follows:

1. After setting the B point at the end of the spray block, continue driving along the first track for about 20 m (this distance can be reduced as the driver gains experience).
2. Turn the vehicle in the direction of the second track. Note that the direction of this first turn is important as it determines whether all subsequent tracks will be to the left or the right of the first track.
3. As the heading of the vehicle passes through 90° to the first track, the track number on the guidance display increments from 01 to 02.
4. Continue turning in the direction of the second track. The dashed line representing this track will come into view on the display. Steer the vehicle so that the position arrow aligns with the dashed line and the dashed line appears vertical on the display. Avoid making sudden changes of direction and do not attempt to intercept the dashed line at too great an angle as this will result in 'over-steering' and overshooting the line.
5. Continue steering the vehicle so that the dashed line remains aligned with the position arrow. The objective of the driver is to 'drive along the line'.
6. Proceed along the line towards the spray block until the perpendicular dotted line indicating the beginning of the block line comes into view. When the vehicle enters the block, the line disappears from the bottom of the display and the in/out of block indicator changes to two arrows \times . Start spraying as required. The SPRAY indicator will change to SPRAY ON \times (if the Spraytrac unit is connected to the sprayer).
7. Continue to follow the track until the perpendicular line indicating the end of the block comes into view. When the vehicle leaves the block, the line

disappears from the bottom of the display and the in/out of block indicator changes to a downward pointing arrow ▼, denoting that the block is behind the sprayer. Stop spraying as required. The SPRAY indicator will change to SPRAY OFF ■ (if applicable).

8. Proceed about 20 m along the current line.
9. Note the TURN DIRECTION (← or →) indicator to establish the direction of the turn onto the next track.
10. Turn the vehicle onto the next track. The track number will increment as the heading of the vehicle passes through 90° to the track and the dashed line on the display will move to the position of the next track.
11. Continue turning and follow steps (4) – (10) above.



3.3.5 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 either to the right or to the left. 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. 7. Do not make any sudden changes in direction and avoid turning through 90° to the original track. A turn through 90° will be interpreted as a turn at the end of the spray block and the track number will increment to the next line.

3.3.6 Marking a Return Point

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 mark the point at which the job was interrupted so that the vehicle can return and resume spraying from the same point. The procedure to mark a return point and to drive back to it is as follows:

1. Whilst the vehicle is still on the current spray track, touch the MARK RETURN POINT button  until the icon changes from an empty (white) flag to a filled (black) flag . This indicates that the return point has been set. The return point can be set whilst driving or with the vehicle stationary.
2. Note the heading of the vehicle.
3. Drive the vehicle out of the spray area as required. Note that the display will change from track guidance mode to orientation mode when the vehicle moves away from the return point – see Fig. 12. The distance at which the display changes can be set via the Spraytrac configuration – see section

- 4.8. When in orientation mode, the display will show the distance (in km) to the return point and a pointer will indicate the direction to the return point relative to the vehicle – see Fig. 12.
4. Do not switch the unit off or touch the ABORT JOB **X** button whilst away from the spray area.
 5. When driving back to the spray area, follow the pointer **↗** on the orientation display towards the return point. The pointer will be vertical (towards the top of the display) when the return point is directly ahead and the display will show the distance to the return point.
 6. When the vehicle approaches to the return point (at the distance specified in the Spraytrac configuration), the display will change to track guidance mode and the dashed line representing the last spray track will come into view. The return point will be indicated by a dotted line intersecting the dashed line – see Fig. 13.
 7. Drive onto the spray track and follow this to the return point, ensuring the vehicle is on the same heading as before (as noted in step (2) above).
 8. When at the return point, touch the RETURN POINT button until the filled (black) flag **■** changes to an empty (white) flag **□**. This indicates that the return point is cleared (ie no longer active). The dotted line indicating the return point will disappear. Start spraying as required and continue to follow subsequent spray tracks as described in section 3.3.4. Note that it is very important to clear the return point when resuming the spray job. If the return point is not cleared, the number and position of the spray track will not increment when the vehicle turns at the end of the spray block. In this case, it will be necessary to drive back to the return point and to touch the RETURN POINT **■** button to clear the flag.

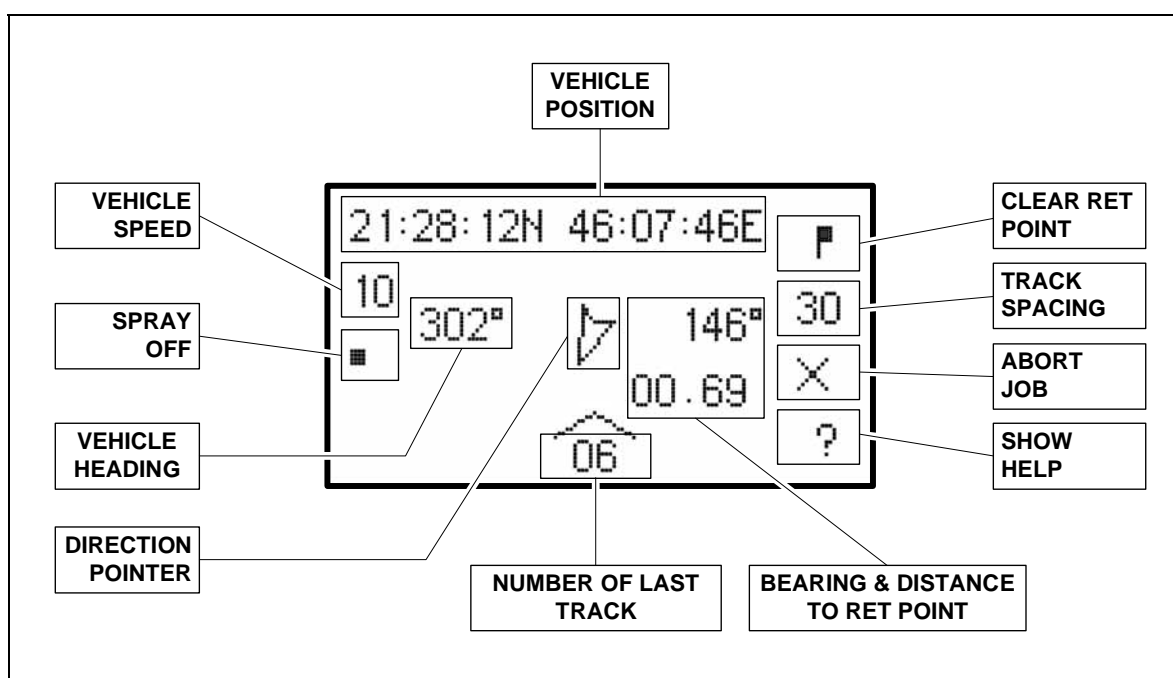


Fig. 12 – Orientation Display

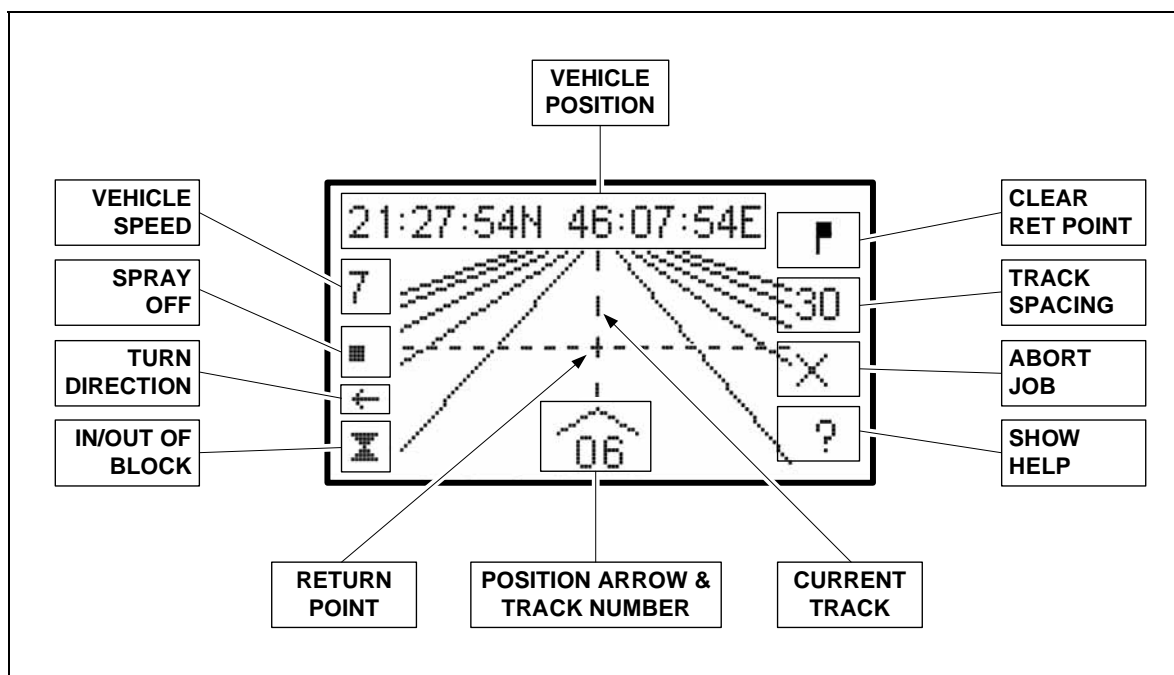




Fig. 13 – Display When Approaching Return Point



3.3.7 Starting a New Spray Job

The Spraytrac unit generates an internal log file that records the position of the vehicle and spray on/off data. This information is logged continuously for as long as the Spraytrac unit is switched on and is appended to any other information already stored in the unit's log file. Each time the unit is switched on, the vehicle is assumed to be working in a new spray block and the Spraymaps program will archive the details as a new job.

If the vehicle sprays several different blocks during one trip, each block must be treated as a separate job, with a new A-B line set for each. There are two options to start a new job:

1. Switch the Spraytrac unit off, using the POWER  button. Wait 10 seconds and switch it on again. This will automatically create a new job in the log file.
2. Touch the ABORT JOB  button until the display returns to the initial guidance mode. This will terminate the current job and start a new job in the log file.

3.3.8 Switching Off

The Spraytrac unit must be switched off after use. In order to avoid corruption of data in the system, it must always be switched off using the front panel POWER  button and never by interrupting the electrical supply to the unit. To switch the unit off, press the POWER  button once so that it latches in the OUT position.

The display will show **SHUTTING DOWN** for about 5 seconds before the display and its backlight extinguish.

The Spraytrac unit will start a new job each time it is switched on. It is, therefore, important that it is not switched off if a job is interrupted (eg by leaving the spray area to refill the spray tank).

3.3.9 Downloading of Log File

The Spraytrac unit maintains an internal log file of the position of the vehicle and the spray on/off data for as long as it is switched on. This file is stored in an internal non-volatile memory and is not erased when the unit is switched off. Each new spray job is appended to the log file as it is carried out. The log file has a maximum capacity of approximately 2000 hours of logged data (2 GB internal memory).

The log file can be downloaded to a USB flash memory key for transfer to the Spraymaps office based software, which allows individual spray jobs to be archived, viewed and printed – see section 4. It is recommended that the USB memory key supplied with the system should be used. Alternatively, any other USB memory key can be used, provided that it is correctly configured and has a minimum of 2 GB of free space.

The USB memory must be formatted for a FAT32 file system and must have the necessary folders prepared for data transfer (see section 4.9). Note that if a download is attempted using a USB memory without the necessary folders, no data will be transferred or lost. This helps to prevent unauthorised download or deletion of the log file from the Spraytrac unit. The procedure to download a log file to a USB memory key is as follows:

1. Ensure that the Spraytrac unit is switched off.
2. Insert the USB flash memory key into the USB socket on the cable from the Spraytrac unit. Note that the flash memory key may be of the 'thin' type, without a metal casing around the connector. This type of key has the advantage of being completely dust- and water-proof but it is possible to insert the device into the socket either way up. The gold contact 'fingers' must face inwards towards the insulator in the socket. No damage will be done if the key is inserted upside down, but the data transfer will not be successful.
3. Switch on the Spraytrac unit. The display should show **DOWNLOADING LOG FILES**, then **LOG FILES TRANSFERRED** and finally **SWITCH OFF AND REMOVE USB**. In the event of an error message, see section 3.4.
4. Switch off the Spraytrac unit and remove the USB memory key. The log files will have been transferred to the USB memory and can be loaded into the archive using the Spraymaps program – see section 4.3.

If the log file has been successfully transferred to the USB memory (ie no error message was displayed in step (3) above), the data in the internal log file in the Spraytrac unit will be deleted the next time the unit is switched on *without the*

USB memory key inserted. Subsequent jobs will be recorded, starting with an empty log file and all previous jobs will be erased.

IMPORTANT: It is recommended that the Spraymaps program should be used to transfer the log file from the USB memory key to the job archive as soon as possible. In the event of a problem with loading the file or viewing the jobs Spraymaps, the transfer procedure can be repeated as many times as necessary by repeating steps (1) – (4) above. However, this is only possible if the Spraytrac unit has not been switched on without a USB memory key inserted since the previous (unsuccessful) download attempt.

A flowchart of the log file download procedure is shown in Appendix I.

3.3.10 Software and Configuration Update

The internal software (firmware) of the Spraytrac unit can be updated if a new version becomes available. The configuration file containing the set-up parameters for the Spraytrac unit (language, default settings etc) can also be updated as required.

The procedure to update the software and/or configuration is as follows:

1. Copy the configuration file and/or software update file to a USB flash memory key. The Spraymaps program should be used to create a configuration file – see section 4.8. A software update file may be supplied on a CD or may be sent as an e-mail attachment. A Windows PC should be used to copy the file into the **program** folder in the USB memory.
2. Ensure that the Spraytrac unit is switched off.
3. Insert the USB memory into the USB socket on the cable from the Spraytrac unit.
4. Switch on the Spraytrac unit. The display should show **FIRMWARE UPDATED** and/or **CONFIGURATION FILE UPDATED** followed by **SWITCH OFF AND REMOVE USB**. In the event of an error message, see section 3.4.
5. Switch off the Spraytrac unit and remove the USB memory key. The new firmware and/or configuration will be used the next time the unit is switched on *without the USB key inserted*. Note that the version number of the firmware is shown on the display during the initial start-up of the unit. This should be compared with the new version loaded to ensure that the update was successful.

The configuration file is automatically deleted from the USB memory after it has been successfully transferred to the Spraytrac unit. This prevents used configuration files from accumulating in the USB memory.

A flowchart of the configuration update procedure is shown in Appendix I.

3.4 Fault Finding

The Spraytrac unit is factory sealed and contains no user serviceable parts or adjustments. Should the system malfunction, it is likely to be due to a simple external cause as shown below.

Symptom	Probable Cause	Solution
Backlight of display does not illuminate when Spraytrac unit is switched on.	12 V power not reaching unit.	Check battery fuse, wiring to vehicle battery and security of 15-pin connector to Spraytrac unit. Check connection to vehicle ground.
Backlight of display illuminates, but with reduced or intermittent intensity. No text visible on display.	Insufficient supply voltage to unit (below 9 V).	Check voltage of vehicle battery, service and charge if necessary. Check condition of connections to vehicle battery terminals. If back-up battery pack is fitted, check supply from vehicle battery and condition of dry batteries in pack.
Unit operates normally, but restarts when engine of vehicle is started.	Supply voltage to unit falls below 9 V due to poor condition of vehicle battery or excessive load from starter.	Service or replace vehicle battery. Install back-up battery pack. If battery pack is already installed, replace dry batteries.
Backlight of display illuminates but either no text visible on display or display area completely black.	Incorrect adjustment of display contrast.	Adjust display contrast knob for optimum contrast of display.
Display shows NO GPS DATA .	No connection between GPS receiver and Spraytrac unit. Faulty GPS receiver.	Check security of 15-pin connector to Spraytrac unit and 6-pin connector on GPS receiver cable. Check GPS receiver cable for damage. Replace GPS receiver

Symptom	Probable Cause	Solution
<p>Display shows ACQUIRING GPS (with moving progress bar) continuously.</p> <p><i>NB: it is normal for this message to appear for 1 – 2 minutes when the unit is first switched on.</i></p>	GPS receiver unable to receive sufficient data from GPS satellites.	<p>Check that GPS receiver is mounted on unobstructed part of vehicle and is facing upwards.</p> <p>Check that vehicle is not under a metal roof or close to an obstruction – move vehicle as necessary.</p>
Display shows BAD CONFIGURATION FILE .	Configuration file in Spraytrac unit is corrupted.	Use Spraymaps program to create a new configuration file and upload to Spraytrac unit. See section 4.8. The Spraytrac unit will continue to operate, but with a default configuration.
Configuration of Spraytrac unit does not update from USB memory and no error message shown on display during attempted update.	<p>Configuration file name does not match Device ID number of Spraytrac unit.</p> <p>Configuration file located in incorrect folder in USB memory</p>	<p>Use Spraymaps program to edit configuration file for the correct Device ID and upload to Spraytrac unit. See section 4.8</p> <p>Use Spraymaps program to create folder and configuration file in USB memory. See section 4.9</p>
Sprayer icon on display does not change to show output from sprayer when sprayer switched on (only applicable when sprayer is connected to Spraytrac unit).	<p>Faulty connection between sprayer and Spraytrac unit.</p> <p>Incorrectly adjusted or faulty pressure switch on sprayer (if fitted)</p>	<p>Check wiring to sprayer and security of 3-pin connector on sprayer cable.</p> <p>Adjust or replace pressure switch.</p>
Display shows LOG FILES EMPTY when attempting to download logs to USB memory.	The memory of the Spraytrac unit does not contain any new log files (ie no files were created since the previous download).	Download files again when the Spraytrac unit contains new job data.

Symptom	Probable Cause	Solution
Display shows LOG FILES TRANSFER FAILED when attempting to download logs to USB memory.	<p>The Spraytrac unit cannot write log files to the USB memory because the memory is full, corrupted or not properly configured.</p> <p>USB memory formatted for FAT16 or NTFS, not FAT.</p> <p>USB memory faulty.</p>	<p>Use Spraymaps program to re-initialise USB memory. See section 4.9.</p> <p>Use Windows PC to re-format USB memory for FAT32 file system.</p> <p>Use a different USB memory (initialise with Spraymaps first).</p>
Display shows VERSION UPDATE FAILED when attempting to update Spraytrac firmware from USB memory.	The Spraytrac unit has found a new version of the system firmware in the USB memory but is not able to use it because the file is corrupted.	Delete the file from the program folder in the USB memory and make a new copy from the source location. See section 3.3.10.
Display does not show file transfer messages when unit is switched on with USB memory inserted.	<p>Spraytrac unit cannot recognise USB memory.</p> <p>USB memory faulty</p>	<p>Check that USB memory is correctly inserted in its connector. If a 'thin' type USB memory is used, check that it is correctly inserted (with gold contact areas towards centre of connector).</p> <p>Use a different USB memory (initialise with Spraymaps first).</p>

4. SPRAYMAPS PROGRAM

The Micronair Spraymaps program enables the user to:

- Download and archive spray jobs, using a USB flash memory key to transfer data from the Spraytrac units in the vehicles.
- Add and edit details of spray jobs.
- View the track of the spray vehicle during a spray job and see statistics both for an entire job and for any point within a job.
- Print a report sheet for a spray job. This shows both the vehicle track and the job statistics.
- Create configuration files for transfer to Spraytrac units via a USB flash memory key.

4.1 Installation and Configuration

The Spraymaps program can be installed on an office PC or a laptop computer running Windows 2000, Windows XP, Windows Vista or Windows 7. The text of the job displays and printed reports can be in English, French or Arabic.

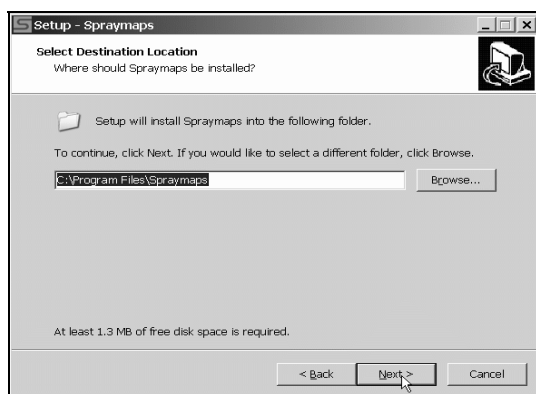
The software is supplied on a CD. It is recommended that the program should be installed using the installation program on the CD but instructions for manual installation are given in Appendix III. The normal installation procedure is as follows (note that the PC must have an Arabic keyboard and Windows Arabic language support enabled if the Arabic version of Spraymaps is to be installed):



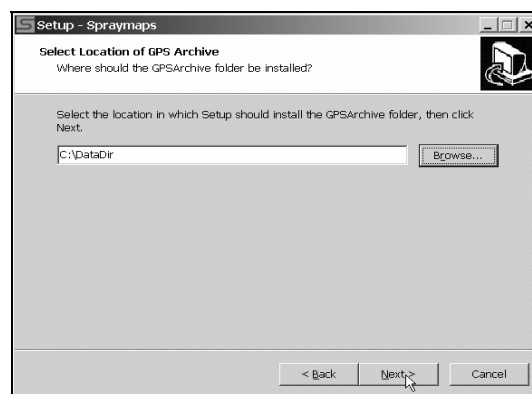
1. Load the CD into the CD drive on the PC. If Autorun is enabled on the PC, the installation menu will appear automatically. Otherwise, double-click **Menu.exe** in the root folder of the CD. Click a button to choose the language to be used in Spraymaps.



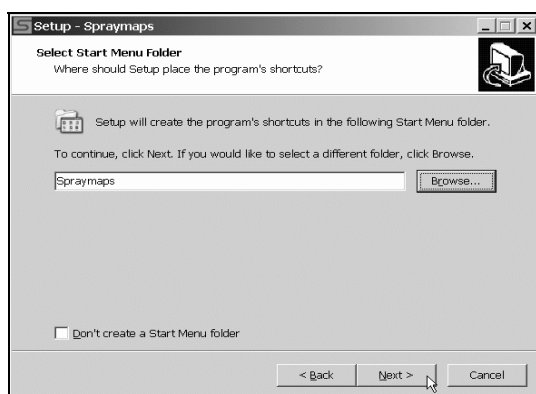
2. The Setup Wizard window will appear. Close any other Windows applications and click on **Next**. On the next screen, accept the licence agreement and click **Next** again.



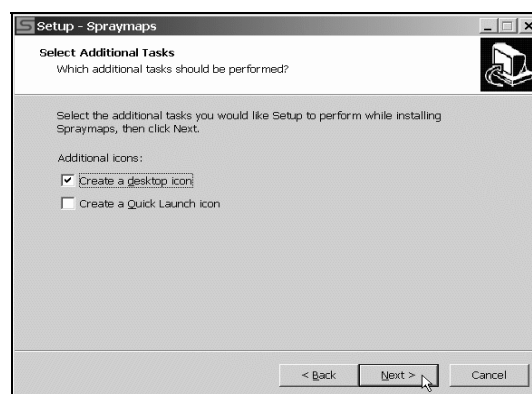
3. Select the destination folder for the Spraymaps program. The default is **C:\Program files\Spraymaps**, but this can be changed (eg to a network location). Click on **Next**.



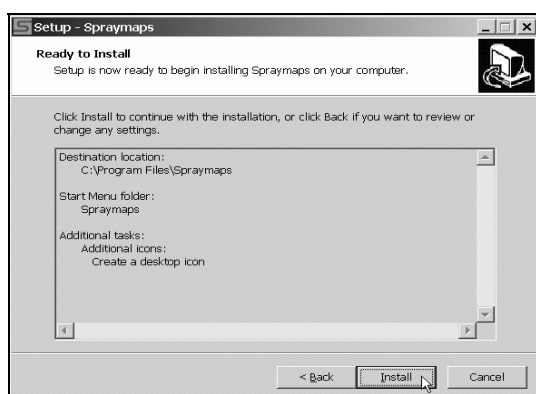
4. Select the location where the GPSArchive folder should be installed. The default **C:\DataDir** can be changed (eg to **C:\..My Documents** or a network location*). Click on **Next**.



5. Select the Start menu folder for the program shortcut or tick the box if a shortcut in the Windows Start menu is not required. The default folder should normally be used. Click on **Next**.



6. Tick the **Create a desktop icon** box to put a Spraymaps icon on the desktop. Tick the **Create a Quick Launch icon** box to add a button to the Windows Quick Launch toolbar. Click on **Next**.



7. Click on **Install** to install the program and GPS Archive folder.



8. Click on **Finish** to exit the Setup Wizard and start Spraymaps.

* Note that security restrictions on a Windows 7 PC can prevent the creation of a new folder in the root of the C: drive. In this case, the Spraymaps program should be run for the first time with Administrator Privileges.

9. Double-click the **Shortcut to Spraymaps** icon on the desktop. When the program starts for the first time a window will appear with the message **Failed to find data folder...** This is normal as the location for the jobs archive has not yet been defined in the Spraymaps program. Click on the **OK** button and the **Options** window will appear – see Fig. 14. Click on the **Browse** button and navigate to the **GPSArchive** folder created in step (6) above. Click on this folder to highlight it and then click on **OK** to close the **Browse for Folder** window. Click on the **OK** button to close the **Options** window. The main program window should open automatically.

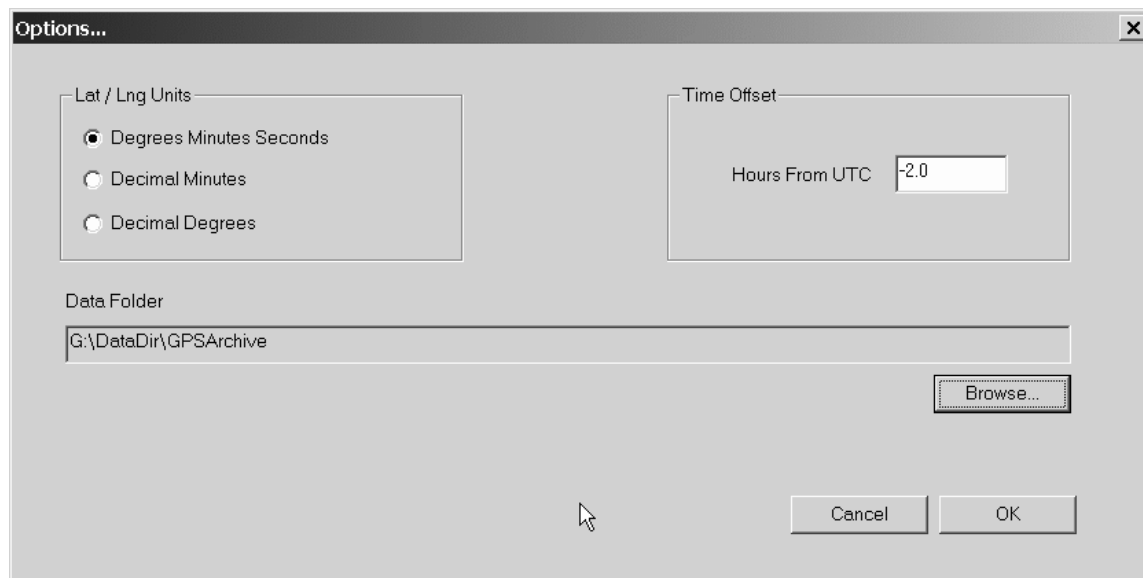


Fig. 14 – Options Window

These steps complete the installation of the program and archive data folder. The program must be configured for user preferences before use. The procedure is as follows:

1. If not already open, start the Spraymaps program by double-clicking on its icon on the desktop. The main program window is shown in Fig. 15.
2. Click on **File > Options** to open the **Options** window – see Fig. 14.
3. Choose the preferred system of latitude and longitude units to be used on the job display and in printed job reports and click on the applicable button. Available options are:
 - **Degrees Minutes Seconds** (eg N 50° 20' 30.00")
 - **Decimal Minutes** (eg N 50° 20.50')
 - **Decimal Degrees** (eg N 50.3417°)
4. Enter the time offset in the **Hours from UTC** box. This is the difference between local time and UTC (GMT) time as used by the GPS satellite network. The times recorded in the log files are UTC and the time offset is used to convert these to the local time shown on the job display and in job reports. The time offset is positive for locations East of the meridian and is negative for locations to the West. Enter an offset of 0.0 if it is preferred to display and print all times as UTC. Note that the time offset is used to convert times in job files whilst they are being imported into the archive, not

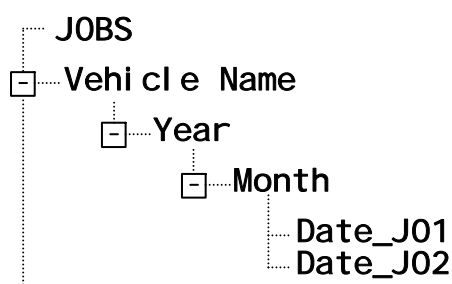
when they are displayed. For this reason, the time offset must be set *before* any jobs are imported.

5. Check that the path shown in the **Data Folder** box corresponds to the correct location for the job archive data files.
6. Click on **OK** to save the configuration options.
7. The configuration options can be changed at any time by clicking on **File > Options** and following the above steps.
8. Should it be necessary to change the location of the **GPSArchive** folder, the procedure is as follows:
 - i. Create a new empty **GPSArchive** folder in the required location.
 - ii. Copy all sub-folders from the original **GPSArchive** folder to the new **GPSArchive** folder.
 - iii. Open the **Options** window, click on the **Browse** button and navigate to the new **GPSArchive** folder. Highlight this folder and click on **OK**. Click on **OK** in the Options window to save the new archive location.
 - iv. Open Spraymaps and check that the archive files are accessible in the new location.
 - v. Delete the original **GPSArchive** folder and all its sub-folders.



4.2 Overview of Program

The main program window is shown in Fig 15. By default, the window is divided into three panes:

- **Jobs (left hand pane).** This shows a list of all spray jobs archived in the system, arranged as a multi-level tree. The tree is structured as follows:



The name of each job file is in the format **Date_Jxx**. Multiple jobs for the same vehicle on the same day are numbered J01, J02 etc in time order (ie J01 is the first job of the day). The actual times are shown when the jobs are displayed.

The tree display can be expanded by clicking on the  button at each branch of the tree. Clicking on the  button collapses the branch. A spray job is selected by clicking on it with the left mouse button.

The Jobs pane can be resized by clicking and dragging on the right hand border.

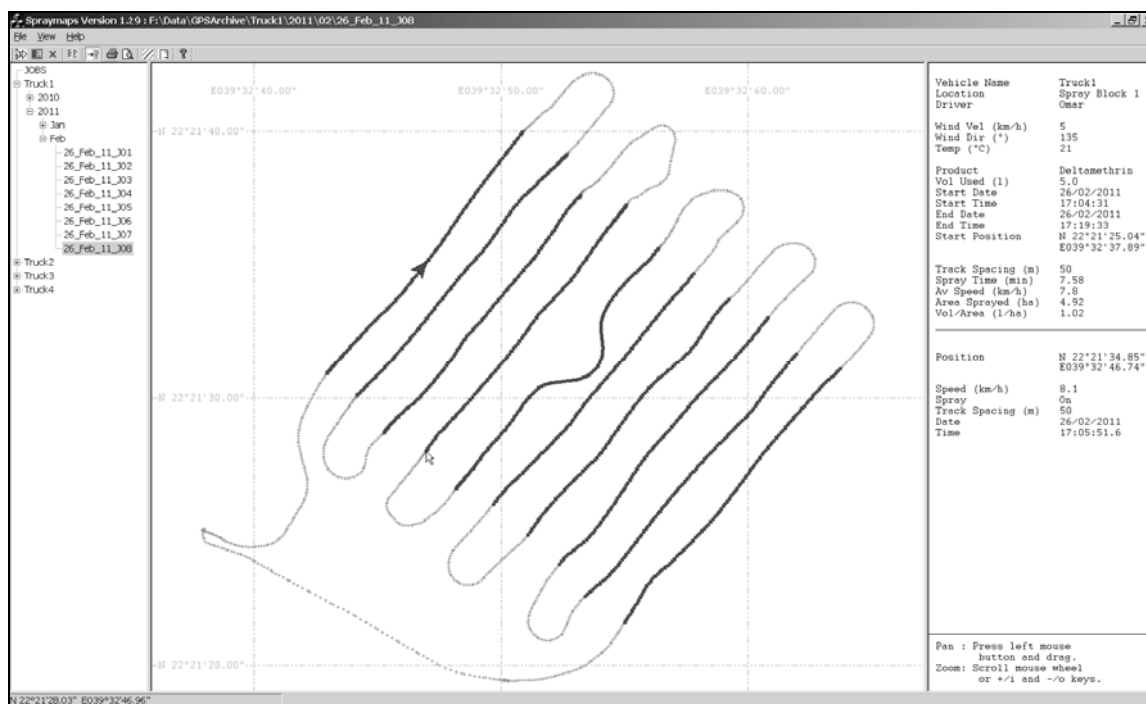


Fig. 15 – Main Program Window

- Map (central pane).** This shows the track of the vehicle for the selected job. The track is overlaid on a latitude/longitude grid. The track is shown in blue when the vehicle is not spraying and in red when the sprayer is turned on. Note that the Spraytrac unit in the vehicle must be connected to the sprayer for spray on/off information to be recorded and displayed.

Initially, the map display will be scaled so that the entire track fits into the Map pane. The display can be zoomed in and out by pressing the **+** or **-** keys on the numeric keypad. On a laptop computer without a numeric keypad, the display can be zoomed with the **i** (in) or **o** (out) keys. If the PC is provided with a mouse with a scroll wheel, the wheel can also be used to zoom the display. Note that it is only possible to zoom the map display whilst the Map pane is active. If the zoom controls do not work as expected, move the mouse cursor anywhere within the Map pane and left click to bring focus to the pane and activate the controls. The track can be moved (panned) within the Map pane by positioning the mouse cursor anywhere in the pane, holding down the left mouse button and dragging the image with the mouse or trackpad.

The left and right hand borders of the Map pane can be moved by positioning the mouse cursor on a border, holding down the left mouse button and dragging the border horizontally.

The Map pane is always active and cannot be hidden.


- **Properties (right hand pane).** This pane is divided into two sections. The upper section shows the parameters for the spray job that is selected in the Jobs pane. Information shown is as follows:

Vehicle Name	The name of the vehicle as configured in the Spraytrac unit.
Location	The location of the spray job (if entered manually).
Driver	The name of the driver (if entered manually).
Wind Velocity	The wind speed at the spray site (if entered manually).
Wind Dir	The wind direction at the spray site (if entered manually).
Product	The type of pesticide used (if entered manually).
Volume Used	The volume of pesticide used for the job (if entered manually).
Start Date	The date on which the job was started (from GPS data).
Start Time	The time at which the job was started (from GPS data, corrected to local time).
End Date	The date on which the job was completed (from GPS data).
End Time	The time at which the job was completed (from GPS data, corrected to local time).
Start Position	The position of the vehicle at the beginning of the spray job (from GPS data).
Track Spacing	The track spacing entered into the Spraytrac unit and used for the spray job (from the Spraytrac unit).
Spray Time	The total time for which the sprayer was turned on during the job (recorded by the Spraytrac unit, but only valid if the unit was connected to the sprayer, shown as 0.00 otherwise).
Av Speed	The average speed of the vehicle <i>whilst spraying</i> (calculated from the speeds recorded by the Spraytrac unit, but only valid if the unit was connected to the sprayer, shown as 0.0 otherwise).
Area Sprayed	The total area sprayed for the spray job (calculated from the vehicle speed and track spacing <i>whilst spraying</i> , but only valid if the unit was connected to the sprayer, shown as 0.00 otherwise).
Volume/Area	The average application rate (litres/ha) on the area sprayed during the job (calculated from the Volume Used and Area Sprayed, but only valid if the Volume Used had been entered manually and the Spraytrac unit had been connected to the sprayer, shown as 0.0 otherwise).

Information shown as *entered manually* will only be displayed if the job details have already been entered or edited as described in section 4.4.

The lower section of the Properties pane shows information about the job at any position selected by the user. To display this information, click on any

part of the vehicle track in the Map pane. An arrow will appear at the selected point on the track to indicate the direction of travel and the information in the lower section of the Properties pane will update to show the position, speed, sprayer status (on/off), track spacing, date and time at the selected point. This information will be displayed until a new point is clicked.

The Properties pane can be toggled on and off by clicking on the  button on the toolbar at the top of the window or by clicking on **View > Show Properties**.

4.3 Archiving of Job Files

Data logged by Spraytrac units is transferred to the Spraymaps program on a USB flash memory key. The same memory key can be used to download data from Spraytrac systems on multiple vehicles. The only limitation on the number of log files that can be held in one key at the same time is that the combined size of the files must not exceed the capacity of the USB memory. As a guide, one hour of logged data will occupy approximately 1 MB, so a 2 GB USB memory can hold log files for jobs totalling about 2000 hours.

The Spraymaps program reads log files from the USB memory and divides these into individual jobs for each vehicle. The job files are then stored in the job archive (**GPSArchive**) folder on the local PC or in the selected network location.


The structure of the archive is as shown in section 4.2. The program uses the following criteria to divide the log file for each vehicle into individual jobs:

- The job starts on a later date than the preceding job; or
- the Spraytrac unit was switched off and on again on the same day; or
- the user pressed the X button on the Spraytrac unit to terminate one job and to start another.

Note that if the Spraytrac unit is switched on significant time before the vehicle first moves, or if the unit is left switched on after a spray job has finished and the vehicle remains stationary, the log file contains a large number of redundant records at the beginning and/or the end of the job. The Spraymaps program automatically removes these redundant records so that the job file only shows the track of the vehicle from the time that it starts moving until it stops at the end of the job. Records showing the vehicle as stationary during a job are not removed. Should the Spraytrac unit be switched on and off again whilst the vehicle remains stationary (ie there is no movement whilst the unit is switched on), the job file contains no useful information and it is automatically discarded.

The procedure to transfer job files to the archive is as follows:

1. Download the log file(s) from the Spraytrac unit(s) on the vehicle(s) into the USB flash memory key as described in section 3.3.9.
2. Start the Spraymaps program.
3. Insert the USB memory key in any empty USB port on the PC. If Windows displays a pop-up list of actions for the files on the USB memory, close the pop-up window.

4. Start the data import process by one of the following:
 - Click on the **Import** button  on the toolbar at the top of the screen; or
 - click on **File > Import New Data**; or
 - use the keyboard shortcut **Ctrl-N** (hold down the **Ctrl** key and press **N**).
5. An **Open Files** window will appear with a standard Windows directory tree display. Browse to the location of the USB flash memory key (normally shown as **Removable Disk (X:)**, where **X** is the drive letter of the device).
6. Double-click on the USB memory entry (eg **Removable Disk (X:)**) and then double-click on the **logs** sub-folder.
7. The **Open Files** window will show the **logs** sub-folder with a list of log files in the format **name_data.log**, where **name** is the name of each vehicle.
8. Click on the first **name_data.log** file to highlight it and then click on the **Open** button.
9. An **Import Job** window will open with all the jobs in the log file listed in the box at the left hand side of the window – see Fig. 16. Left-clicking on a job will highlight it and its parameters will be displayed in the window. Parameters read from the job file are displayed in the lower part of the window. These are shown against a grey background as they cannot be changed. Parameters in the right hand side of the window are initially blank because the relevant information must be entered manually. If required, these parameters can be entered as follows:
 - i. Click on the job for which parameters are to be entered. The job will be highlighted and existing parameters will be displayed in the grey boxes.
 - ii. Click in the **Location** box and enter the spray block location as text.
 - iii. Click in the **Driver** box and enter the name of the driver as text.
 - iv. Click in the **Product** box and enter details of the pesticide as text.
 - v. Click in the **Vol Used** box and enter the volume of pesticide used for the job in litres. This must be entered as a number only. The entry will be stored to one decimal place (eg if 32.123 is entered, the volume will be stored as 32.1).
 - vi. Click in the **Temp** box and enter the air temperature in the spray area in degrees C. This must be entered as a number only, with no degree symbol or letter (eg 28, not 28° or 28°C).
 - vii. Click in the **Wind Vel** box and enter the wind speed in the spray area in m/sec. This must be entered as a number only. The entry will be stored as a whole number, without any decimal fraction.
 - viii. Click in the **Wind Dir** box and enter the wind direction in the spray area in degrees. This must be entered as a number only, with no degree symbol. A direction entered as letters will not be stored (eg both 45 and 045 are acceptable but 45° or NE are not).
 - ix. Click on the next spray job and repeat steps (ii) – (ix).

Note that it is not essential to enter all (or any) of the above parameters. However, the **Volume/Area** parameter in the job display and printout will only be calculated if the volume of pesticide is entered in the **Vol Used** box.

10. Finally, click on the **Save** button to save all job files, together with any manually entered parameters, to the archive. Note that this button should *not* be clicked until *after* the parameters have been entered for *all* jobs in the log file. Should the files be saved before all the parameters have been entered, they can be edited later – see section 4.4.
11. Repeat (8) – (10) for the log file corresponding to name of each vehicle for which a log file is stored on the USB flash memory.
12. Click on the **Unplug or Eject Hardware** icon in the Windows system tray at the bottom of the screen and follow the instructions to stop and remove the USB memory key from the PC. *Do not remove the USB key without stopping it first.* Failure to follow this procedure could result in corruption of the log files and other data in the memory key.
13. View each of the new job files in the archive to check that it has been downloaded successfully. See section 4.6.

There is no need to delete log file(s) from the USB memory key after they have been successfully archived by the Spraymaps program. A log file will be automatically over-written the next time data is downloaded from the corresponding Spraytrac unit.

IMPORTANT: Should any problems be encountered whilst archiving the log files (eg due to corruption of the USB memory key), the files can be downloaded again from the Spraytrac unit(s). However, this will only be possible if the Spraytrac unit(s) have not recorded any new log files in the meanwhile. It is therefore strongly recommended that the job files should be archived using the Spraymaps program immediately after they have been downloaded from the Spraytrac unit(s). In the event of a problem with data transfer using the USB memory key, it is recommended that the memory should be re-initialised as described in section 4.9. If the problem persists, a different USB memory should be used. This should be initialised before it is used to download data from the Spraytrac units.

4.4 Editing Job Details

The manually entered parameters for a spray job can be added or edited after the job has been added to the archive. The procedure is as follows:



1. Click on the job in the **Jobs** pane. The job will be highlighted.
2. Either click on the **Edit** button  on the toolbar at the top of the window or click on **File > Edit Job**. The **Edit Job Details** window will appear – see Fig. 16.

Fig. 16 – Job Details Window

3. Follow the same procedure as described in section 4.3, step (9) to add or edit parameters. Existing parameters can be deleted or overtyped as required, but note that only the parameters in white boxes can be edited. The parameters in the grey boxes are automatically generated by the Spraytrac unit and cannot be changed.
4. Click on **Save** to save the edited job file to the archive.

4.5 Deleting Jobs





Jobs can be deleted from the archive as follows:

1. Click on the job to be deleted in the **Jobs** pane. It will be highlighted.
2. Either click on the **Delete**  button on the toolbar at the top of the window or click on **File > Delete Job**. A **Delete?** confirmation window will appear with the name of the job file to be deleted.
3. Check that the correct job is shown and click on **Yes**. This will delete the job from the archive and it will disappear from the tree in the Jobs pane. Note that deleting a job will *not* affect the numbering of other jobs in the archive for the same vehicle on the same day. For example, if the archive contains jobsJ01 –J04 and jobJ03 is deleted, the numbers of jobsJ01,J02 &J04 remain unchanged.

IMPORTANT: After a job has been deleted from the archive, it cannot be recovered. It is strongly recommended that the entire **GPSArchive** folder should be backed up regularly.

4.6 Displaying and Reviewing Jobs

The procedure to display a spray job is as follows:

1. Select the job from the tree display in the Jobs pane at the left hand side of the program window. If necessary, the tree can be expanded by clicking on the  buttons alongside the relevant **Vehicle Name**, **Year** and **Month** branches. Select the job by clicking on it with the left mouse button. This causes the job name to be highlighted.
2. The track of the sprayer appears in the central Map pane. To see the vehicle track in more detail, the display can be zoomed or panned as described in section 4.2.
3. The A – B line for the spray job can be toggled on and off by clicking on the **Show AB Line**  button on the toolbar at top of the window or by clicking on **View > Show AB Line**. The A – B line is shown as a thick blue line and the theoretical parallel tracks are shown as thin blue lines. The spacing between the lines corresponds to the track spacing set at the start of the spray job. The lines can be used to compare the actual tracks of the vehicle with the intended tracks.
4. A ruler tool is provided to measure the distance between any two points in the map display. The tool is toggled on and off by clicking on the **Show Ruler**  button on the toolbar at top of the window or by clicking on **View > Ruler**. When the ruler is active the mouse cursor changes from an arrow to a cross. To measure the distance between two points: position the cross over the first point and left-click, then drag the cross to the second point. A red line will be drawn between the two points and the distance will be shown in metres. Left-clicking again will release the cross cursor from the end of the line. The procedure can then be repeated to measure other distances.
5. The latitude and longitude co-ordinates of the mouse cursor are displayed in the lower left hand corner of the Spraymaps window. The co-ordinates of any point on the vehicle track can be shown by positioning the cursor over the point (without clicking the mouse).
6. Job details appear in the right-hand Properties pane. If necessary, user-entered parameters can be added or edited as described in section 4.4.
7. The Properties pane can be toggled on and off by clicking on the  button on the toolbar at the top of the window or by clicking on **View > Show Properties**. This allows a greater area of the program window to be used to display the vehicle track.
8. Another job can be displayed by clicking on its name in the tree in the Jobs pane.

4.7 Printing Job Reports

Spraymaps provides an option to print a hard copy of the currently displayed job. The printed job report shows the vehicle track and job parameters – see Fig. 17. The procedure to print a job report is as follows:

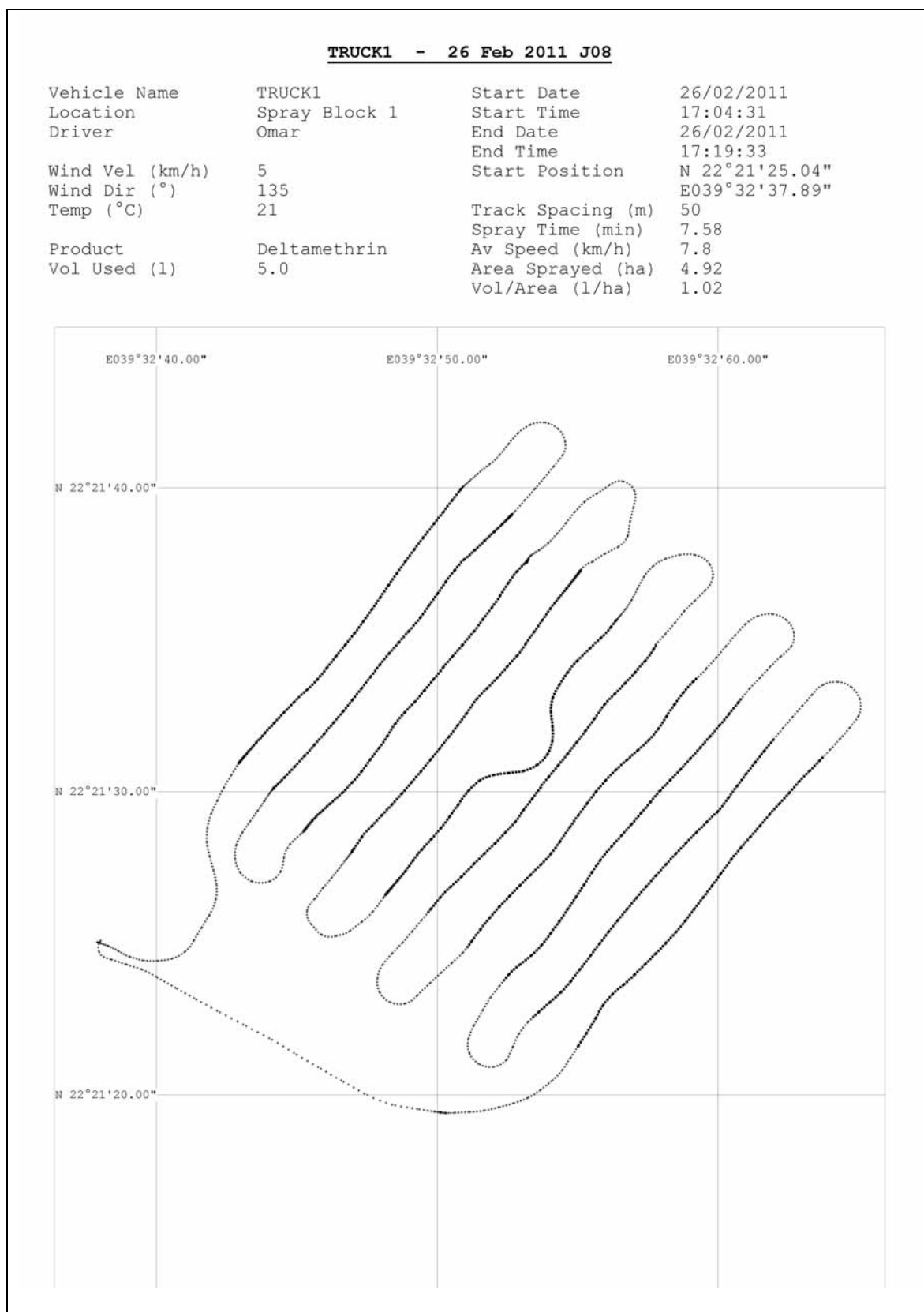




Fig. 17 – Printed Job Report

1. Select and display the job as described in section 4.6.
2. Click on the **Print Preview**  button in the toolbar at the top of the window or click on **File > Print Preview** to see a preview of the printed page. If the zoom level and position of the spray track on the preview are correct, the report can be printed directly from the preview window by clicking on the **Print** button.
3. If it is preferred to change the zoom level and/or position of the track, click on the **Close** button, use the zoom and pan controls to adjust the track display and repeat step (2).
4. Further copies of the job report can be printed directly from the Spraymaps window by clicking the **Print**  button in the toolbar at the top of the window or by clicking on **File > Print**.

If a colour printer is used, the vehicle track will be printed in blue where the vehicle is not spraying and in red where the sprayer is operating. If a monochrome printer is used, points at which the vehicle is not spraying are shown by grey + symbols and points at which the sprayer is operating by darker ■ symbols.

4.8 Configuration File

The Spraytrac unit uses a configuration file to set user-defined parameters. To simplify the operation of the Spraytrac unit (and to eliminate the possibility of inadvertent changes by the operator), the configuration file can only be changed by uploading a new version from a USB flash memory key.

Every Spraytrac unit has a unique identification number (Device ID). This is a sixteen-digit number assigned to the unit during production. This number cannot be changed. The Device ID is shown on a label attached to the rear of the unit. The user must also give a unique name (corresponding to the vehicle number, registration etc) to each unit. The name is defined in the configuration file.

Every configuration file is unique and is automatically named after the Device ID of the Spraytrac unit into which it will be uploaded. A new configuration file must be created for each unit to be configured.

The procedure to create a new configuration file is as follows:

1. Open the Spraymaps program and click on **File > Config**. This will open the Configuration File Maintenance window as shown in Fig. 18.
2. Insert a USB flash memory key in an available USB port on the PC. Note that the memory should already have been initialised as described in section 4.9.
3. Click on the **Create Config** button. This will open a standard Windows Browse for Folder tree display.

CONFIGURATION FILE MAINTENANCE

Create Config Edit Config Delete Config

Default

Device ID 00000000000000123

Vehicle Name Truck1

Language English

Track Spacing (m) 50

Lat/Long Format Deg:Min:Sec

Min Speed (km/h) 2.0

Min AB Distance (m) 20

Ret Point Rad (m) 150

Button Delay (sec) 0.7

Button Repeat (Hz) 3

LCD Contrast 30

LCD Bias H

Advanced Options Save Config

Set Defaults Cancel

Fig. 18 – Configuration File Maintenance Window

4. Locate the USB flash memory (typically **Removable Disk (X:)** under the **My Computer** branch of the tree. Expand the tree if necessary to show the **config** folder in the USB memory. Click on the **config** folder to highlight it and then click on OK to confirm the location for the file and to close the Browse window.
5. The window shows twelve configuration parameters. Of these, the upper five are in white boxes and can be edited immediately. The lower seven parameters are initially displayed in grey (non-editable) boxes and should only be changed by advanced users. However, these advanced parameters can be made editable by clicking on the **Advanced Options** button at the bottom of the window. All parameters can be changed to their default values by clicking on the **Set Defaults** button at the bottom of the window.

Configuration parameters must be entered in the boxes as follows (note that no boxes can be left blank and * denotes advanced options):

Device ID

The sixteen-digit identification number shown on the label on the back of the Spraytrac unit to be configured. This number must consist of exactly sixteen digits and cannot consist of all zeros. It is recommended that the number should be entered by over-typing the default

string of zeros. The number can be re-set to all zeros by clicking on the Default button alongside the number. Note that the configuration file will only be recognised by the Spraytrac unit corresponding to the Device ID used in name of the configuration file. The file will be ignored by all other units.

Name	A user-assigned name for the vehicle. The name should be unique and easily recognised (the vehicle number, registration, etc). This name will be used to identify the vehicle in the job archive and the Spraymaps job display. The name can include letters and numbers, but should not contain any spaces or other characters (*, /, &, ? etc). However, an underscore character (_) can be used instead of a space.
Language	<p>The language and numeric format to be shown on the Spraytrac display. One of four language options must be selected from the drop-down list (click on the downward-pointing arrow to select). Available options are:</p> <p>English English language text and numerals in Western script with a dot as the decimal separator (eg 123.4).</p> <p>French French language text and numerals in Western script with a comma as the decimal separator (eg 123,4).</p> <p>Arabic 1 Arabic language text and numerals in Hindi script with a comma as the decimal separator (eg ١٢٣,٤).</p> <p>Arabic 2 Arabic language text and numerals in Western script with a comma as the decimal separator (eg 123,4).</p>
Track Spacing	The initial track spacing (in m) to be used by the Spraytrac unit. The track spacing can be changed later by the operator as required.
Lat/Long Format	<p>The format of the GPS co-ordinates shown on the Spraytrac display. One of two options must be selected from the drop-down list (click on the downward-pointing arrow to select). Available options are:</p> <p>Deg:Min:Sec Degrees, minutes and seconds, eg N 50:20:30 (N 50° 20' 30")</p> <p>Decimal Degrees Decimal degrees to 4 places, eg N 50.3417 (N 50.3417°)</p>

Note that this parameter determines the format of the Spraytrac display only. The format of co-ordinates shown in the Spraymaps program is set from within Spraymaps.

- Min Speed*** The minimum speed of the vehicle at which the Spraytrac unit provides track guidance. This must be high enough to avoid ambiguous operation whilst the vehicle is manoeuvring very slowly and be low enough to ensure guidance at low spraying speeds. The speed should only be changed from the default of 2 km/hr if the vehicle is driven at an unusually low speed during a spray job.
- Min AB Distance*** The minimum distance (in m) between the points representing the beginning of the first spray track (point A) and the end of the first track (point B). The Spraytrac unit will not allow the operator to define point B until the vehicle has moved the minimum distance from point A. This distance should not be changed from the default of 20 m unless the spray lines are unusually short.
- Ret Point Rad*** The distance (radius) from a marked return point at which the Spraytrac display changes from orientation to track guidance mode. When the vehicle returns to a previously marked return point, the display is initially in orientation mode and shows the location of the point relative to the vehicle. When the vehicle reaches the distance from the return point defined by Ret Point Rad, the display changes to track guidance mode and shows the desired and adjacent spray tracks. The Ret Point Rad should not be set to a distance of more than five times the minimum anticipated track spacing. This ensures that at least one adjacent spray track will be visible on the Spraytrac display when changing to track guidance mode. Setting a higher figure could result in a completely blank track guidance display.
- Button Delay*** The time (in seconds) for which a button on the Spraytrac unit must be touched before the system responds. Setting this time too low can result in inadvertent operation if a button is touched accidentally. Setting the time too high can make the system excessively slow to respond.
- Button Repeat*** The rate (in counts/second) at which the track spacing increments or decrements whilst the ▲ or ▼ buttons are touched for an extended time. Note that the track spacing will initially increment or decrement four times at a rate determined by the Button Delay and will then increment or decrement more quickly at a rate determined by Button Repeat. Setting the repeat rate

too high can result in over-shooting the desired figure and setting it too low can make the process of setting the track spacing excessively slow.

LCD Contrast* A factory-set parameter that controls the adjustment range of the display contrast knob on the Spraytrac unit. This should not be changed.

LCD Bias* A factory-set parameter that controls the configuration of the LCD display on the Spraytrac unit. This should not be changed.

6. When all parameters have been entered, click on the **Save Config** button at the bottom of the window to save the file in the location selected in step (4) above. The file name will be in the format **000000000000123.cfg**, where the number corresponds to the Device ID.

An existing configuration file can be edited as follows:

1. Click on the **Edit Config** button at the top of the window. This will open a normal Windows **Browse for Folder** tree display. Locate the USB flash memory (typically **Removable Disk (X:)**) under the **My Computer** branch of the tree. Expand the tree if necessary to show the **system** folder in the USB memory. Expand the tree if necessary to show the **config** folder under **system**. Click on the configuration file to be edited. The file name (in the format **0000000000001234.cfg**) will be highlighted.
2. Click on **Open** to open the file in the **Configuration File Maintenance** window.
3. Edit the file as required and click on the **Save Config** button to save the file.

Note that the name of the file saved is based on the device ID. This allows multiple configuration files containing similar parameters to be created for several Spraytrac units very easily. The procedure is as follows:

1. Use the Create Config option to create and save the configuration file for the first Spraytrac unit.
2. Use the Edit Config option to change only the Device ID and Name parameters in the file. Save the file. The file will be saved with a new name corresponding to the new Device ID.
3. Repeat step (2) to create a configuration file for each Spraytrac unit.

An unwanted configuration file can be deleted from the USB memory as follows:

1. Click on the **Delete Config** button at the top of the window. This will open a normal Windows **Browse for Folder** tree display. Locate the USB flash memory (typically Removable Disk (X:)) under the **My Computer** branch of the tree. Expand the tree if necessary to show the system folder in the USB memory. Click on the System folder and then click on the configuration file to be deleted. The file name (in the format **0000000000001234.cfg**) will be highlighted.

2. Click on the **Open** button. A **Confirm** window will appear. Click on **Yes** to confirm deletion of the file. Note that a file deleted from within Spraymaps cannot be recovered.

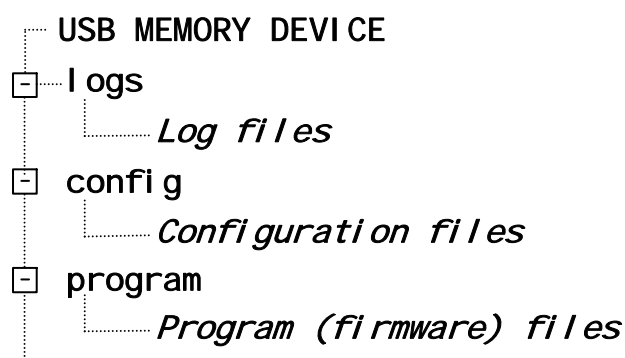
4.9 Preparation of USB Flash Memory Key

A standard USB flash memory key is used to transfer log files from Spraytrac units in vehicles to the Spraymaps program on a PC. The same USB memory is used to transfer new configuration files or updated firmware to the Spraytrac units.

Although not essential, it is strongly recommended that the USB flash memory supplied with the system is kept for this purpose only and that it is not used to store other files unrelated to the Spraytrac/Spraymaps system. This avoids any risk of the memory being corrupted by other applications.

The USB memory must be formatted for the FAT32 file system (the memory supplied is already formatted for FAT32). The Spraytrac unit will show an error if the memory is formatted for the alternative Windows FAT16 or NTFS file systems.

Data is stored in folders in the USB memory. The folders are structured as follows:



Note that the folder names must be in all lower case characters (eg **logs** and not **Logs** or **LOGS**).

The folders (logs, config & program) must be created in the USB memory before it is used to transfer data. Spraymaps provides a utility to initialise a USB memory by creating the necessary folders automatically. The procedure to initialise a USB memory key is as follows:

1. Insert the USB memory in an available USB port on the PC.
2. If necessary, format the memory for the FAT32 file system (right-click on the device in My Computer or Windows Explorer and select **Format > FAT32**). Note that formatting will destroy *all* data in the USB memory.
3. Start Spraymaps and click on **File > Initialise USB**. This will open a command window.

4. Enter the drive letter corresponding to the USB memory. The folders (if any) already in the memory will be displayed.
5. Enter **Y** to confirm that the program is working with the correct device or **N** if an incorrect drive letter has been entered.
6. If any of the folders used by the system already exist in the memory, the program will display a warning that they will be deleted (any other folders will remain). Enter **Y** to delete the original folders and data. The program will create new folders and will display **USB Flash Drive Configured**.
7. Press any key to return to the main Spraymaps window.
8. Click on the **Unplug or Eject Hardware** icon in the Windows system tray at the bottom of the screen and follow the instructions to stop and remove the USB memory key from the PC. *Do not remove the USB key without stopping it first.* Failure to follow this procedure could result in corruption of the log files and other data in the memory key.

5. PARTS LIST

When ordering spare parts, please specify the following information:

- Serial number of system unit
- Approximate date of purchase
- Description of part
- Part number as shown in this section
- Number of parts required

Item	Part No	Description	Notes
1	EX7118	Spraytrac system unit	With mounting bracket
2	EX7119	Mounting bracket	
3	EX7129	Cable assembly	
4	EX7128	GPS receiver	With cable & connector
5	EX7131	Battery cable	With fuse
6	EX7136	Back-up battery pack	Supplied without batteries
7	EX7135	USB flash memory key (2 GB)	Supplied formatted
8	EX7142	Software CD	
9	EX7143	Storage case	With foam insert

6. CONVERSION FACTORS

1 yard	= 3 feet	= 0.91 metre
1 metre	= 39.37 inches	= 1.09 yards
1 statute mile	= 0.87 nautical mile	= 1.61 kilometres
1 nautical mile	= 1.15 statute mile	= 1.85 kilometres
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 gals	= 4.54 litres
1 litre	= 0.26 US gal	= 0.22 Imp gal
1 US pint	= 16 US fl ounces	= 0.47 litres
1 Imp pint	= 20 Imp fl ounces	= 0.57 litre
1 US gal/acre	= 8 US pint/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 pounds/sq in

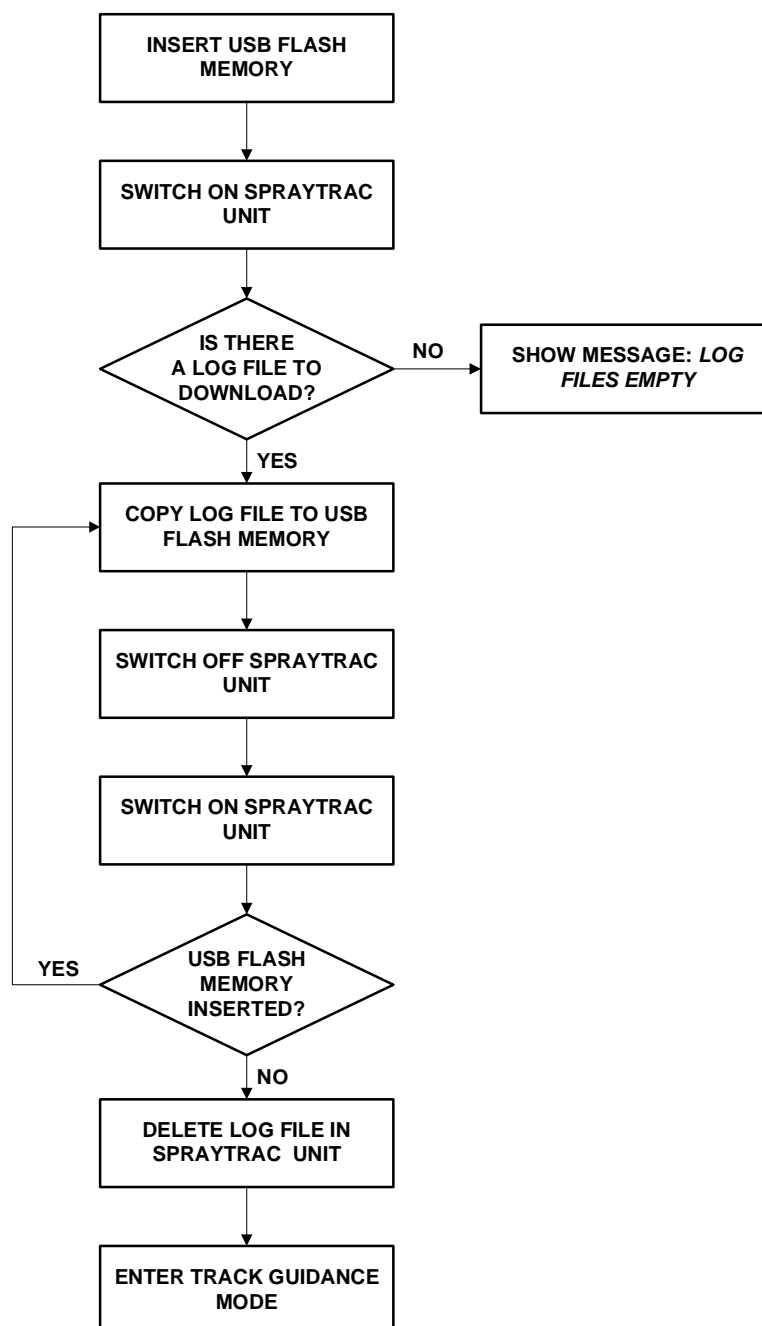
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Every care has been taken in the design of this equipment and the preparation of this Handbook. However, Micron Sprayers Limited cannot accept responsibility for errors or the consequences thereof. The user must satisfy himself that the equipment is suited to his needs, is performing according to his requirements and that all relevant regulations are being complied with.

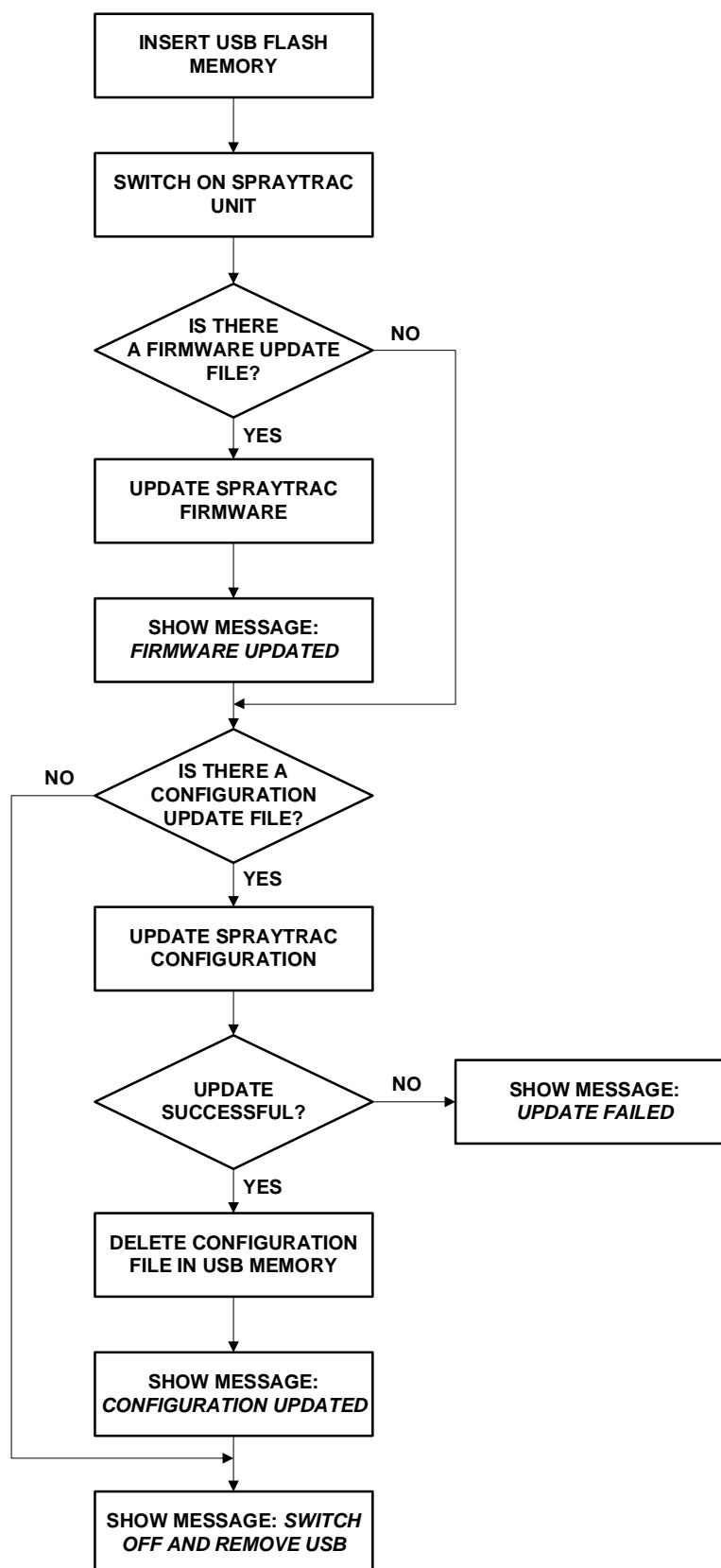
Spray jobs shown in the Handbook are simulated. The co-ordinates shown do not correspond to actual spray operations.

APPENDIX I – FLOWCHARTS

1. Transfer of Log File to USB Flash Memory



2. Update of Firmware & Configuration File



APPENDIX II – ARABIC SCREEN TEXT

English Screen Text	Arabic Screen Text	Explanation
VERSION	إصدار	رقم الإصدار للبرمجيات (سوفت وير) الداخلية بالجهاز يظهر تحت النص
NO GPS DATA	لم يتم استقبال إشارات من الأقمار	لم تتوافر بيانات عن الموقع لدى جهاز تحديد المواقع
<u>ACQUIRING GPS</u>	<u>انتظر الوصول على البيانات من الأقمار</u>	مُستقبل جهاز تحديد المواقع GPS يبحث عن الأقمار الاصطناعية ويحدد بيانات الموقع
INSUFFICIENT DISTANCE FROM FIRST POINT	المسافة غير كافية لتعيين النقطة الثانية	تم تحديد النقطة الأولى (A) ولكن لم يتم التحرك مسافة كافية لتعيين النقطة الثانية (B)
SHUTTING DOWN	إيقاف التشغيل	يتم إيقاف تشغيل الجهاز (بعد إغلاق مفتاح مصدر الطاقة)
CONFIGURATION UPDATED	تم تحديث ملف التكوين	تم تحديث ملف التكوين الذي يقوم بإعداد المعايير (البارامترات) في وحدة جهاز تحديد المواقع GPS
BAD CONFIGURATION FILE	خطأ في ملف التكوين	ملف التكوين الذي يقوم بإعداد معايير (بارامترات) الوحدة به خلل أو يحتوي على معلومات غير صحيحة
DOWNLOADING LOG FILES	يتم تحميل ملفات سجل العمليات	يجري تحميل ملفات سجل العمليات التي تحتوي على معلومات بشأن أعمال الرش
LOG FILES TRANSFERRED	تم تحميل ملفات سجل العمليات	تم تحميل ملفات سجل العمليات بنجاح، الذي يحتوي على معلومات بشأن أعمال الرش
LOG FILES EMPTY	ملفات سجل العمليات فارغة	ملفات سجل العمليات التي تحتوي على معلومات بشأن أعمال الرش فارغة (لا تحتوي على بيانات)
LOG FILES TRANSFER FAILED	فشل في تحميل ملفات سجل العمليات	فشل في تحميل ملفات سجل العمليات التي تحتوي على معلومات بشأن أعمال الرش
FIRMWARE UPDATED	تم تحديث البرمجيات الثابتة	تم تحديث البرمجيات (السوفت وير) الداخلية في الجهاز بنجاح إلى إصدار أحدث
VERSION UPDATE FAILED	فشل تحديث الإصدار	فشلت محاولة تحديث البرمجيات الداخلية بالجهاز إلى إصدار أحدث
SWITCH OFF AND REMOVE USB	اغلق مفتاح التشغيل واسحب الفلاش (يو. إس. بي)	أوقف تشغيل الجهاز واسحب الفلاش (مفتاح الذاكرة للناقل التسلسلي العام USB memory key) المستخدم في تحميل ملفات سجل العمليات

English Screen Text	Arabic Screen Text	Explanation
PRESS P↑ AT START OF FIRST TRACK	اضغط P↑ لبداء مسار الرش الكول	اضغط الزر المميز بالعلامة P↑ في بداية مسار الرش الأول (أي تحديد النقطة الأولى A)
PRESS P↵ AT END OF FIRST TRACK OR X TO ABORT	اضغط P↵ لإنهاء مسار الرش الكول أو اضغط X للبدء من جديد	اضغط الزر المميز بالعلامة P↵ في نهاية مسار الرش الأول (أي تعيين النقطة الثانية B) أو اضغط الز X للإلغاء والبدء من جديد
TURN ONTO NEXT PARALLEL TRACK AFTER SPRAYING OR PRESS X TO ABORT	تحول إلى مسار الرش التالي الموازي أو اضغط X للبدء من جديد	تحول إلى مسار الرش التالي الموازي أو اضغط X للبدء من جديد
TURN ONTO NEXT TRACK, PRESS X TO ABORT OR P TO MARK RETURN POINT	تحول إلى مسار الرش التالي، اضغط X للإلغاء، أو اضغط P لتحديد نقطة العودة	تحول إلى مسار الرش التالي ، اضغط X أو P لتحديد نقطة العودة في منطقة الرش بعد إعادة ملء خزان الرش.. الخ
FOLLOW POINTER >> TO RETURN TO SPRAY AREA	اتبع المؤشر >> للعودة لمنطقة الرش	اتبع اتجاه المؤشر >> على الشاشة للعودة لمنطقة الرش
FOLLOW POINTER >> TO RETURN POINT, PRESS P TO RESUME GUIDANCE	اتبع المؤشر >> للعودة لنقطة الرجوع واضغط P لاستئناف التوجيه على المسار	اتبع اتجاه المؤشر >> على الشاشة للوصول لنقطة العودة في منطقة الرش، ثم اضغط P ستئناف التوجيه على طول المسار

APPENDIX III – MANUAL PROGRAM INSTALLATION

It is recommended that the Spraymaps program and folders should normally be installed using the Setup Wizard on the CD as described in section 4.1. Should it be necessary to install the program manually, the procedure is as follows:

1. Load the CD into the CD drive on the PC.
2. Using Windows Explorer (or by clicking **My Computer > System (C:) > File > New**), create a folder named **Spraymaps** at **C:\Program Files\Spraymaps** (or at a different location if required).
3. Copy the file **Spraymaps.exe** from the **Program** folder on the CD to the **...\Spraymaps** folder created in step (2).
4. Decide whether the program is to show English or French language text.
 - For English: Copy the **Strings.cfg** file from the **Program\English** folder on the CD to the **...\Spraymaps** folder on the PC.
 - For French: Copy the **Strings.cfg** file from the **Program\French** folder on the CD to the **...\Spraymaps** folder on the PC.
5. Right-click on **Spraymaps.exe** and select Create Shortcut from the menu. Drag the shortcut from the folder onto the desktop.
6. Decide on the location for the folder to hold the archive of spray jobs. On a stand-alone PC this could be **C:\DataDir** or **C:\Documents and Settings\Username\My Documents**. Alternatively, the folder could be located on a network server or NAS drive. Regardless of the location chosen, it must be accessible via a drive letter on the local PC and should be in a part of the directory structure that is backed up regularly.
7. Using Windows Explorer (or by clicking **My Computer > System (C:) > File > New**), create a folder named **GPSArchive** (with no space in the name) at the chosen location.
8. Remove the CD from the drive on the PC.
9. Start the Spraymaps program and configure the location of the GPS Archive folder as described in section 4.1, step (9).

