User manual for danfoil
PC-SprayController VI

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Foreword

1.1 Introduction

Congratulations with your new *Danfoil PC-Spray Controller*.

The *Danfoil PC-Spray Controller* includes a wide selection of useful features, which enable it to be a valuable partner together with your agricultural implement. The manufacturer takes no responsibility for any installation or application outside for this application area.

This manual provides essential information for safe and efficient use, together with information on the care and maintenance required to combine trouble free operation with minimum operating costs.

The instructions and information contained within this manual assumes operator ability, level of training and familiarity with the machine type used with this monitor/control system. It is the owner's responsibility to ensure operator training in the correct and safe usage of this control system.

If the monitor/control system is used in accordance with the guidelines in this manual, the *Danfoil PC-Spray Controller* will be a useful and reliable tool for many years to come.

1.2 Specification changes and manual compatibility

The manufacturer operates a policy of continuous product development and reserve the right to vary the specification with or without notice.

Whilst every effort is made to ensure the accuracy of the particulars contained within this manual the manufacturer shall not be held liable for any inaccuracy or the consequences thereof.

2. Safety instructions

2.1 Disclaimer

The manufacturer does not accept liability for damage to persons or property resulting from use in ways other than the intended use. In such cases all risks are the responsibility of the user.

Relevant accident prevention regulations as well as other generally recognized safety, industrial, health and road traffic rules are to be adhered to. Unauthorized alterations or modifications to the controller, deviations from intended use will relieve the manufacturer of all liabilities for any subsequent injury or damage.

2.2 Safety precautions

Read the user manual before using the controller for the first time and always pay attention to the important safety precautions outlined.

Among other things please observe the following recommended precautions and safety measures:

- Before using this controller, read and understand this user manual. It is of equal importance that other operators also read and understand this manual. Do not allow anyone to operate the machine without exact instructions

- Keep the machine and controller in good condition. Unintended use can impair the function and/or safety and affect the life-span of the controller and machine

- Do not remove any safety mechanisms or labels

- Never service or repair the controller when it is switched on

- When using a battery charger the power supply must be disconnected

- When welding on the tractor or implement, the power supply must be disconnected

- Only use dry cloth (or cloth with very little clean water) to clean the monitor

3. Starting up and shutting down the PC-Spray controller terminal

The PC-Spray controller terminal is powered separately to the Can bus operating system (which is typically powered ignition live or constant live) This means as soon as the ignition is turned on or the engine is started the machine is operable, however screen information will not be available until the PC-Spray controller terminal is powered on.

3.1 Starting the machine

To start the machine, it is advised to turn the ignition to the IGN position until an audible beep sound is heard inside the cab, this signifies the Can bus system has successfully checked the system, initialized and is ready for operation. The ignition switch can then be turned to the start position in order to crank the engine. If this sequence is not adhered to it may be possible to start the engine by rotating the ignition switch quickly, from the off position, directly to start position before the PC-Spray controller system has initialized fully, and therefore no operations will be possible as a suspected power supply problem will prevent operation as a safety precaution. If this situation occurs simply turn the ignition off and perform the correct start sequence as detailed above.

NOTE! As described above the PC-Spray controller Canbus system is ignition powered whereas the PC-Spray controller operator terminal is powered directly, therefore settings and factors in menus cannot be successfully altered, reset or changed via the Terminal unless the ignition is switched on, the existing figures/factors will be retained in this case.

3.2 Starting the PC-Spray controller terminal

To start the PC-Spray controller terminal, press the power switch (**A**) on the side of the terminal, the screen will initially scroll text and then display a start-up screen with progress bar, the PC-Spray controller will take approx. 60 seconds to fully start-up. During the start-up the screen may be temporarily black for 10-15 sec., this is perfectly normal and <u>no additional key presses are necessary</u>. During this start up procedure the machine is fully operable but will show no display on the PC-Spray controller terminal.
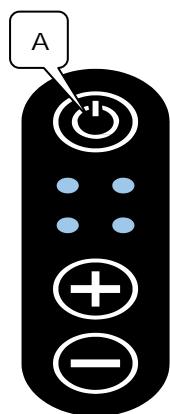
3.3 Shutting down the PC-Spray controller terminal

To switch off the PC-Spray Controller terminal press the "Power" logo in the top right hand corner of the screen (PRESS). The display will read "Are you sure you want to shutdown?", press [Shutdown] to continue to power down, press [Cancel] to return to main screen if accidentally pressed. The computer will now prepare to close down and will be powered of in approximately 5 seconds.

NOTE! *The computer <u>must</u> be shut down by the operator to avoid battery drain when the vehicle is left unused.*

NOTE! *The PC-Spray controller terminal <u>must</u> be shut down correctly to avoid data corruption/loss as detailed above, it is <u>not</u> advised to switch off the Terminal without first prompting shut down.*

4. General display structure and symbols

An overview of the general structure of the graphical user interface, including explanation of selected features is included below.

4.1 Overall structure of graphical user interface

All of the outlined areas of content are explained in further detail in later paragraphs.

Key/Area	Functions and Indications
A	Manufacturer logo (in some cases also power down button)
B	Warning messages area
C	Alarm messages area
D	Power down buttom
E	Status bar – Area for selected status updates and operations (to be explained later)
F	Screen tabs – Right side of screen outlines possible main screen views of terminal
G	Spray computer screen
H	Road screen (if applicable on machine)
I	Setup menus – Both operator and technical setup
J	Help menu
K	Field/job menu
L	View selector – Only visible in spray computer screen to alter sub-views
M	Time clock
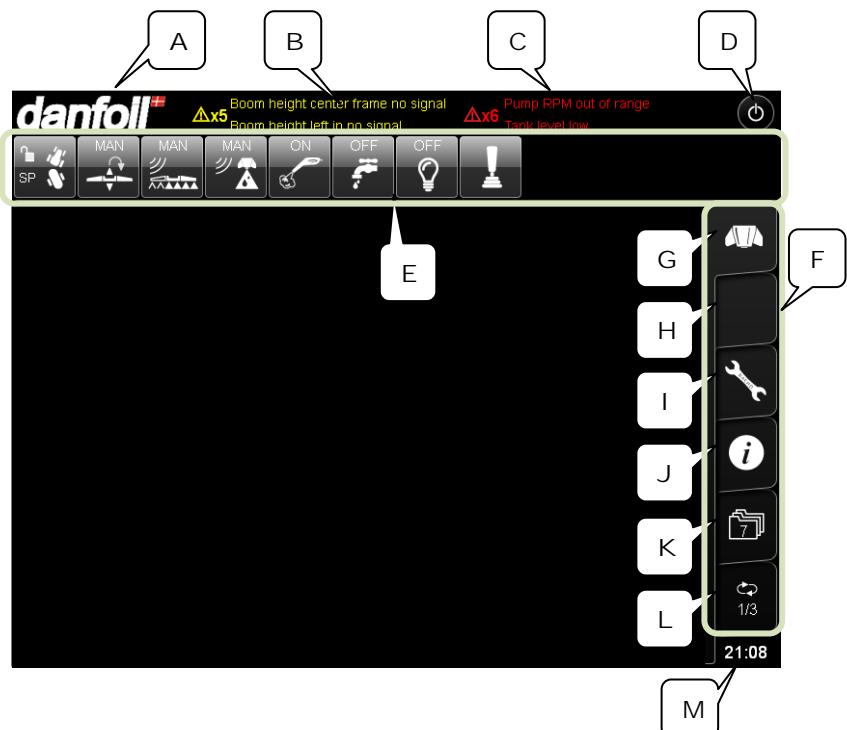
4.2 Pop-up keypad

The PC-Spray controller terminal utilizes a 10" touch screen as the operator interface, to enter figures into setup menus on screen a "Pop-up" keypad will appear when an adjustable setting/setting menu box is pressed. For example, to enter a new Application rate, press the current displayed application rate in the spray mode screen, and the screen below will appear, the "pop-up" keypad screen will always show Min, Max and Current value to help with setting selection. Pressing the icon on the screen you wish to adjust generally hyper-links directly to menu you wish to alter i.e. nozzle colour/spray line etc.

ID	Functions and Indications
A	Current value
B	Min value that can be entered
C	Max value that can be entered
D	Incremental adjustment steps (for easy application of small changes)
E	Value keyed in on keypad
F	Keypad numbers
G	Decimal point
H	Arithmetical symbols (when used as calculator)
I	Delete key
J	Clear key (clears value entered)
K	Change sign key
L	Enter key (to enter value keyed in)
M	Escape/back key (exits "pop-up")
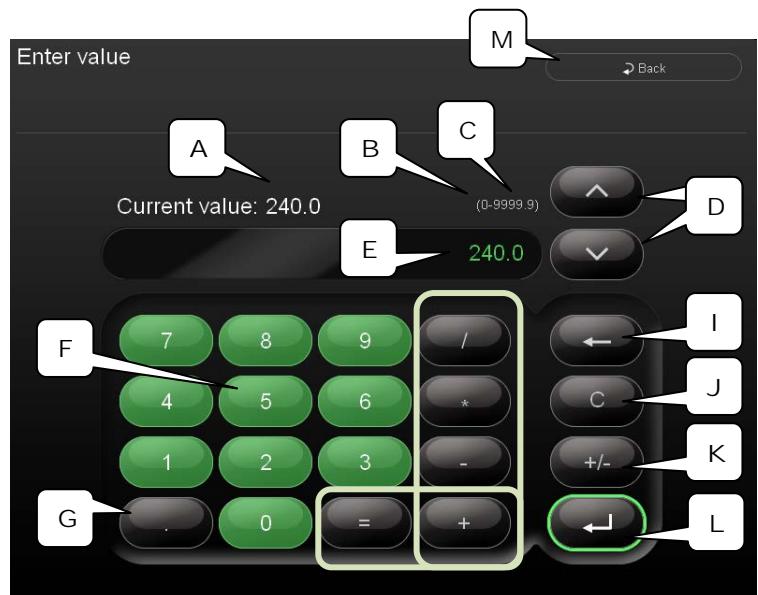
As the pop-up keypad contains arithmetical symbols it can be used as a standard calculator!

4.3 Computer warnings/alarms

Warning messages and alarm messages may appear, to alert the operator of any potential issues relating to the PC-Spray controller system, or components connected to it. Warning messages will be indicated in yellow writing (and alarm messages in red writing) at the top of the screen, regardless of the current screen displayed.

In front of the warning/alarm text a number indicates the total amount of active warnings/alarms.

NOTE! *In case the number of warnings/alarms exceeds two, it is crucially important to press the symbol to expand the total list of warnings/alarms!*

Press when number larger than 2 to expand full list

NOTE! *Any red text or warning signs on screen, must be investigated immediately.*

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5. Statusbar symbols and icons

An overview of statusbar symbols and icons is included below. In the following paragraphs these will be explained in further detail.

Functions marked with *Optional* may not be available on all brands and types of sprayers.

Main functions are explained in further detail below.

Symbol/icon	Functions and Indications
	Track control and steering operation (optional)
	Headland Assist (optional)
	Ultrasonic Boom leveling (optional)
	Auto Section Control operations (optional)
	High pressure cleaner operations (optional) – On/off function as outlined in text above the symbol
	Clean water pump operation (optional) – On/off function as outlined in text above the symbol
	Working lights operation (optional) – On/off function as outlined in text above the symbol
	Joystick operations overview (optional)

5.1 Track control and steering operations (optional)

5.1.1 Drawbar track control (V1) – Danfoil version

There are three basic steering modes selectable from a joystick switch (A).

Lock: In Lock mode, the drawbar is locked in straight ahead position to avoid instability at high road speeds. This mode is signified by the track control mode switch (A) being in top position and the terminal will display a closed padlock and the sprayer in straight ahead position.

NOTE! Although several safety interlocks avoid automatic drawbar movement at higher speeds it is recommended that this mode is selected for road transport.
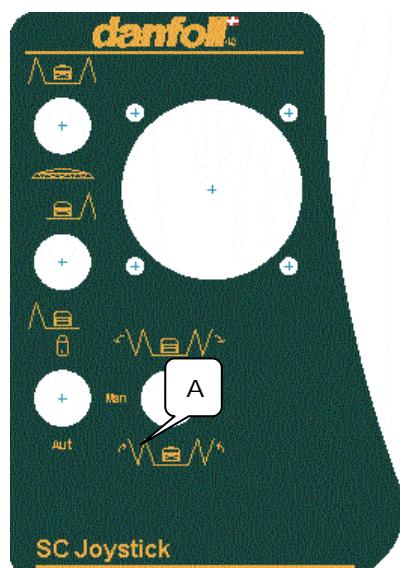
NOTE! When this mode is selected the drawbar will immediately self centre regardless of current position, pay attention to people around you when this operation is performed.

Man: In Man mode, the drawbar can be manually controlled by turning the joystick knob in clockwise and anti-clockwise direction. When this mode is selected the manual steer operation can, for example, be used to manually steer the drawbar left/right for headland operation or alignment calibration. This mode is signified by the track control mode switch (A) being in center position and the terminal will display an open or closed padlock and the sprayer in straight ahead position.

Auto: In Auto mode, the drawbar will enable the sprayer to track with the tractor at all times up to the "Threshold driving speed for wheel steering self-centering" (in menu setup). After this speed, the drawbar will lock the next time it reaches the straight ahead alignment position.

The drawbar will become active again once the forward speed drops below the "Threshold driving speed for wheel steering re-engage after self-centering", when this threshold speed is met, an audible beep will be heard as a warning to the driver and the drawbar will "catch up" and track to the same angle as the hitch. The padlock symbol will close in Auto mode to show when the drawbar is aligned, i.e. when threshold speed is exceeded.

NOTE! The drawbar will initially track at a lower speed when forward speed drops below threshold trigger speed, purposely to avoid instability.

SP: The SP mode can be engaged by pressing the track control symbol in the status bar when track control switch is in Auto. When SP mode is engaged, the drawbar is automatically controlled, dependent on the machines spraying state. This means the drawbar steers dependent of the master spray switch position, i.e. when actively spraying, locked steering is automatically engaged to aid straight tramlines and avoid unnecessary boom instability due to erratic drawbar movements. At the headland turn Auto steer is automatically engaged once spraying has been switched off (Master off), if the drawbar and sprayer is not in line with tractor when the Master spray switch is turned off it will automatically catch up to the tractor position, and then track at the same angle. When the Master spray switch is turned back on, the drawbar will revert to Lock position the next time it passes the straight ahead position.
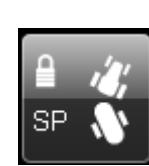
NOTE! When locked in lock/2WS mode, the padlock will close once aligned, when turning with master off, padlock will open to signify the drawbar is active.

NOTE! The above mode operation only works below the "Threshold driving speed for wheel steering self-centering" (setup menu). More information of the setup of this figure and others can be found in later paragraph.

5.2 Headland Assist (optional)

Headland assist is designed to aid the operator at headland turns in difficult conditions (for example, on uneven terrain or exceptionally tall crops), by lifting the booms to a pre-determined height when the spray Master switch is turned off, and lowering them back down to the original spraying height when spraying is resumed. To engage Headland assist, press the Icon shown, AUTO will be displayed beneath the Icon. When the Spray Master switch is Off, lift the booms to the desired height for turning, when the Master spray is switched On, lower the booms to the desired spray height, the Headland assist is now set. Each time the Spray Master switch is turned On, the booms will lower to the pre-determined height and each time the Spray Master switch is turned Off, the booms will lift to the pre-determined height.

To adjust Headland assist lift height whilst in operation, when spray Master switch is Off, simply adjust desired height manually using Joystick (or side console operator controls if applicable). The next time the spray Master switch is turned off after spraying, the booms will lift to the new height.

To adjust spray operation height, when spray Master switch is On, simply adjust the spray height manually using operator controls. The next time the spray Master switch is turned On after spraying is stopped the booms will lower to the new height.

NOTE! Headland assist is intended as a headland turn aid and must not be relied upon to ensure booms do not come into contact with the ground, this is the operators responsibility and no measure is in place to avoid boom and ground contact.

NOTE! Spray operation height and headland height will be saved during power-off.

5.3 Ultrasonic boom levelling (optional)

The Ultrasonic boom levelling function operates by sensing the distance between the ground/crop canopy, and the spray boom using Ultrasonic sensors. In order to activate boom levelling, the Boom level icon must be pressed on screen until AUTO appears, signifying automatic levelling is active. The distance in metres, of the spray nozzle from the target (ground or crop canopy), will be displayed beneath the Boom level icon in order for the operator to lower/raise the boom to the desired height from the target. Several options of boom levelling are available i.e. Ultrasonic boom tilt control, to fully independent boom height control, setup instructions for all options are detailed in the separate Boom levelling Technical setup manual supplied if this option is installed.

5.4 Auto Section Control operations (optional)

The Auto Section Control (ASC) function operates by integrating to an external control device that keeps track of GPS positions and calculates desired status of Master spray valve and the respective section valves. In order to activate auto section control functionality, the ASC icon must be pressed on screen until AUTO appears, signifying automatic section control from the

external device is active. Please note that it is generally made possible to "overrule" the external input i.e manually deciding that certain sections should be dis-engaged at all times, this will be displayed with colours on the boom section icons at the bottom of the spray screen as outlined in a later chapter regarding Section control.

In order to disengage the ASC functionality, the ASC icon must be pressed on screen until MAN appears.

Several options of external ASC-controllers could be made available and setup instructions for these options are detailed in the separate "External Spray Information setup" found in the User setup chapter.

5.5 Joystick operations overview (optional)

By pressing the joystick operations overview symbol the currently active functions on the joystick will be highlighted in a pop-up display as shown below.

Number	Joystick reference position
1	Joystick movement upwards
2	Joystick movement top right corner
3	Twist joystick knob clock-wise
4	Joystick movement horizontal right
5	Top Right buttom on joystick knob
6	Joystick movement buttom right corner
7	Joystick movement downwards
8	Joystick movement buttom left corner
9	Top Left buttom on joystick knob
10	Joystick movement horizontal left
11	Twist joystick knob anti clock-wise
12	Joystick movement top left corner
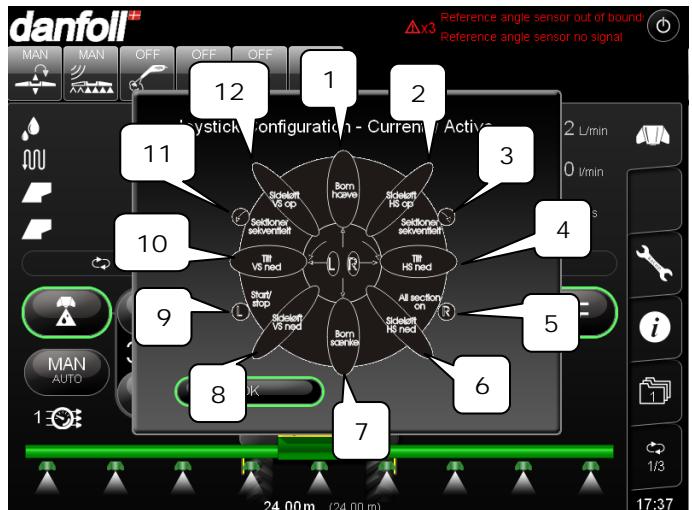
By pressing the (OK) button the highlighted functionality overview will disappear again.

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6. Spray control screen

To select 'Spray control Mode', press the Nozzle symbol on the right hand side of the screen.

The spray control screen is structured as follows:

All of the outlined areas of content are explained in further detail in later paragraphs.

Key/Area	Functions and Indications
A	Spray control screen tab
B	Information screens – 3 separate info-screens are provided and the content can be selected by the operator based on pre-defined options
C	Info-screen selector button
D	Spray operations screen with all handling and control of spray control functions
E	Sub-tab selector – This will alter between a select set of pre-defined spray operations screens (number of tabs will be brand and type dependant)
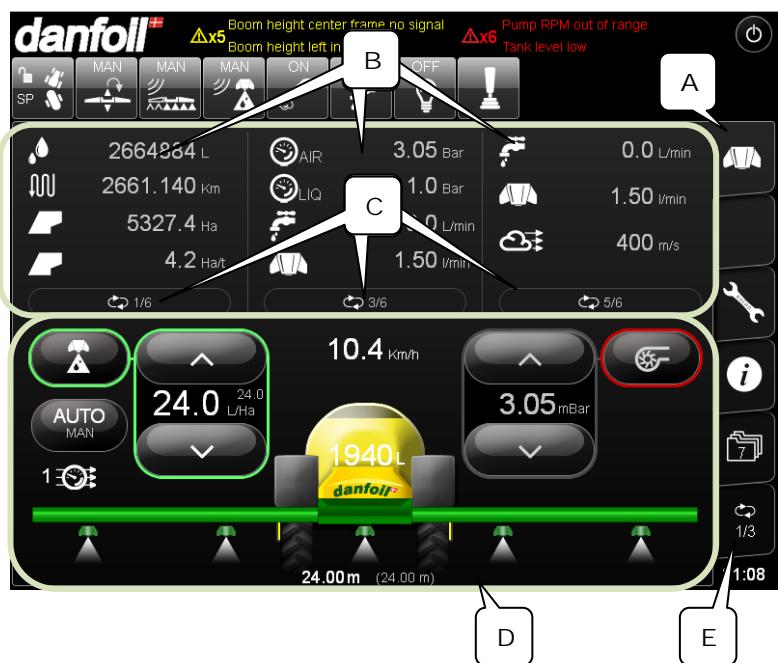
6.1 Overview of information-screen content

All of the outlined areas of content are explained in further detail in later paragraphs.

Info-screen 1

Total volume dispensed on current field/job number (Litres)

Distance travelled on current field/job number (Kilometre)

Total Area sprayed on current field/job number (Hectares)

Average spray speed on current field/job (Ha per hour for last 10 minutes)

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Info-screen 2

⏱D	0:14:56 h:m:s
⏱S	0:05:44 h:m:s
⏱TOT	0:00:00 h:m:s
🔁 2/6	

Total driving time on current field/job number

Total spraying time on current field/job number

Stop Watch time on current field/job number – The stop watch time can be started/stopped by pressing the symbol. When the stop watch time is running the icon will be flashing.

Info-screen 3

AIR	- mBar
LIQ	0.0 Bar
🚰	0.0 L/min
	0 l/min
🔁 3/6	

Current Air pressure

Current Spray line pressure (not currently used by Danfoil)*

Total flow/output to the boom

Spray line selected (occasionally no number if single line sprayer), ISO nozzle is active and current output per nozzle. In some cases hyperlink to nozzle selection menu. (not in use currently on Danfoil sprayers)

* This is calculated if no pressure transducer is fitted and regulating to a flow meter or actual if regulating to a Pressure transducer or one is fitted.

Info-screen 4

💧	919 L
〰	2.421 Km
⏱	0:00:00 h:m:s
▱	2.3 Ha
🔁 4/6	

Total volume dispensed on current field/job number (Litres)

Distance travelled on current field/job number (Kilometre)

Stop Watch time on current field/job number

Total Area sprayed on current field/job number (Hectares)

Info-screen 5

🚰	148.2 L/min
	0 l/min
☁	0 m/s
🔁 5/6	

Total flow/output to the boom

Spray line selected, ISO nozzle is active and current output per nozzle (not currently used by Danfoil.

Current wind speed from wind speed sensor (Optional)

Info-screen 6 – Only used for Direct Chemical Injection
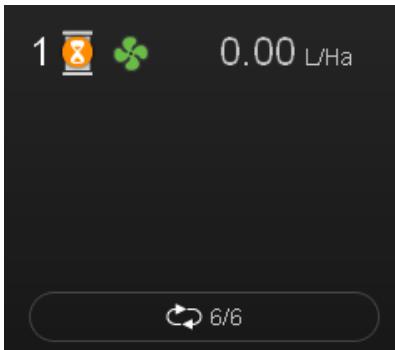
	Chemical tank number, chemical injection spray status, agitator status and direct chemical injection application rate
	This is to be described in further detail under the paragraph Direct Chemical Injection.

6.2 Spray Operation screen – 1 Spray Product and Air

Spray mode functions and indications (please see illustration below):

| ID	Description	ID	Description
A	Regulation principle icon: Flow meter 1, Flow meter 2 or pressure transducer	I	Start/stop of Air turbine
B	MANual or AUTOmatic sprayer regulation icon	J	Total sprayer boom width
C	Master Spray On/Off Icon – Rim of Icon is Green when Current and Target application rate is in line. Rim of Icon is Red when Current application rate is not equal to Target application rate in Automatic spray mode.	K	Actual spray boom width (boom width is displayed in red when actual boom width does not match total sprayer boom width)
D	Current/Target application rate (target rate is displayed in red when in Auto and Master switch is off)	L	Spray sections status (see later paragraph)
E	Up and Down arrows manually raise or lower regulation pressure by incremental steps that are added to application rate in AUTOmatic regulation. Arrows used to adjust spray pressure in MANual mode.	M	
F	Forward speed (actual or simulated)	N	
G	Current tank contents. Either based on tank level sensor (if applied) or subtraction of spray volume from initial tank content	O	
H	Up and Down arrows manually raise or lower Air pressure. Value expresses pressure in mBar is regulated to hold constant pressure	P	
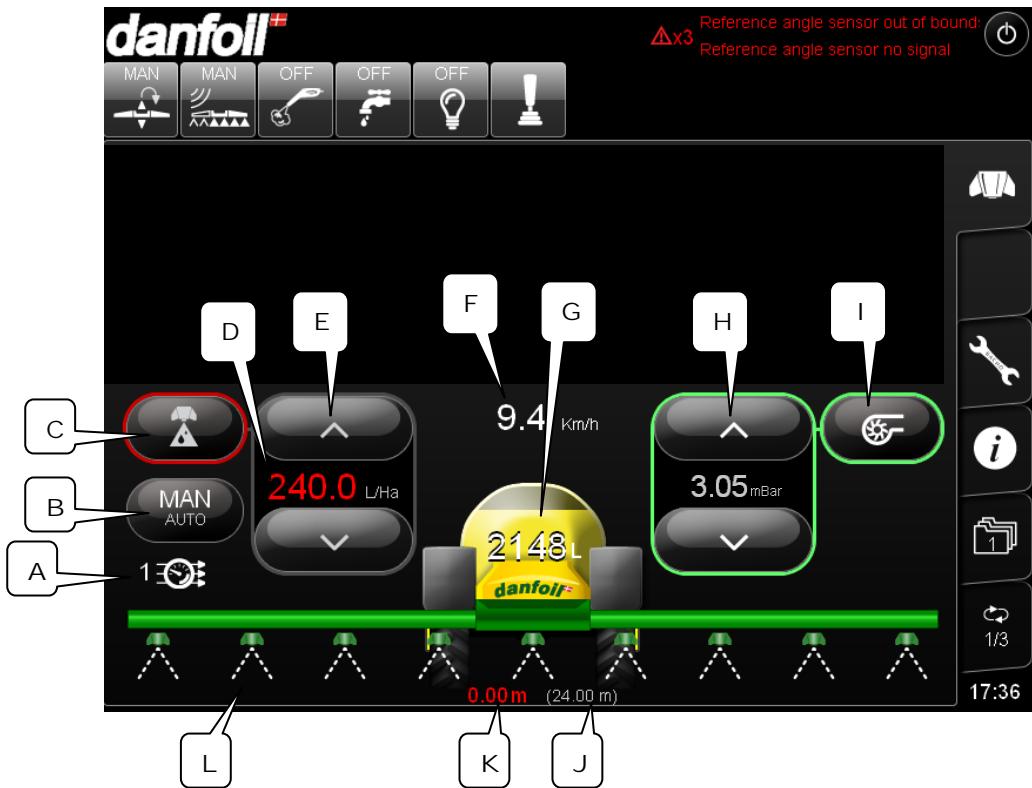
6.3 Regulation

Auto regulation:

Automatic regulation to a pre-set application rate can be achieved by selecting AUTO on the PC-Spray controller terminal, this will toggle between Auto and Manual regulation. When AUTO regulation is selected pressing the UP or Down arrows on screen raises or lowers the application rate by standard incremental steps respectively (typically +/- 10%).

Manual regulation:

Manual regulation allows the operator to manually over-ride the Automatic regulation. This can be used to calibrate or setup the PC-Spray controller Terminal or in specific applications where Automatic regulation is not required. By pressing the UP and DOWN arrows when in Manual regulation the regulation valve is manually raised or lowered for as long as the arrows are pressed.

NOTE! When regulating in AUTO, a coloured icon rim will appear around the Master spray icon, this will be Red to signify current application is off target until current application regulates inside a (usually3%) dead-band where it will turn green to signify on target application rate at a glance.

6.4 Application rate

Adjusting current application rate:

To enter the desired application rate you wish to apply in L/Ha, press the Application rate display (**A**) and type in desired application rate using the "pop-up" keypad.

NOTE! The current desired application rate will be displayed each time the master spray switch is off and AUTO regulation is active, as soon as the Master switch is turned back on the current application rate will be displayed.

NOTE! When MAN regulation is selected dose rate will read 0 L/Ha in green when master is off as no application rate will be automatically regulated to.

6.5 Spray sections controls and selected hydraulic functions (joystick control)

6.5.1 Danfoil SC Joystick – ConCorde and AirBoss v 1

Description of the overall switch configurations and functions on the joystick is outlined below.

Number	Function
1A	Boom folding mode
1B	Spray mode
2A	Fold mode – Rigth only
2B	Fold mode – Both sides
2C	Fold mode – Left only
3A (Only on ConCorde)	Track control - Lock
3B (Only on ConCorde)	Track control - Man
3C (Only on ConCorde)	Track control - Auto
4A (Only on ConCorde)	Outer fold out (on triple fold boom)
4B (Only on ConCorde)	Outer fold in (on triple fold boom)
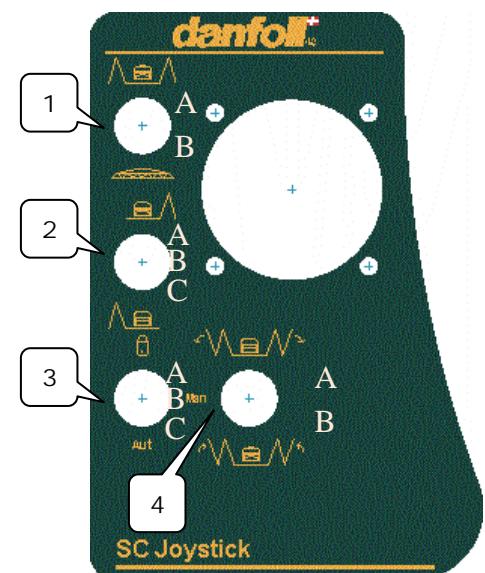
The joystick functionality is mainly dependent on the position of the main mode switch (1).

An overall schematic of the joystick functionalities is enclosed below.

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Joystick konfiguration Version 2

Bom hæve

Track Left (II)* Track Right (II)*

Inder VS ind | Inder Fælles ind | Inder HS ind | Inder HS ud | Inder Fælles ud | Inder VS ud

Mellem HS ind | Mellem HS ud

Mellem Fælles ind | Mellem Fælles ud

Mellem VS ind | Mellem VS ud

Bom sænke

Switchforklaring

(A) Hoved-switch (B)

Valg af funktion (mode 2) ① ② (II) MAN ③ AUTO

Valg af funktion (mode 1) ① Højre ② Fælles ③ Venstre

* Ved I/III ingen joystick funktion

Joystick konfiguration Version 2

Bom hæve

Sektioner sekv. | Sideløft VS op | Sideløft HS op | Sektioner sekv.

Track left | Track right

Sektioner sekv. | Sektioner sekv.

Tilt VS ned | Tilt HS ned

Start/stop | All section on

Sideløft VS ned | Sideløft HS ned

Bom sænke

Switchforklaring

(A) Hoved-switch (B)

Valg af funktion (mode 2) ① => Sektioner sekvens (II) MAN =>Track (III) AUTO =>Sektioner Sekvens

The master spray control can be switched on/off either by pressing the top left button on the joystick knob (when switch 1 is in spray mode) or Master On/Off button on the screen.

Spray sections can be switched On/Off individually on the joystick and also on screen.

Sequential sections:

This Joystick control allows the operator to sequentially switch off the sections from left to right (turning joystick knob clock-wise in spray mode and track control switch 3 NOT IN CENTER POSITION) or right to left (turning joystick knob anti clock-wise in spray mode and track control switch 3 NOT IN CENTER POSITION). It is also possible to reset all sections to be active if some sections have been turned off whilst spraying or when Master is off (top right button on the joystick knob when in switch 1 is in spray mode). This option of joystick section control is ideal if using more than 6 sections and most work allows sequential switching.

NOTE! This option allows the operator to switch off any section by pressing the icon on screen as the joystick control is only momentary.

NOTE! This option also allows individual manual incline hydraulic control switches on the joystick as less switch positions are used.

Active spray sections are symbolized by the following icons:

Green nozzles/dottet spray signifies sections that are active (turned on) but the Master Switch is turned off (not currently spraying).

Green nozzles/full spray signify sections that are active and the master is turned on (sections are spraying).

Red nozzles/No spray signify sections that are turned off by the operator (sections cannot spray regardless of Master switch and GPS Auto Section Controller input).

Orange nozzles/No spray signify sections that are turned on by the operator but temporarily turned off by the external Auto Section controller (sections are not spraying).

6.6 Tank filling

To enter the Spray tank volume, press the Spray Operation tab selector on the main spray screen (**A**), the screen to right will be shown. All tank capacity related functions are described below:

ID	Description
A	Spray operation tab selector
B	Fill button key
C	Tank level icon
D	Numerical tank volume readout
E	Tank volume entry key
F	Set volume key
G	Empty tank key
H	Auto fill start/stop key (option)
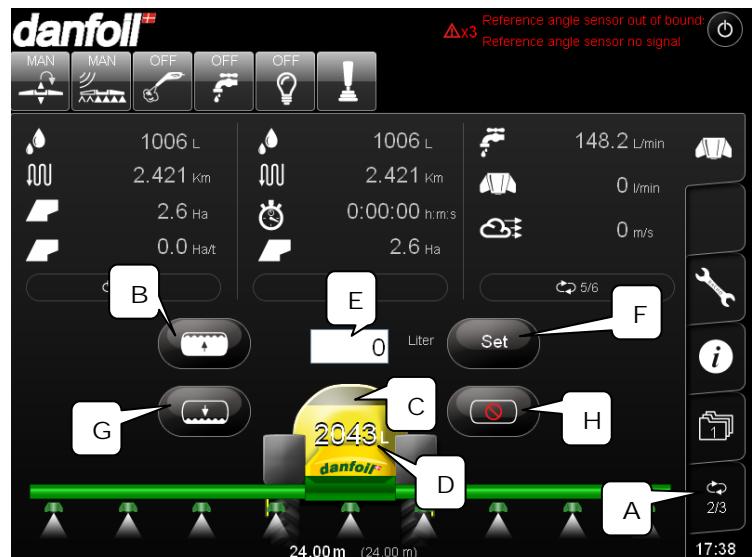
6.6.1 Manual tank filling

To manually fill the PC-Spray Controller tank volume press the [FILL] icon (**B**) the Tank Fill Level icon (**C**) will be filled to the maximum capacity preset and the tank contents (**D**) will also read maximum capacity (i.e. 3000L).

Set volume:
The Set feature allows the volume of liquid in the tank to be set to a specific quantity (i.e. when filling a part tank).
To enter a part volume, press the entry box (**E**) and enter part volume using the pop-up keypad that appears, press the Enter key to enter part volume and then [SET] (**F**) to set the tank icon and volume in the PC-Spray Controller terminal.

Empty:
By pressing the [EMPTY] icon (**G**) the tank icon empties and the numerical volume will go to zero, this will clear remaining contents.

6.6.2 *Auto-fill (Optional)*

The Auto fill feature allows a quantity of liquid to be pre-selected, and then automatically added to the sprayer tank without operator intervention.

Press [EMPTY] to start from 0 L (not if you intend to add to existing volume).
Type '2000' in the entry box (**E**) by pressing entry box and using the "pop-up" keypad.

Connect suction pipes to sprayer and open all taps/valves as required before Auto-filling.

Press the Red [AUTO FILL STOPPED] (**H**) button (the button will change to Grey and will display GREEN ARROW or ORANGE HOURGLASS depending on whether filling can be directly initiated).

When the pre-set volume is achieved, the sprayer will turn off the infill valve. Turn off all taps and disconnect suction pipe work.

The machine is filled to the desired volume and ready for work.

NOTE! For instructions on how to calibrate filling flow meter see Technical machine setup section of this manual.

NOTE! To add a volume to an existing part tank the desired tank volume must be entered, not the desired additional amount, i.e. to fill to 2300L with an existing 2000L tank volume key in 2300L not 300L

7. Direct Chemical Injection (DCI) – Only on applicable machines

On sprayers mounted with Direct Chemical Injection equipment and were this has been verified/approved in the relevant setup menu a couple of extensions to the standard spray operation screen will be added.

7.1 Overview - DCI

The DCI features are accessed similarly to the standard spray screen by pressing the Nozzle symbol on the right hand side of the screen.

The spray control screen including DCI is then structured as follows:

All of the outlined areas of content are explained in further detail in later paragraphs.

| Key/Area	Functions and Indications
A	Standard Spray control screen used during spray operations. All main control features still present here.
B	Main DCI operations screens – 1 or 2 (depending on number of pumps fitted) separate DCI info-screens are added/provided. These are used for control of main specific DCI functions.
C	An extra sub-tab selector menu is added for DCI purposes. This typically covers all fill, empty, and cleaning operations used for out of field operations
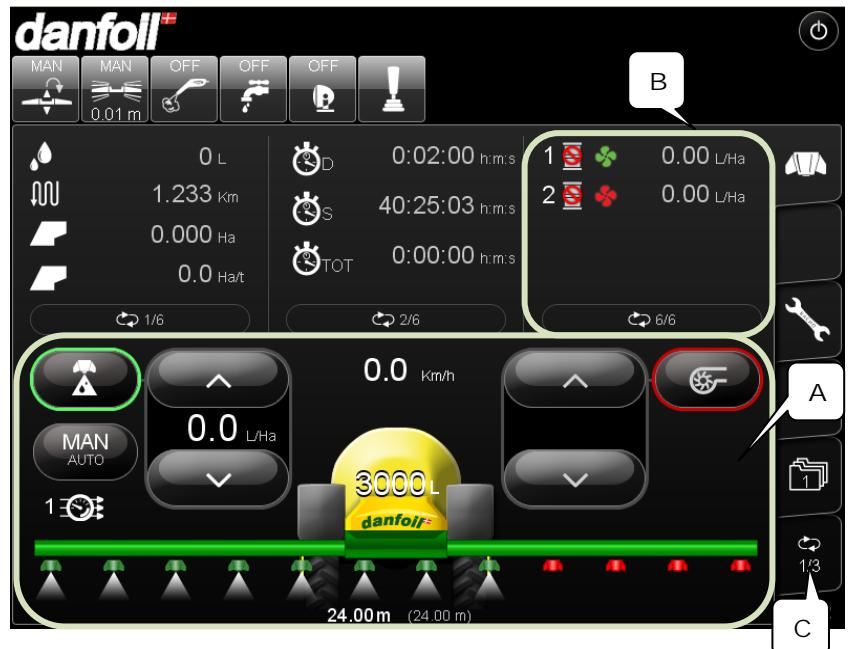
7.2 DCI Main operations

All main DCI operations for in-field use are handled via the added info-screen.

The information contents in the screen are as follows:

Key/Area	Functions and Indications
A	DCI Pump number
B	DCI pump status: ⬇ Pump activated and spraying ⌛ Pump activated but not spraying 🚫 Pump de-activated
C	Agitator status: (if relevant) 🌀 Agitator activated 🌀 Agitator de-activated
D	Application rate statement: - Current rate in WHITE writing - Target rate in RED writing
E	Unit of measurement
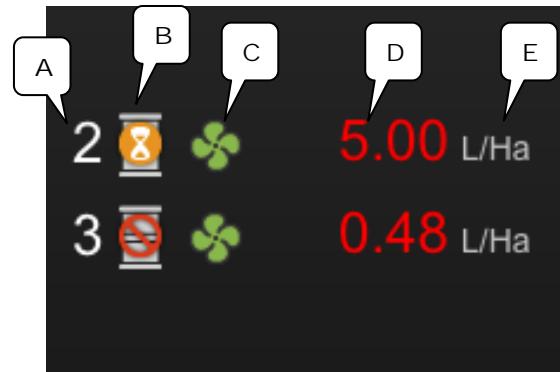
NOTE: The yellow/orange hour-glass is typically displayed when a pump is activated but not spraying due to the Master spray valve being turned off.

The content in the screen can be operated as follows (dotted line indicating Touch areas of the screen):

Key/Area	Functions and Indications
A	Press this area to change pump status from active to non-active or vice versa (this area is allocated per pump)
B	Press this area to change the target application rate via the pop-up calculator - same principle as for main spray operations. (this area is allocated per pump)
C	Press the entire area to the right of the DCI info-screen to perform a quick adjustment of the target rate (please see screen dump below)
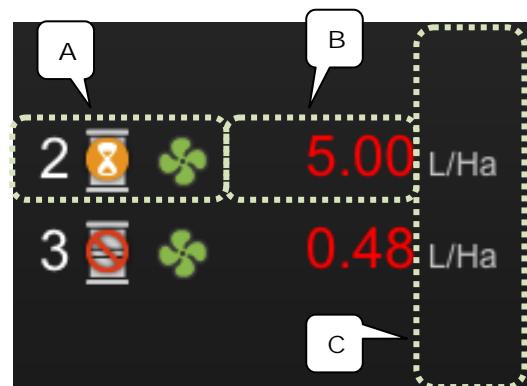
When activating the Quick rate adjustment feature (C) the following screen will appear until [OK] is pressed. Please note that ALL pumps can be adjusted from this "Quick adjustment" screen.

| Key/Area	Functions and Indications
A	Pump number
B	Default target application rate (L/Ha)
C	Adjusted target application rate (L/Ha) – This is based on the default target rate and the correction factor outlined in [E]
D	Keys for quick adjustment of the correction factor i.e. the adjusted target application rate
E	Correction factor – this is added/sub-tracted from the default target rate
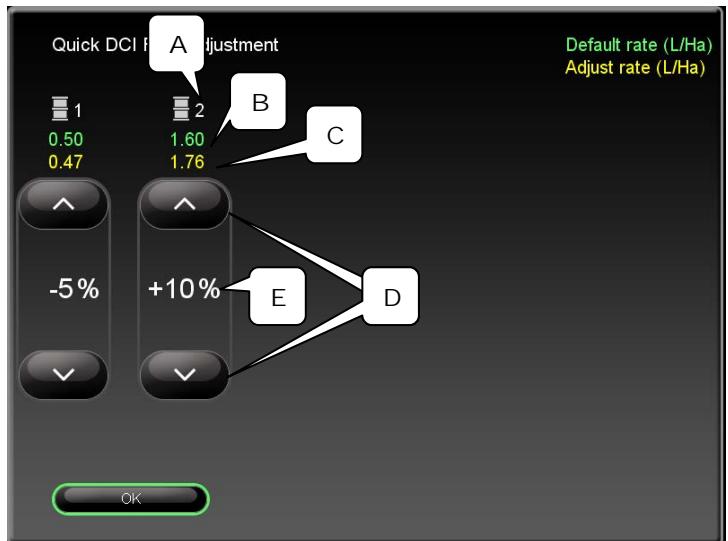
7.3 DCI Fill/empty/cleaning operations

The DCI fill/empty/cleaning operations screen is accessed by pressing the sub-tab selector (in Spray screen mode) a number of times until the DCI Fill/Empty screen appear.

Please note that the necessary pipes, hoses and electrical connections should be in correct place to enable the different functions. Please ask a Danfoil Sales/Service engineer for specific mounting instructions on mechanical and electrical parts to support full range of DCI functionalities.

The DCI Fill/empty/cleaning screen is then structured as follows:

Key/Area	Functions and Indications
A	Pump number
B	Pump status – can only be changed on main operation DCI screen
C	DCI Tank content – Press number to enter new filled or emptied tank level via pop-up calculator
D	Press to start/stop agitator (if mounted) – Current status is displayed inside button and in DCI info-screen
E	Start priming chemical into the hoses and mixing chamber from selected pump/tank
F	Start reverse priming in order to return chemicals from system to DCI tank
G	Rinse with clean water
H	Activates a cleaning sequence consisting of clean water rinse, soap rinse and then clean water rinse again
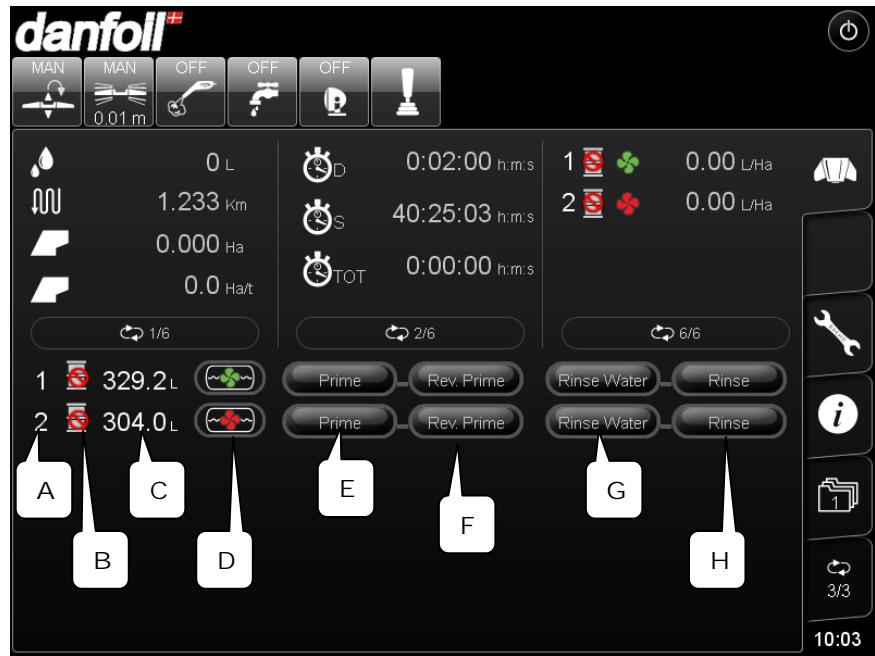
*NOTE! Selected helping texts and messages are displayed in the info-screen to assist the operator in correct usage.*

NOTE! Before priming is initiated the boom should be open to allow the liquid to get out. In case this is not adhered to the pressure in the system will result in pipes/hoses bursting or disconnecting.

8. Help menu

By pressing the 'Help' Icon, any applicable Operators manuals and trouble-shooting pages should be viewable to aid machine setup/fault diagnosis. This also includes selected video instructions in case these are supplied for the sprayer brand in question.

Number and content of help files is variable and could easily divert from the enclosed screen shot.

The remote support function is not yet enabled.

9. Job menu

To enter the 'JOB MENU' screen, press the File Record icon (**A**) at the screen tabs on the right side of the screen. The current status or field/job number is written in the File Record icon.

9.1 Job menu – Standard version

The controller is capable of storing up to 19 separate jobs (fields), and recording Total Area, Total Volume Dispensed, Distance Travelled, Driving and Spraying Time.

NOTE! Job number 0 is selectable as 'read-only' and displays the totals for the machine, these figures cannot be reset like job numbers 1-19) and hence will show the total sprayed volume or area covered by the machine in its lifetime.

To select a new job number, press the entry box (**B**) and type in new job number using the pop-up keypad.

To reset existing data in the job number, select job number required as explained above, press the green Reset Job Data button (**C**) to delete all data stored, a prompt will ask you to confirm reset and then data will be reset to zero. Data stored for each field/job includes total area actually sprayed, total litres sprayed out, the distance travelled in total for the job, time the sprayer was driving without spraying (transport) and the time taken to complete the spraying task.
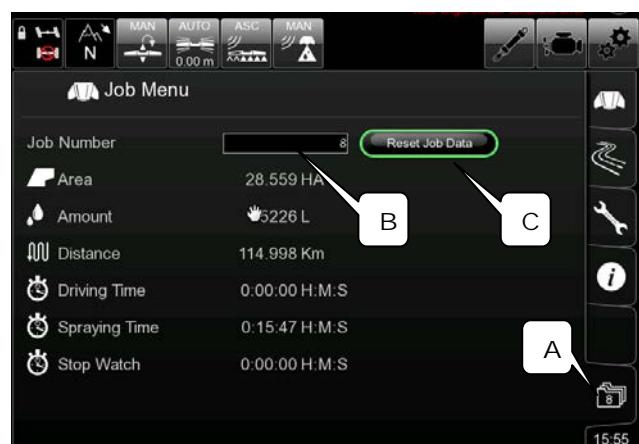
9.2 Job menu – Extended job database (option on selected models)

On selected models the controller is made capable of full database functionalities. This includes possibility to include more jobs, adding text strings and descriptions to all jobs and perform search queries on all parameters including specific chemicals, fields and/or time periods.

In order to use the extended job database functionalities this should be un-locked by an authorized Danfoil engineer in the tech setup menu.

NOTE! Job number 0 is still selectable as 'read-only' and displays the totals for the machine and hence will show the total sprayed volume or area covered by the machine in its lifetime.

9.2.1 Job database preparation – Entering source data

The job database CANNOT be used and jobs handled before source data has been created in the different data categories supported by the database. The data categories are:

Category	Description
Fields	In this category the different fields that the sprayer operates on can be uniquely named for future reference
Chemicals	In this category the different chemicals (and potentially concentrations of chemicals) used for spraying can be entered for general documentation purposes and to allow detailed data analysis.
Customers	In this category the different customers/owners that are serviced by the sprayer can be entered for general documentation purposes and to allow data analysis per customer/owner (primarily for contractors)
Operators	In this category the different operators of the sprayer can be entered for general documentation purposes and to allow data analysis per operator.
Machines	In this category the different machines which use the PC console can be entered for general documentation purposes and to allow data analysis per machine (data analysis to be added later). In most cases just the primary machine will be added in this category

PLEASE NOTE: The data content can at all times be supplemented by new data but submitted data in the different categories CANNOT be deleted after confirmation, hence please keep data entry simple and well-structured in order to ease data search afterwards.

Entering source data is done via the User setup menu called "Job Database Setup" which is dedicated to source data entry.

Source data can be entered by following the steps below:

1. Press the appropriate entry box, a pop-up keyboard will appear
2. The keyboard can be moved around on the display by holding a finger on the keyboard - *not touching keys* – and then moving the keyboard to the best suitable position. E.g. press at the buttom of the keyboard, under the "Space"-key
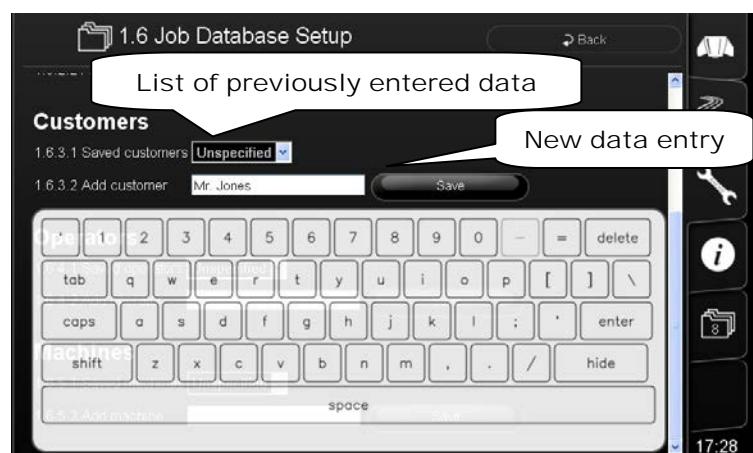
3. Type the text string wanted for the corresponding entry field
4. Press [ENTER] and the keyboard will disappear again
5. PLEASE CHECK THAT DATA IS CORRECT: Submitted data in the different categories CANNOT be deleted after confirmation, hence please keep data entry simple and well-structured in order to ease data search afterwards
6. Press [Save] to add the data entry to the database. In case [Save] IS NOT pressed the data entry will not be saved in the database for future reference

NOTE: Please add data to all relevant categories before first job creation.

9.2.2 Create new job

To create a new job to allocate data to the following steps should be followed:

1. Press the File Record icon (A) at the screen tabs on the right side of the screen to enter the "Job Menu"
2. Press the [Create New Job] button (B) at the top
3. Define the job parameters by choosing from the lists of source data in each entry category (C). It IS NOT strictly necessary to fill out all categories for a given job, but please be aware that parameters left blank cannot be used for future search queries
4. In the category "Description" a "free" text can be added to the specific job
5. Enter chemical for the main tank and direct chemical injection tanks (if applicable) (E)
6. Press [Create job] to add the job entry to the database. Press [Cancel] if the job entry should not be saved in the database for future reference

PLEASE NOTE: The submitted data in the different categories CANNOT be altered/deleted after confirmation, hence please check data before confirming.

PLEASE NOTE: From the time of confirmation this job will be used to log data including distance driven without spraying. In case data is not meant to be logged immediately after job confirmation, please postpone job creation, activate an old job immediately after new job creation or change to "Waste"-job (please see later paragraph on this).

9.2.3 End activated job (activate "Waste"-job)

An activated job can only be ended in two ways:
1. By creating a new job (see earlier paragraph)
2. Re-activate an old job after a job search (see later paragraph)
3. Activate the "Waste"-job by pressing the Red Waste-button. "Wst" will be written in the File record tab instead of a job number.

The "Waste"-job is a sort of miscellaneous job that could be used in periods where data entry is not wanted under any of the regular jobs i.e. work and time for contractors not directly billable to end-customers.
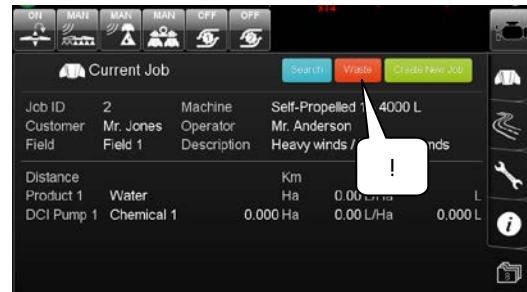
9.2.4 Re-activate previous job

To re-activate a previous job the following steps should be followed:

1. Press the File Record icon (A) at the screen tabs on the right side of the screen to enter the "Job Menu"
2. Press the [Search] button (B) at the top of the Current job menu
3. Enter/choose the search criteria that define the job that should be re-activated. It is not necessary to fill out all categories for a given job search
4. Press the green [Direct] button (D) at the top of the search menu that will initiate a direct search query in the database
5. Use the [<] and [>] arrows to choose between the identified jobs that fulfilled the search criteria (E)
6. Press [Activate] to start logging data in the database on the old/previous job.
7. Some versions of the jobdatabase will prompt for a reconfiguration of chemicals in the tanks
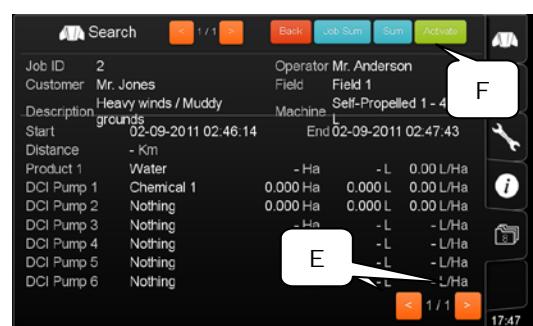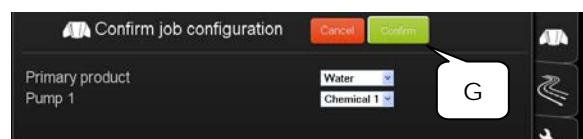
9.2.5 Job Search

The Job Search has two different types of search queries: 1) Direct search and 2) List search. Both search queries starts with:

1. Press the File Record icon (A) at the screen tabs on the right side of the screen to enter the "Job Menu"
2. Press the [Search] button (B) at the top of the Current job menu
3. Enter/choose the search criteria that define the job, documentation or data analysis in question (C). It is not necessary to fill out all categories for a given job search
4. Press the green [Direct] button (D) or the blue [List] button (E) at the top of the search bar for the relevant search option.

PLEASE NOTE: The start and end time MUST be entered, it is optional to use any one of the other parameters as search criteria. In case the actual timing is of no relevance, please just type in a start data in year 2010 and an end date in 2030.
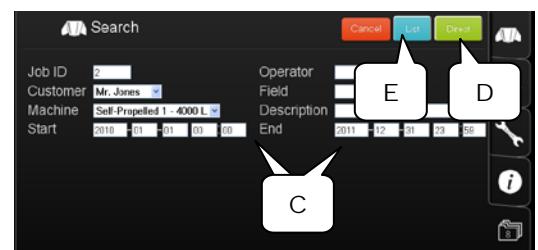
Direct search:
The Direct search option gives a detailed listing of content on all the individual jobs that fulfills the search-criteria. Use the [<] and [>] arrows to choose between the identified jobs that fulfilled the search criteria (F).

Press [Back] (G) to return to the search page.

Press the [Job Sum] button (H) for summarization of logged data on the JobID displayed
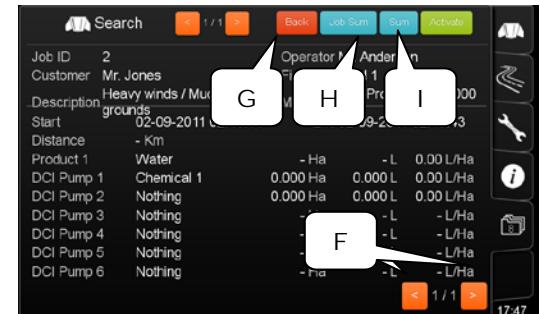
Press the [Sum] button (I) for for summarization of the logged data across all the identified JobIDs during the search process.

List search:
The List search option gives a simplified overview of the jobs that fulfills the search-criteria.

Press the tick-box next to the relevant jobs that should be summarized in the following step (J). Multiple tick-boxes can be activated.

Press [Total] button (K) to summarize data on the selected jobs.
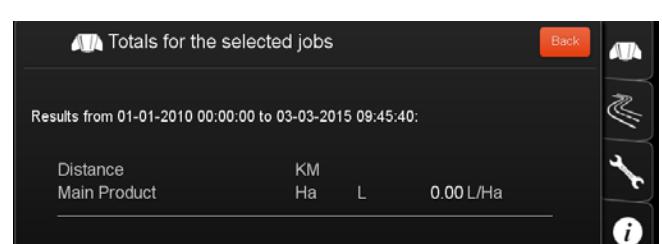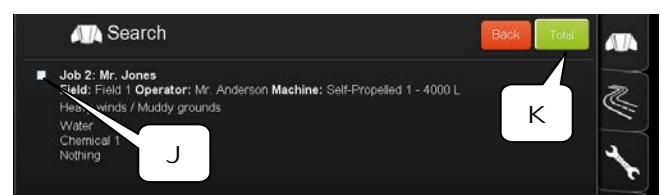
Totals include distance driven without spraying, total hectares and litres for the different products applied and average application rate per product.

9.2.6   *Job Database backup (!)*

The Job Database backup functionality gives the opportunity to save and backup the entire content of the job database.

This is especially important for general backup safety procedures and as part of updating software versions on the PC console in order not to loose previously logged data. A USB thumb-drive is needed for the backup procedure.

The first parameter indicates storage space left on the PC console for job database purposes (A).

In order to back up the extended jobdatabase, please connect the USB Thumb-drive to one of the USB ports on Console and press the "Backup" button (B).

In order to restore an older version of the Database e.g. after a Console software-upgrade, please connect the USB Thumb-drive to the USB port and press the "Restore" button (C).

PLEASE NOTE: In order to prevent data being lost, always backup the Extended jobdatabase before performing software upgrades on the PC Console.

10.   Overview of setup menus

To select the 'Setup menu Mode', press the Wrench symbol on the right hand side of the screen.

The different levels of setup menus are structured as follows:

Key/Area	Functions and Indications
A	The User Setup (or Operator Setup) menu is designed to contain the most frequently adjusted settings by the operator
B	The Machine Setup menu contains setup and calibration settings that should rarely need adjusting once the machine is setup correctly
C	The Tech Setup menu contains more detailed setup procedures and programming screens. This area is password protected and exclusively intended for use by Danfoil engineers
D	The service setup menu contains specialized diagnostic functions exclusively intended for manufacturer engineering personnel only

To select the 'Setup menu Mode', press the Wrench/spanner symbol on the right hand side of the screen.

11.   User setup (Operator Setup) menu

The operator setup menu is designed to contain the most frequently adjusted settings.   More detailed/Technical settings are accessed via the Machine setup menu or by OEM Manufacturer Engineers using coded access.

11.1   Sprayer setup

11.1.1 Wheel constant setup

The controller can store multiple preset wheel factors/constants at any time allowing the operator to select the correct wheel factor for the wheels fitted without having to recalibrate the factor each time.

To select a different wheel type/factor press the drop down arrow next to the wheel selection box and highlight the desired wheels type.

To enter a wheel factor/constant (distance travelled per wheel pulse received) two methods can be used:
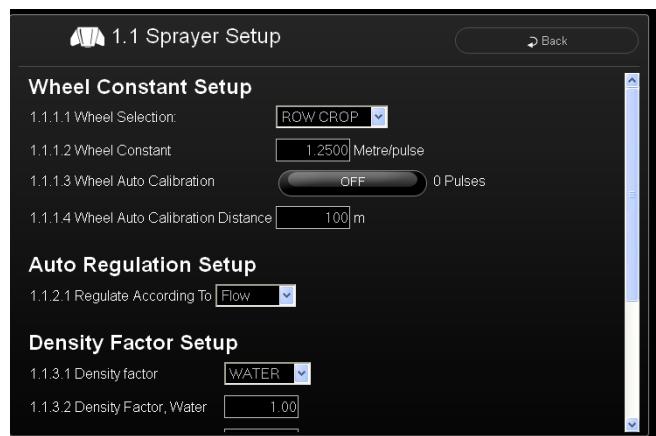
Manual Entry:

A new figure can be manually entered by selecting the wheel factor/constant to be adjusted then pressing the entry box in menu 1.1.1.2 and overtyping in a new figure using the "pop-up" keypad, this figure will be the distance travelled per pulse from the wheel sensor, i.e. distance travelled of one rotation of the wheel divided by the number of magnets fitted to the wheel. A rough estimation can be made by marking the tyre and ground, then driving forward until the wheel completes one revolution, measure the distance travelled along the ground and divide by the number of wheel magnets installed.

*NOTE! This method of entry is inaccurate and must not be relied upon for accurate application/area calculation.*

Automatic Entry:

A new figure can be automatically entered by selecting the wheel factor/constant to be adjusted then pressing the WHEEL AUTO CALIBRATION button. The pulse counter should be reset to 0, then the machine should be driven forward a distance *greater than 100 m and less than 1000 m*, the number of pulses will be counted on the screen as you drive. Enter the distance travelled in metres in the WHEEL AUTO CALIBRATION DISTANCE entry box once you have stopped, press enter and the wheel constant will be automatically calculated.

11.1.2 Auto regulation setup

Regulate according to Flow/Pressure:

The controller is capable of regulating according to pulses received from a Flow meter (Flow based) or signal received from a Pressure transducer (Pressure based). It is possible to install both sensors and choose to regulate according to which method is the most suitable for the current application. To choose to regulate according to Flow meter input or Pressure transducer signal select the drop down box next to the window showing Flow or Press and highlight the method to which you choose to regulate.
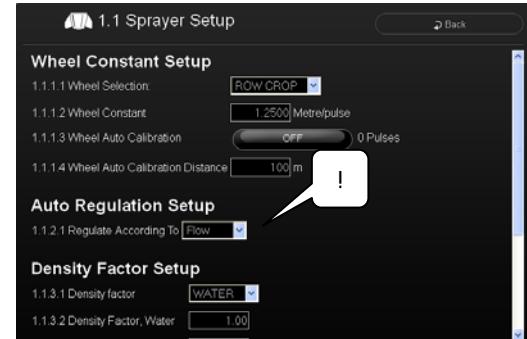
NOTE! An icon will be shown on the spray screen representing a Pressure gauge or flow meter depending on regulation type.

NOTE! The standard regulation method for single line machines is flow meter.

11.1.3 Density factor setup

If the fluid to be applied is other than water the Specific Gravity or Density may be different, affecting the actual flow rate versus measured flow rate, hence affecting the actual machine application rate versus calculated application rate. It is possible to store a different Density factor for the three available products selected by the drop down box, Water, Liquid A and Liquid B. This means a calibration can be made for standard Chemical application (Water) and stored, as well as a different calibration for liquid fertiliser for example (Liquid A) and stored. The operator can quickly choose the pre calculated density factor required for the current spray application by selecting Water, Liquid A or Liquid B.
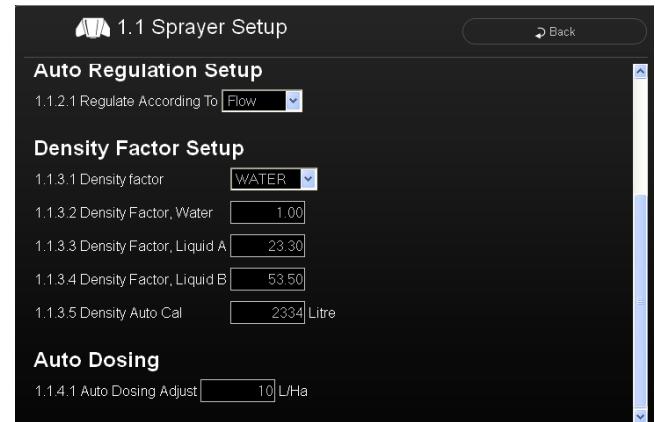
There are two methods in which the operator can adjust the Density factor of the liquid being applied, for example if applying Liquid fertiliser with a known specific gravity/density factor of 1.29 (water being 1.0):

Manual entry:

The known Density factor can be entered manually by pressing the entry box and keying in the new factor using the "pop-up" keypad (i.e. 1.29) for the appropriate liquid.

Density Auto cal:

To automatically calculate the Density factor of the fluid being applied, select the liquid the density factor requires calculating for (Liquid A for example) and fill the tank with a known volume of the liquid i.e. 2000 litres. Press the entry window and reset to 0 using the "pop-up" keypad. Now the liquid can be applied in the usual manner by exiting the menu and using the spray control screen. When the load is dispensed the calculated volume will be shown in the Auto cal window, to adjust the Density factor to that of the current liquid being applied (assuming it is not reading 2000 litres) enter the actual volume dispensed by typing in 2000 litres by pressing the entry window and using the "pop-up" keypad.

The Density factor in the menu should now change to show the calculation has been performed.

NOTE! If no flow has been received or the machine has been recently switched on it is normal for the entry box to display ERROR, press the entry box and type 0 to start counting.

NOTE! The Density factor will apply for Pressure regulation as well as Flow regulation systems.

11.1.4 Auto Dosing setup

When spraying in auto at a set application rate, this rate can be adjusted using the up and down arrows on the spray screen by a fixed incremental application rate. This figure can be set between a fixed minimum value and maximum value that will appear on the key pad when the entry box is activated.

11.2   Controller setup

11.2.1 Sound

The sound level of all audio output (i.e. warnings and when Touch screen operations are performed) can be adjusted in the Volume level entry box by entering a new volume figure. Press the entry box and key in a new figure using the "pop-up" keypad.

NOTE! The maximum volume achievable is 31, 20 is standard.

11.2.2 Product registration

Unit ID:

The unit ID is a unique code for the PC-Spray Controller Terminal, and is used to register the storage media (e.g. Compact Flash card) software to the PC for security.

Status:

The status will show whether the PC-Spray Controller Terminal storage media is currently registered to the console or not.

The storage media data is locked and needs to be registered to the computer in order to operate. The registration code needs to be generated by the Unit ID number and can only be performed by Machine manufacturer.

Reg code:

The Reg Code entry box is used to enter the 14 digit registration code if the unit has been upgraded with new software.

11.2.3 Set time and date

The date and time can be set by pressing the entry boxes and using the "pop-up" keypad.

11.2.4 Touch screen

Calibration:

Although the touch screen will be calibrated before leaving the factory, it may be necessary to recalibrate the screen over time. To calibrate screen press [Calibrate] key and follow on screen instructions, press ok to store calibration and exit back to menu screen.

NOTE! *Depending on the screen installed the calibration procedure may vary, it is recommended this process is performed by an Authorized Danfoil engineer.*
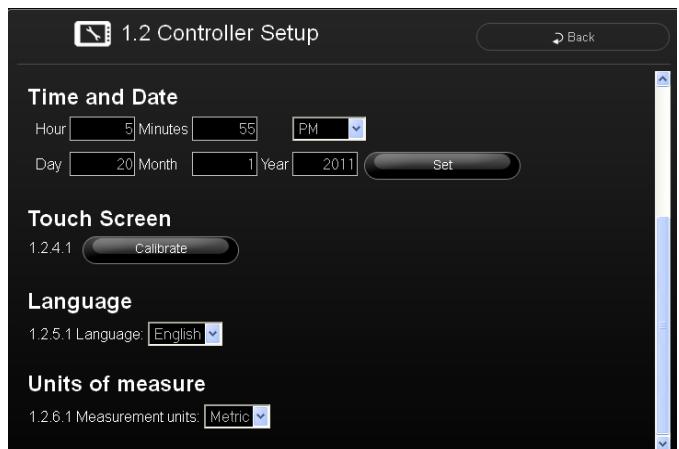
11.2.5 Language

Language selection:

The controller may contain multiple different language options depending on brand and type of implement.

To select a different language press the drop down arrow next to the language selection box and highlight the desired controller language.

11.2.6 Units of measure

The units with which the controller displays information can be changed in this menu by selecting the drop down arrow next to the entry box and highlighting the option required.

11.3 External Spray Information setup

The PC-Spray Controller is prepared to integrate to a selected set of external control units, typically GPS application units. This paragraph is used to define the desired units to integrate to and the communication protocol format for that integration.

11.3.1 Communication protocol setup (COM-port 1)

Communication protocol on COM1:

The controller supports multiple different COM-port protocols; however these may vary by brand and type of sprayer. In case integration to an external control unit (e.g. for Auto Section Control or Variable Rate Application control) is performed via a COM-port it is necessary to define the communication protocol format from the drop down menu list.

Activation of Communication protocol:

This box should have a green tick to activate the communication protocol selected above.
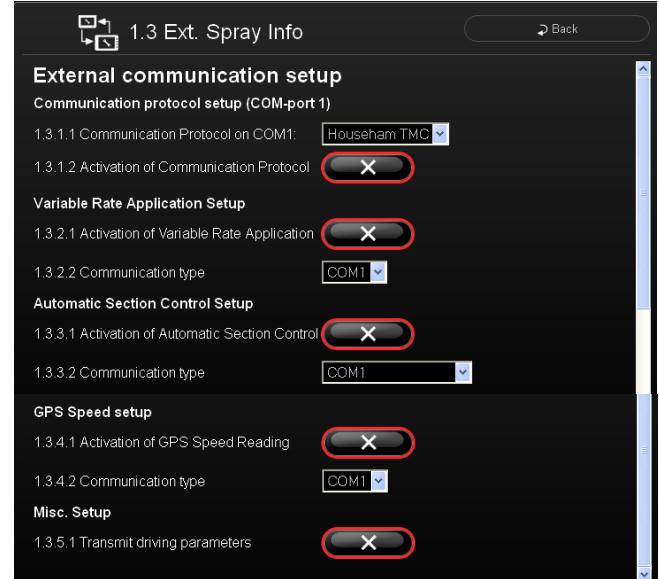
11.3.2 Variable rate application setup

The activation box should be ticked if the machine is set up with a Variable rate application control unit e.g. Field Maps.

Secondly the communication type should be selected from the drop down menu list containing currently supported communication methods and types.

11.3.3 Automatic Section Control setup

The activation box should be ticked if the machine is set up with an Automatic Section control unit e.g. Househam Field Master GPS or Teejet Matrix

Secondly the communication type should be selected from the drop down menu list containing currently supported communication methods and types.

11.3.4 GPS speed setup

The activation box should be ticked if the machine is set up with a unit that can provide a calculated speed signal.

NOTE! *A standard GPS receiver without speed signal calculation cannot be used for providing GPS speed as the controller does not dynamically calculate speed based on GPS signal i.e. only units with a calculated speed signal can be used for this purpose.*

Secondly the communication type should be selected from the drop down menu list containing currently supported communication methods and types.

12. Machine Setup menu

The Machine setup contains setup and calibration settings that should rarely need adjusting once the machine is setup correctly.

12.1 Sprayer setup

12.1.1 Number of spray sections

The number of spray sections on the machine to be controlled is entered here, this setting will alter how many nozzle icons are shown on the touch screen display also.

12.1.2 Working width of sections

The width of the sections selected can be entered in this menu, the total width of the machine will be calculated from these settings and therefore area covered and rate applied.
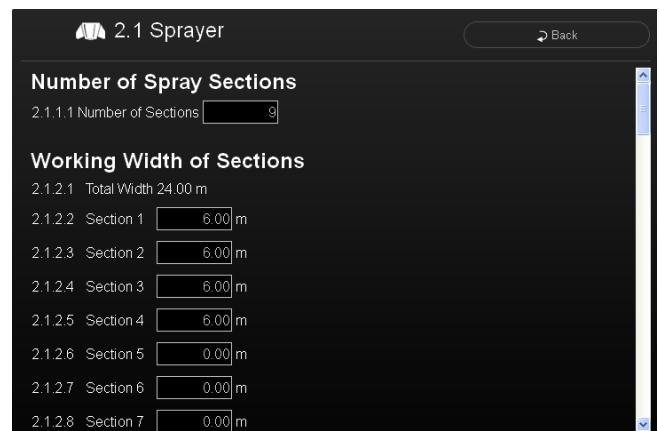
NOTE! When viewing total boom widths, be aware the width displayed is the current boom width active i.e. as displayed on spray screen, therefore only the currently activated sections will be counted not maximum boom width if all sections were to be switched on.

12.1.3 Flow Meter 1 Setup

If installed the flow meter settings can be adjusted in this menu:

The flow meter can be activated by pressing the Red cross/Green tick and scrolling between On/Off.

When the sprayer is operating, the *actual current* recorded flow/min will be shown in the top right of the menu (position of "undefined Litre/min" in attached screen shot).
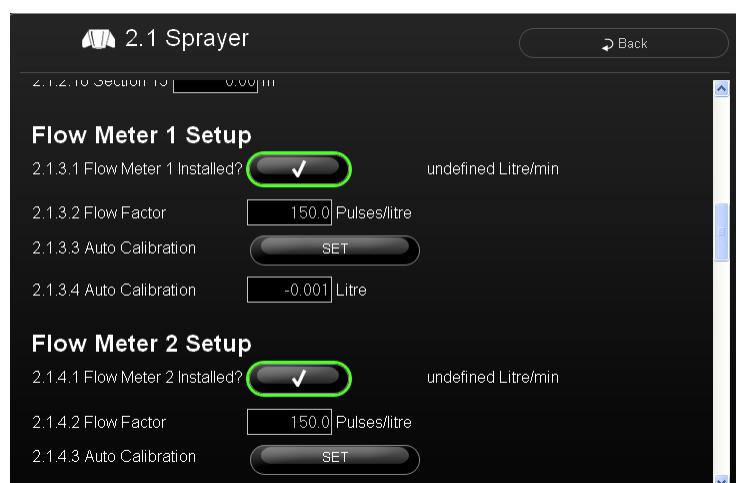
Manual factor entry:

The flow factor/pulses per litre can be manually entered by pressing the entry box and typing in the known factor using the "pop-up" keypad.

The calculation below should be used to calculate and correct the factor manually entered:
(Volume dispensed on spray controller screen / Actual volume dispensed) x flow factor.
(3300 litres on spray controller / 3000 litres (known volume) x 136 ppl = 150 ppl

NOTE! *The ppl (pulse per litre) factor needs to be raised to counter under dosing and lowered to counter overdosing. This method of entering a factor is not accurate and simply allows the operator a close initial starting point before a more accurate Auto calibration is performed*

Auto calibration factor:

The flow factor/pulses per litre can be automatically calculated, to perform an automatic flow meter calibration follow the steps of one of the options below:

Full/part tank output method:

Ensure the tank is empty, then fill the tank with a known volume (at least 200 litres - the greater the volume the greater the accuracy) measured into the tank by weight or accurate calibrated infill meter i.e. 3000 litres).

Enter the Machine sprayer setup menu, Flow meter settings and initiate calibration by pressing [Start calibration] or [Set]. This will reset counted volume to 0.

The contents of the tank (i.e. 3000 litres) can now be sprayed out statically in the yard using a simulated speed in Auto regulation and a suitable application rate, or in Manual regulation at a fixed application pressure or also the Auto calibration can be turned on as described and left running (by pressing sprayer screen icon and exiting the menu) whilst the sprayer is used in the field and adjusted by re-entering the flow factor menu when application has been completed.

The volume counted by the flow meter (using the current flow factor) will be displayed in the window next to the Auto calibration menu as liquid is applied, therefore when all the liquid has been applied (3000 litres) the window theoretically should display very close to 3000. Depending on the accuracy of the flow factor entered and many other factors this may differ from the actual volume known to be distributed.

Assuming the volume applied according to the controller does not correspond to the actual volume known to be distributed, type in the known applied volume (i.e. 3000) in the entry window using the "pop-up" keypad. The flow factor will be automatically adjusted to a new factor to take into account the discrepancy.

NOTE! *It is advised to perform a full or part tank calibration whilst static with a full boom spraying as in field conditions with part boom spraying at headlands etc small inaccuracies of dose/flow rate may affect calculated output.*

12.1.4 Flow Meter 2 Setup

NOTE! There are two flow meter setups (Flow meter 1 and Flow meter 2) these can be setup entirely independently to allow the operator to install two flow meters, wired into separate inputs on the Job computer. This would generally be used for example, if extremely high and low application rates are likely to be required from the same sprayer a small flow meter can be fitted and calibrated to flow meter setup 1 and a large flow meter could be fitted and calibrated to flow meter 2. To independently select flow meter 1 or 2 simply press the installed box so a green tick appears for the desired flow meter or if the system allows both meters can be installed together and the sprayer will regulate to the flow meter pulses are received from when spraying commences.

Setup of Flow factor is identical as Flow meter 1, including Manual entry and Auto calibration methods.

12.1.5 Filling flow meter Setup

If installed, the Filling flow meter factor can be adjusted in this menu:
The filling flow meter can be activated to measure or not by pressing the Red cross/Green tick.

Manual entry:

The Filling flow meter factor can be entered manually by pressing the entry box and using the "pop-up" keypad. The factor for the Flow meter is generally stamped on the meter or can be obtained from the sprayer manufacturer. If the calibration is not correct the following principle should be used to correct the factor:

Volume in-filled on spray controller screen / Actual volume in-filled to sprayer x flow factor.
(3300 litres on spray controller / 3000 litres (known volume) x 96 ppl = 105.6 ppl

In basic the principle below should be adhered to:

If the *calculated* in-filled volume is lower than *actual* in-filled volume the factor should be adjusted lower.
If the *calculated* in-filled volume is greater than *actual* in-filled volume the factor should be adjusted higher.

Automatic calibration:

To automatically calibrate the Infill meter, it is first necessary to pre measure a point in the tank to fill to that is calibrated accurately, and be connected to a clean ample supply of water. To start Auto calibration press [Start calibration] button to reset L counter then select Fill mode on sidepanel if manual ball valves are used and engage PTO once all pipes are connected. The counter will measure the water infilling through the attached water meter and the estimated volume will be shown in the L counter box. If the displayed volume is not the actual volume, overtype the displayed with the actual and the pulses per litre figure will be calculated.

12.1.6 Air Pressure Transducer Setup

If installed, the Pressure Transducer calibration figure settings can be adjusted in this menu:

The Pressure Transducer can be activated to measure or not by pressing the Red cross/Green tick and scrolling between ON/Off.

When the Pressure transducer is installed and the sprayer is running, the actual current in mA received as an input to the controller, along with the measured pressure (based on the current in mA) will be shown in the top right of the menu for diagnostic purposes.

Calibration:
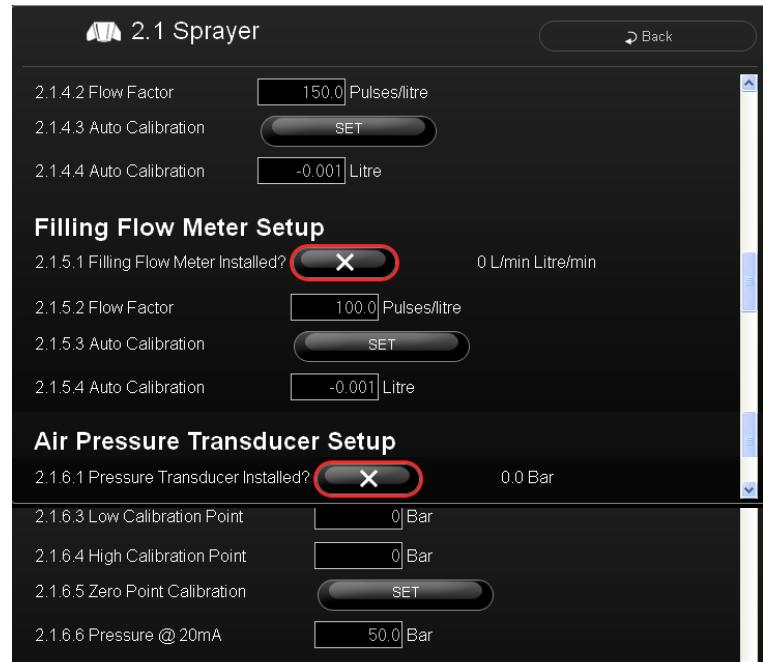
The Pressure Transducer can be calibrated by using two methods.

Calibration method 1: (not currently activated – fixed calibration)

Attach a calibrated line gauge to the Air line to calibrate the transducer to.

Start the Air turbine and manually regulate to a low pressure e.g. 5 mBar according to the calibrated line gauge. Enter the Low calibration point (Actual recorded pressure) by pressing the entry box and using the "pop-up" keypad. (this calibrates the Transducer to display 5 mBar when 5mBar is actually present at the Transducer).

The Air turbine should now be manually regulated to read a high pressure e.g. 30 mBar according to the calibrated line gauge. Enter the High calibration point (Actual recorded pressure) by pressing the entry box and using the "pop-up" keypad. (this calibrates the Transducer to display e.g. 30 mBar when 30 mBar is actually present at the Transducer).

The transducer is now calibrated using a Low and High pressure.

NOTE! *The two calibration points can be other than 5 mBar and 30 mBar, ideally they should be higher and lower than general spraying Air pressures if other than 5 mBar and 30 mBar.*

Calibration method 2: (not currently activated – fixed calibration)

Make sure the Air turbine is not running and the airline is depressurised.

Press the [SET] button next to Zero point calibration, to set transducer 0 point.

Enter the pressure stated by the manufacturer of the transducer at which it will give a 20 mA output in the Pressure @ 20 mA entry box using the "pop-up" keypad.

12.1.7 Tank capacity Setup

Set volume of spray tank:

The volume of the sprayer tank should be entered at machine setup so when [FILL] is pressed in the tank menu the volume the tank is filled to represents the volume of the tank installed on the machine.
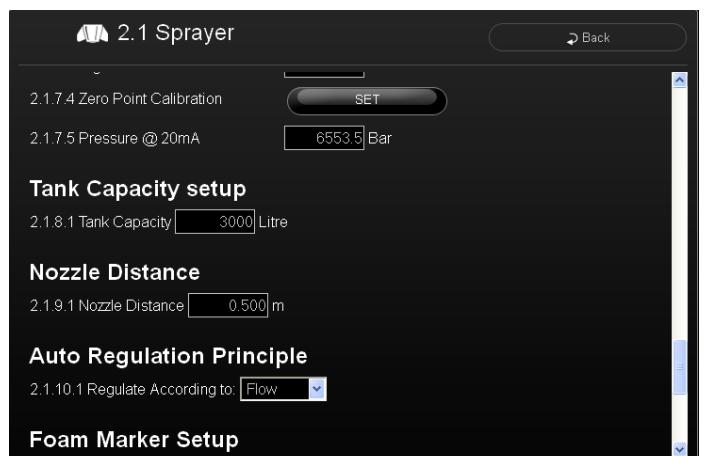
12.1.8 Nozzle distance

The nozzle distance or spacing between nozzles can be entered in this menu, normally this is set to 0.161 metres but if other spacing is used i.e. 0.50 metre or 0.25 metre the value should be entered here to ensure correct application and area counting.

12.1.9 Auto regulation principle

Regulate according to Flow/Pressure:

The principle as to how the sprayer is going to regulate, i.e. According to the flow turbine or pressure transducer (if both or only one is fitted) can be changed in this menu by pressing the drop down arrow next to the entry box and selecting the principle desired.

12.1.10   RPM sensor (not currently activated)

Pulses/rev setting:

The RPM sensor typically measures the PTO rpm for the spray pump, if installed this option can be turned on by pressing the Green tick/Red cross. The pulses per revolution can be entered in the entry box by using the "pop-up" keypad.

12.1.11 Section valves Open/Close with Master

The controller is capable of two section valve control modes (A/B);
A: When the master is turned On/Off all sections are turned On/Off
B: When the Master is turned On/Off all sections are unaffected (often used with some ball valve controlled re-circulating sprayer systems).

12.1.12 Spray Active State (option)

This can either be selected as the master switch where the master switch controls the spraying or the section master valve can be used when using machines fitted with GPS so when all sections are off the master switch is off.

12.2 Boom control setup

12.2.1 Boom Control function (option)

If installed the electronic boom lock and/or boom position sensor can be calibrated and settings can be adjusted in this menu.

Time delay after Manual override:

If the Boom lock is switched on, it can be overridden manually by using the manual boom tilt switches. Once the operator has overridden the Auto Boom lock feature it will re-engage after a set period of time. This figure in seconds can be adjusted by pressing the entry box and using the "pop-up" keypad.
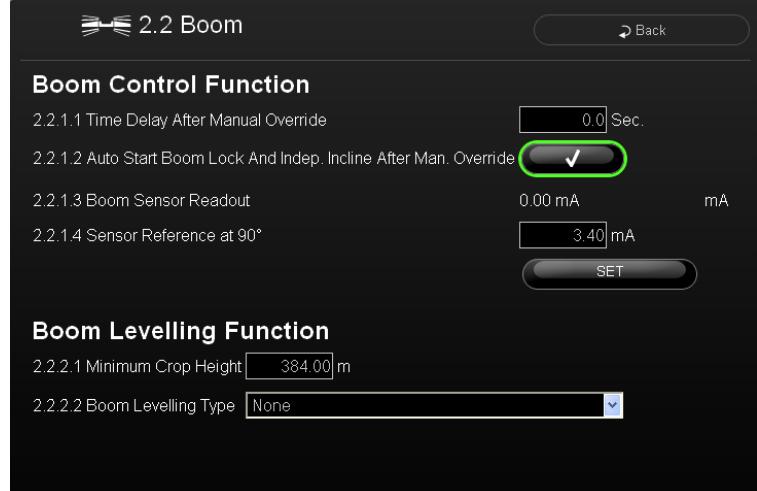
Auto start boom lock and independent incline after override:

If the Boom lock is switched on, it can be overridden manually by using the manual boom tilt switches, the operator can choose whether the boom lock re-engages after manual override by pressing the Red cross/Green tick.

Boom sensor readout:

The 4 – 20 mA angle sensor output can be seen on screen to ensure potentiometer feedback is working correctly.

Sensor reference 90`: (not currently activated on Danfoil sprayers)

To set the Boom lock, ensure the boom is the same height from the ground at each tip when the machine is parked on level ground, the [SET] button should be pressed to save this position as level. This setting is the position the Boom lock will level the boom to automatically when engaged.

12.2.2 Boom Levelling function (option)

Minimum Crop Height:

This figure is used for setting the minimum height the crop is so the boom cannot go below the height entered.

Boom Levelling Type:

This function is used to change the boom levelling type depending upon the size of the boom, how many sensors are attached to the machine and where the sensors are positioned.

For instance, a 12/24meter boom could have one ultrasonic sensor positioned at each end of the boom and a string potentiometer on the centre frame of the boom.
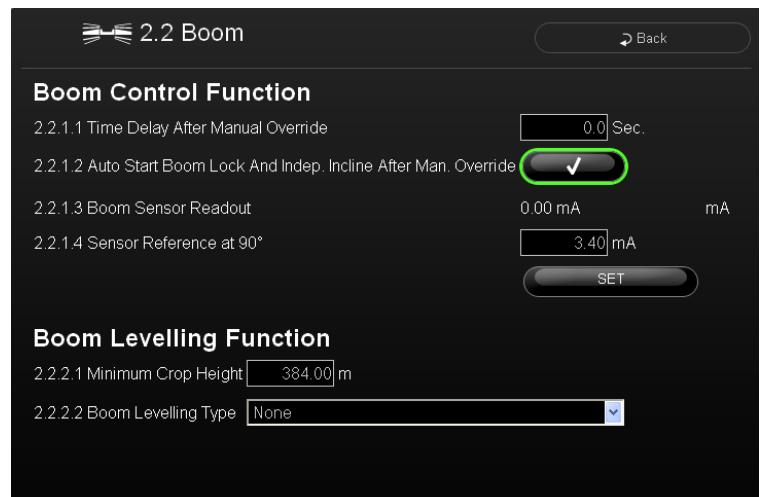
12.3   Track control setup (Option)

The Active Track control (e.g. active wheel/drawbar steering) can be calibrated for alignment by the operator in the event of component replacement or adjustment. All other settings for calibrations etc must be performed by a Sprayer Manufacturer engineer and are code locked for safety.

NOTE! The steering setup needs to be set accurately and correctly to ensure safe operation, care must be undertaken when adjusting figures and calibration setup and steering must be checked for safety off the highway.

If there is any doubt to setup procedure or operation, contact you Danfoil representative for advice.

12.3.1 Track Control activation

On initial start-up, i.e. before active track control is calibrated, the track control will be automatically turned off, to turn on active steering press the Red cross/Green tick.

NOTE! Approximate figures/suggested speeds are default figures and may not necessarily be correct for all machines.
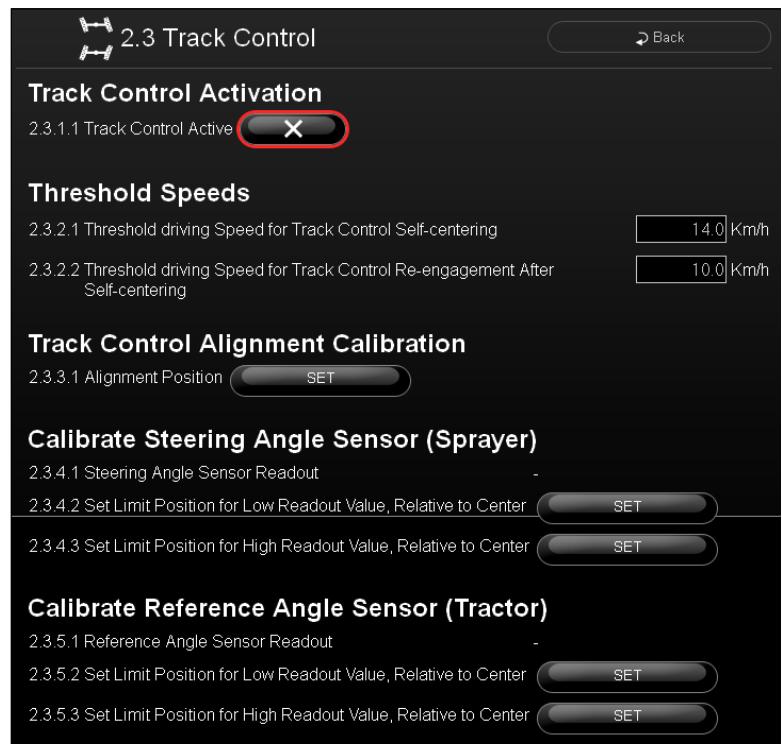
12.3.2 Threshold speeds

Threshold driving speed for track control self-centering: 16 kph

This figure dictates the speed at which the steering (if left in Auto or Auto SP mode) will automatically "lock" into locked straight ahead steering for high speed stability i.e. if the machine is in auto mode and the driver exits the field, once the machine reaches this speed (16 kph) the next time the axle/drawbar passes centre position the drawbar steering will be de-activated for high speed stability.

Threshold driving speed for track control re-engage after self-centering: 10 kph

This figure dictates the speed at which the steering (if left in Auto or Auto SP mode) will automatically re-engage and "catch up" when decelerating after exceeding the self centre speed. i.e. if the machine is in Auto mode and the driver exits the field, once the machine reaches the self centre speed (16 kph) the next time the drawbar passes centre position the rear steering will be de-activated for high speed stability. When the speed drops below the re-engage speed (10 kph) an audible beep will be heard from the controller and the rear steering will re-engage and "catch up".

Rear Steer Catch-Up Speed: (Option)

This figure dictates the percentage catch-up of the rear wheels in relation to the front wheels when changing steering mode from two wheel steering to four wheel steering modes. The figure can be between 10% and 50%. The higher the figure, the quicker the rear wheels will catch up with the front wheels.

Track control Delay Distance: (Option)

This figure dictates the delay distance between the distance the machine moves and the steering adjustment. The maximum figure can be 3 meters. This is used for when the machine is coming to the end

of a row, the master spray switch is turned off and the machine is steering round the headland, the machine has to travel the inputted distance before the wheels start to turn and follow the front wheels in order to not disturb the edge of the crop.

12.3.3 Track control alignment calibration

Alignment position:

Press the [SET] button to set the straight ahead alignment position.

NOTE*! In order for a calibration to be accepted the controller must beep three times when the* [SET] *button is pressed, if this is not the case the process must be restarted.*

12.3.4 Calibrate rear steering potentiometer

Calibrate back track control potentiometer (sprayer)

Press [SET] to accept the maximum right lock and maximum left lock position of the back track control potentiometer.

The actual sensor readout can be seen directly on screen!

NOTE*! In order for a calibration to be accepted the controller must beep two times when the* [SET] *button is pressed, if this is not the case the process must be restarted.*

12.3.5 Calibrate front steering potentiometer

Calibrate front track control potentiometer (tractor)

Press [SET] to accept the maximum right lock and maximum left lock position of the front track control potentiometer.

The actual sensor readout can be seen directly on screen!

NOTE*! In order for a calibration to be accepted the controller must beep two times when the* [SET] *button is pressed, if this is not the case the process must be restarted.*

12.4   Alarms

Below is a short description of user configurable alarms settings. However please note that note all alarms are supported on all brands and types of field crop sprayers.

12.4.1 Alarm limits for RPM sensor

An alarm can be set to warn the operator of spray pump rpm exceeding acceptable limits and falling below minimum effective pumping speed. To activate Min and Max speed alarms press the Red cross/Green tick. To adjust rpm alarm speed thresholds enter a new figure by pressing the entry box and using the "pop-up" keypad.

12.4.2 Alarm limits for tank sensor

A minimum volume can be set to alert the operator the spray tank is becoming low and may run out. To activate this setting press the Red cross/Green tick, to adjust the volume at which the alarm will alert the operator the tank is low, enter a new figure by pressing the entry box and using the "pop-up" keypad.
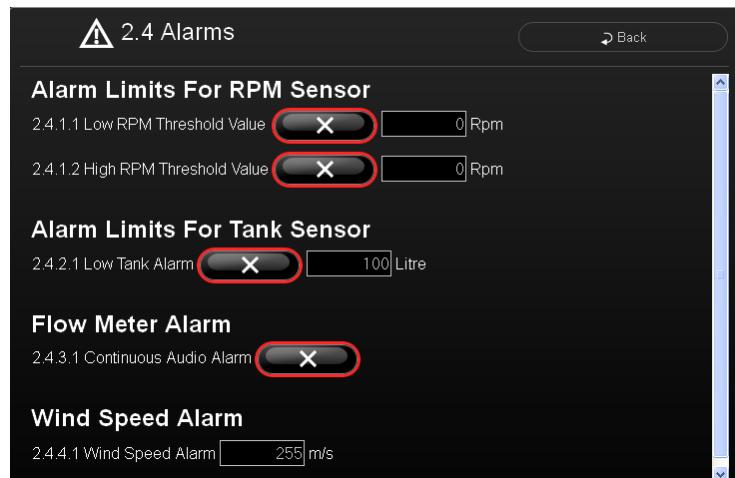
12.4.3 Flow meter alarm

An alarm can be set to alert the operator that no output from the sprayer is present although the master spray switch is on, i.e. the flow meter has failed or the tank has prematurely ran out. To activate this setting press the Red cross/Green tick.

12.4.4 Wind speed alarm

An alarm can be set to warn the operator of wind speed exceeding acceptable limits for effective spraying conditions. To adjust Wind Speed alarm threshold enter a new figure by pressing the entry box and using the "pop-up" keypad.

12.5 Test & Diagnostics

The test and diagnostics menu allows the operator to diagnose problems on the Canbus system.

12.5.1 Test speed

To set a simulated forward speed, i.e. 6kph to allow automatic regulation to 6 kph when static nozzle calibrating, turn on to set speed by pressing the Red
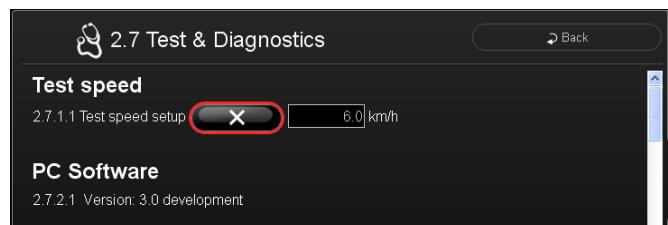
cross/Green tick and enter the speed value required by pressing the entry box and using the "pop-up" keypad.

12.5.2 PC Software

The PC based controller can be upgraded for additional functionality etc, the current software version is displayed in this menu (diagnostic utility for Sprayer manufacturer engineers).

12.5.3 Communication

CAN-Bus: (up to two CAN-Bus lines)

Incoming packets per second (Control):

Shows data transfer rate on jobcomputer CAN bus systems (diagnostic utility for Sprayer manufacturer engineers).

Incoming packets per second (Engine): (Option on Self Propelled sprayers)
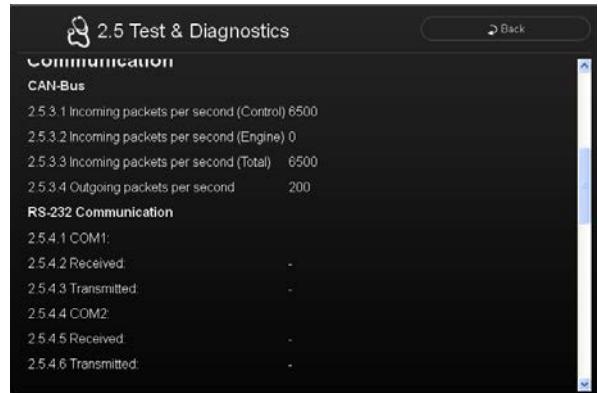
Shows data transfer rate on engine CAN bus systems (diagnostic utility for Sprayer manufacturer engineers).

Incoming packets per second (EngineTotal):

Shows summarized data transfer rate on engine and job computer CAN bus systems outlining overall load on can bus system (diagnostic utility for Sprayer manufacturer engineers).

Outgoing packets per second:

Shows outgoing data transfer rate on job computer CAN bus systems outlining overall load on can bus system (diagnostic utility for Sprayer manufacturer engineers).

RS232 Communication:

COM 1 – Received and transmitted packages:

Shows data transfer rate on COM-port 1 (diagnostic utility for Sprayer manufacturer engineers).

COM 2 – Received and transmitted packages:

Shows data transfer rate on COM-port 2 (diagnostic utility for Sprayer manufacturer engineers).

Job computers – Units online

The units online menu shows the CAN Bus units connected to the Can Bus at any time to aid diagnostics. All CAN units are powered by ignition live therefore if the ignition is off all units will read NOT PRESENT.

Each Can unit can be selected e.g. master spray computer and tested for input and output signals.

Information for selected unit:

For the selected unit a standard set of ISOBUS parameters are available to aid diagnostics including software version of each unit.

Power supply currents:

Current power supply on system is indicated for diagnostic purposes.
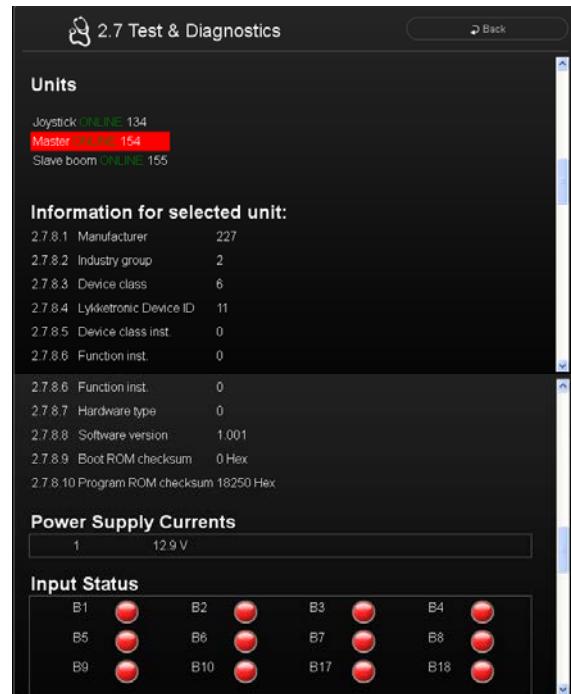

Show status for unit:

To test a specific input or output on any Job computer or I/0 unit it is necessary to have access to the Danfoil Canbus wiring details. All inputs and outputs are given as Program or Terminal number on the wiring details which refers to the Input or output status on the test and Diagnostics pages.

An overview can be provided on Input status (divided on digital or analogue input signal type), Switch and joystic input status. In addition to this the actual output statuses are indicated under a separate heading.
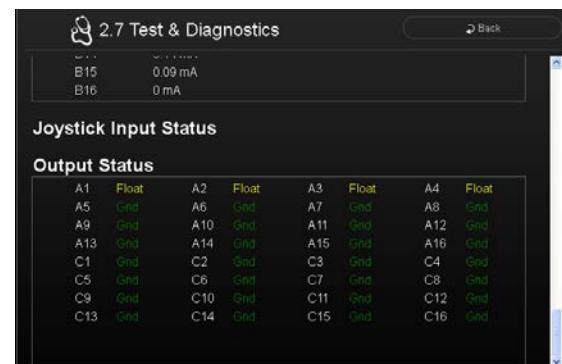
12.6   Base board status

The Base board status menu allows Danfoil Engineers to diagnose problems on the PC console.

These parameters are generally not for Operators use, but only included for remote diagnostics purposes.
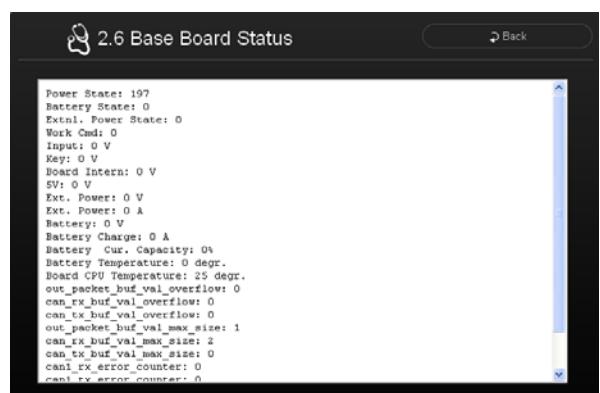
13. Tech Setup menu

Password:

To access more detailed setup procedures and programming screens, passwords must be entered in the Tech setup box.

NOTE! This system is intended to exclusively provide Danfoil engineers access to the following settings, passwords/access codes should normally not be provided to the end user under any circumstances, if absolutely necessary please seek authorisation by your Danfoil dealer.

NOTE! It is not advised to adjust any of the figures in the service menu unless directly advised to be a member of the Danfoil organisation.

14. Installation guideline

14.1 Mounting of the computer

The back panel of the PC terminal is equipped with a RAM Mount C-size ball for fixation of the terminal. A corresponding RAM mounting bracket should be selected (multiple mounting principles are supported) and fitted in the operator's cabin in a way that suits the driver the best.

WARNING: The PC-Spray Controller is a powerful computer system designed for in-vehicle use and designed to operate at temperatures of up to 50°C or 122°F.

The temperature inside some vehicles may at times exceed this temperature, especially during summer when the vehicle or air-conditioning is not operating.

It is recommended that if the vehicle is to be left unattended for any time without air-conditioning that the PC-Spray Controller is turned off. In case of extreme temperatures the PC-Spray Controller may shut down – should this occur – allow the terminal to cool down to a normal operating temperature and then restart.

The manufacturer is not responsible for damage caused by exceeding the temperature operating range.

The manufacturer recommends that the PC-Spray Controller is mounted as far from the window as possible to allow sufficient air-flow over the cool down ribbons and out of direct sunlight.

15.   Final remarks

Please note, that Lykketronic A/S solely is responsible for the electronic controller/monitor and not for the complete function of the machine, including the safety aspects of the entire machine.

15.1   Warranty

The warranty provided by the manufacturer covers faulty manufacture, defective components and installation of components, but not installation to the machine.

If, within 12 months from delivery, it is deemed that there are faults or deficiencies with any of the products delivered by the manufacturer, due to faulty manufacturing or materials, the manufacturer will – based on timely claim – repair or replace the defective part at no extra charge. The manufacturer reserves the right to deliver replacement goods instead of repairing the defective goods.

Claims of any kind after delivery must be made without undue delay. Claims concerning deficiencies, which could not be noticed during a check of the delivery, must be made as soon as the deficiency has been discovered. The defective part, and proof of date of purchase, should be brought to the local dealer. If the dealer agrees with the warranty claim, the defective part will be sent to his distributor or to the manufacturer for final approval.

The Purchaser pays postage for the return of a defective part to the manufacturer, whereupon the part(s) will be repaired as quickly as possible under normal working hours. Replacements or repairs are returned by the manufacturer postage paid. Re-fitting costs are the responsibility of the Purchaser.

The manufacturer accepts no responsibility for other kinds of faults and deficiencies, and is not liable, for any other kind of replacement or repair or compensation of any kind. The manufacturer is not liable for delay, loss, interruption to business or any other indirect loss that may follow from faulty delivery.

This warranty is voided when original replacement components are not used.

Notes