SETUP GUIDE

TOPCON APOLLO

FAST SHUTOFF - SINGLE LIQUID - SECTION CONTROL

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APPROVED BY	J. NAISMITH

Overview

This document provides instructions for setting up a Fast Close Control Valve equipped Liquid Systems (SA) Rate Control Module with Topcon Apollo CM-40 ECU as the Master Controller and EM-24 Expansion Module for section control using Topcon X25, X35, XD+ and XD Console. The CM-40 ECU can control up to 4 application channels. This scenario covers setup of a single liquid system with section control. A second liquid channel with section control can be setup by following the same instructions again.

This document should be read in conjunction with relevant Topcon Apollo Seeder Control Operator's Manual.

CM-40 Master Controller

EM-24 Expansion Module

Configuration Prerequisites

Before the liquid system can be configured in the X Series Console following steps need to be completed.

- Physical installation of Liquid Systems (SA) Rate Control module including tank plumbing.
- Physical installation of a Stacker distribution system on the tool bar or planter.
- Installation and connection of Apollo CM-40 & EM-24 ECUs to X Series Console using appropriate Topcon harnesses.
- Product tanks filled with enough water to conduct testing.

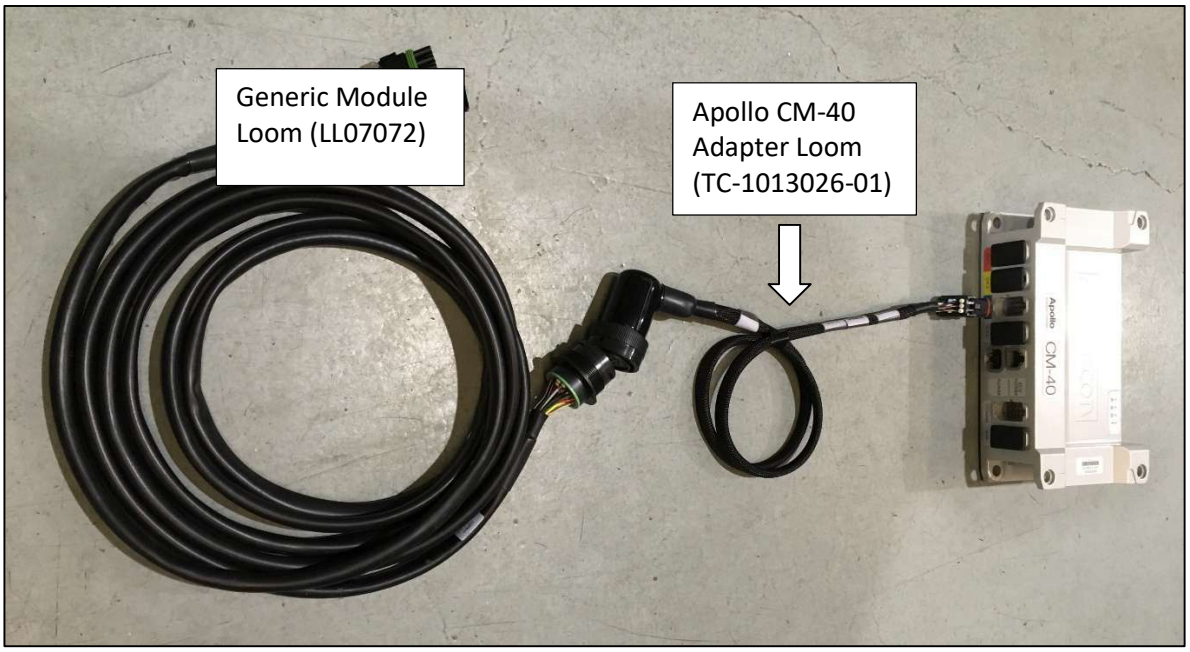
Physical Connection to Liquid Systems module

Connect Liquid Systems (SA) module to the Apollo CM-40 & EM-24 ECUs with wiring looms supplied. Liquid Systems (SA) looms available for single liquid set up with section control are:

Part No.	Name		Description
TC-1013026-01	Apollo CM-40 Adapter Loom		Adapter that connects to CM-40 ECU.
TC-1013025-01	Apollo EM-24 Section Adapter Loom		Adapter that connects to EM-24 ECU.
LL07072	Generic Module Loom (5m)		Connects to individual device connectors on LQS pump module. Connects to TC-1013026-01 Adapter Loom via 23 pin circular connector.
LL07080 or LL07079 Or LL07082	Section Loom (12 Sections, 6m) Section Loom (6 Sections, 6m) Section Loom (8 Section, 6m)		Connects to individual section valve connectors on LQS section module. Connects to TC-1013025-01 Adapter Loom via 20 pin circular connector.
LL07014 (optional) or LL07021 (optional)	Section Loom Extension (12 Section, 6m) Section Loom Extension (12 Section, 12m)		Extensions of Section Loom for when additional length is required from LQS section module to EM-24 ECU.
LL07015 (optional) or LL07020 (optional)	Generic Module Loom Extension (6m) Generic Module Loom Extension (12m)		Extensions of Generic Module Loom for when additional length is required from LQS pump module to CM-40 ECU.

1. Plug Apollo CM-40 Adapter Loom (TC-1013026-01) into CM-40 ECU. Ensure it is connected to the correct channel for liquid tank. e.g., if tank **3** is set up for liquid, then plug connector into channel **3**.

2. Connect the other end of Apollo CM-40 Adapter Loom to Generic Module Loom (LL07072). Connect & route Extension Looms (LL07015 or LL07020) in between if additional length is required to reach LQS pump module.

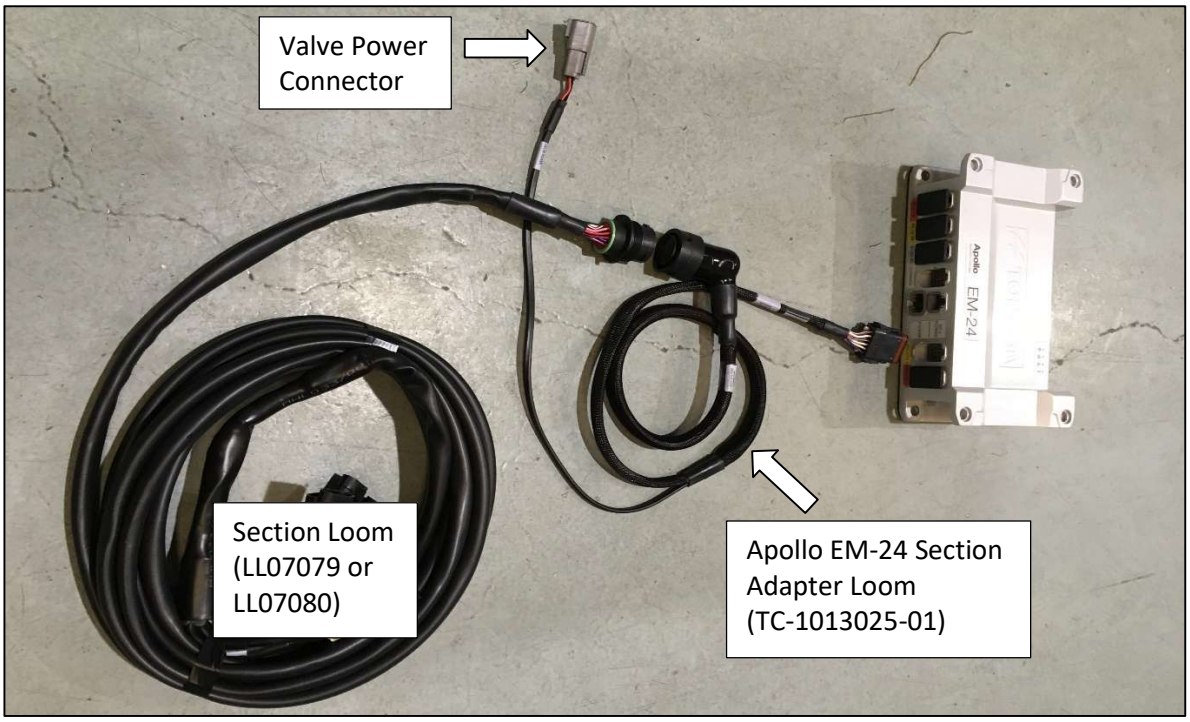


3. Connect Generic Module Loom to device connector on Liquid Systems (SA) module, ensuring it is clipped in all the way.

4. Plug Apollo EM-24 Section Adapter Loom (TC-1013025-01) into **Relays 1** port on EM-24 ECU

5. Connect the other end of Apollo EM-24 Section Adapter Loom to Section Loom (LL07079 or LL07080). Connect & route Section Extension Looms (LL07014 or LL07021) in between if additional length is required to reach LQS section module.

   Connect Valve Power connector on Apollo EM-24 Section Adapter Loom to Valve Power receptacle on the Seeder Harness.

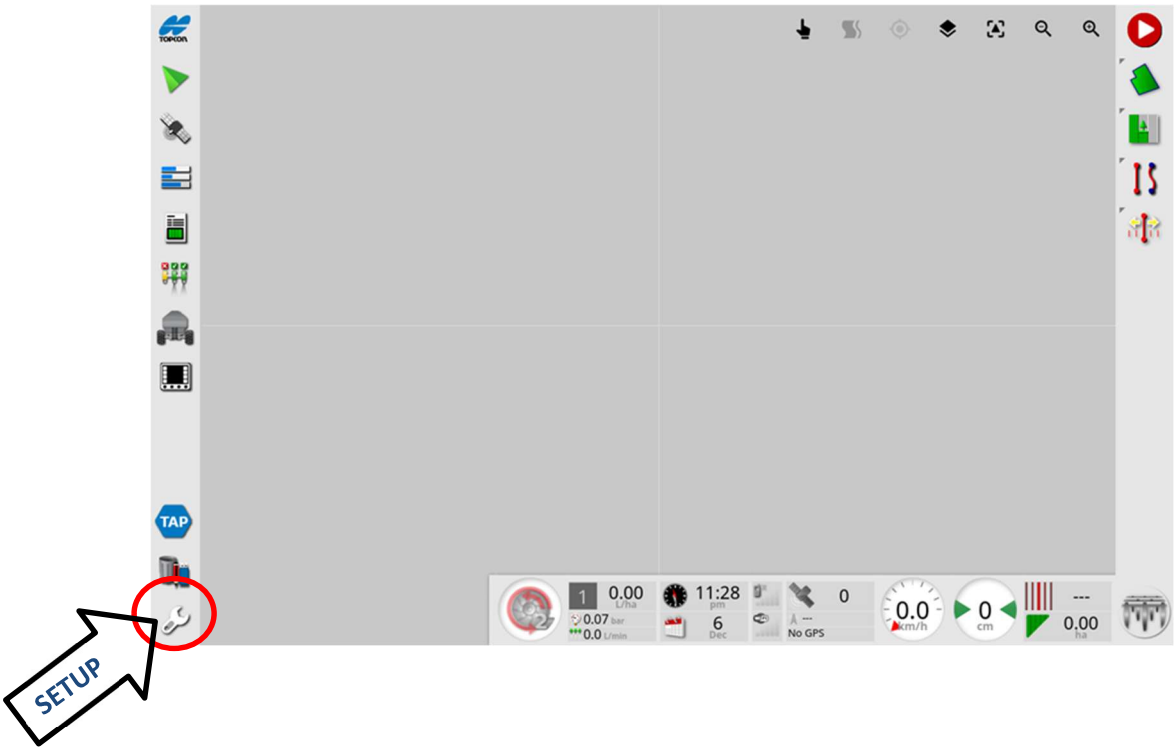


6. Connect Section Loom (LL07080 or LL07079 or LL07082) to individual connectors on the Liquid Systems (SA) section module. Ensure section valve number matches connector number. e.g., valve No. 1 plugs in to connector No.1. Insert dust plugs into un-used connectors on the Section Loom.

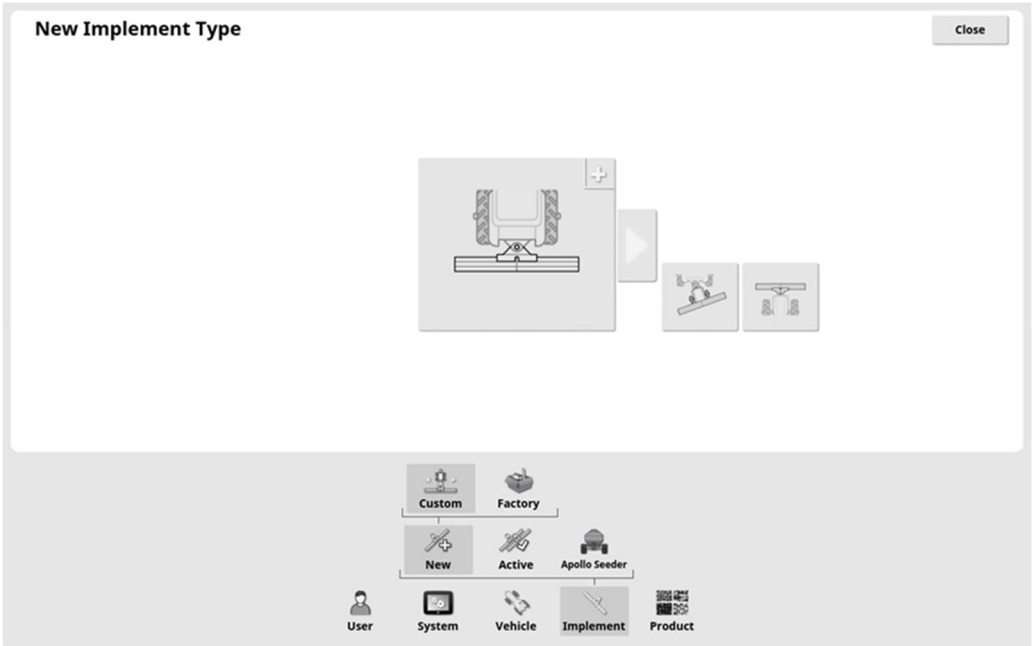
Apollo CM-40 & EM-24 ECU Setup

Before the module can be setup, a new implement profile with a liquid tank must be created.

Select **Setup** icon (bottom left corner) on the run screen to enter main setup screen.



Select **Implement**, **New** & **Custom**, then select the appropriate configuration.

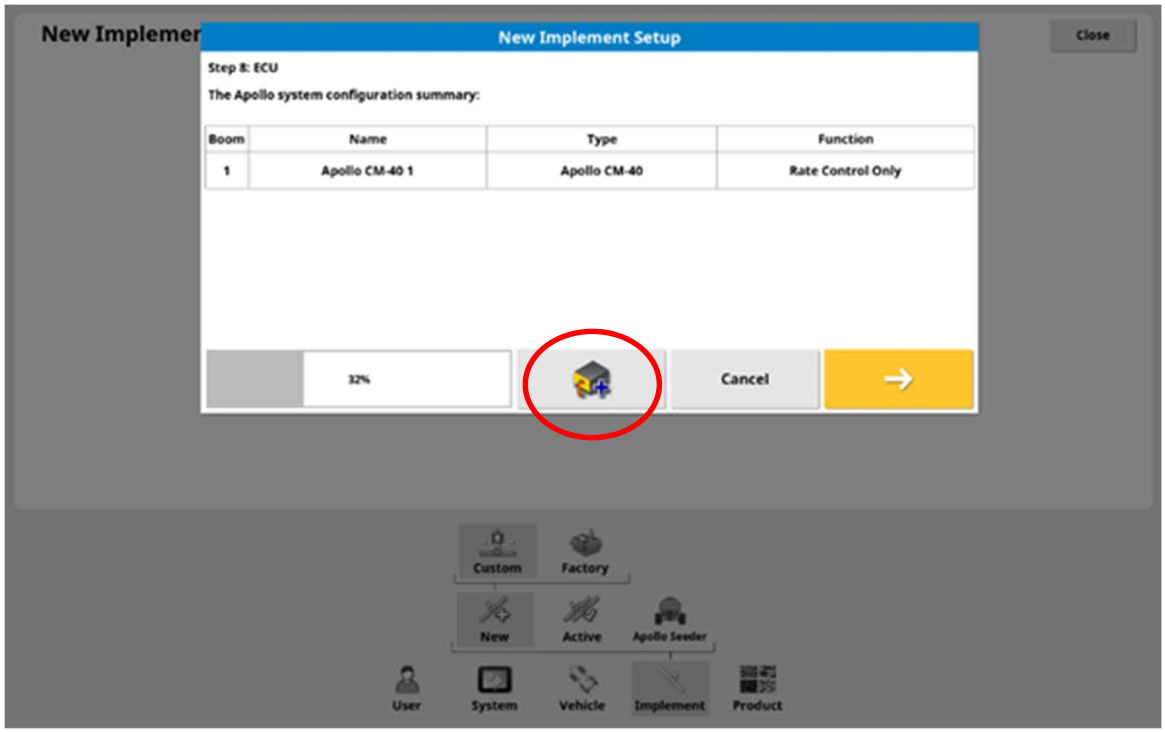


The implement should be configured with:

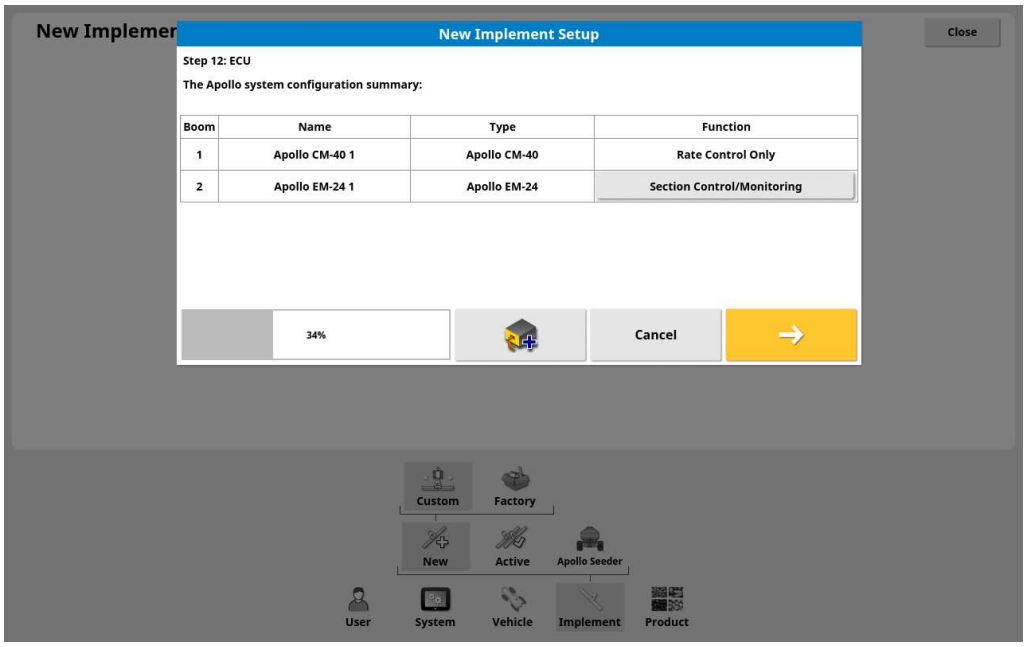
IMPLEMENT CONTROL: Section Control and Rate Control
ECU TYPE: Apollo
IMPLEMENT FUNCTION: Seeder
ECUs: CM40 and EM-24

At least 1 Liquid Boom and 1 liquid tank need to be created.

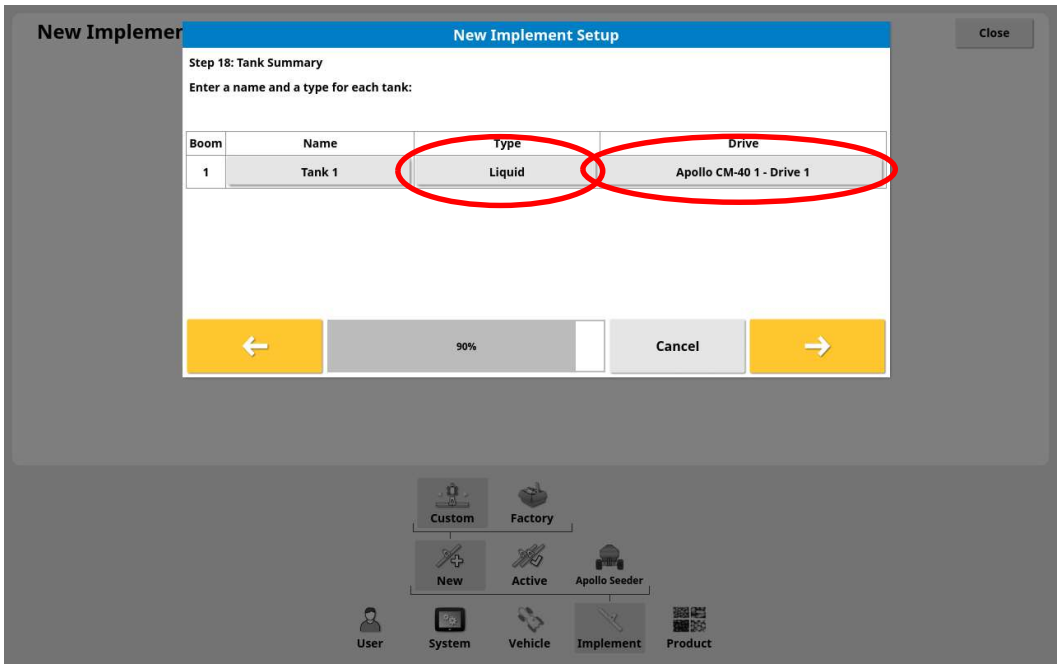
Ensure the EM-24 is not connected to the CM-40 'comms' port while the system detects the first ECU. Once the CM-40 has been detected, select the Add ECU icon, remove dust cap and connect the CAN line to the EM-24 'comms' port.



`Select **Section Control/Monitoring** as the function for the EM-24

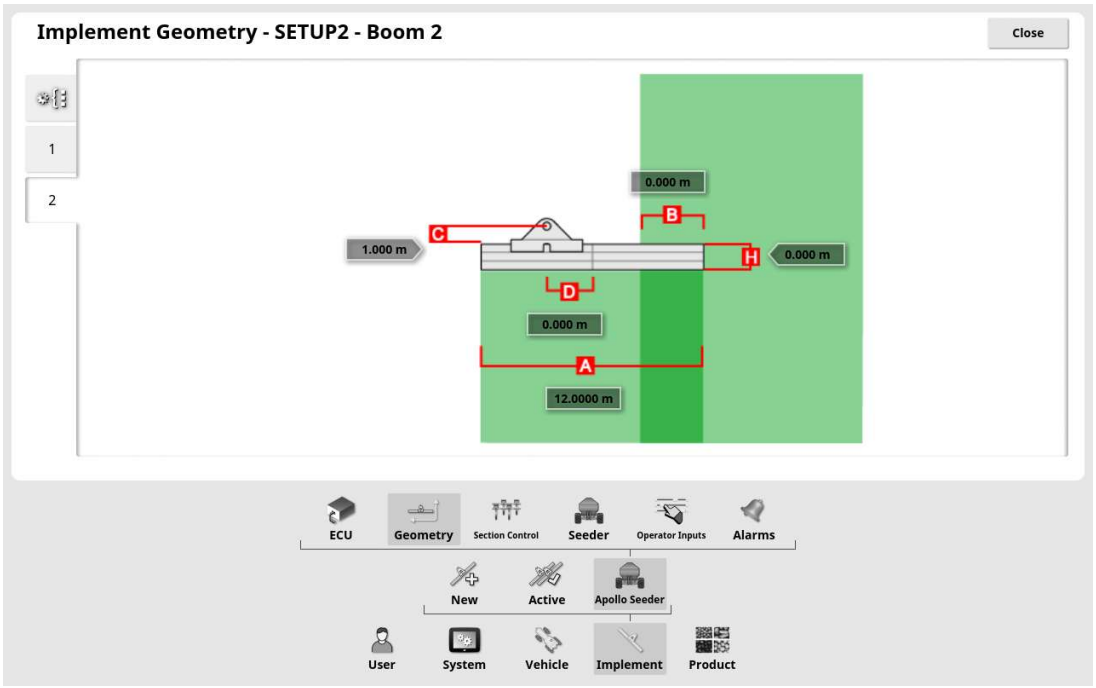


Select **Liquid** for the appropriate tank and which drive for each tank according to the port connected on the CM-40. E.g.- Channel 1 is Drive 1



Geometry Setup

Select **Implement** and **Geometry**, then select the boom which will be used for guidance. Select the boom used on the side tab and set the measurements according to the implement used.

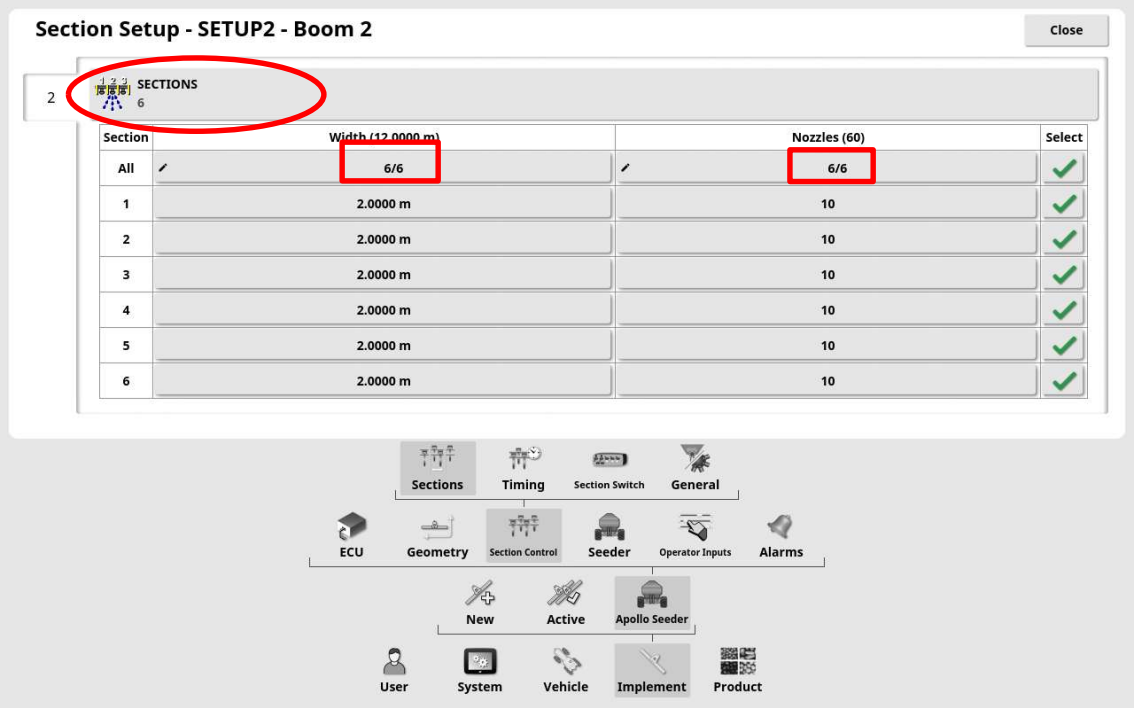


Select **Implement, Section Control** & **Sections** icons to enter section setup parameters.

Press **Sections** icon to enter number of sections.

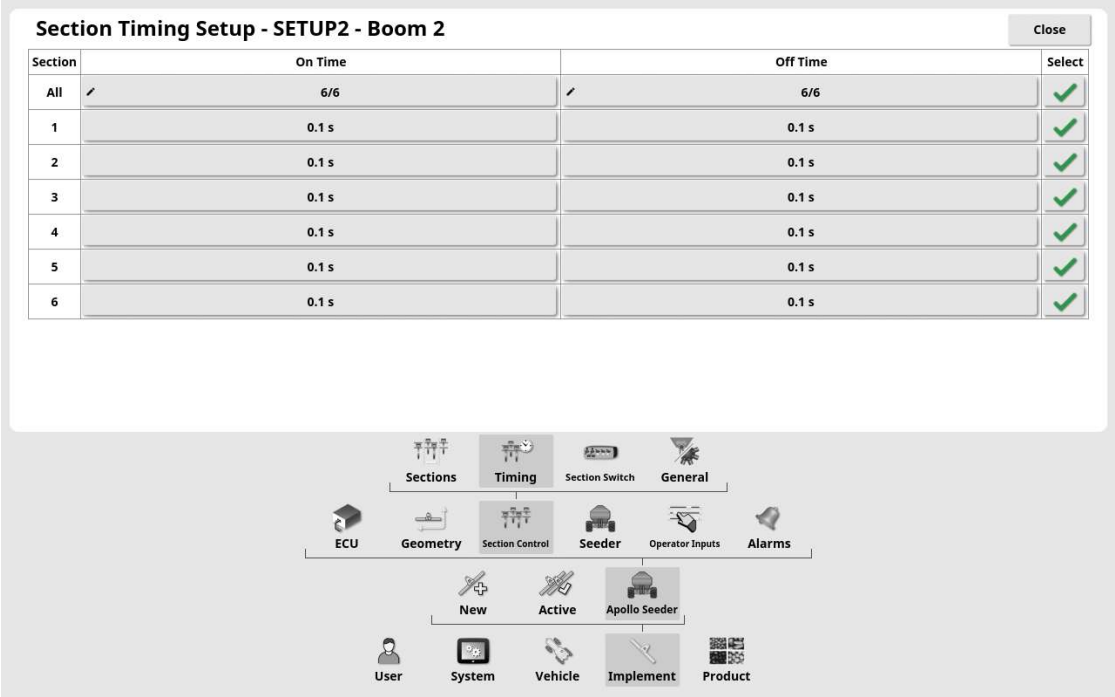
Enter section width by pressing **All** icon to enter widths for all sections at once. Alternatively, unequal widths can be entered for one section at a time by pressing number corresponding to each section.

Similarly, press **Nozzles** icon and enter total number of liquid outlets (usually one for each opener) for all sections or one section at a time.

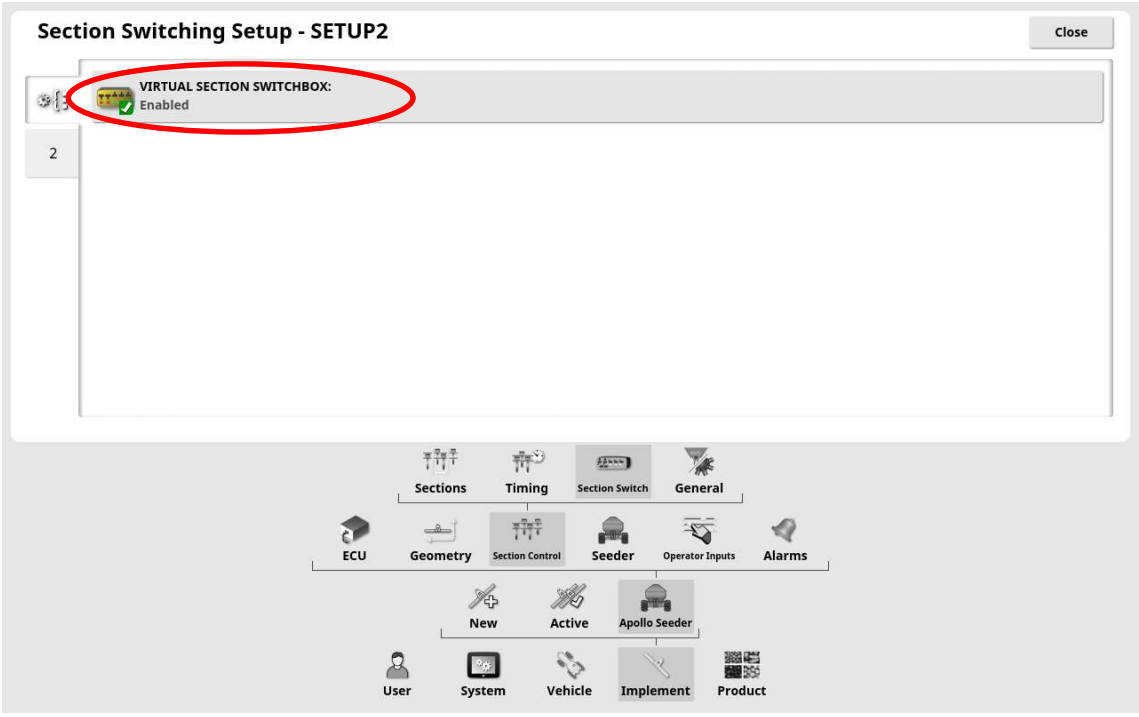


Select **Timing** icon to edit on/off time for sections.

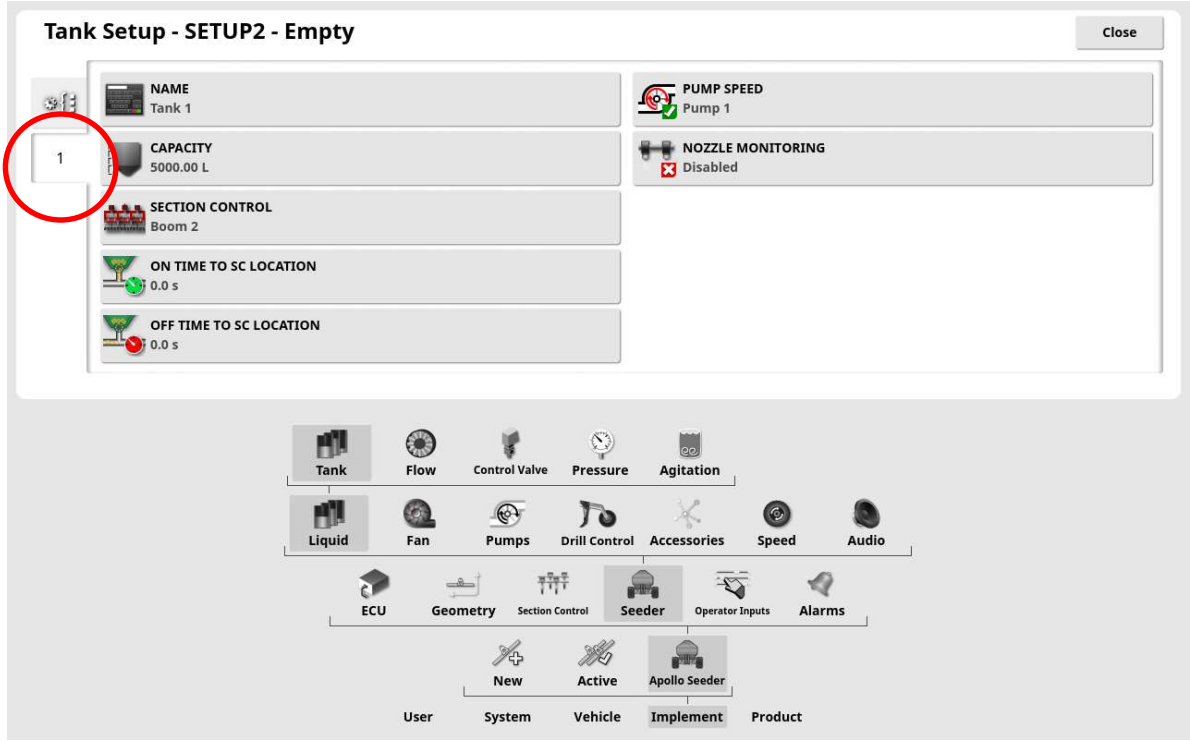
Press each **On Time** & **Off Time** icons to edit section response times one at a time. (or press **All** to enter same time for all sections). Start with 0.1s for each. This can be changed later after testing response times.



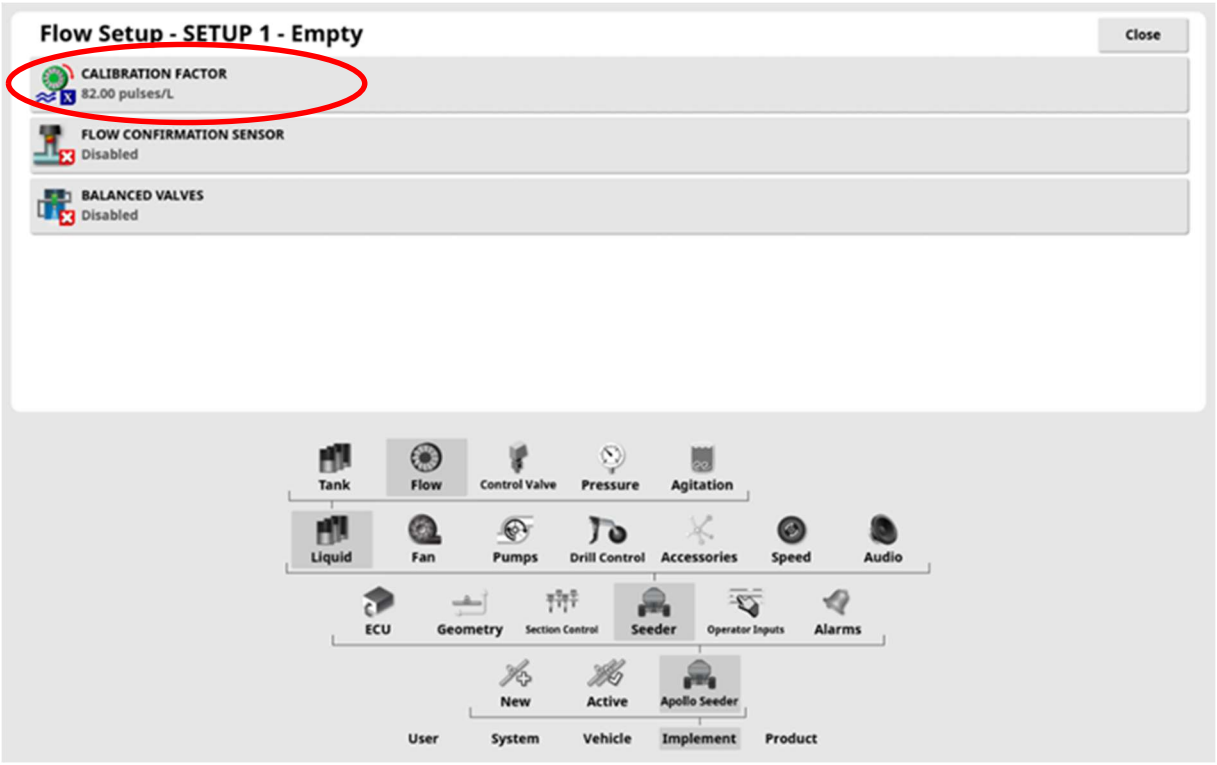
Virtual section switch allows on screen manual override control of sections. If this function is required, Select **Section Switch** icon. Select **Virtual Section Switchbox** icon and select **Enabled**



Select **Implement, Seeder, Liquid** & **Tank** icons from the setup menu to edit tank setup. All liquid tanks set up will be accessible. Select the numbered tab corresponding to tank that needs editing e.g., Tank **1**.



Select **Flow** icon to edit Flowmeter setup. Press **Calibration Factor** icon and enter appropriate calibration factor for the type of flow meter from the table below



FLOW METER Identification & Settings----------

All Liquid Systems (SA) Pump and Rate Control Modules are available with multiple flow meter configurations to suit specific applications and flow rates. Each flow meter has a 'Calibration Factor' which needs to be input to the rate controller by the operator. If the incorrect calibration factor is used, the system will not operate correctly, and the applied rate will be incorrect. The below images and tables show the different flow meter and calibration factors.

TeeJet 801 Flow Meter (STD)

ARAG Flow Meters

IDENTIFICATION LABEL
ARAG Flow Meters all appear visually the same, although can be identified by the label on the side. This label shows the range and calibration factor in pulses per litre.

Flow Meter Variations & Calibration Setting	**TeeJet 801 Flow Meter** (Standard)	**ARAG Electromagnetic Flow Meter**		
Flowmeter Range	7.5-250L/Min	2.5-50L/Min	1.0-20L/Min	0.5-10L/Min
Pulses Per Litre	82	1200	3000	6000
Pulses Per US Gallon	310	4542	11355	22710
Pulses Per Imperial Gallon	373	5455	13638	27277

SHUTOFF VALVE Identification & Settings----------

LQS Modules are built with 3 different Fast-Shutoff Valves, the images below show the difference between the two KZ Valves and Teejet Valve.

KZ Valve- L03067

KZ Valve- L03085 (Standard)

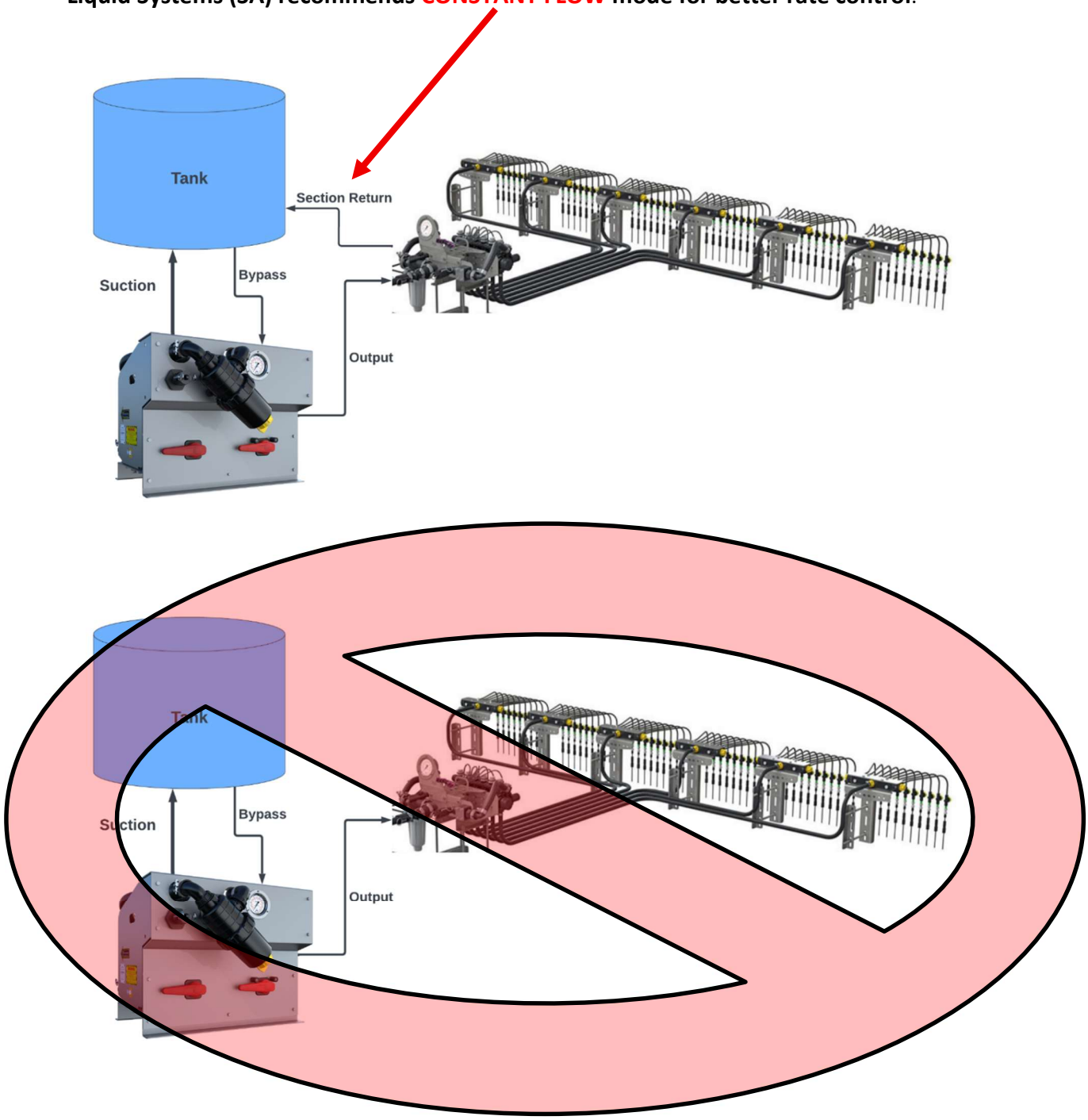
TeeJet Valve

Constant Flow

The LQS Stacker Section Control Module is designed to operate in both Constant Flow and Hard Shut-off mode. When a section valve is switched off in Constant Flow mode, excess flow is diverted back to tank thus maintaining a constant flow through remaining section valves.

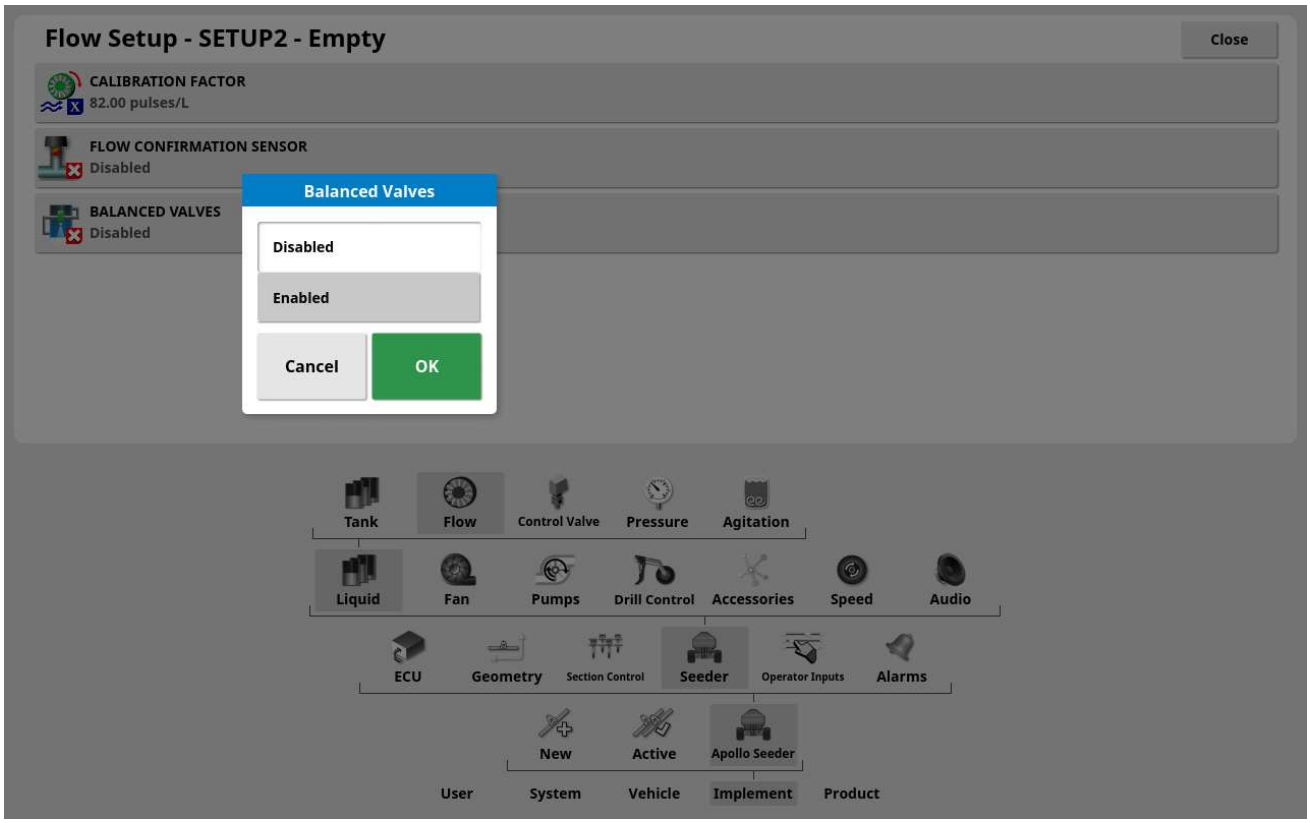
In Hard Shut off mode there is no return line to tank from the section valves. When a section valve is switched off, the control system needs to reduce output from the pump module so flow to remaining open sections remains the same. This is only recommended if a dosing system is installed, and the contaminated product cannot be returned to the tank.

Liquid Systems (SA) recommends CONSTANT FLOW mode for better rate control.

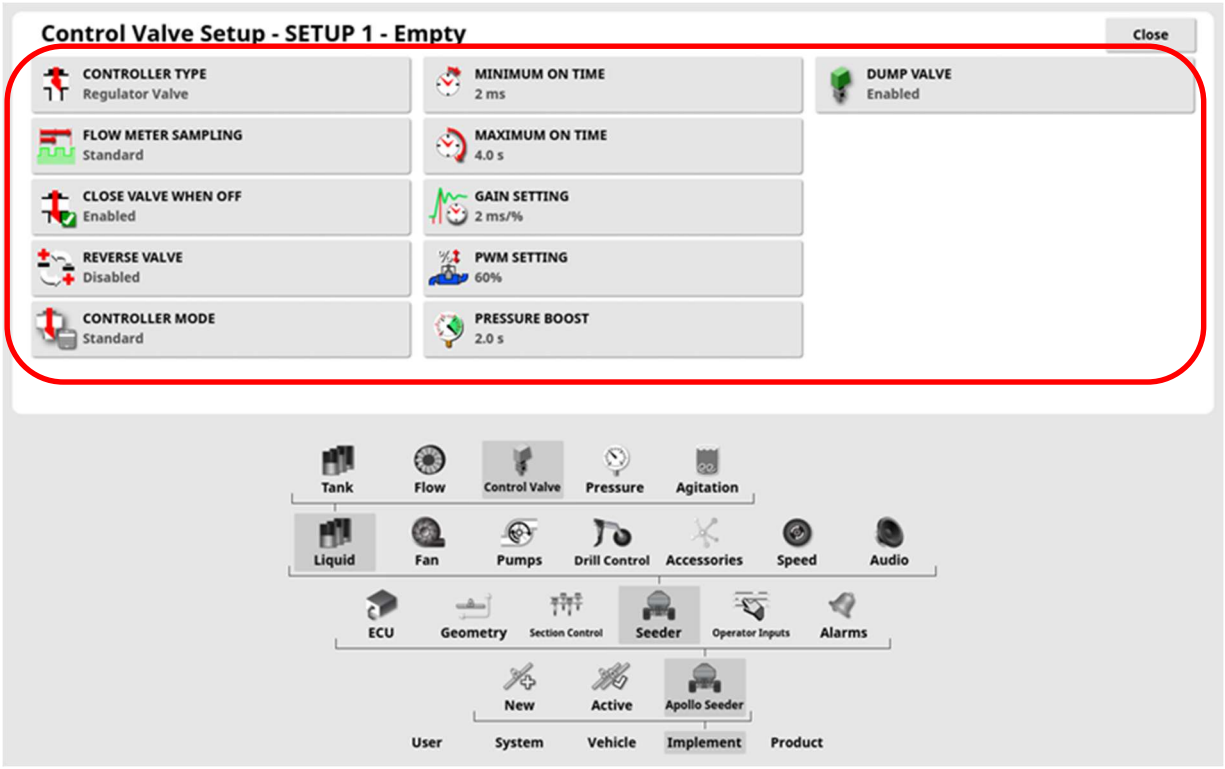


Press **Balanced Valves** icon and select appropriate section control mode.

- **Enabled** for Constant Flow mode or
- **Disabled** for Hard Shutoff mode



Select **Control Valve** icon to edit control valve setup.

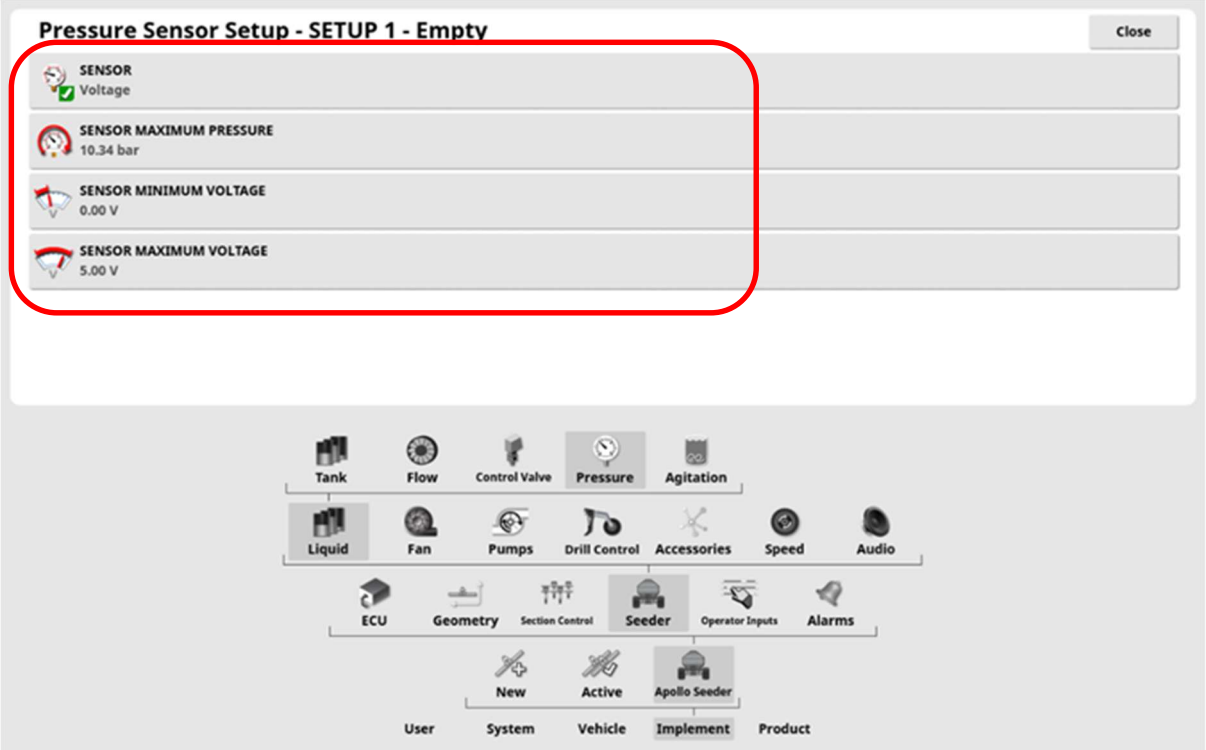


Enter the following values into each setting.

Setting	L03067	L03085	Teejet
CONTROLLER TYPE	Regulator Valve		
FLOW METER SAMPLING	Standard		
CLOSE VALVE WHEN OFF	Enabled		
REVERSE VALVE	Disabled		
DUMP VALVE	Enabled		
CONTROLLER MODE	Dickey John		Standard
MINIMUM ON TIME	2 ms	2 ms	2 ms
MAXIMUM ON TIME	48 s	48 s	48 s
GAIN SETTING	3.4 ms/%	1.6 ms/%	1.6 ms/%
PWM SETTING	45%	60%	60 %
PRESSURE BOOST	0.6 s	0.6 s	0.6 s

Note: **Minimum & Maximum on Time, Gain & PWM** settings can be adjusted later to improve control if required.

Select **Pressure** icon to edit pressure sensor setup.



Enter the following values into each setting.

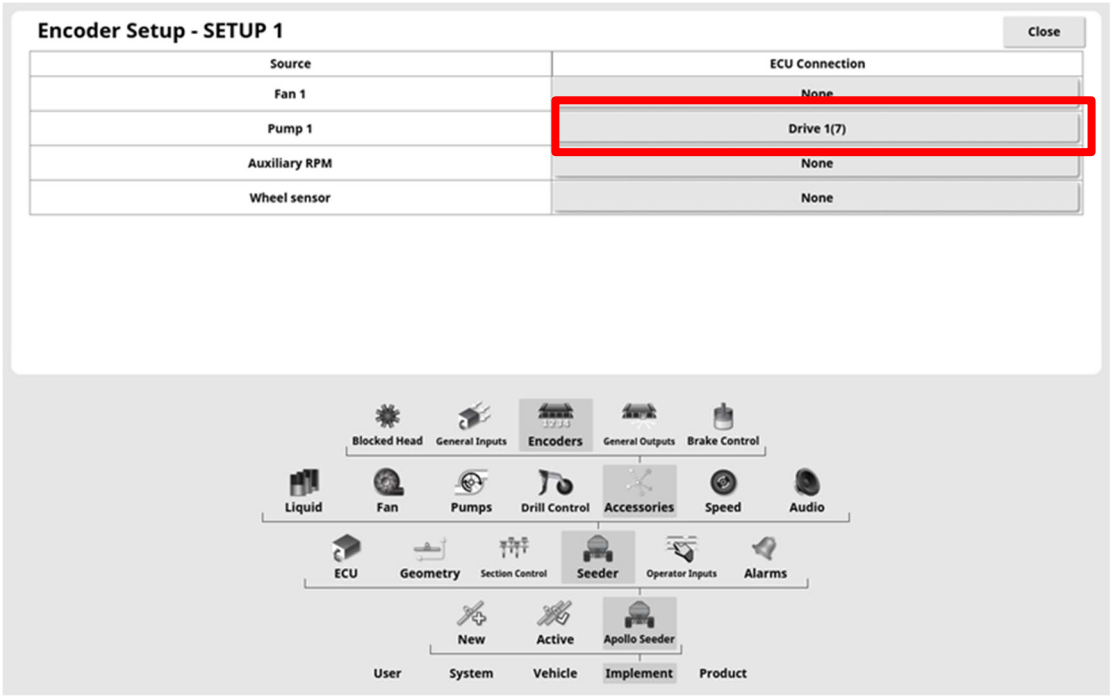
SENSOR	Voltage
MAXIMUM PRESSURE	10.00 bar
MINIMUM VOLTAGE	0.00 V
MAXIMUM VOLTAGE	5.00 V

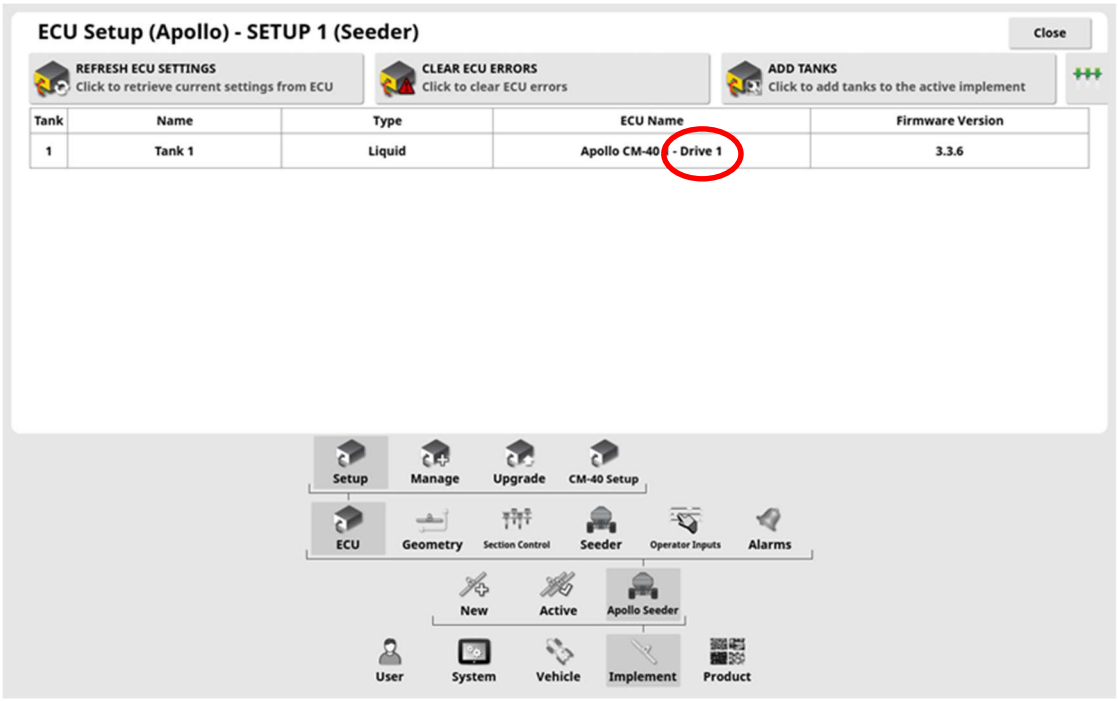
Setup On Screen Pump RPM Display

Go to Encoders Setup Page. Configure a Pump Source with appropriate ECU Connection. Select matching drive number for the tank. If unsure, drive number assignment for the liquid tank can be checked on ECU Setup screen.

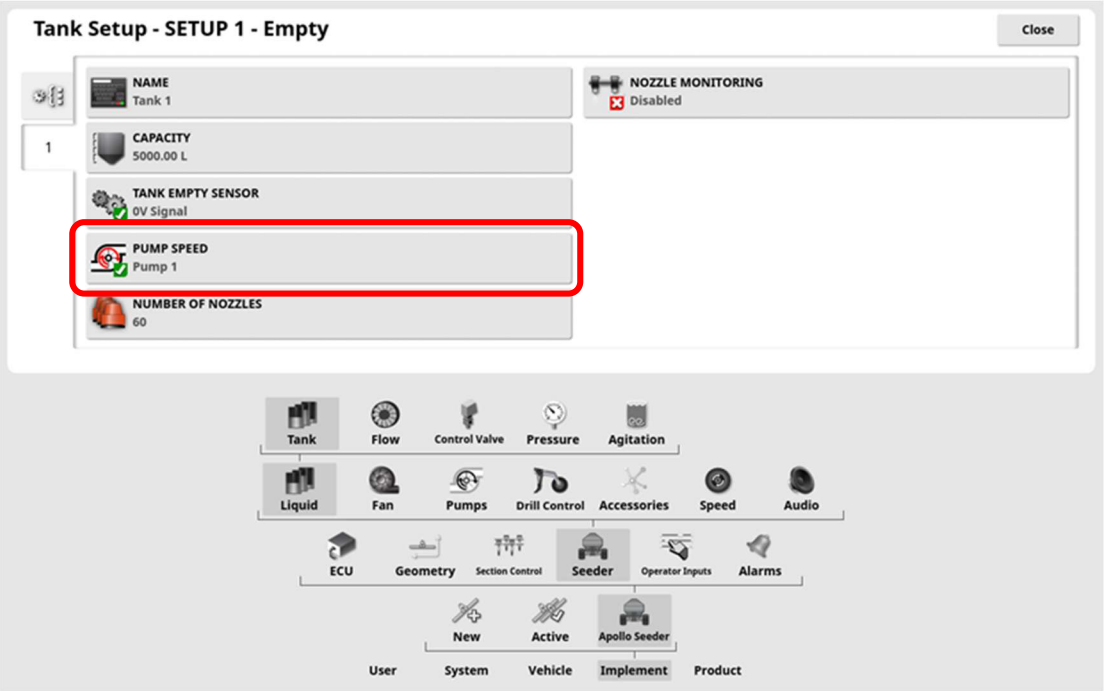
If no Pump Source is available, configure Auxiliary RPM

Changing ECU Connection requires DEALER User access level.



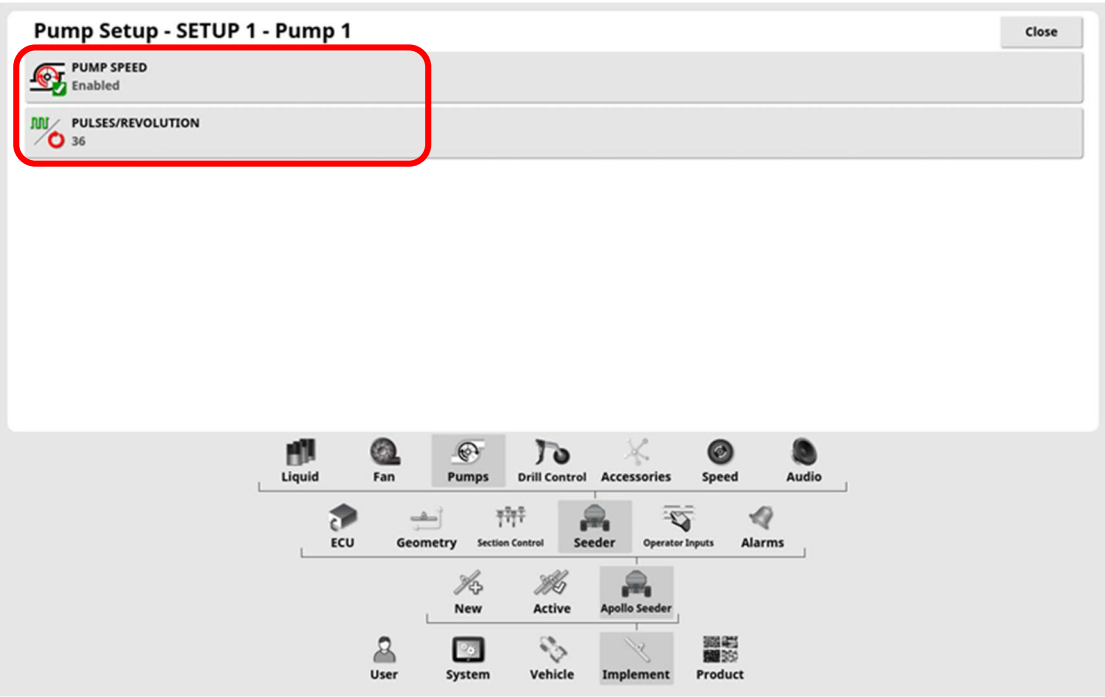


Select **Implement, Seeder, Liquid** & **Tank** icons from the main setup menu to edit tank setup. Assign Pump Source to PUMP SPEED setting.

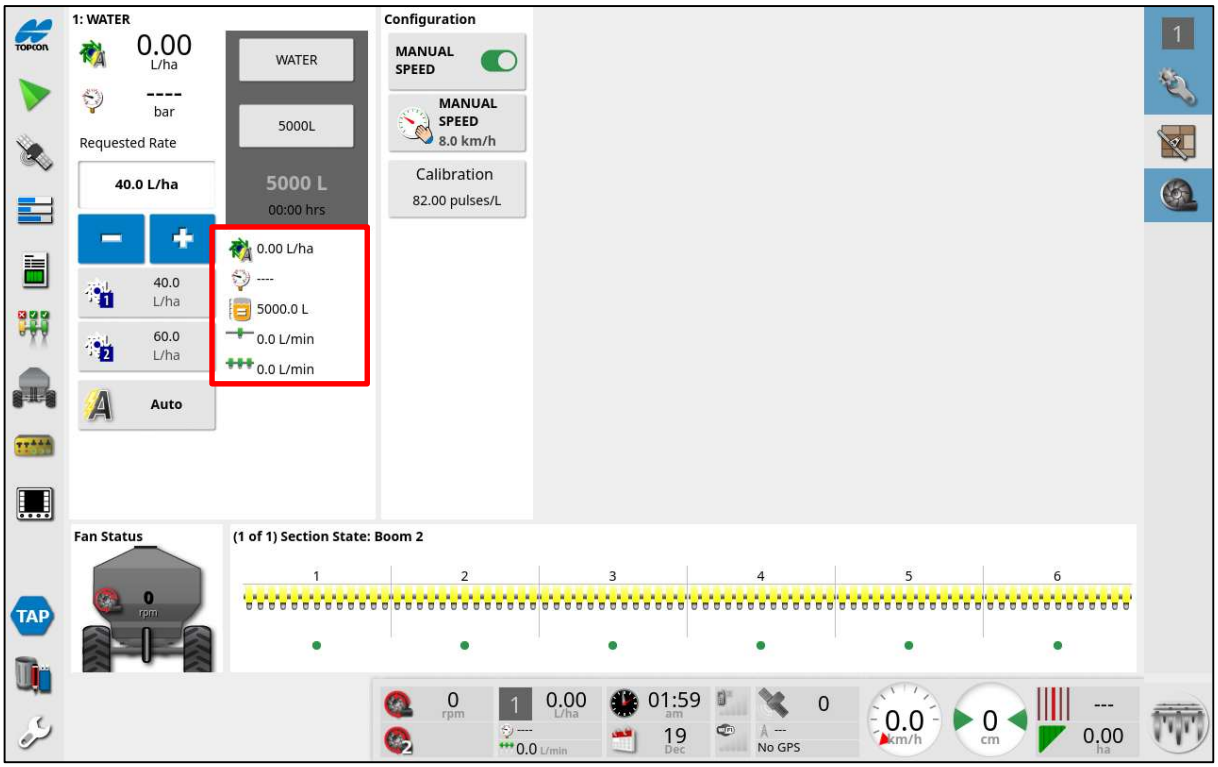


Go to **Pumps** setup page to enter pump RPM calibration.

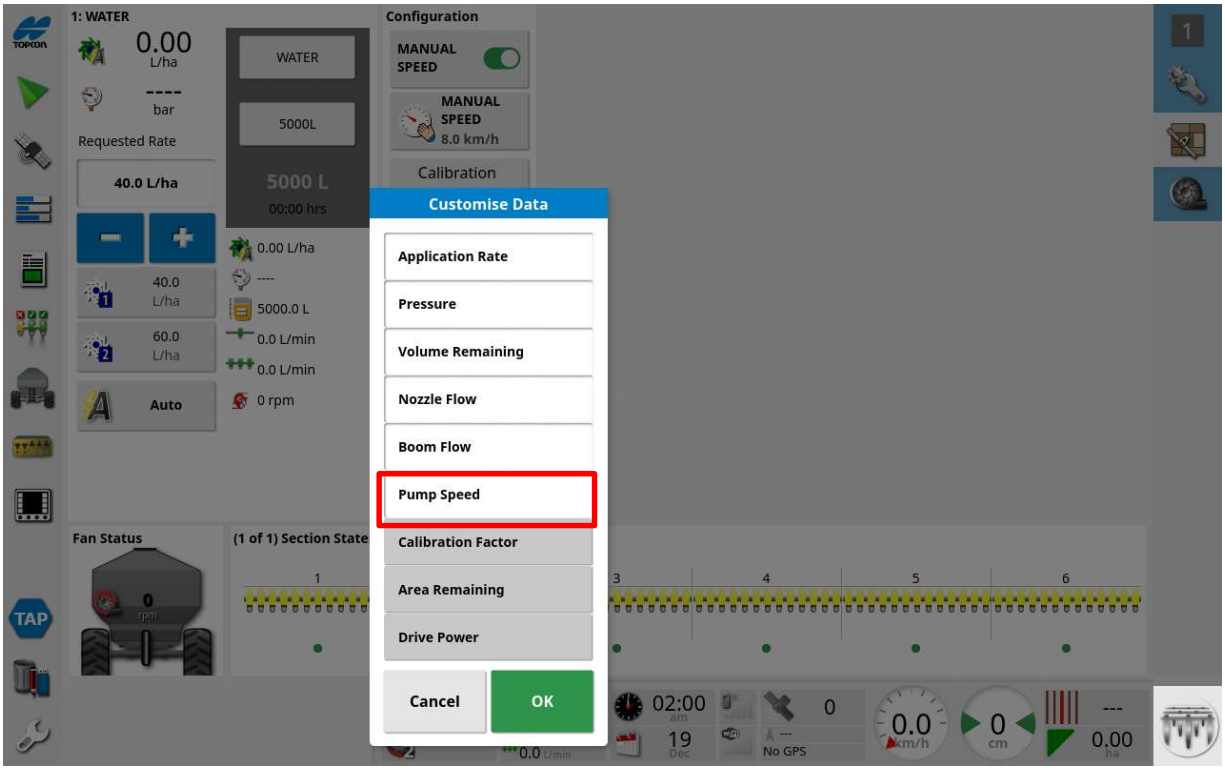
PUMP SPEED: Enabled **PULSES/REVOLUTION:** 36 (30 for LQS20 module)



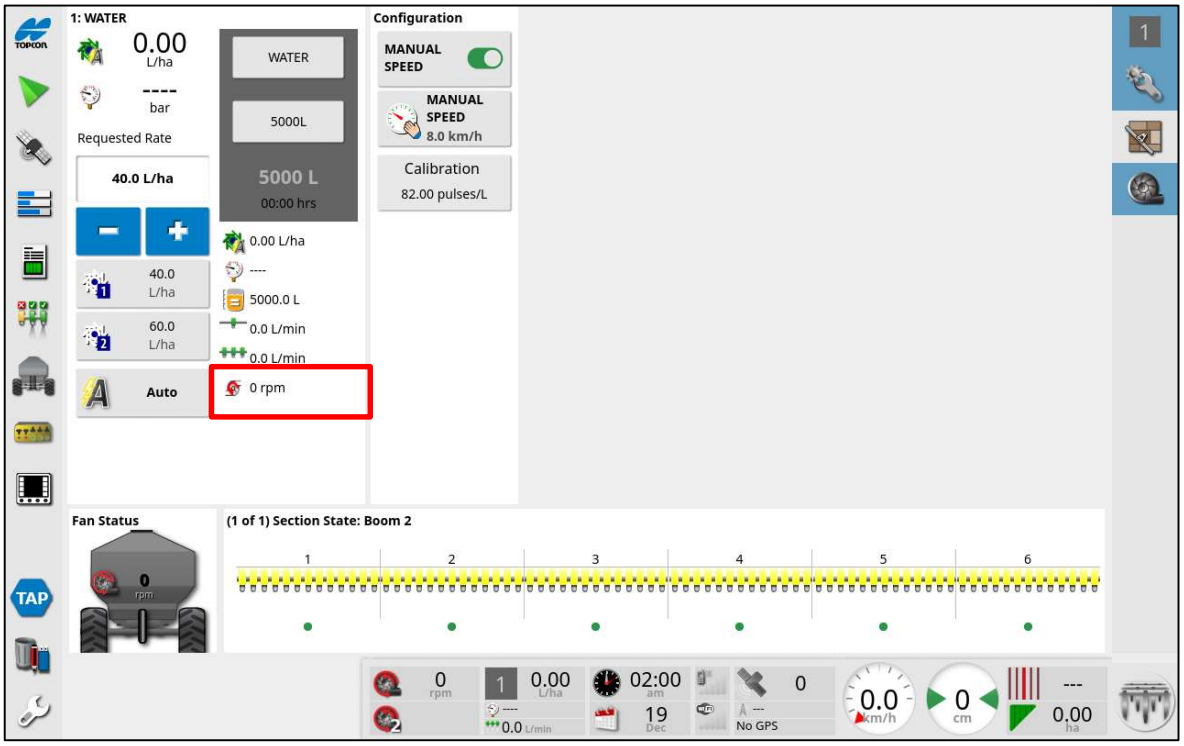
Return to run screen to configure the screen to display Pump speed.
Press data display area to open a window with a list of available parameters.



Select **Pump speed** from the list and press Green Tick arrow.
Note - maximum of 5 parameters can be displayed on the run screen.

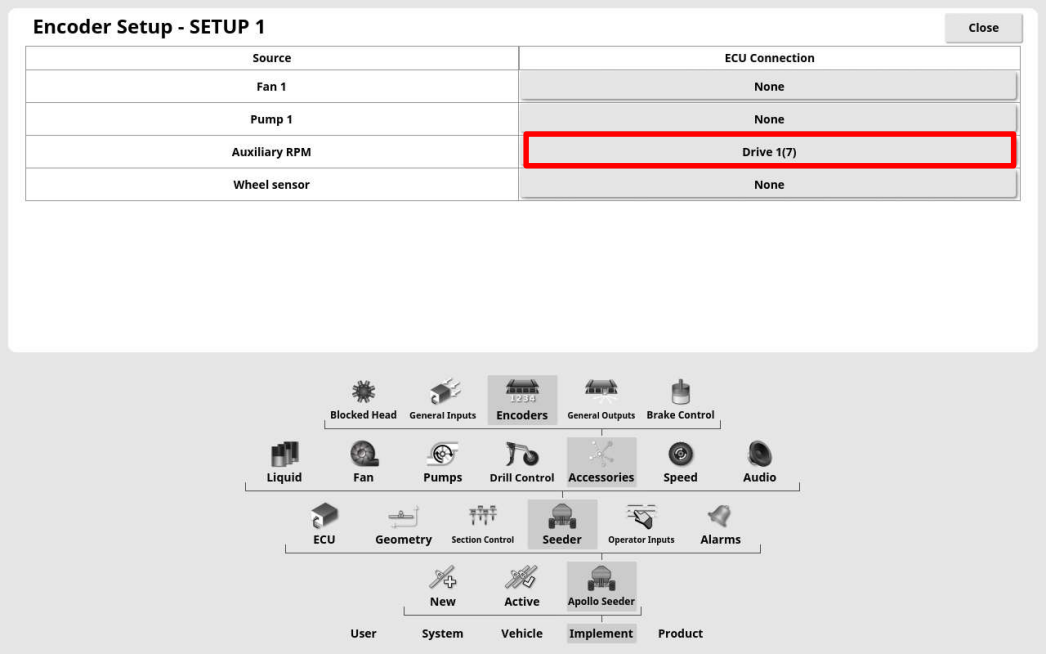


Pump speed should now be displayed on the run screen.



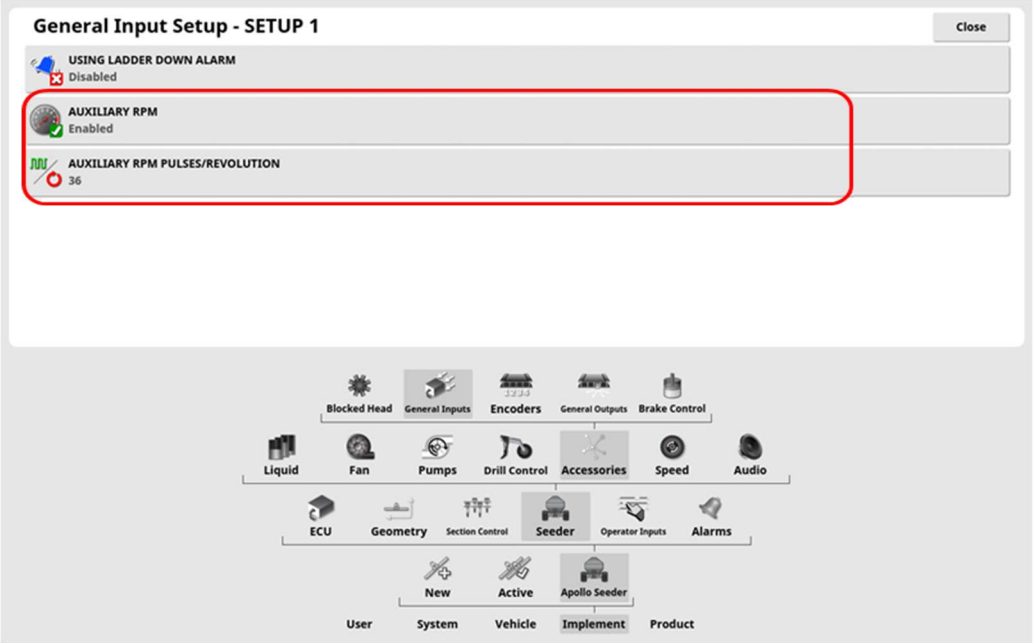
AUXILIARY RPM Setup

If no Pump Encoder Source is available setup an Auxiliary RPM Encoder with the following steps. Map Auxiliary RPM Source to Drive connected to liquid tank.

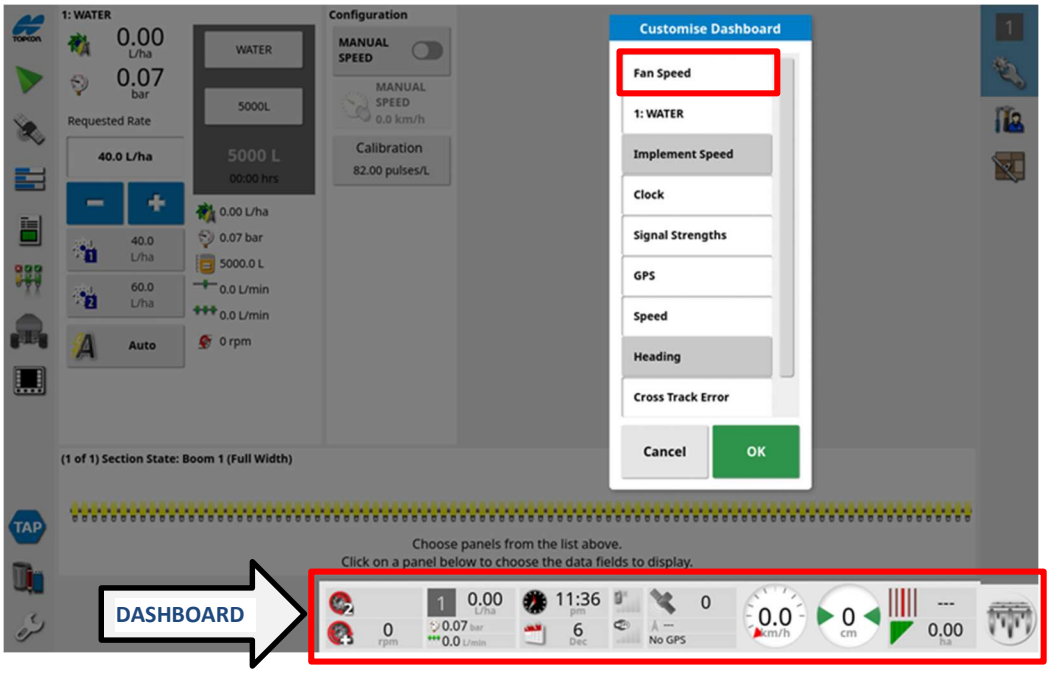


Enable Auxiliary RPM on General Inputs page and enter calibration factor:

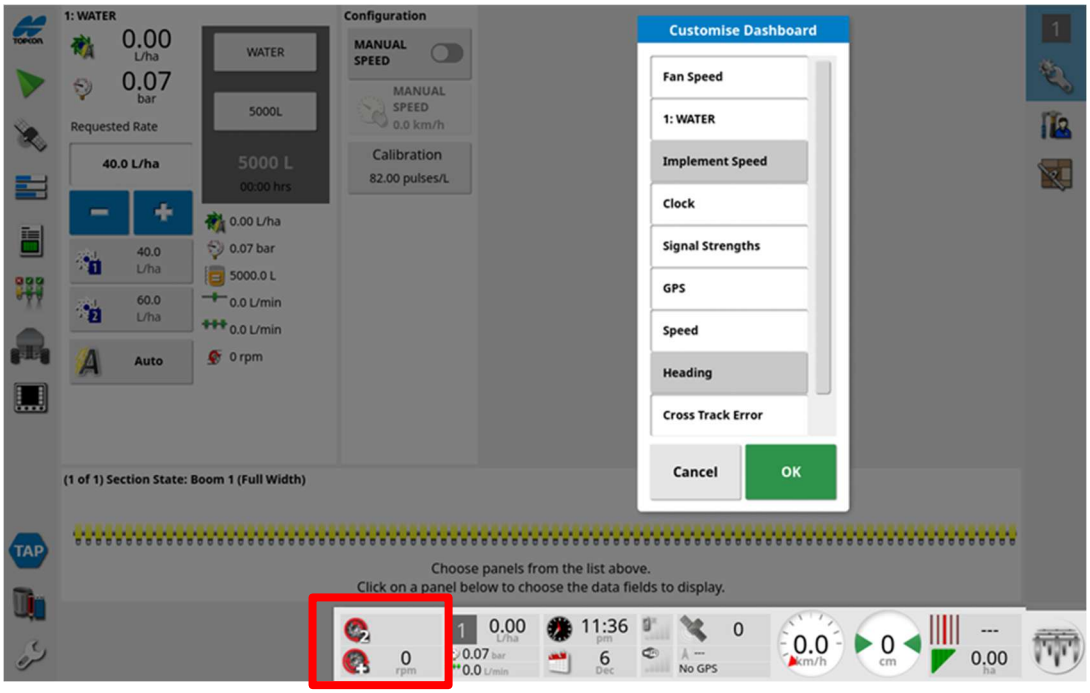
PULSES/REVOLUTION: 36 (30 for LQS20 module)



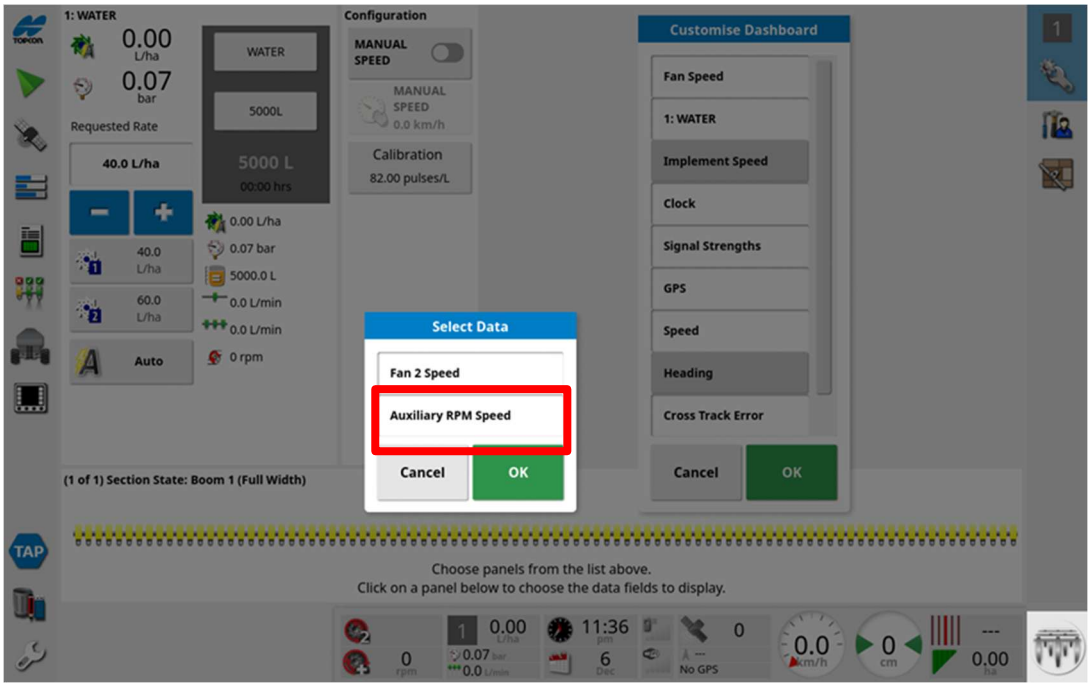
Touch Dashboard to customise and enable Fan Speed display.



Touch Fan Speed section of Dashboard to bring up Select Data menu.

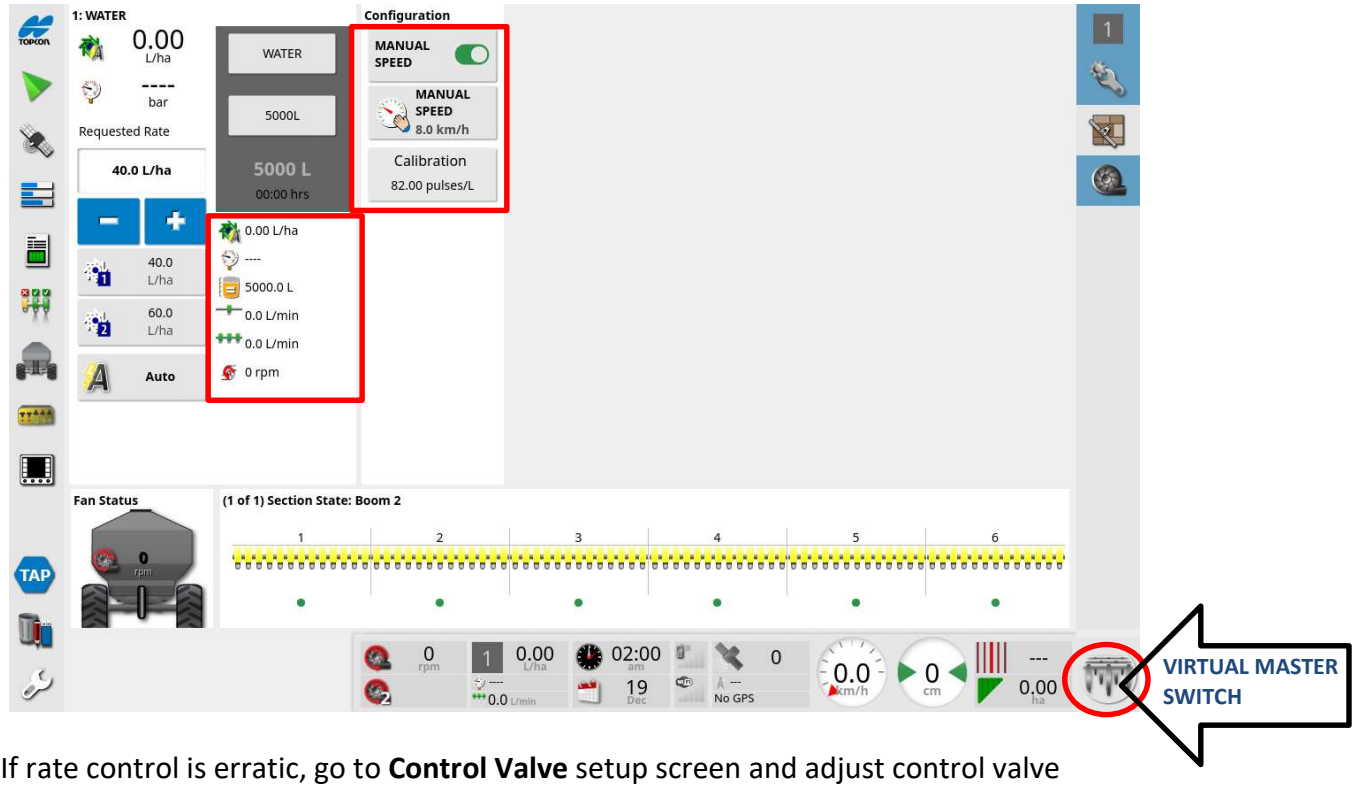


Choose Auxiliary RPM Speed. Click Green Ticks to save settings. Auxiliary RPM will then show on Dashboard. (Fans can be shown as well if required.)

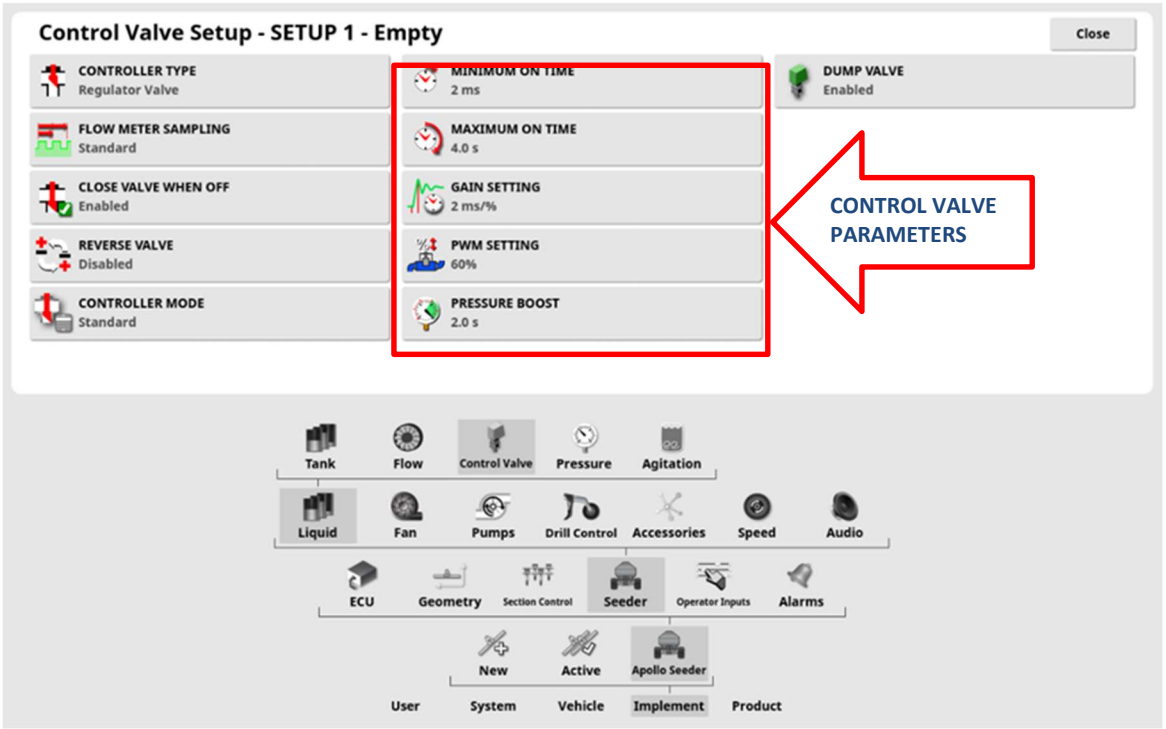


System Setup Verification Tests

Start the pump and perform a test to verify system set up. Select **Manual Speed** option and enter a typical speed. Select a pre-defined application rate. Press **Virtual Master Switch** to start the test. Vary speed and application rate to ensure control system is performing correctly across the entire setup range. Press **Virtual Master Switch** to terminate the test.



If rate control is erratic, go to **Control Valve** setup screen and adjust control valve parameters. DECREASE GAIN or PWM setting for smoother control, INCREASE for faster

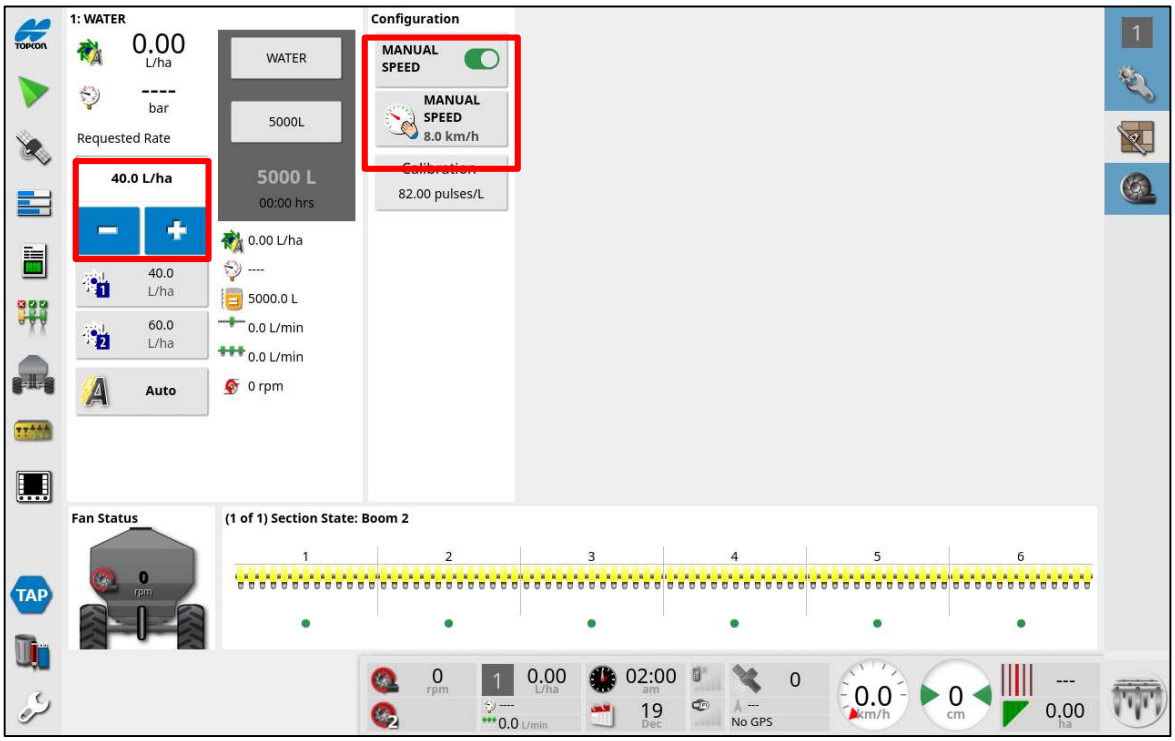


response. Refer to Topcon Apollo Seeder Control Operator's Manual for more information.

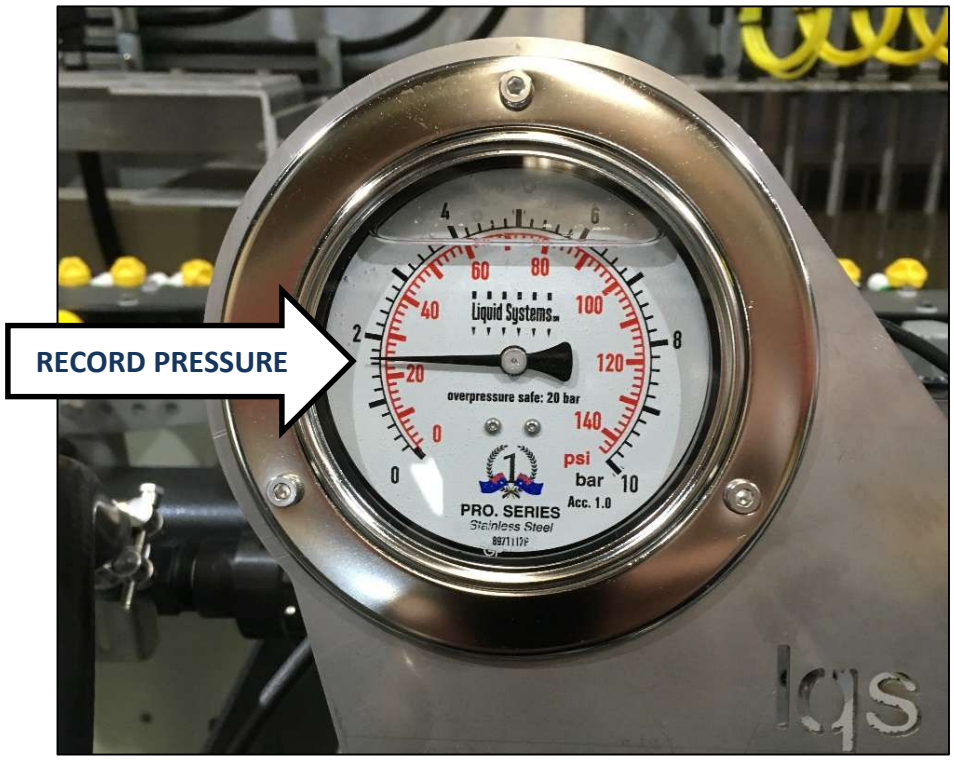
Section Valve Tuning

For correct application of liquid in **Constant Flow** mode, section valves must be tuned (or balanced) while the module is running using the following procedure.

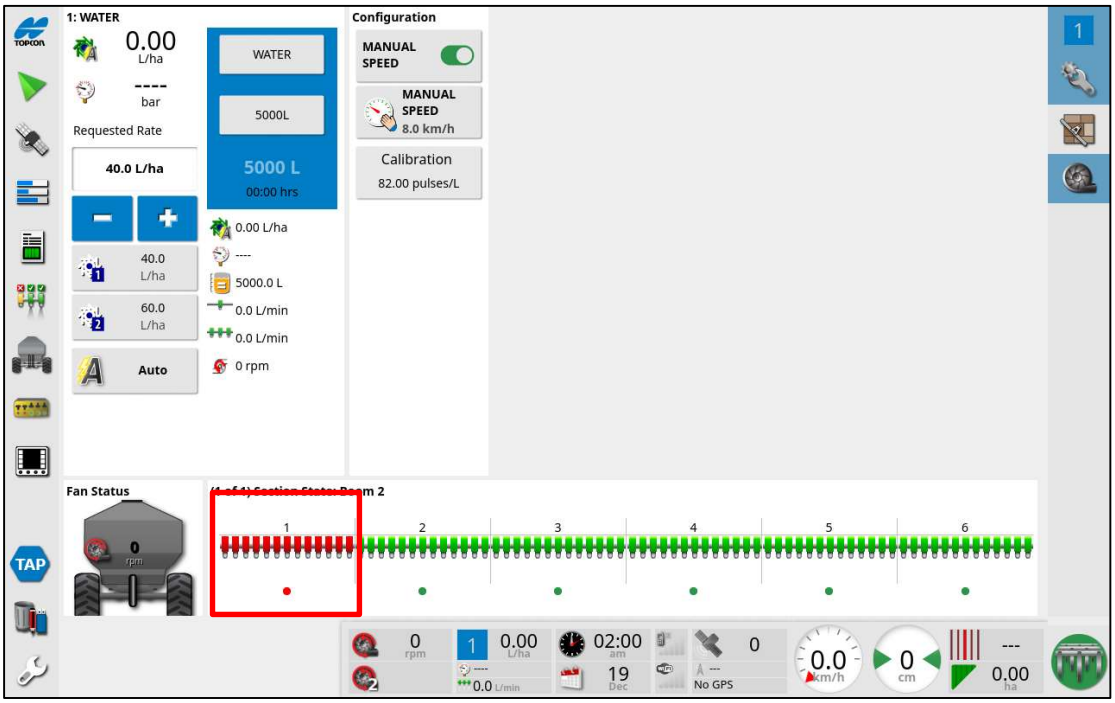
1. Start the pump and perform a test using typical speed and application rates. Ensure all sections are open.



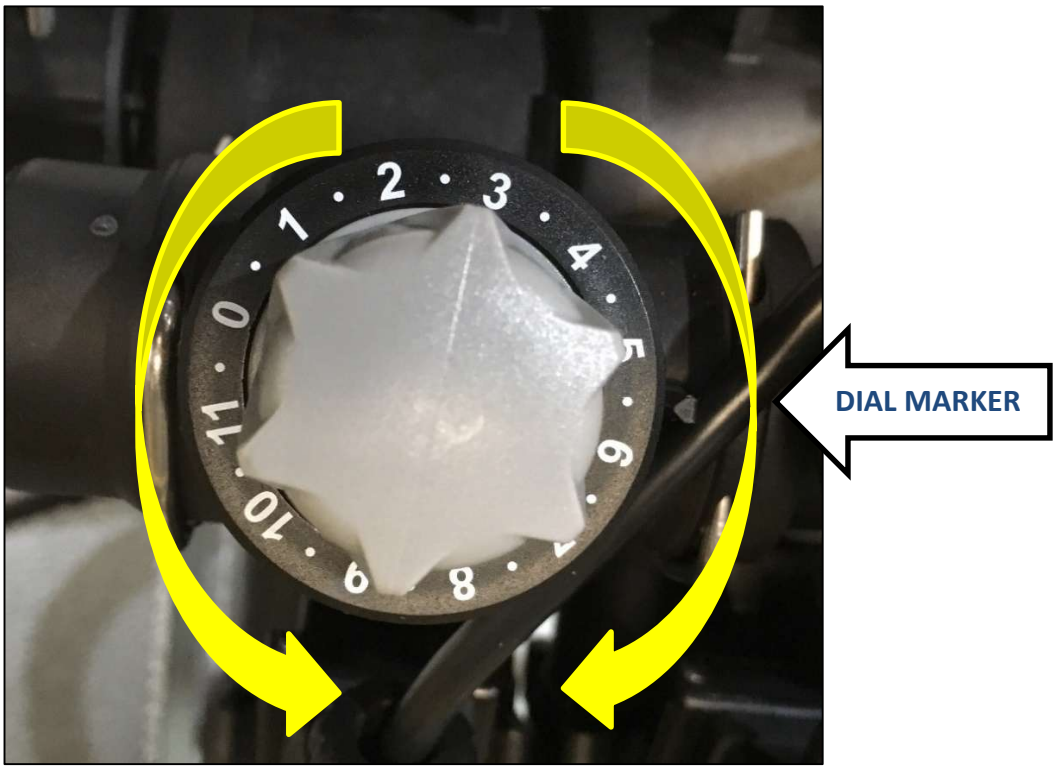
2. Record indicated pressure on the section control module gauge. Taking a photo on a smartphone is an easy way to do this.



3. Shut off section valve #1 via the control system and observe pressure.



- If pressure has increased, rotate the dial on the valve anti-clockwise until it drops to the level recorded in step 2.
- If pressure has decreased, rotate the dial clockwise until it increases to the level recorded in step 2.



4. Repeat step 3 for remaining valves one at a time. Sections with the same number of outlets will usually end up with the same setting on the dial.