

WeedSeeker[®] Quick Reference Guide

Selective Spot Spray System

System Startup

1. Verify that the **FLUSH** switch is OFF.
2. Turn the **POWER** switch ON. The WARM UP indicator will flash for approximately 20 – 30 seconds while the electronics reach the proper operating point.
3. During the warm up phase, make initial adjustments to the system for **SENSITIVITY** and **SPEED**. Use 3 to 4 as a good starting point for Sensitivity, and then adjust as necessary in the paddock. **NOTE: If the SENSITIVITY setting is set too high (setting 10), the sensor will miss small weeds. If it is set too low (setting 1) it will be too sensitive, and will tend to false fire.**
4. Set **SPEED** to “**LO**” for 5–10kph, “**MED**” for 10–15kph, and “**HI**” for 15–20kph. If the vehicle speed is unknown, set **SPEED** to “**MED**” and adjust as necessary once you start spraying.
 - If the spray pattern falls before the weed, reduce the **SPEED** setting.
 - If the spray pattern falls after the weed, increase the **SPEED** setting.
5. When the **WARM UP** light goes off the Sensors will be in **STANDBY** mode. The Sensors should be calibrated for the specific soil or pavement type in which the system is to be working. Calibrate the Sensors by positioning the sensors over a weed free patch of ground. To calibrate the sensors press the **SOIL BASE** switch up for a couple of seconds. For best results, set the **SOIL BASE** within the paddock which you are spraying. **NOTE: In variable soil types calibrate the Sensors over the lighter coloured soil or background.**
6. Press the **STANDBY** switch to change the Sensors from Standby mode to Operational mode; the **STANDBY** light will turn **OFF**. The **SOUND** switch may be **ON** or **OFF** as desired (refer to the Controller section of the manual for further details).
7. Turn on the pump and set the desired pressure to **300 kPa (45 psi maximum)**.
8. Verify the operation of each Sensor by waving a weed (or a leaf) under each Sensor to confirm that each unit sprays. **AVOID CONTACT WITH THE CHEMICAL SPRAY; FOLLOW SAFE AND PROPER CHEMICAL HANDLING PROCEDURES.** If there is a problem with a Sensor recognising the weed, check the Sensitivity setting. If the problem persists, refer to the WeedSeeker[®] Troubleshooting Manual.



You are now ready to begin spraying



Tips for getting the best out of your WeedSeeker® System

Initial Startup

1. **Start the tractor or sprayrig prior to turning on the WeedSeeker® system.** Before you fill up with chemical and drive to the paddock turn on the WeedSeeker® system. This will give the circuitry in the Sensors time to warm up to operating temperature, saving you having to calibrate the Sensors as often when you first start operating.
2. **It is also good practice to check the lenses of the Sensors for dust or dirt** every time you fill the spray tank. This usually only takes a couple of minutes to wipe clean with a soft clean cloth.

Calibrating the System

Calibration of the Sensors is one of the most important parts to operating the system to its full potential.

You **can not** over calibrate the system. If the Sensors seem to be false firing to much, it is far better to re-calibrate the system first before changing the sensitivity to a higher setting. **NOTE:** *Take a little time to get the calibration figure right and you find you will acheive better results.*

1. **Make sure the Sensors are positioned over a weed free zone in the paddock.**(Not over the road or track at the end of the paddock). Each Sensor stores its own calibration figure, if there is a weed present under one of the Sensors, that Sensor will not target any weed of the same size or smaller than the weed the Sensor was calibrated over.
2. **The boom has to be within the correct working height (between 600-750mm from the ground).** If working in tall stubble make sure to run the boom above the stubble. **NOTE:** *Running the boom in the stubble could cause damage to cables and Sensors.*
3. **If working in variable soil types** it is best to calibrate the Sensors over the lightest coloured soil in the paddock. If the Sensors are calibrated over the darkest soil, when you travel over lighter soil the reflectance value is too high for the Sensors and they may miss small weeds. Where as calibrating over lighter coloured soil, the Sensors become more sensitive when over the darker soil type.
4. **Calibrating over a even background** can acheive the best results. Calibrating along a header trail so every sensor has a similar light coloured background can help. When you do this you may find that the sensors will false fire a little at bare spots through the paddock, but you will also see that the system will be targeting smaller weeds.

Setting the Sensitivity

1. **A normal sensitivity range for the system is between 2 – 5.** **NOTE:** *Remember 1 is the most sensitive 10 is the least sensitive.* When starting in a paddock, always start on a lower setting until you are comfortable with what the Sensors are targeting. **NOTE:** *To spray a bit to much for the first couple of runs is better than missing weeds.*
2. **To target the smallest weeds possible,** you will have to have the system false firing a little. If no Sensors are firing until a weed is present usually means the system is not sensitive enough.

NOTE: *A few Sensors false firing usually doesn't equate to much wasted chemical*



WeedSeeker Rates (L/Ha) using TP65 even nozzles

Sprayed Width (cm)

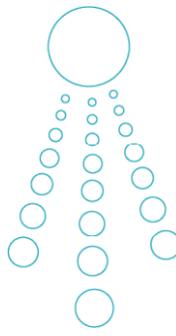
60

Testing has shown that the effective spray coverage of a single nozzle is 60cm.

Nozzle Size	Pressure (Bar)	Droplet Size	Flowrate (L/min/nozzle)	Speed (Km/H)				
				12	14	16	18	20
03	2	C	0.96	80	69	60	53	48
	2.5	C	1.08	90	77	68	60	54
	3	C	1.18	98	84	74	66	59
	4	M	1.36	113	97	85	76	68
04	2	C	1.29	108	92	81	72	65
	2.5	C	1.44	120	103	90	80	72
	3	C	1.58	132	113	99	88	79
	4	M	1.82	152	130	114	101	91
05	2	C	1.61	134	115	101	89	81
	2.5	C	1.8	150	129	113	100	90
	3	C	1.97	164	141	123	109	99
	4	C	2.27	189	162	142	126	114

Caution:

Increasing spray pressure above 3 Bar will reduce WeedSeeker accuracy and increase the chance of creating driftable fines.



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Kev's Tech Tips

Getting the most out of your WeedSeeker

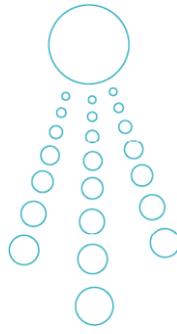
Calibration – it is important to calibrate your WeedSeeker correctly prior to use.

When you press and release the calibrate switch you are setting the background chlorophyll level for each individual sensor. This is instantaneous and there is no need to hold the switch. The sensor will only trigger the solenoid if the chlorophyll level is greater than that set at calibration. It is therefore important to make sure there are no weeds under the boom. If there is a weed present under a sensor when you calibrate the system, it will cause that sensor to detect only weeds bigger than the one calibrated over. It may be necessary to manually remove weeds from under the boom prior to calibrating.

It is also essential to calibrate the system over the same background that is in the paddock. If the paddock is bare soil, simply calibrate over that soil. If the paddock has stubble, the system should be calibrated over the stubble, not over a roadway or bare area. The ideal area would be in a headland with the boom placed over any header trail. Calibrate the system over the lightest soil background in the paddock, i.e. if you have both sandy and black soil, calibrate over the sandy soil. This will ensure your WeedSeeker operates at its most efficient over the entire paddock.

There is no difference in the calibration technique for day or night use.





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Kev's Tech Tips

Routine Maintenance of your WeedSeeker System

Compared to most equipment on the farm the WeedSeeker is a very low maintenance system, however it is important to follow a few basic steps to make sure it is working at its best.

Please note that these steps are additional to any required for a normal broadcast spraying operation.

Before every use the operator should conduct a visual inspection of all sensors, solenoids and wiring.

(A good time to do this is while filling the chemical tank)

- 1) Visually inspect the cables and wiring for damage and replace as necessary. Replace any broken or missing cable ties and ensure cables are secured to the boom. This prevents any possible damage from contact with stubble.
- 2) Visually inspect the sensors for physical damage and ensure the light and detection windows are clear and clean. If a damaged sensor is located please replace it with one of your spare sensors immediately and return it to your dealer for repair. If a damaged sensor is removed immediately it may only require a new casing. If it is left on the boom and chemical or water finds its way into the electronics the repair is more complex. If the light or detection windows are dirty please clean with a soft clean cloth being careful that any grit will not scratch the lense surface.
- 3) Once within the area to be sprayed "Flush" the WeedSeeker and ensure chemical is flowing through all solenoids.

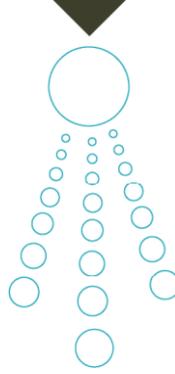
After each use the operator should clean the system ready for next use.

- 1) All chemical lines and solenoids should be flushed with clean water.
- 2) Check the cables and wiring for damage and replace as necessary. Check cable ties.
- 3) Check the cables and sensors for physical damage and replace as necessary.
- 4) If dirty, the boom and sensors can be cleaned by using a garden hose or other low pressure water source. Please ensure water is not directed upwards towards the cable entry points.

Other Precautions

For booms where the sensors face upwards in the folded position, please ensure the sensors are covered, this is to prevent optics damage by direct sunlight entering the light source and detection windows, as well as possible damage from water pooling in the lense housings.

Although the WeedSeeker is designed for outside storage we recommend that you store it undercover for maximum service life.



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Kev's Tech Tips

Getting the most out of your WeedSeeker

Spray Pressure

Your WeedSeeker system should be operated with a constant spray pressure. Please ensure you operate your controller in manual mode and not at an automatic litres per hectare rate.

It is essential that you operate your WeedSeeker with a spray pressure of between 2.5 and 3bar. This is important due to the operational limitations of the goyen solenoid. If the spray pressure rises above 3bar, the speed of operation of the solenoid may slow. This may cause your WeedSeeker to miss the target weeds.

As a reminder, operating the WeedSeeker at 3bar at 16km/hr with the standard 6503E nozzle, will deliver a water rate of 100L/hectare. If you require a higher water rate, this can be achieved by increasing your orifice size or reducing your speed, not increasing your spray pressure.

If maintaining a constant spray pressure is a problem, this is more apparent with diaphragm pumps. There are solutions available. For example, a Ramsay Valve and/or installing a better quality pressure relief valve system.

Operating Speed

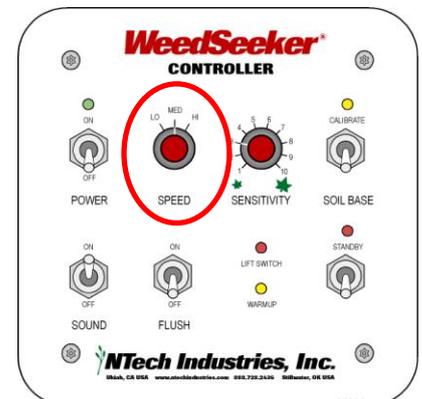
For agricultural applications, we recommend that your WeedSeeker system be operated at a speed of between 16-18km/hr. Although faster operation is possible, this has proven to be the ideal speed. Please remember that when you increase your speed two issues may arise:

1. The WeedSeeker will become less sensitive and may miss smaller weeds.
2. The timing of the solenoid firing may mean the chemical misses the target weed.

In a standard installation, there are 3 speed settings on your Controller:

1. 'LO' = 5-10km/hr
2. 'MED' = 10-15km/hr
3. 'HI' = 15-20km/hr

Therefore, at our recommended speed of 16-18km/hr your WeedSeeker system speed should be set to 'HI'.



WeedSeeker[®]

Selective Spot Spray System



Operators Manual



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WARNING: To reduce the risk of injury and damage to property and persons, the user must read, understand and follow guidelines in the Operators Manual precisely before using this product. If you do not understand either the warnings or the instructions in the Operators Manual, then do not use this product. Crop Optics Australia Pty Ltd will not be responsible for any injury or damage caused by a user failing to understand or follow the guidelines in the Operators Manual.

Any possible liability with respect to use of the product will only apply in the event that the product was correctly installed, configured, maintained and operated strictly in accordance with the Operators Manual.

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INTRODUCTION

Congratulations on your purchase of a WeedSeeker® Selective Spot Spray System.

WeedSeeker Sensors are an innovative leap in precision spray application and weed control. They are manufactured and tested to provide many years of dependable service, enhanced weed control, long term cost savings, and reduced environmental impact resulting from reduced application of chemicals.

TECHNICAL SUMMARY

A WeedSeeker® Sensor consists of an internal dual-wavelength light source, an optical detector and optics module, and an electronics module. Its operation is based on the fact that every substance has a unique spectral reflectance signature. The Sensor is optimized to compare the reflected light from soils and plants. The presence of chlorophyll in plants results in a distinct reflectance signature at particular wavelengths as compared to soils (and concrete, asphalt, etc). The Sensor compares the reflected light at two different wavelengths. When a plant comes into the field of view, the circuitry “recognizes” the chlorophyll signature and activates the spray solenoid via the valve driver cartridge.



Figure 1: Major System Components

SAFETY PRECAUTIONS



Rules for Safe Use of Chemicals

- Always read the label before using chemicals. Follow instructions from chemical manufacturer on how to select, use and handle each chemical. Note protection information each time before opening the container.
- Verbal warnings must be given if written warnings cannot be understood by workers.
- Do not spill chemicals on skin or clothing. If chemicals are spilled, remove contaminated clothing immediately and wash skin and clothing thoroughly with soap and water. Wash hands and face with soap and water and change clothing after spraying. Wash clothing each day before reuse.
- The spray tank and system should be emptied of chemical mixture and flushed with clean water before servicing the spray system or spraying components. Clean the WeedSeeker System of all chemical residues before servicing.
- Avoid inhaling chemicals. When directed on the label, wear protective clothing, face shield or goggles.
- Never smoke while spraying or handling chemicals.
- Cover food and water containers when spraying around livestock or pet areas.
- If symptoms of illness occur during or shortly after spraying, call a physician or go to a hospital immediately.
- Follow label directions and advice to keep residues on edible portions of plants within the limits permitted by law.
- Keep chemicals out of reach of children, pets and unauthorized personnel. Store them outside of the home, away from food and feed and lock them in a secure area.
- Keep bystanders away from spray drift.
- Always store chemicals in original containers and keep them tightly closed. Never keep them in anything but the original container. Read labels for hazards about chemical reaction with certain types of metals.
- Always dispose of empty containers according to manufacturers' directions.



Operator Safety Warnings

- Never use the WeedSeeker® System without instructions. See Owner and Operations Manual.
- Always read chemical manufacturer instructions before handling or spraying chemicals.
- Always install boom stop before working under or around raised spray booms.
- Clear spray boom area before extending and folding the booms.
- Keep bystanders away from the WeedSeeker System when operating.
- Drive slowly over rough terrain or when turning.
- Avoid driving up and down steep ditches and hills.
- Always install boom tie-down chains before transporting or towing the WeedSeeker System sprayer.
- **Caution:** If welding on the tractor or sprayer is necessary, disconnect the power from the battery by removing both the positive and negative leads from the battery terminals. Disconnect all connectors into each Line controller. Place your welding earth strap as close as possible to where you are welding. Protect your WeedSeeker components from welding splatter.

OPERATING INSTRUCTIONS

Open the lid of the Controller to gain access to the front panel.

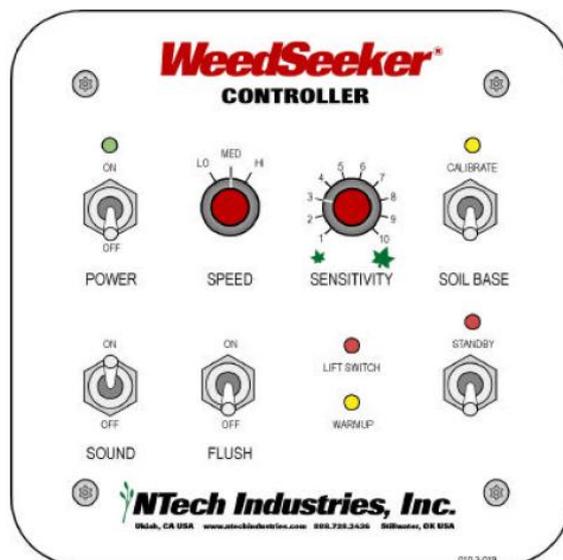


Figure 2: Master Controller Switch Panel

<u>Function</u>	<u>Description</u>
Power	Turns all sensors connected to that controller ON and OFF. Sensors do not retain calibration settings in memory when turned OFF.
Speed	Range to match vehicle speed. LO 5-10 km/h, MED 10-15 km/h, HI 15-20 km/h.
Sensitivity	Adjusts the sensitivity of the sensors for the size of the weeds to be sprayed. A small number equals a small weed.
Calibrate (Soil Base)	Resets the background reference value of each sensor. Select a weed free spot to calibrate.
Sound	Enables the beeper in each Line Controller. This is a reminder that the system is in standby mode.
Flush	Energizes (opens) all connected solenoid valves.
Lift switch	Light is ON when the standby mode has been activated by a remote switch.
Warm Up	Light is ON when the sensors are first powered up (30 sec).
Standby	Pauses operation of all sensors by directing the solenoids to close. The Standby LED will flash. Calibration settings are retained while in Standby Mode.

Starting Up

- Verify that the FLUSH switch is OFF. Turn on the pump and set the desired pressure **300kPa (45 psi) maximum**.
- Turn the POWER switch ON. The WARM UP indicator will flash for approximately 20-30 seconds while the electronics reach the proper operating temperature.
- During the warm up phase, make initial adjustments to the system for SENSITIVITY and SPEED. Use 2 or 3 as a good starting point for Sensitivity. Then adjust as necessary in the field.
- If the SENSITIVITY setting is set too high, the Sensor will miss small weeds. If it is set too low it will be too sensitive, and will false fire.
- Set SPEED to “LO” for 5-10kph, “MED” for 10-15kph, and “HI” for 15-20kph. If the vehicle speed is unknown, set SPEED to “MED” and adjust as necessary once you start spraying.
- If the spray pattern falls before the weed, reduce the SPEED setting.
- If the spray pattern falls after of the weed, increase the SPEED setting.
- When the WARM UP light goes off the Sensors will be in STANDBY mode.
- Adjust **your sensor height to 750mm**. Calibrate the Sensors for the specific soil or pavement type. Position the Sensors over a completely weed free patch of ground and press the SOIL BASE switch momentarily. For best results, set the soil base within the field which you are spraying. In variable soil types calibrate the Sensors over the lighter colored soil or background.
- Press the STANDBY switch to change the Sensors from Standby mode to Operational mode; the STANDBY light will turn OFF. The SOUND switch may be ON or OFF as desired.
- Verify the operation of each Sensor by waving a weed (or a leaf) under each Sensor to confirm that each unit sprays. AVOID CONTACT WITH THE CHEMICAL SPRAY; FOLLOW SAFE AND PROPER CHEMICAL HANDLING PROCEDURES. If there is a problem with a sensor recognizing the weed, check the sensitivity setting. If the problem persists, refer to the WeedSeeker® Troubleshooting Manual.



You are now ready to begin spraying.

Operating

Press the **SOIL BASE** switch to calibrate whenever soil conditions change. Do this over a weed free area of ground. For best results, set the soil base within the area to be sprayed.

In the first half hour of operation it may be necessary to recalibrate **SOIL BASE** two or three times until the system reaches optimum operating temperature. After the first half hour the SOIL BASE would only need to be calibrated when changing to a different soil type or field. You can't over calibrate the system.

Check periodically that all WeedSeeker® Sensors are working properly. Turn on the **FLUSH** switch, and verify that all LED indicators are on and each nozzle is spraying. Stop the vehicle if necessary for this step.

At the same time, check the Detector and Light Source windows on the underside of the Sensors. If they are dusty or dirty, use a soft dry rag to wipe them clean.

When traveling in an area that is not sprayed (i.e., between fields), switch to **STANDBY** to pause operation of the Sensors.

If the sprayer has a boom which is automatically lifted (such as on a Hooded Row Crop Sprayer), a lift switch can be added to remotely switch the sensors to **STANDBY** mode. The Lift Switch light comes on when the Lift Switch is activated. When the boom is lifted, all the Sensors are automatically put in standby to avoid inadvertent spraying.



Caution: *The sensors are susceptible to interference from some mobile phones and two-way radios. If operating a radio communication device near the sensors, please be aware that the sensor valve may activate and spray. If in an area where this would be a problem, it is recommended to switch the system to **STANDBY** to avoid erratic spraying.*

WEEDSEEKER® SENSOR

Your WeedSeeker® Sensors contain sophisticated electronic and optical components and are environmentally sealed to protect their integrity. Each Sensor weighs 1.2kg. An integrated mounting bracket allows easy assembly to a spray boom. Fig. 1 identifies the key parts of the sensor.

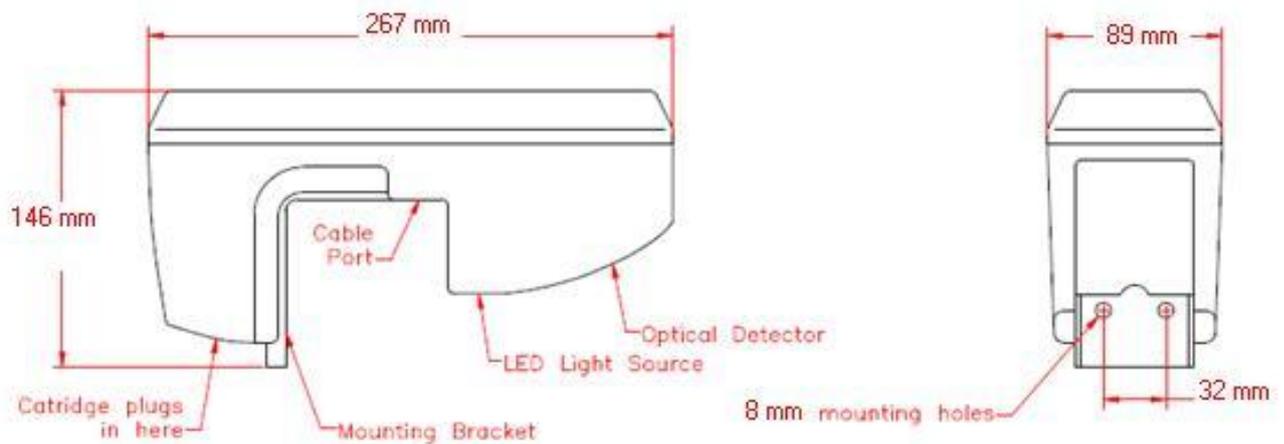


Figure 3: Identification of the key parts of the Sensor.

- The Optical Detector is at the front of the sensor. Positioned slightly behind the Optical Detector is the LED Light Source—a precision array of LEDs. The LEDs emit a modulated light signal, and the Detector reads the reflected light signal. *Note: the emitted light is not hazardous to look at directly.*
- When a plant is present, the Sensor circuitry activates the Spray Solenoid which will dispense the chemical.
- Electrical connection is made to the Sensor via a 12-pin cable to either of its two Ports.

Operating Height

Your WeedSeeker sensors should be operated at a height of between 650mm and 850mm above the ground for best results.

If the Sensors temporarily go too high or too low due to boom movement the spray solenoids will be activated to avoid missing weeds.

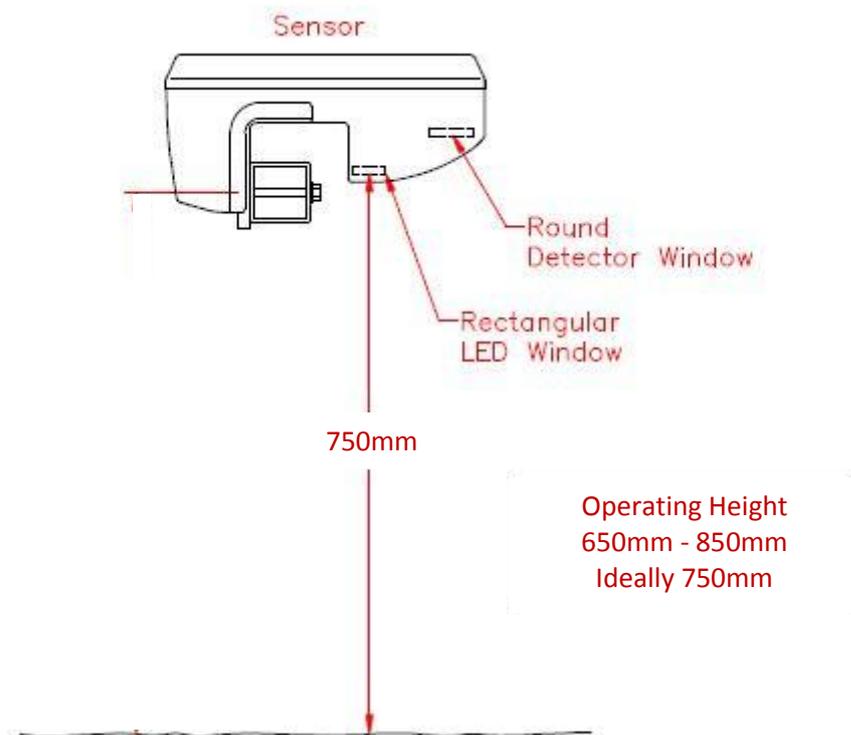


Figure 4: Operating height.

VALVE DRIVER CARTRIDGE

The Valve Driver Cartridge (VDC05) plugs into the cavity at the rear of Sensor. The valve driver and Sensor are slotted to ensure proper alignment.



Figure 5: Valve Driver Compartment



Figure 6: Valve Driver cartridge

Two captive screws hold the valve driver in place. The Valve driver contains a circuit board that drives both the spray solenoid and the indicator LED. This circuit is capable of supplying up to 5 Amps at 12V. When the Sensor detects a plant or weed, the VDC05 outputs an electronic signal of 12V. This signal is used to operate an spray solenoid which in turn controls a spray nozzle. The LED will turn on indicating that the cartridge is energized.

Figure 7 shows the connections for the VDC05. The red wire is connected to the positive side of a 12 Volt (negative ground) battery; the yellow wire is connected to the external solenoid. The solenoid is then connected to the same ground as the Controller.

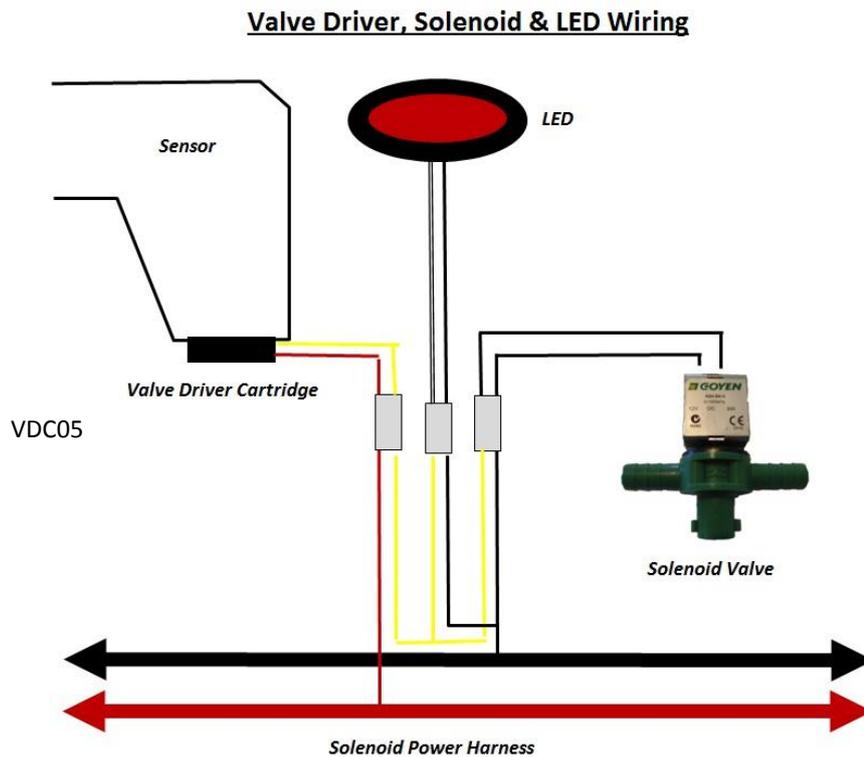


Figure 7: Wiring of Valve Driver Cartridge to External Solenoid valve & LED.

SPRAY NOZZLE

A bayonet nozzle cap attaches the spray nozzle to the base of the solenoid. The spray nozzle provides an optimum spray pattern which matches the field of view of the Sensor.

Recommended Nozzle Options

TP6503E-SS	65°	Even	03 orifice	Stainless Steel
TP6504E-SS	65°	Even	04 orifice	Stainless Steel
TP6505E-SS	65°	Even	05 orifice	Stainless Steel
TP6503E	65°	Even	03 orifice	Brass
TP6504E	65°	Even	04 orifice	Brass
TP6505E	65°	Even	05 orifice	Brass

NB: Water rates for each nozzle are given below:

WeedSeeker Rates (L/Ha) using TP65 even nozzles

Sprayed Width (cm)

Nozzle Size	Pressure (Bar)	Droplet Size	Flowrate (L/min/nozzle)	Speed (Km/H)				
				12	14	16	18	20
03	2	C	0.96	80	69	60	53	48
	2.5	C	1.08	90	77	68	60	54
	3	C	1.18	98	84	74	66	59
	4	M	1.36	113	97	85	76	68
04	2	C	1.29	108	92	81	72	65
	2.5	C	1.44	120	103	90	80	72
	3	C	1.58	132	113	99	88	79
	4	M	1.82	152	130	114	101	91
05	2	C	1.61	134	115	101	89	81
	2.5	C	1.8	150	129	113	100	90
	3	C	1.97	164	141	123	109	99
	4	C	2.27	189	162	142	126	114

Caution Operating the WeedSeeker solenoids at pressures over 3 Bar will reduce accuracy

Figure 8: WeedSeeker Nozzle Rate Chart

PLUMBING

Your WeedSeeker should be operated at a pressure of 3 bar (45psi) or below.

It is important to provide each spray solenoid with chemical at equal pressure.

The boom will usually be divided into a number of sections with a separate chemical supply line to each section. A $\frac{3}{4}$ " hose is teed into each of these supply lines to supply chemical to the WeedSeeker System. It is connected via a shut off valve. We recommend that a shut off valve is also installed in the supply to the broad acre spray line section.

This gives us three options for use:

1. Broad acre spray line only.
2. WeedSeeker only.
3. Both WeedSeeker and Broad acre lines.

Each of the $\frac{3}{4}$ " supply lines are teed to two $\frac{1}{2}$ " lines as close as possible to the centre of the boom section. These $\frac{1}{2}$ " lines then run from each external solenoid valve to the next until the end of the section. At this point a tap is plumbed to aid flushing of the line.

Figure 9 shows typical plumbing for a *WeedSeeker*® System.

In addition to the chemical tank, a clean water flush system is recommended.

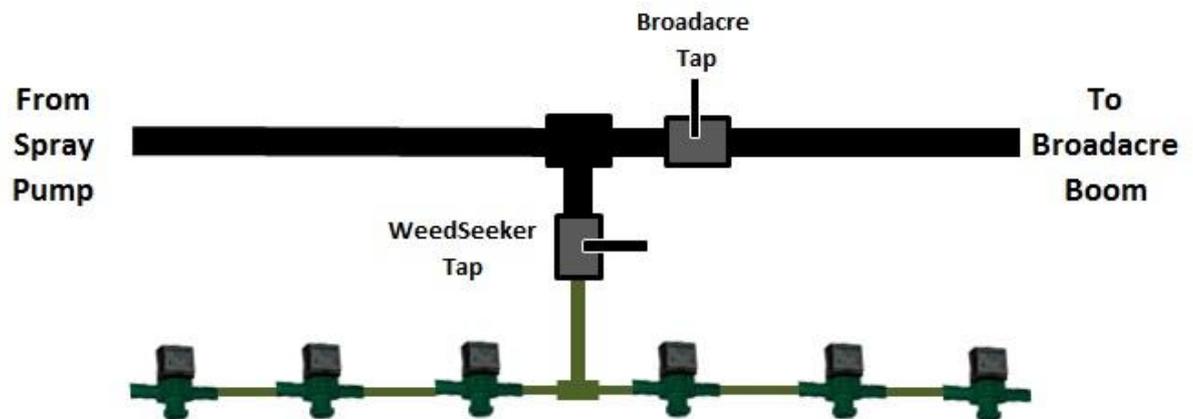


Figure 9: Typical Dual Line System Plumbing Diagram.

CARE AND MAINTENANCE

Proper care of your *WeedSeeker*® Selective Spot Spray System is important to maintain high performance. At the end of each day of spraying, the following steps should be taken:

- Flush the entire system with fresh water at the end of each spray session. To do this, switch to your fresh water flush tank or fresh water hose connection, and turn On the **FLUSH** switch. This will clean all delivery systems of chemical residue.
- With the **FLUSH** switch **ON**, check each nozzle. If a Sensor ceases to spray, but the valve LED lights are still operating, the spray solenoid or spray nozzle is clogged. *Caution: Removing the inlet hose while there is pressure and chemical in the line is a potential safety hazard. Turn the pump off and relieve the pressure in the line before removing the inlet hose.*
- Check the Detector and Light Source Windows for dust and dirt, and wipe clean with a soft clean rag. It is important not to scratch the Detector and Light Source Windows.
- The *WeedSeeker*® System should not be left outdoors during extreme weather conditions. Wide temperature variations are hard on electronics and fluid seals, and may reduce the operating life of the system. Storage in freezing weather may split the spray solenoid if not first emptied of its contents.
- **DO NOT** store a WeedSeeker system with the Sensors facing upward. Doing so may allow water to collect around the windows and gaskets, causing seal failures in those areas. It also can shorten the life span of the Sensors due to the effects of direct sunlight on the optical components.
- *Caution:* The sensors are susceptible to interference from some mobile phones and two-way radios. If operating a radio communication device near the sensors, please be aware that the sensor valve may activate and spray. If in an area where this would be a problem, it is recommended to switch the system to **STANDBY** to avoid erratic spraying.
- If you experience operating problems, refer to the Troubleshooting Manual. Limit any fixes or repairs to those covered in the Troubleshooting Manual. *There are no field serviceable components of the electronic system; do not attempt any field repair of a malfunctioning Controller or Sensors.* Contact your local dealer or representative for assistance.

WARRANTY

To make a claim under warranty, contact the Dealer from which you purchased the system giving a description of the problem and request instructions.

CONTACTS

Your WeedSeeker dealer should be your first point of contact for all WeedSeeker related matters.

FOR FURTHER INFORMATION PLEASE CONTACT:

Crop Optics Australia Pty Ltd

22 Marathon Street, Tamworth NSW 2340

P. 02 6760 7756 | F. 02 6760 7781

E. support@croptics.com.au | www.croptics.com.au

WeedSeeker[®]

Selective Spot Spray System



Troubleshooting Manual



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WARNING: To reduce the risk of injury and damage to property and persons, the user must read, understand and follow guidelines in the Troubleshooting Manual precisely before using this product. If you do not understand either the warnings or the instructions in the Troubleshooting Manual, then do not use this product. Crop Optics Australia Pty Ltd will not be responsible for any injury or damage caused by a user failing to understand or follow the guidelines in the Troubleshooting Manual.

Any possible liability with respect to use of the product will only apply in the event that the product was correctly installed, configured, maintained and operated strictly in accordance with the Troubleshooting Manual.

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TROUBLESHOOTING GUIDELINES



The first step in troubleshooting the *WeedSeeker*® Selective Spray System is to do a visual inspection. Check all cables for cuts or pinches.

Ensure that all light source and detector windows are clean and clear.

- Troubleshooting the *WeedSeeker*® system can be divided into power, controller, cable, sensor, or valve driver cartridge faults.
- If the entire system will not turn on, firstly check the 12V supply. If the fault persists then troubleshoot the controller and the cables.
- If the controller turns on, but one or more sensors do not operate properly, troubleshoot the sensors, valve cartridges and spray solenoids.
- Faults that affect both sides, or all of the sensors on one side, are usually in the controller or cables.



CAUTIONARY NOTES

To avoid damage due to voltage spikes, **turn the power off** before connecting or disconnecting cables or valve cartridges.

- Before starting to troubleshoot the *WeedSeeker*® Selective Spray System, flush all the hoses and spray solenoids with fresh water.
- Ensure the pump is turned off and the pressure has been released before disconnecting any hoses.
- Use fresh water when testing the spraying capabilities of the system.
- Wear the appropriate personal protection equipment as necessary.

This troubleshooting guide will not cover pump or other plumbing related issues.

SYSTEM DIAGRAM

Component layout for large Line Controller systems

Current Generation

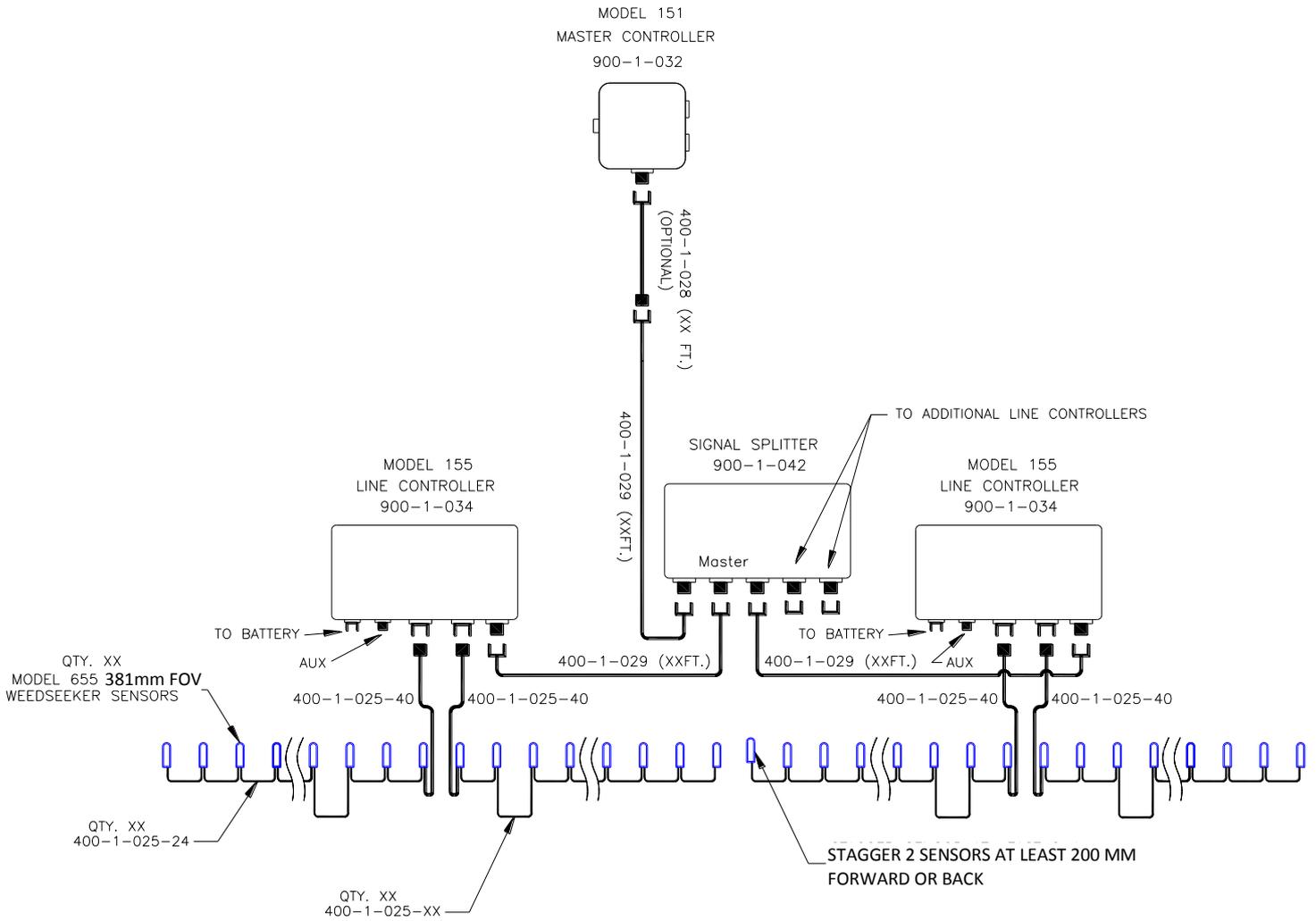


Figure 1: Component Connection Diagram for Current Generation System

Previous Generation

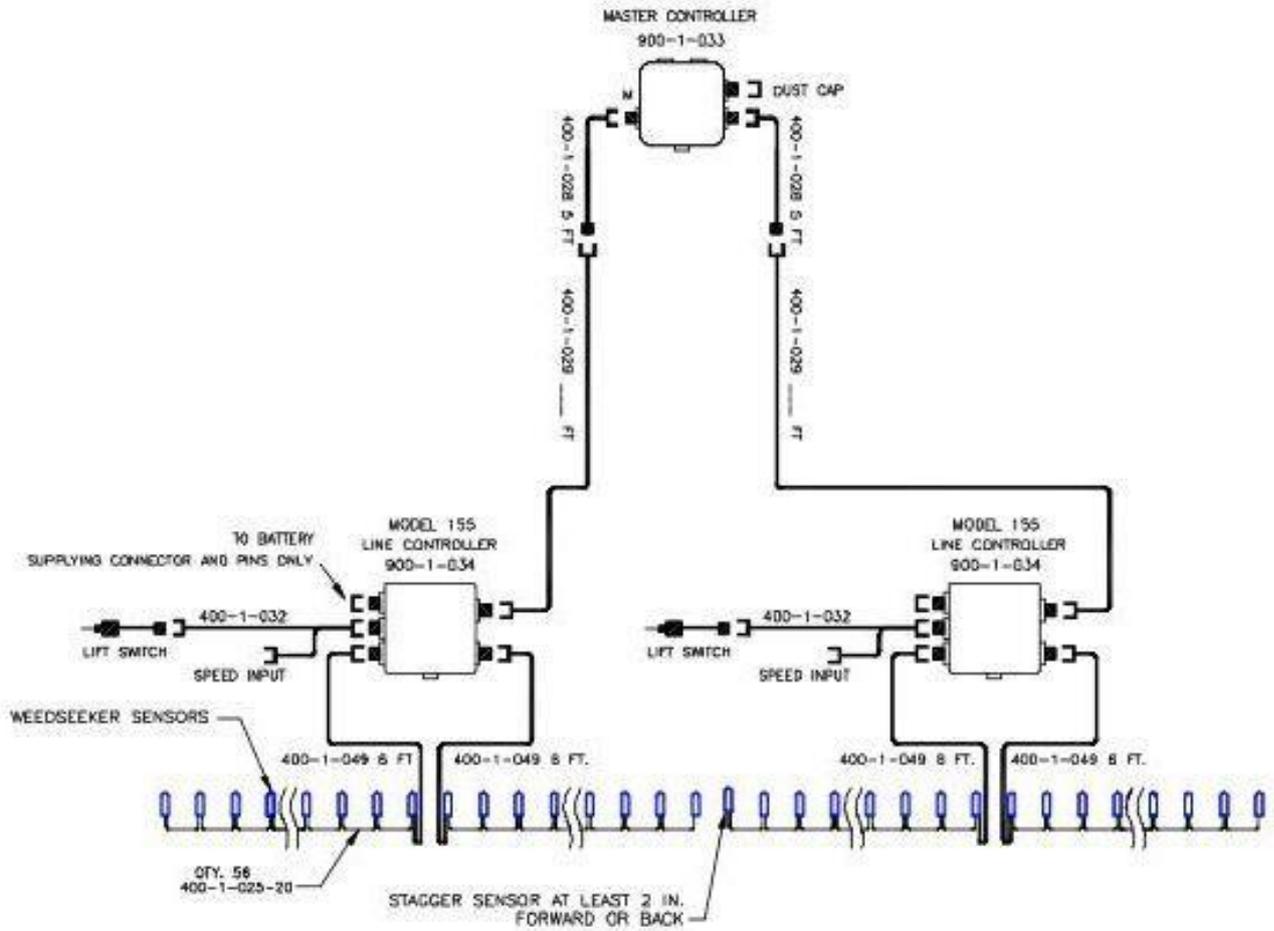


Figure 2: Component Connection Diagram for Previous Generation System

SYSTEM COMPONENTS

Controllers

The controller has internal circuits that will prevent the system from turning on if the power source is too high, (19 volts or more), too low, (10.8 volts or less), or if the current draw is too great, such as a short in the system.

Small Systems

The Controller should be connected directly to a fully charged 12 volt battery, or the Power Cable quick-disconnect can be plugged into a reliable convenience outlet. The Controller distributes the power directly to the Sensors through the Controller Cables and the Sensor Cables.

Systems with Line Controllers

The 12V power is distributed from the vehicle battery via an 80 or 120 Amp circuit breaker to a power distribution box located on the boom. This power distribution box houses a number of circuit breakers to distribute the power to both the line controllers located on the boom and the power loom for the spray solenoids.

The sensor power travels from the line controller through the controller cables to the nearest sensors. Sensor cables then link the remainder of the sensors. All cables must be connected before power will be available to the system.



Note: The master controller should have a master controller cable plugged into the plug marked 'Master' for the system to work.

Spray Solenoids & LEDs

The power for the spray solenoids and LEDs is supplied via a wiring harness.

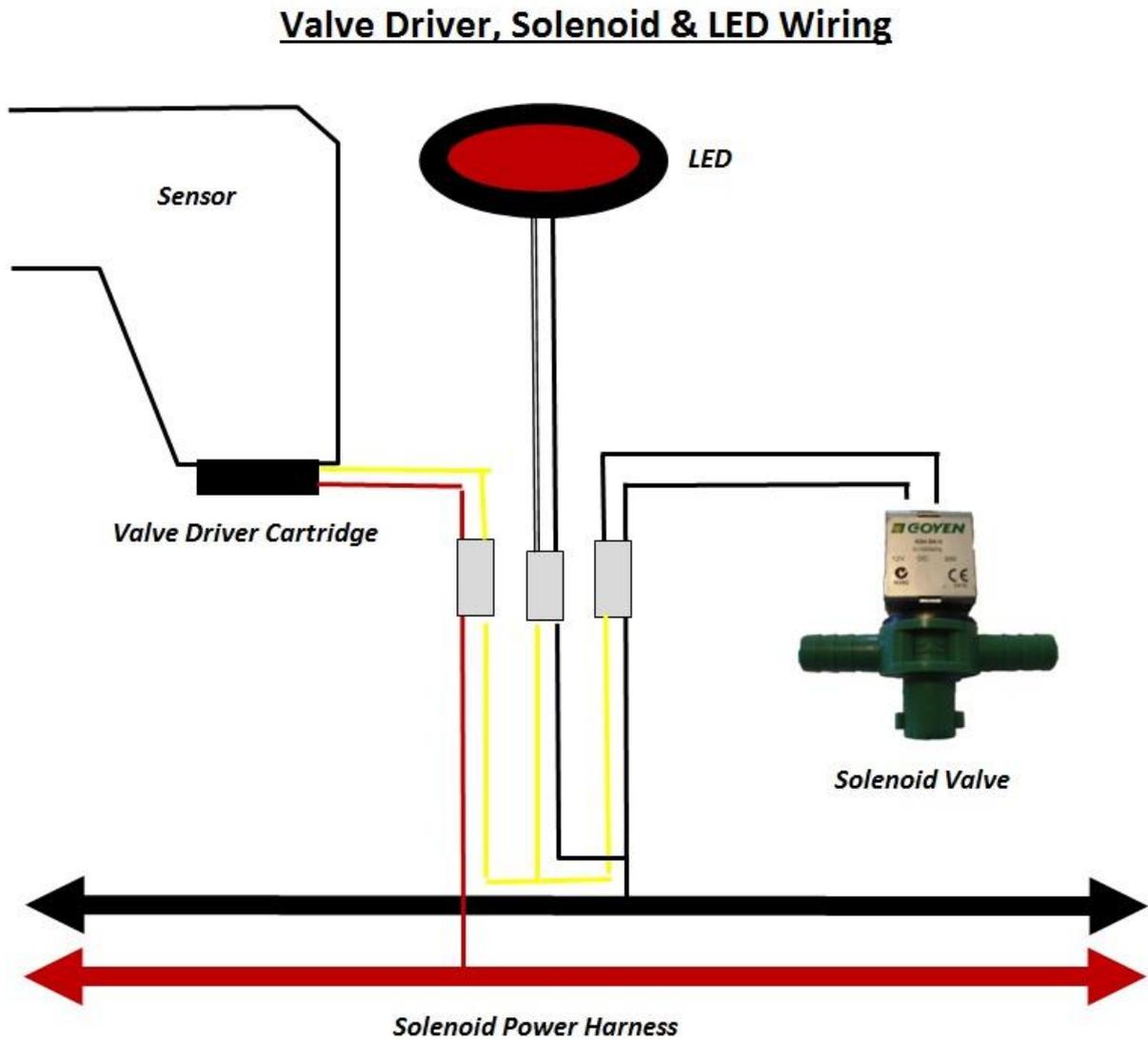


Figure 3: Wiring of Valve Driver Cartridge to External Solenoid valve & LED.



If the system Will Not Operate

Most problems are related to insufficient power e.g. vehicle battery voltage.

1. **Measure the vehicle battery voltage.** If it is less than 10.8V start the vehicle. Measure the Vehicle Battery Voltage with the engine running. If the voltage is still below 10.8V check the vehicle charging system.
2. **Ensure that all circuit breakers are ON.** Check the main circuit breaker located near the vehicle battery. On line controller systems check the 40A and 15A circuit breakers located in the power distribution box on the boom. If a circuit breaker has tripped OFF, reset the circuit breaker. If it immediately trips off again the associated wiring should be inspected for damage and short circuits.
3. **Ensure that all of the power cables are connected properly** and that there are at least 10.8 volts at the power cable quick disconnect socket of the Master controller on small systems, or line controllers on larger systems.
4. Ensure that the Master Controller, Controller and Sensor Cables are connected properly.
5. On large systems, it is easier to isolate the fault by dividing the group in half and checking for the symptom. Please ensure the master **Power** switch on the cab controller is **OFF** before disconnecting any cables.
6. Depending on the size of the system, continue to divide the group until the fault is found.
7. Turn the main cab power switch OFF.
Disconnect all "additional" Line Controller Cables from the Splitter Box.
Turn Power ON.
If the system still will not power up turn power OFF.
Swap the cable in the "Master" Line Controller port with one that was disconnected previously.
Turn power ON.
If the system powers up correctly the problem lies with the disconnected Line Controller or associated cabling.
If the system still fails to power up the problem lies with the Master Controller or associated wiring.
Repair or replace as necessary.

If the system switches into the Standby mode by itself

1. See above. (If the system will not operate).
2. Ensure that the battery is fully charged, the alternator is charging properly, and all cable connections are tight and secure.
3. If an electric pump is used, drawing most of the power, add an additional heavy-duty, deep-cycle battery to the electrical system.

CABLES

Power and the control signals are distributed to the sensors from the Master controller on small systems and from the line controllers on large systems through the controller cables and sensor cables.

The sensor cable plugs are a 12 pin, keyed connector.

The two bumps in the cable plug fit into the two notches in the Sensor connector jack.

It is not easy to do, but it is possible to force a cable plug into a sensor cable connection jack so that the connection is backwards. When this happens, the Controller will not turn on.

The circuit boards will not be damaged if the cable connection is reversed since they are protected by internal safety components.

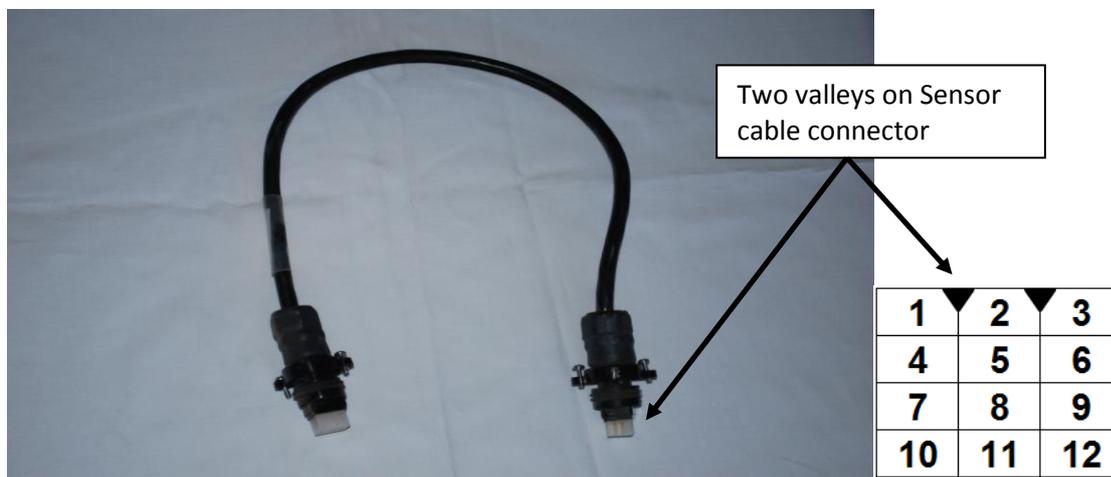


Figure 4: Sensor cable Connector

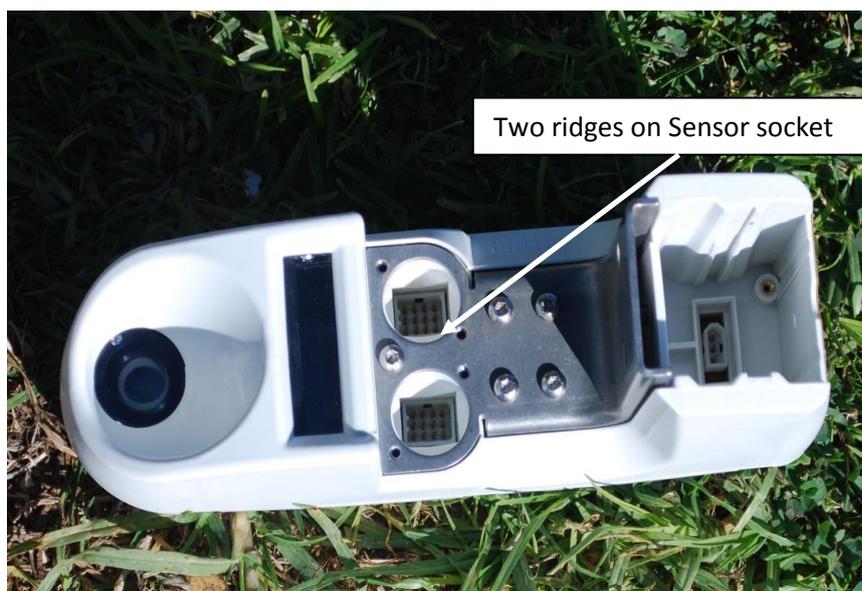


Figure 5: Sensor Connector

CIRCUIT BREAKERS

There is a main circuit breaker (80 or 120amp) located near the vehicle battery. This breaker can be used to isolate the power from the system when not in use.



Figure 6: Main Circuit Breaker

Line Controller Systems

There are also a number of circuit Breakers located in the Power Distribution Box on the Boom. This Box supplies power to each Line Controller via a separate 15Amp Circuit Breaker. It also supplies power via separate 40Amp Circuit Breakers to the spray solenoids and LED's on each section of the Boom via a wiring loom.



Figure 7: Power Distribution Box

If a Circuit Breaker Trips

When a circuit breaker trips it will not be easy to see as it will still be sitting at the same height as others.

1. Reset the tripped circuit breaker by pressing in all circuit breakers until the tripped circuit breaker is reset (you will feel it click back into place).
2. If it immediately re-trips there must be a fault in the cabling or components related to that circuit breaker.
3. Turn the power OFF.
4. Isolate the circuit breaker by disconnecting all cables or components at an appropriate location and then reset the circuit breaker.
5. Turn the power ON.
6. If the circuit breaker trips check all cables or components are disconnected. If so the circuit breaker may be faulty.
7. If the breaker stays ON, turn the power OFF.
8. Reconnect the components or cables one at a time.
9. If the circuit breaker re-trips the fault is most likely in the last item reconnected.
10. Investigate that cable or component and replace as necessary.

POWER WIRING

System Diagram

All power wiring should be installed in a way to avoid damage.

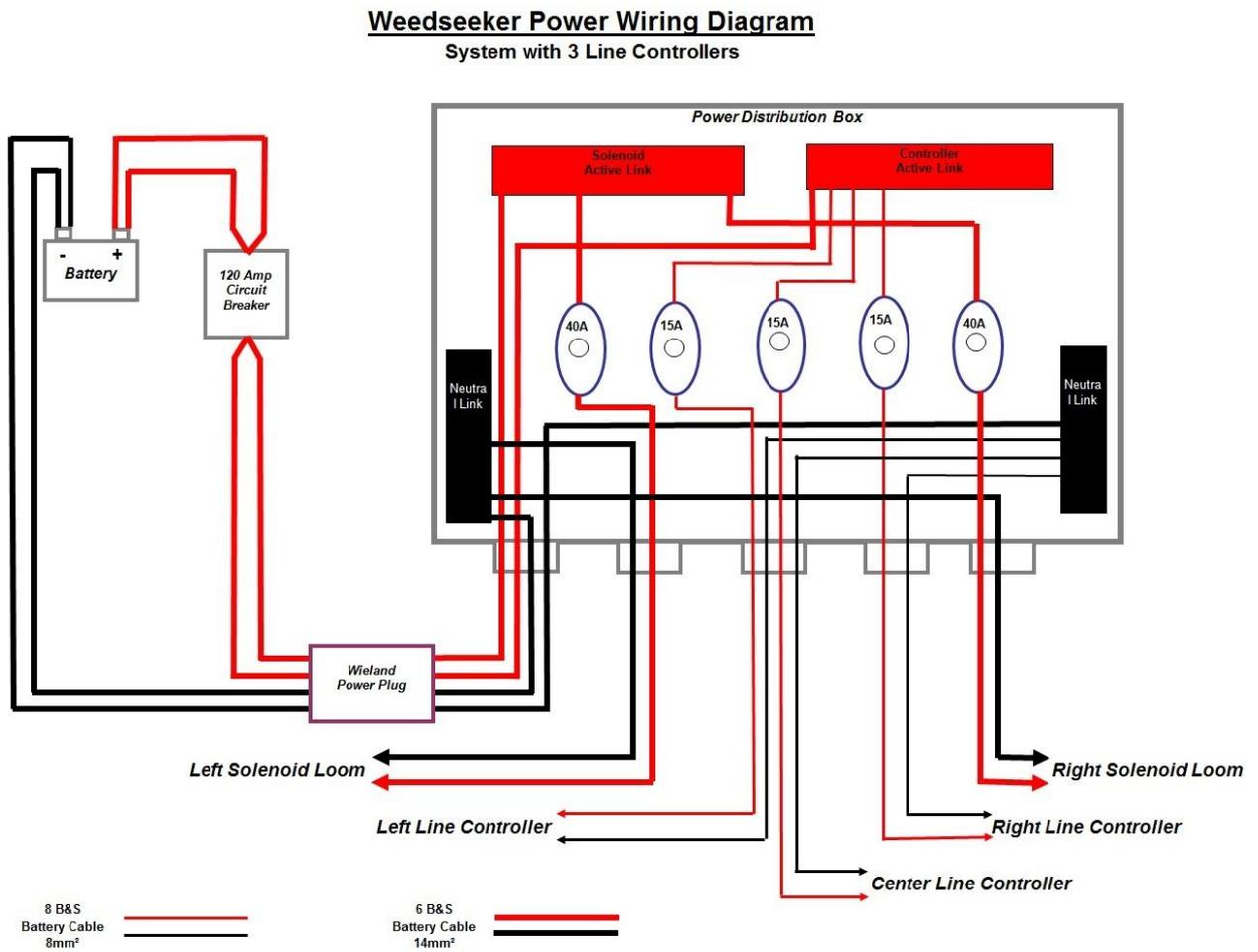


Figure 8: System Power Wiring Diagram

WEEDSEEKER® SENSORS

The sensors have an internal light source that shines on the ground.

A beam of red light will project from the rectangular window. It is safe to look into the window to check for the light source since the light is produced by Light Emitting Diodes, (LEDs.)

The reflected light is collected by the detector and the signal is processed by electronic circuitry.

If a weed is detected, the sensor fires the spray solenoid via the Valve Driver cartridge and the weed is sprayed with herbicide.

When the **flush** switch on the controller is turned on, all of the sensors will fire their spray solenoids.

If a Sensor is not operating properly

- 
1. Determine if it is one unit, a group of units, or all the units.
 2. **Ensure that the light source and detector windows are clean.**
 3. Ensure that the sensor's light source is on (Red Light). It is safe to look at the light source.
 4. If there is no light source, but the spray solenoid sprays when the flush switch is turned on, look for a broken pin on the sensor cable or the socket on the sensor.
 5. If the spray solenoid does not react properly when plant material is placed in the field of view, but does when the **flush** switch is turned ON, then the fault could be with the sensor or the valve driver cartridge. Further testing is required.

To determine if the Valve Driver cartridge or the Sensor is faulty

Step One

- a) Turn the **power** switch to **OFF**.
- b) Remove the valve driver cartridge.
- c) Install a different valve driver cartridge that is known to be good.
- d) Turn the **power** switch to **ON** and allow the system to warm up.
- e) If the spray solenoid now reacts properly, the original valve cartridge is probably faulty.
- f) Further testing of the original valve driver cartridge is required.
- g) If the spray solenoid still doesn't react properly, the sensor is probably faulty.
- h) Further testing is required. See Step Two.

Step Two

- a) Turn the power switch to OFF.
- b) Replace the unit with a known good Sensor.
- c) Turn the power switch to ON and allow the system to warm up.
- d) If the symptom remains, the fault is in another component. Further testing is required.
- e) If the symptom disappears, then the original Sensor is faulty.

VALVE DRIVER CARTRIDGES

When the sensor detects a weed or the Flush Switch is turned on, the Valve Driver Cartridge is sent a signal to fire the spray solenoid.



Figure 9: Valve Driver location.



Figure 10: Valve Driver cartridge

When the spray solenoid is energized it will open to spray herbicide and the LED above the serial number label and the LED (If Fitted) will turn on.

- If the LED turns on, but the spray solenoid does not spray, ensure that the nozzle tip is clear. Also check the 2 pin connector on the spray solenoid wiring.
- If the spray solenoid sprays continuously when the system is in the Standby mode and the LED is off, the solenoid is stuck open. Flush the system and if that doesn't clear the solenoid, dismantle and clean the spray solenoid. If the spray solenoid still does not spray replace the solenoid.
- If the spray solenoid does not spray and the LED does not turn on when plant material is placed in the field of view, or when the flush switch is turned on, the fault could be with the valve driver cartridge or the sensor.
- Further testing is required.

To determine if a Valve Driver Cartridge is bad

- a) Turn the **power** switch to **OFF**.
- b) Remove the valve driver cartridge.
- c) Install the suspected bad valve driver into another sensor that is known to be good.
- d) Turn the **power** switch to **ON** and allow the system to warm up. If the spray solenoid and LED still don't react properly, the valve cartridge is faulty.
- e) If the spray solenoid and LED do react properly, the original Sensor is probably bad.
- f) Further testing of the original sensor is required.

Spray Solenoid

If the Spray Solenoid does not spray:

- a) Check to see if the spray solenoid will spray when turned to **flush** mode.
- b) If it doesn't spray but the LED activates check the spray nozzle for blockages.
- c) If blocked clean with fresh water.
- d) If still not spraying check the two pin connector and associated wiring.
- e) If still not spraying the spray solenoid may be faulty. Replace the spray solenoid.

LED

If one or more of the LED's do not activate:

- a) Check the two pin connector and associated wiring
- b) If still not activating the LED may be faulty. Replace the LED.

SENSITIVITY

- The sensitivity knob determines what size weed will be sprayed. **Sensitivity** setting **1** detects the smallest weeds, i.e. most sensitive. **Sensitivity** setting **10** detects the largest weeds, i.e. least sensitive.
- Several small weeds are equal in chlorophyll content to one large weed.
- Moss is a plant, so a small patch of moss will be detected as if it were a large weed.

If the system, as a whole, is missing some smaller weeds

- **Ensure that the sensor light source and detector windows are clean and clear.**
- Increase the sensitivity by setting the adjustment to a smaller number. Make the adjustment in single increment steps until the desired sensitivity is reached.

If the system, as a whole, is spraying more than it should

- Press and release the **soil base** switch to re-calibrate. Do this over weed free soil!
- Decrease the sensitivity by setting the adjustment to a larger number. Make the adjustment in single increment steps until the desired sensitivity is reached.

If one Sensor is missing some smaller weeds or is spraying more than it should

- **Ensure that the sensor light source and detector windows are clean and clear.**
- The soil base might have been calibrated while over a different sample of soil than the rest of the system, such as a small weed, a puddle of water, or a dry spot.
- Reset the soil base with the entire system over weed free soil.
- Ensure that the field of view for that sensor is the correct width (refer field of view test procedure).

Field of View Test Procedure

- When pointing straight down, each sensor will have a field of view of 405mm +/- 12mm.
- When set at an angle, the Field of Field of View will be larger, depending on the angle.
- **System** should be **ON**, warmed up and in the **standby** mode.
- Pump should be OFF and the pressure in the hoses released.
 1. Position the Sensor over dry, and weed free soil
 2. Calibrate the **soil base**.
 3. Set the **sensitivity** to maximum sensitivity, (fully counter-clockwise).
 4. Switch the system out of the standby mode.
 5. Use a piece of healthy plant material that is 25mm wide to test the reaction of the sensor.
 6. Find and mark the limits of the sensor's field of view by observing when the external solenoid valve or remote LED turns on and off.

SOIL BASE

- Calibrate the soil base over weed free soil.
- Since a dry, sandy soil has a different reflectance value than moist, loamy soil, the soil base may have to be changed after the system has been moved to a different type of soil.
- For the most sensitive operation if soil types change within a field, calibrate the **soil base** over the lighter colored soil.
- Calibrate the soil base in the field and not on the road at the end of the rows.
- At the instant when the soil base switch is released, whatever reflectance value is being detected by each sensor becomes that sensor's new background value.
- Each sensor constantly compares the reflectance value to the background value it has stored in memory.
- The background value represents a certain amount of chlorophyll.
- An object must have a chlorophyll reflectance value greater than what is in memory in order to be sprayed.

If the Soil Base was calibrated while a Sensor was over a weed

- a) Smaller weeds will not be sprayed.
- b) Only weeds larger than the initial weed will be sprayed.



If a Sensor is spraying areas where no weeds are present, i.e. "phantom spraying"

- a) Press the **soil base** switch to re-calibrate the background value. (Do this over weed free soil!)
- b) If the problem persists, use a lower **sensitivity** setting.



If a Sensor is not spraying areas where weeds are present

- a) Press the **soil base** switch to re-calibrate the background value (Do this over weed free soil).
- b) If the problem persists, increase the **sensitivity** setting.

SPEED

To properly spray a weed, the time delay before the spray solenoid opens and the duration that it stays open must match the vehicle's speed.

Since the system does not use a speed sensing device, the **speed** switch selects a range of speeds to control the timing.

The system has an operating range between 5 and 20 kilometers per hour.

When properly set, the spray will turn on slightly before the weed and stay on until slightly after the weed.

LO	5-10 kph
MED	10-15 kph
HI	15-20 kph

If the Sensor is spraying before the weed

Reduce the Speed setting.

If the Sensor is spraying after the weed

Increase the Speed setting.

Avoid changing the vehicle's speed, as it would require a recalculation of the nozzle flow rates.

Speed Setting Test Procedure

- System should be on, warmed up and in the standby mode.
- Pump should be on and the hoses pressurized.
- Conduct the test on a dry, weed free road.
- The use of water sensitive paper may be needed to detect the spray pattern on the ground.
 1. Calibrate the **soil base**.
 2. Set the **sensitivity** to maximum sensitivity (fully counter-clockwise).
 3. Select the desired **speed** setting.
 4. Place a target weed on the road ahead of the vehicle.
 5. Leave enough space between the vehicle and the target so that the vehicle will be able to reach the correct speed.
 6. Switch the system out of the Standby mode,
 7. At the correct speed, drive the vehicle so that the target weed is detected and sprayed,
 8. Observe the spray pattern on the ground.

If necessary, change the **speed** setting and repeat the test.

APPLICATION OF WARRANTY

To make a claim under warranty, please **contact the Dealer** from which you purchased the system giving a description of the problem and request instructions.

CONTACTS

Your WeedSeeker dealer should be your first point of contact for all WeedSeeker related matters.

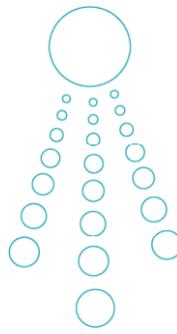
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Kev's Tech Tips

The importance of maintaining your batteries and alternator

It cannot be emphasised enough how important it is to maintain your batteries and alternators to keep them in peak condition.

The most common problems that arise with WeedSeeker can be traced to a weak set of batteries or a faulty or unsuitable vehicle charging system.

The electronic circuitry contained within your WeedSeeker system relies on a minimum operating voltage of 10.8V, but please remember that this voltage is required at the Line Controller terminals of your system.

On your average 24 metre system this means that a battery voltage of at least 12.0V is required for smooth operation.

On a 36 metre, or larger, system battery voltages need to be upwards of 12.5V.

Most modern tractors and sprayers have a large amount of electronics installed and the manufacturer usually supplies an alternator that will easily cope with this.

However, as tractors and self-propelled sprayers age their batteries deteriorate meaning that their current supplying ability diminishes. This is made even more apparent if the equipment is left unused for extended periods or the batteries become flat.

As a guide, if your tractor requires jump starting it will not have enough power to run the WeedSeeker system reliably until the batteries are fully charged once more. This may mean several hours of engine operation prior to turning on your WeedSeeker. Alternatively an overnight charge via a good quality battery charger should be sufficient.

The symptoms of battery or charging system faults are easy to spot. Your WeedSeeker system requires more power the more solenoids that fire at once. Therefore when the system is in flush mode, all solenoids firing, it is most susceptible. A typical problem will be shown by the LED's of one section turning off and on when the "Flush" switch is activated. The Master Controller in the cab may also switch itself off and back on in a cycling motion.

If this occurs please ensure that the engine is running.

