garford

providing advanced technology for progressive farming

robocrop inrow weeder

Operator Instructions

Contents

CE Declaration of Conformity

Garford Farm Machinery Ltd
Frognall, Deeping St James,
Peterborough PE6 8RP. United Kingdom.

Declare that the product...

Product		Model	
Serial number		Year	

Complies with European Directive...
2006/42/CE and 2004/108/CE
The following standards are applied ...
ISO 4254-1:2013, ISO 4254-5:2010, ISO 3767-2:2008 and ISO 11684:1995.

Garford Farm Machinery Ltd. Deeping St James.
01.01.2014

Philip Garford
Managing Director

Overview

Garford Robocrop Inrow Weeders are designed for the purpose of weed destruction, using mechanical means, inter-row and inter-plant in transplanted vegetable crops which are planted to a stand. It may also be possible to operate in seeded crops so long as the plants are evenly spaced and the crop is the more dominant feature rather than the weeds.
Weed destruction is achieved by cutting through the soil with a share the depth of which is controlled at approximately 10-20mm depth by means of a parallel linkage gauge wheel unit.
The steering of the implement and the synchronisation of the inter-plant rotors is controlled by a computer employing image analysis of the crop just ahead of the implement in real time.
The Robocrop InRow Weeders are supplied in a range of working width and crop row width configurations to suit customers crop configurations.

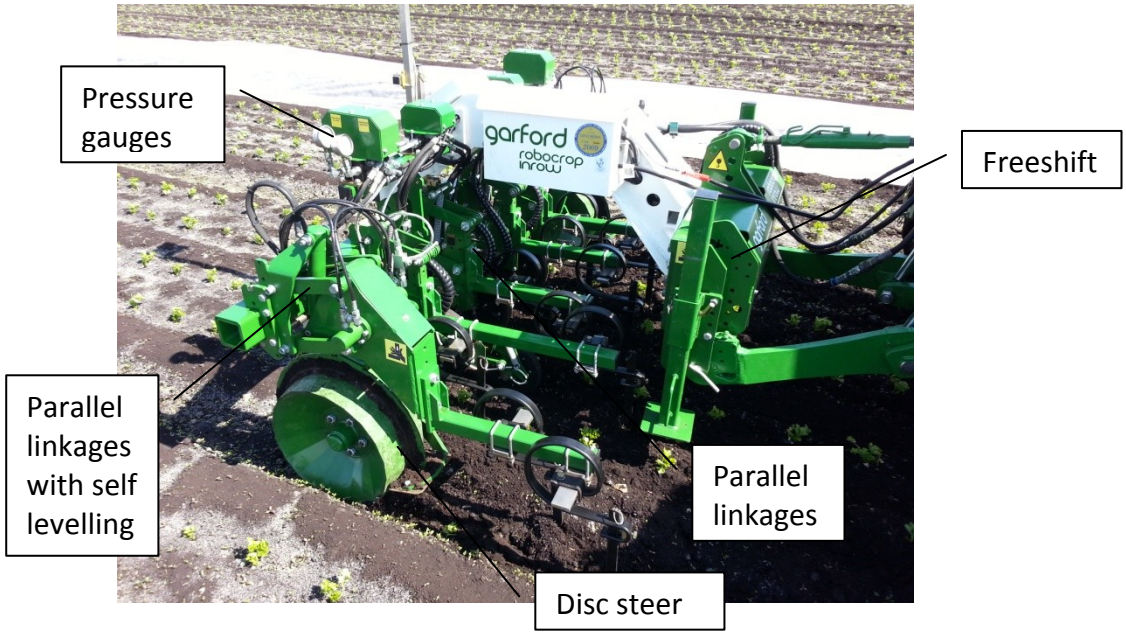
Typical employment of the Robocrop Inrow Weeder

Garford Weeding Implements
General Safety Instructions

Please read all of the safety instructions before commencing use of the implement.

Before carrying out mechanical repairs and adjustments

1. **Stop the tractor engine and apply the handbrake**
2. **Turn off the hydraulic supply.**
3. **If carrying out mechanical repairs or adjustments of the implement, shut down the Robocrop computer system and switch off the power via the rocker switch on the side of the console.**
4. **If the hydraulic system includes accumulators which store hydraulic pressure even when the tractor supply is turned off, ensure the system is depressurised and allow oil to return to the tractor by positioning the hydraulic lever in the float position. There are two pressure gauges on the hydraulic system at the front of the implement, ensure they both read zero before carrying out repairs or adjustments.**
5. **If the implement has an electric power pack, switch the isolator to the off position.**
6. **If possible lower the implement to the ground before working on it.**
7. **Never work under a raised implement unless it is supported by suitable jack stands.**
8. **Be aware of potential trap and shear points on the unit parallel linkages, the freeshift and the disc steer units with self levelling, and do not put yourself at risk.**



While changing settings on the computer the operator should ensure other persons do not try to make repairs or adjustments to the implement and keep other persons well clear of the implement.

Never conduct maintenance work on the side shift or disk steering mechanisms while they are supporting the weight of the implement.

Regularly check the condition of electric cables, hydraulic hoses and fittings and tightness of nuts and bolts etc.

If the hydraulic supply manifold is fitted with a hydraulic accumulator. Discharge the accumulator before disconnecting the implement from the tractor.

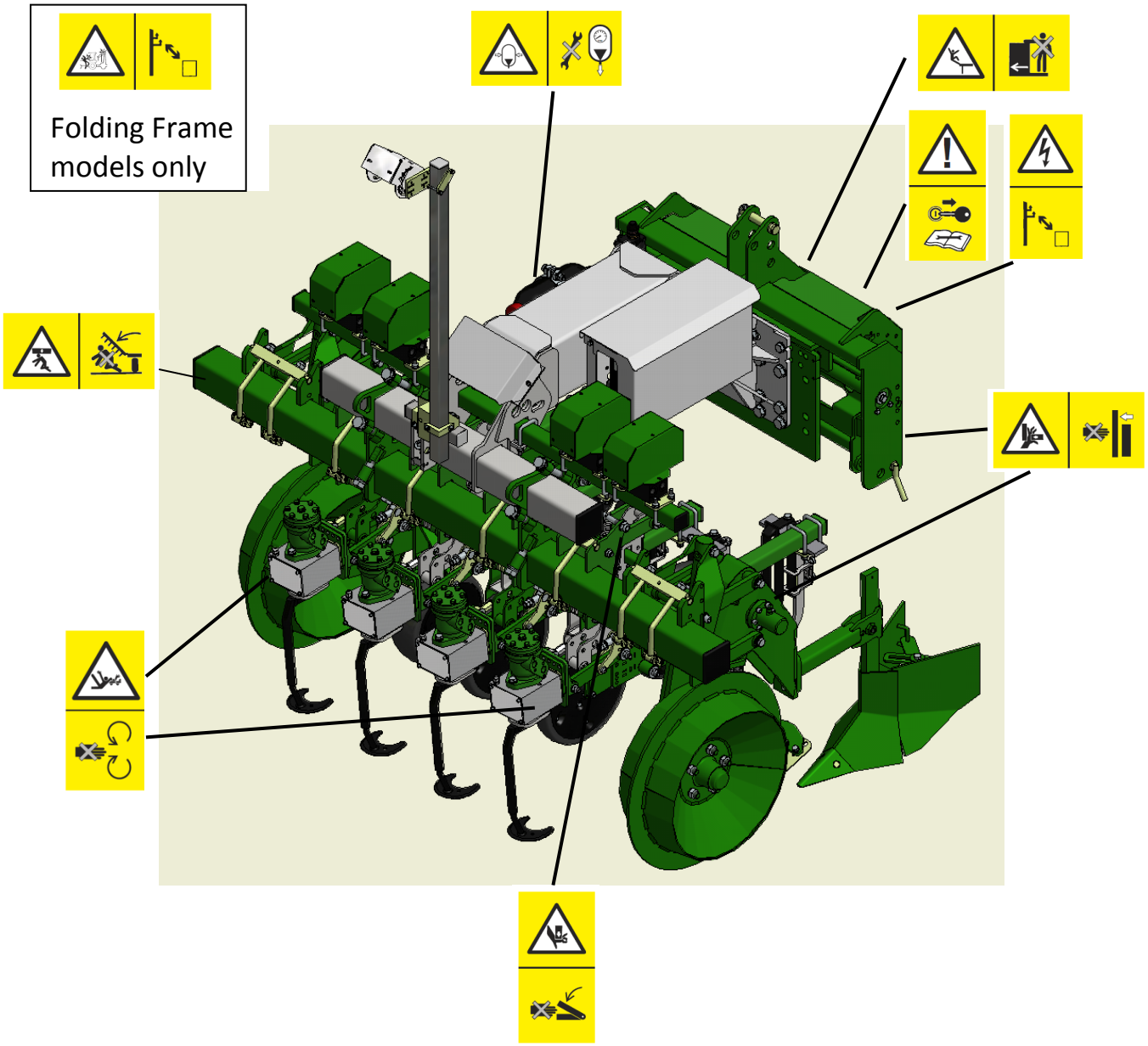
It is the operator's responsibility to ensure the safety of other persons and they must not be allowed to ride on or work near the implement when it is in operation.

The 12V power supply cables have fuses fitted near to the power plug or battery terminals. This is for short circuit protection and must not be omitted.

When routing the loom and power supply cables ensure that they do not cause a restriction or trip point in the cab.

Due to the bespoke nature of the design some Garford Hoes, particularly the larger size hoes, may need special measures when travelling on highways. Lighting equipment and marker boards are available as optional extra. Garford lighting is designed to comply with the Revised Standard for agricultural Vehicles 1st January 2016.

<u>Safety Signs</u>



Meaning of the Safety Warning Signs

Read the operating instructions before carrying out adjustments or maintenance.

Electrical shock/Electrocution Risk. Keep sufficient distance away from electrical power lines.

Crushing risk. Keep clear of the sideshift and disc steer mechanism, folding frame points and surrounding area during operation.

Never ride on machine during operation

Danger of crushing. Keep clear while machine is being unfolded or lowered.

Crushing risk. Keep clear of wheel unit parallel linkages during operation.

High pressure hydraulic system. Depressurise system before carrying out adjustments or maintenance.

Powered Rotating Blade and Rotor. May rotate at anytime. Danger of entanglement

Mounting the Robocrop InRow Weeder

Never put yourself or others at risk between the tractor and implement while hitching the implement.

On a firm and level surface, hitch the implement to the tractors category 2 front 3 point linkage.
Check that the 3 point linkage has sufficient movement to raise the implement well clear of the crop when in the field and that it will be possible to lower the implement to the soil and allow it to float on its own disc steer support wheels.
Adjust the top link to be sure the implement is level when in the work position.

Connect the hydraulic supply lines to suitably located hydraulic supply couplings ensuring the correct direction of flow. The supply hose is marked with a red marker and connects directly to the accumulator, the return line is marked with a blue marker.
During work it will be necessary to lock the hydraulic supply valve of the tractor in a constant pumping position but please ensure the supply can be stopped and pressure dumped immediately in an emergency.
It is preferable for the tractor to have a closed centre hydraulic system, however open centre systems can be used but you may require the optional oil cooler and pressure reducer system.
Oil supply requirement is pressure of minimum of 175bar and flow of 10ltr/min + number of rows x 12ltr i.e. a 4 row machine requires 58 ltrs per minute.

Mount the console in the tractor cab in a convenient location, using the bracket supplied, where it can be easily seen but does not obscure the operators view for safe driving. It is only necessary to glance at the console now and again during work to reassure oneself that the system is working correctly and efficiently.

Robocrop Inrow Weeder requires 2 electrical power supply connections. The cab mounted console is fitted with a D plug, common in most tractor cabs. The implement itself has a power cable which must be connected directly to the tractor battery. Always take great care to observe the correct polarity - the fused side of the supply Brown/Orange cable connects to positive, the blue cable connects to negative.

Ensure the hoses and cables are routed in such a way that they cannot chaff or become trapped or cut.

Robocrop InRow Weeder – Setup Guide

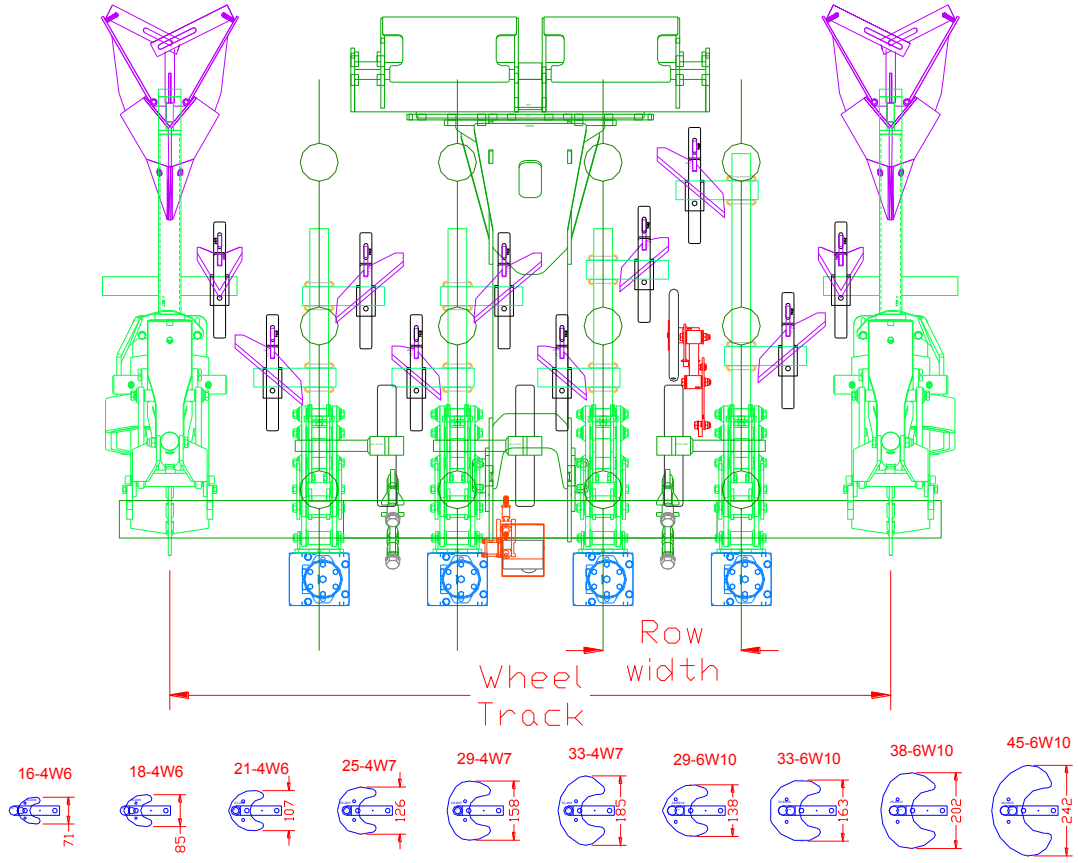
Setting up the Robocrop InRow Weeder consists of..

- mechanical alignment of the weeding units
- mechanical alignment of the cameras
- configuration file settings

The inter relationship between all of these settings is critical; if one is wrong the weeder will not work accurately. The accuracy of taking measurements and setting the weeder will be reflected in the accuracy of work.

It is the operator's responsibility to measure the crop and adjust the implement and computer settings to match the crop.

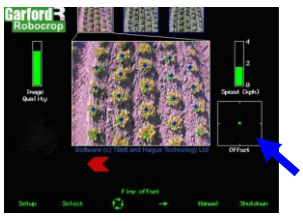
1) The implement must be set up physically to suit the crop you are working on.
   i) Set the disc steer wheel track width to suit the crop track width
   ii) Set the weeder row units to suit the row widths to be worked (Always take these measurements from the crop in the field to be worked).
   iii) Ensure the rotor disc size fitted suits the crop to be worked and the setting shown on the setup screen. The disc size should be equal to or smaller than the plant spacing to be worked. The physical measurement across the wide part of the disc is approximately half the disc design size i.e 126mm disc width = 25cm disc size.
   Disc size designation is a special code
   e.g. 16-4W6
   1st part (16) is the crop spacing design size
   2nd part (4) is the design offset between crop centre line and rotational axis of the disc
   3rd part (W) specifies a Weeding disc, alternative =T, a Thinning disc
   4th part (6) is the plant zone to be left by the disc
   The numerical reference is in centimetres.



2) Switch on the hydraulic supply and console and allow the system to test and park the rotors.

i) Settle the weeder into the crop rows with all tractor wheels and the weeder well into the crop. You should see the self levelling system adjust the steer discs in order to set the toolbar height. Put the 3 point linkage into the float position (never use pressure down). Adjust the top link so that the weeder is level and the camera stem is vertical. The self levelling system monitors the position of the outside most row unit parallel linkages to ensure the toolbar height stays a constant height above the soil around the plants irrespective of wheeling depth or bed height. If the toolbar appears to be always higher on one side than on the other consult your service agent.

3) Press "Setup" and check the basic settings.
   i) **Crop size** - set to height of thickest part of foliage.
   ii) **Configuration** – Check that the intended file is highlighted in white.
   iii) **Plant spacing** - measure distance of 5 plant spaces and divide by 5 in at least 4 places and use the average or set to a slightly smaller setting if it is found some plants do not get selected with a cross while working.
   iv) **Clearance** – start with the setting on Normal. This feature allows the non cultivated plant zone size to be adjusted.
   v) **Crop Colour** – set to suit the crop. If crop is a mix of red and green it may be necessary to work in infra red mode (ask your service agent).
   vi) Camera > **Row quantity and width** - It is the operator's responsibility to measure the crop and adjust the implement and computer settings to match the crop
   vii) Camera > **Height** – settle the weeder onto the crop with all tractor wheels and the weeder well into the crop so that everything is level. Measure the height from soil to camera lens. Check that the height matches the setting in the configuration file. If not then adjust the camera on its bracket to the setting shown on the console
   viii) Camera > **Look ahead** –check that the machine is level (camera stem vertical), if not adjust the top link of the tractor 3 point linkage until it is. Ensure that every time you enter the crop, the implement always settles to the same position by using the 3 point linkage in the **float position** (never impose pressure down from the tractor via the tractor 3 point linkage!!). With the "manual" button pressed, measure the distance along the soil from the point directly vertically below the camera lens to the cross hairs on the camera image. This is the **look ahead** distance.
   ix) Camera > A**head of rotors** – the distance back from the point below the camera lens to the rotational centre of the rotor discs. If the discs are ahead of the camera lens filter then the distance is entered as a negative.
   x) Camera > **Disc Size** see section 1. iii above
4) Press the "Manual" button so that the grid lines appear. Go to setup>Advanced menu and set camera skew to zero, then return to the working screen. If the grid, for each camera, does not exactly match the crop rows, check the **camera lateral adjustment**, if necessary move the camera sideways until the grid is centred. If the overall size of the grid looks wrong go to config editor and check the Camera > **focal length setting**. 2008 cameras should have a 4mm lens with focal length of 0.0185mm (0.7283") and 2009 have a 2.9mm lens with focal length of 0.0133mm (0.5253").
5) Check that the in work sensor is set correctly and switches the grid on and off as the implement is lowered and raised. Check that the odometer wheel is reliably in contact with the soil and soil flow is not impeded by tines close to the wheel.
6) Check hydraulic oil supply pressure before commencing work and during working at full speed to be sure the oil supply is sufficient. Oil pressure should be stable and not fall below 150bar (2100psi). The return line pressure should be near to zero, please check it, if it is more than 20 bar refer to your service agent.



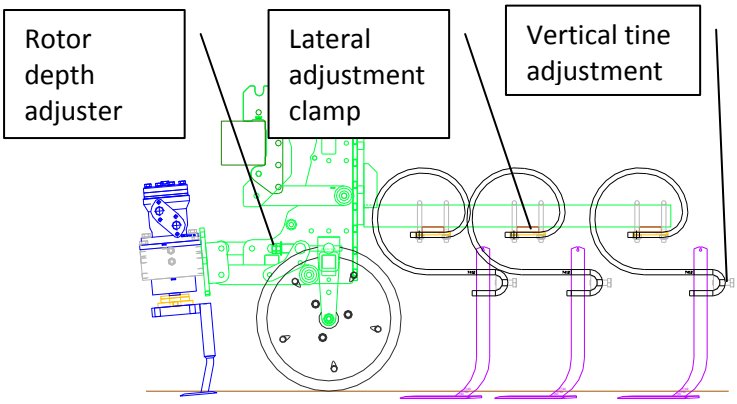
Fine offset- the two central buttons facilitate adjustment of the offset. Each press of the button will move the cutting position by 1cm.
Start with the fine offset indicator dead centre. Right/left adjustment moves the whole implement in relation to the crop position on the camera, forward/rearward adjustment advances or retards the rotation of the rotor disc as the implement advances forwards.

On a 2 or 3 camera machine the offset forward and backwards will only adjust the rotors that each camera is looking at. Use the select button to choose the camera section you want to alter, the cameras always read left to right as do the thumbnail pictures on the console.

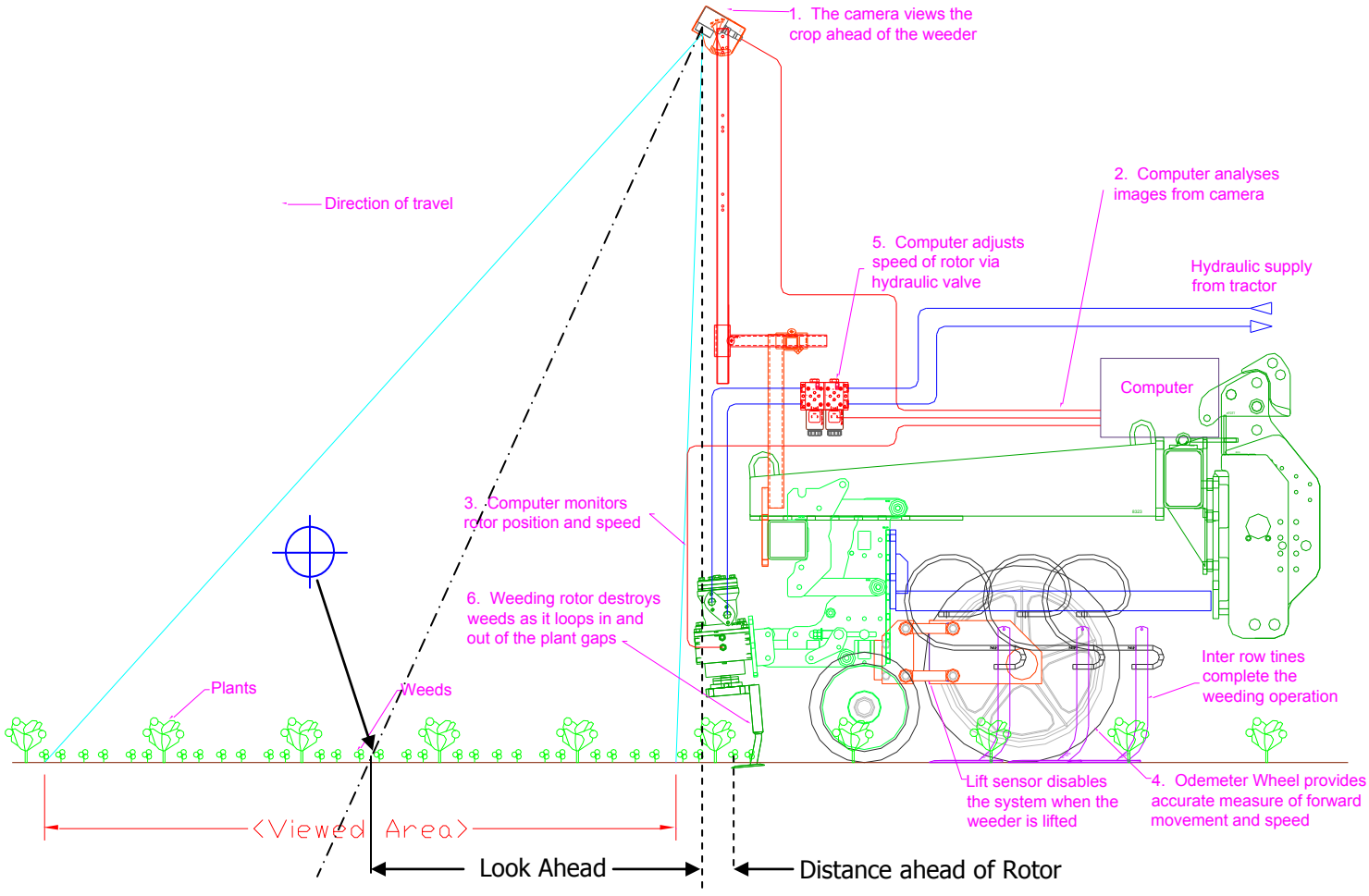
Once you are happy that the settings and adjustments are correct, slowly advance forward into the crop. Check the path that the weeding disc passes to ensure it is accurately centreing on the gaps between the plants and rotating around each plant. Use the fine offset to adjust it perfectly.
Likewise check that the implement is centred left/right on the crop rows and use the fine offset to adjust perfectly.
Hydraulic drive machines have a capability to operate at a forward speed of up to 4 plants per second and electric drive machines at up to 6 plants per second, however quality of work and soil throw should be monitored and speed adjusted accordingly.

<u>Tine adjustment</u>
The tines are adjusted laterally by the clamp on the 50x12mm brackets and vertically via the clamp block.

<u>Rotor disc depth adjustment</u>
Use the rotor depth adjuster to adjust the cutting depth of the disc



HAPPY HOEING.



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