PALMER AG

HAY PRESERVATIVE APPLICATORS

BS200FGLM-485V21

BS+200LM (optional)

Operators Manual

Preservative Flow Controller
(WITH TANKS)

200L low mount applicator system (with optional increase to 400L) for KRONE 6 & 8 string Big Square Balers

Model BS200FGLM-485V21 & BS+200LM

SOFTWARE CODE V22.00

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IMPORTANT INFORMATION for your Model BS200FGLM-485V21 & BS200+LM

Please Note: With regard to the possibility of spontaneous combustion of hay, we cannot tell you at what moisture you can safely bale hay at. The safe baling moisture level (even when using preservative) is dependent on many other factors including but not limited to the water soluble carbohydrate levels, microbial count, down time, type and variety of plant, prevailing weather conditions and storage conditions.
For information on determining the levels of the various factors that lead to spontaneous combustion of hay we suggest you contact you fodder peak body who should be able to assist you.

The following information should be maintained in the event that you require support from the manufacturer.

Bluetooth Name: Model 485-21-_____

Serial Number:_____ System Software Version_____

Date:_____

Recommended essential third party components:

Nozzle Body: TeeJet Part # QJ39685-1R500-NYB

Check Valve: TeeJet Part # 219508-NYP (Black)

Cap & Seal TeeJet Part # 25612-1-NYR

Spray Tip: TeeJet Part # TT110xx-VP or Turbo Drop #TDPFFP1100xxXL**

** TD type preferred – courser drops, less effected by wind

Nozzle mounting bracket: Part # 875-M18-R02

The operating range for the nozzle is typically 1 to 2.5 bar (15 to 40 PSI).
The remaining pressure up to the pump limit is required for the flow sensor, check valve and piping pressure drops.

PALMER AG CONTACTS:

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APPLICATION RATES AND NOZZLE SIZE CHOICES.

Nozzle colours for typical flow rate ranges (per nozzle in litres per minute)

Nozzle	Orange	Green	Yellow	Blue	Red	Brown	Grey	White
1bar	0.23	0.34	0.46	0.68	0.91	1.1	1.4	1.8
2.5bar	0.36	0.54	0.72	1.1	1.4	1.8	2.2	2.9

Tonnes Per Hour from bale weight & how many seconds it takes to make a bale

Seconds			Weight per Bale (in Kg)					
per Bale	300	400	500	600	700	800	900	1000
30	36	48	60	72	84	96	108	120
40	27	36	45	54	63	72	81	90
50	22	29	36	43	50	58	65	72
60	18	24	30	36	42	48	54	60
70	15	21	26	31	36	41	46	51
80	14	18	23	27	32	36	41	45

1 Nozzle

0.8 litres / ton	
TPH	L / Min
20	0.3
40	0.5
60	0.8
80	1.1
100	1.3
120	1.6
Use 1 x 110° nozzle	

2 Nozzles

0.8 litres / ton		PER
TPH	L / Min	Nozzle
20	0.3	~~0.13~~
40	0.5	0.27
60	0.8	0.40
80	1.1	0.53
100	1.3	0.67
120	1.6	0.80
Use 2 x 110° nozzles		

2 Nozzles

1 litres / ton		PER
TPH	L/Min	Nozzle
20	0.3	~~0.17~~
40	0.7	0.33
60	1.0	0.50
80	1.3	0.67
100	1.7	0.83
120	2.0	1.00
Use 2 x 110° nozzles		

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1. Introduction

1.1 System Description

The 485V21 G-Link Pressure Controller is a Vomax Instrumentation Pty. Ltd. product.

This system is designed for most baler types, and is designed to apply additive at the pickup of the baler for hay or balage.

The Palmer Ag Model 485V21 is an electronic control system which measures the flow rate via a flow calibrated pressure sensor and controls the speed of the pump motor to keep the flow rate set at a constant Set Point (Target). The flow rate Set Point is determined by the dose rate and the mass flow rate of fodder in tons per hour (TPH). The TPH of the fodder into the baler is set manually by the operator during the baling process.
There are a number of parameters in the system (some of which may be changed by the operator) which determine alarm conditions or cause certain status information to be displayed on the LCD screen.

This instrument uses a combination of the number of nozzles being used, the colour (size) of the nozzles, the measured fluid pressure to determine if all of the nozzles are working properly. An alarm is raised if an out of range condition is detected.

In summary the following inputs are used to determine the Set Point and control the preservative flow rate:

- Dose rate required (in Litres per tonne of fodder – keyboard entry)
- Tons per hour (Operator keyboard input)
- System status (from continuous internal flow controller checks)

Whenever the system starts to apply additive, the control system operates at the maximum pump speed for a short period of time to quickly fill the hose and check valve to ensure enough preservative is being applied at the start to preserve the fodder correctly. The system then goes into automatic pressure control as determined by the input parameters.
To enable the control system to do its task properly a number of values for various parameters need to be set by the operator from the control panel. These parameters are in a separate list towards the end of this manual.

The 485V21 G-Link Flow Control System consists of the following components:

- *Dual Touch Screen Terminal* - This resides in the tractor cabin and consists of a liquid crystal display touchscreen (LCD) unit inside a metal enclosure.
- *Control Unit* - This is an aluminium panel which mounts on or near the tanks and pump. It has a pump motor control module in the enclosure part and the pressure sensor mounted on the panel.
- *G-Link Connection Cable* - This cable (870-E113-R01) runs from the 485V21 Control Unit to the 870 Gazeeka G-Link Active Antenna
- *Owner's Manual and Reference Card*

The following operational conditions must be met to ensure your system operates correctly.

- For maximum longevity and accuracy, a 150 micron (100 US mesh) particulate filter is installed in the fluid line. Make sure the filter is cleaned regularly and replaced if damaged.

- Many problems with spray jets blocking up (and possibly other blockage issues) is caused by extraneous particles in the fluid. As the fluid level in the tank goes down, it is replaced by air from around the operating baler which is often very dust laden.

To ensure that this product remains compliant in terms of electromagnetic emissions and electromagnetic susceptibility, the instructions and procedures in this manual are recommended to be followed.

1.2 How it Works

The control system continuously reads in all the sensors, and combined with the values that have been entered into the flow controller parameter list by the operator, determines what the flow rate of the preservative should be at that point in time. This calculated value is called the Set Point (or target).
The control system reads the flow rate by deriving it from the flow calibrated pressure sensor and compares this reading with the current Set Point. If the measured flow rate does not match the desired flow rate (Set Point) this creates an Error value that the system uses to change the speed of the pump in a controlled way to make the flow rate move towards the Set Point value. The control system does this using an algorithm called a PID loop, which means it uses part of the Error value based on a combination of a Proportional, Integrated and Differentiated mathematical treatment of the Error value.

From the combination of the nozzle colour, number of nozzles and measured flow rates, and taking into account the extra pressure required to overcome check valves and pipe resistance the system calculates what the pressure should be and then compares this with the actual pressure measured and sets an alarm if this is out of reasonable range.

1.3 Using the Model 485V21.

Understanding the limitations of use.

Some of these points are reasonably obvious, but are documented here to clear up any misunderstanding:

- *Normal Operating Conditions* – The system has been designed to operate under normal operating conditions. It should not be used when conditions are not conducive to producing quality fodder or dangerous atmospheric conditions such as extreme fire risk, hail or lightening events. All hay should be cured and be under 25% WB moisture.
- *Clean fluids* – The preservative must be filtered to remove any particulate matter above 150 microns (100 US mesh). Filters should be cleaned and or replaced regularly as required to ensure the fluid going to the control system is clean and there is not too much pressure drop across the filter. The breather filter for the tank should also be regularly checked to ensure no dust greater than 50 microns (270 US mesh) is entering into the tank as the fluid level goes down.
- *Distribution of Preservative* –The distribution of the preservative over and into the fodder is not the responsibility of this product. The recommended spray system is supplied only as a starting point as no two brands of baler are the same, and often models from the same company are different. It is up to the operator to make adjustment as required. If in doubt, check with the supplier of the preservative.
- *Types of fluid* – the system has been designed for use with most of the commonly available hay and silage additives. It is up to the operator to carry out all necessary tests to determine if the model 485V21 is suited to the brand of preservative, or inoculants for silage which is to be used.

1.4 Indemnity

Neither Palmer Ag nor Vomax Instrumentation Pty. Ltd shall be responsible for any consequential damage cause by the use of the applicator.

This Palmer Ag instrument is an extra tool which should assist the operator in applying preservative to the fodder being baled and help in assessing and controlling the operational status of the preservative application operation.

The flow rates and other values provided by the instrument should not be used to determine contractual or custody transfer issues. *These issues should be determined by statistically representative sampling and laboratory assays carried out to national or international standards.*

The 485V21 Instrument has been designed to withstand reasonable levels of normal electrical "noise"; however, warranty does not cover any damage cause by electrical noise which may include exceeding the general noise specification, electrostatic discharge, lightening strike, load dumping (disconnecting the battery whilst the alternator is still charging), welding etc. Palmer Ag shall not be responsible for any consequential damage cause by the use of the Flow Controller.

1.5 Terms and Conditions of Contact (Sale)

This instrument has been sold under the Palmer Ag Terms and Conditions of Contract (Sale). A copy of these Terms and Conditions of Contract are available from www.palmerag.com.au

1.6 Setup for Various Companies' Products.

Using Hay Guard in your Palmer Ag applicator.

There is no need to dilute Hay Guard with water.

For Hay Guard set the number of nozzles to 1, the colour of the nozzles to yellow and the Dose rate to 0.8. (Note, this is the default for a new instrument).

This can be done in the menu structure in setup mode, or in the analyse mode using the Field key and the Up and Down arrows. (Use the ENT key to select the colour nozzle once it is on the screen using the Up and Down arrows)

When edited, these values are retained when the system is turned off.

We recommend the use of one 110 degree nozzle mounted on the Palmer Ag stainless steel nozzle mounting plates to counter the 15^{o} angle typical of most nozzle bodies.

Using Si-Lac Extra in your Palmer Ag applicator.

When using Si-Lac Extra with the Palmer Ag applicator, it is best to optimise the flow rate for best flow control which is typically centered around a half to a litre per minute (0.8 litres per tonne dose rate at 45 Tonnes per Hour). Thus:

A 2.25KG sachet of Si-Lac Extra with 200 litres of water = 0.8 litres per tonne dose rate.

A 450gm sachet of Si-Lac Extra with 40 litres of water = 0.8 litres per tonne dose rate.

Your applicator has this dose rate as the default if you choose **Si-Lac** from the Product Menu.

For Si-Lac Extra set the number of nozzles to 1, the colour of the nozzles to yellow and the Dose rate to 0.8. (Note, this is the default for a new instrument).

This can be done in the menu structure in setup mode, or in the analyse mode using the Field key and the Up and Down arrows. (Use the ENT key to select the colour nozzle once it is on the screen using the Up and Down arrows)

When edited, these values are retained when the system is turned off.

We recommend the use of one 110 degree nozzle mounted on the Palmer Ag stainless steel nozzle mounting plates to counter the 15^{o} angle typical of most nozzle bodies.

Using HY-SI in your Palmer Ag applicator.

When using HY-SI with the Palmer Ag applicator, it is best to optimise the flow rate for best flow control which is typically centered around a half to a litre per minute (1.0 litres per tonne dose rate at 45 Tonnes per Hour). Thus:

For the RB100 (100 litre round baler applicator), empty 20 litres of HY-SI concentrate into the 100 litre tank, then add 80 litres of clean water.

For the BS200 (200 litre big square baler applicator), empty 40 litres of HY-SI concentrate into the 200 litre tank and then add 160 litres of clean water.

For HY-SI set the number of nozzles to 2, the colour of the nozzles to green and the Dose rate to 1.0.

This can be done in the menu structure in setup mode, or in the analyse mode using the Field key and the Up and Down arrows. (Use the ENT key to select the colour nozzle once it is on the screen using the Up and Down arrows)

When edited, these values are retained when the system is turned off.

A good coverage of the HY-SI across the fodder at the baler pickup is required, so we recommend the use of two 110 degree nozzles mounted on the stainless steel nozzle mounting plates to counter the 15^{o} angle typical of most nozzle bodies.

Additive Information sheets provided by additive supply companies

The following information sheets from various additive supply companies are not an endorsement by Palmer Ag or Vomax Instrumentation. These information sheets are supplied by these companies to assist you in making your own decision on which product to use and how to use it.

1.61 Using Hay Guard on Hay (A Tama Australia / ISF product)

The object of using Hay Guard on hay is to preserve the food value of the baled hay.

There are a number of factors that need to be considered to achieve the best results when using Hay Guard. Baling at a higher moisture using Hay Guard in the correct manner will enable baling operations to be carried out at times which will provide you with a higher food value (including higher ME and protein) without unduly risking fire and fibre damage.

Firstly, Hay Guard is a chemical and its operation is absolutely repeatable when used in the same circumstances. It is not an inoculant that may contain live bacteria which may rapidly degrade if not used within a short time (usually days). The primary ingredient in the Hay of moulds and yeasts which cannot multiply in the absence of Oxygen.

The scavenging of the Oxygen can only take place within a well packed bale. The Hay Guard cannot work properly if a loose packed bale is allowing atmospheric Oxygen to permeate the bale faster than the Hay Guard can absorb it.

On the other hand, a well packed bale at these moisture levels will store some of the energy imparted to the hay as it was being made. This energy (heat) must be allowed to escape otherwise some degree of caramelisation may occur. This is why the stacking system described below should be followed.

Thus the following steps should be taken.

- For Lucerne and similar hay products pack: 3x3x8 bales to over 425Kg
4x3x8 bales to over 625Kg
4x4x8 bales to over 830Kg
- For Cereal and similar hay products pack: 3x3x8 bales to over 400Kg
4x3x8 bales to over 575Kg
4x4x8 bales to over 760Kg
- For Straw and similar hay products pack: 3x3x8 bales to over 300Kg
4x3x8 bales to over 420Kg
4x4x8 bales to over 560Kg
- Hay should be baled after a dry down of no more than 1 week. A longer dry down time increases the microbial count exponentially to unacceptable levels.
- Only bale when moisture levels are under 25% total moisture, and optimally at 22% total moisture. These moisture levels are based on oven dried (Feed Test) levels. The Hay Guard must be applied at a dose rate of at least 0.8 litres per tonne.
- Stack the hay in single rows in the shed no higher than 5 bales high for 4x3 and 4 bales high for 4x4 and about half a meter apart. After the bales have ceased changing temperature (at least 3-4 weeks), they may be stacked closer together.

Low density bales and bales that were not stacked as per these recommendations may not burn, but the hay is most likely to have mould, be discolored and also dusty (fall apart easily).

1.62 Using Si-Lac™ on Hay

Round Bale Silage.

Recommended for use on round bale silage made from all crops and pastures. Si-Lac Extra is applied as a live culture, and ensiles quickly, maintaining feed value through rapid reduction of pH and consumption of oxygen. Reduces growth of yeasts and moulds that cause heating, especially at feed-out.

Example: Reduces heating of round bales for up to 4 days once the bale has been opened. This allows producers to feed out round bales in advance ensuring that the entire ration remains edible with minimal losses due to spoilage.

High Moisture Hay.

Recommended for use on high moisture hay, Si-Lac Extra allows you to bale at up to 25% moisture and reduces the growth of yeasts and moulds. Si-Lac Extra will assist in reducing heat whilst high moisture hay is being stored therefore lowering the chances of combustion. Si-Lac Extra remains active for long periods minimising losses and utilizing your total harvest. Suitable for use with all crops and pastures.

When using Si-Lac Extra please refer to the manufactures documentation, as there are some critical issues that need to be heeded to optimise the effectiveness of Si-Lac which include, but are not limited to; a time to allow bacterial growth before use (temperature dependant), and up to 14 day tank life (also temperature dependent).

1.63 Using HY-SI on Hay

The use of HY-SI on hay has the following features and benefits:

- Reduce wilting time, baling hay sooner retaining more colour, leaf, energy and protein.
- Increase digestibility and palatability
- Increase conversion of sugar (WSC) to lactic acid for improved hay preservation reducing heating and spoilage
- Reduce weather risk.

HY-SI is:

- easy to use
- cost effective
- non corrosive and contains no living bacteria
- requires no refrigeration
- has the longest shelf life when mixed
- safe to the operator
- safe to the environment

HY-SI Application rate:

Please note that the following mixing volumes are different to that which is usually printed on the HY-SI container, but has been approved by Rumenwork (the supplier of HY-SI) to better suit the applicator, and allow you to go twice as far (do twice the tonnage of hay) before having to fill up the tank again.

For the RB100 (100 litre round baler applicator), empty 20 litres of HY-SI concentrate into the 100 litre tank, then add 80 litres of clean water.

For the BS200 (200 litre big square baler applicator), empty 40 litres of HY-SI concentrate into the 200 litre tank and then add 160 litres of clean water.

In both cases, use the dose rate of 1 litre per tonne.

Use a two nozzle system.

HY-SI is an excellent management tool to help farmers and contractors plan to make high quality hay and silage. HY-SI will not take the place of poor hay and silage preservation practice. Good hay and silage management practices will actually enhance the effectiveness of HY-SI. Due to many factors beyond the control of Rumenwork, the farmer and contractor assumes all the responsibility for results of hay and silage.

2. Installation

Refer to the following Drawings which can be found in the back of this manual:

Drawing Number

CONSOLE G-LINK	Terminal Wiring Diagram
485-E13-R02	Controller Wiring Diagram
BS200GLM-BS200FGLM	General Arrangement

2.1 General Installation notes:

When mounting an applicator on any baler type consideration must be given to the structural integrity of the area where the applicator frame is to be fitted. It may be necessary to fabricate additional support frames/brackets to minimize any excessive stresses on baler components.

An installation which is properly carried out and takes into account all of the issues raised in this manual will minimise any risk that the flow controller may provide erroneous flow rates.

Other than the specific issues raised in this chapter, the general issues of good installation practice and common sense still apply if the best results are to be obtained.

General items not supplied.

Normal supply may not include the following:

- Electrical Noise filters or isolation that may be required on the vehicle.
- Lightening protection.
- Some miscellaneous brackets, fasteners and general installation hardware.
- Brackets and fasteners to mount the spray system.
- Brackets and fasteners to mount the control panel in the tractor.
- Sensor to stop the preservative flow (e.g. a hay sensor) contact Palmer Ag if you wish to install a sensor for this purpose. A number of parameter changes may be required to activate this sensor input.

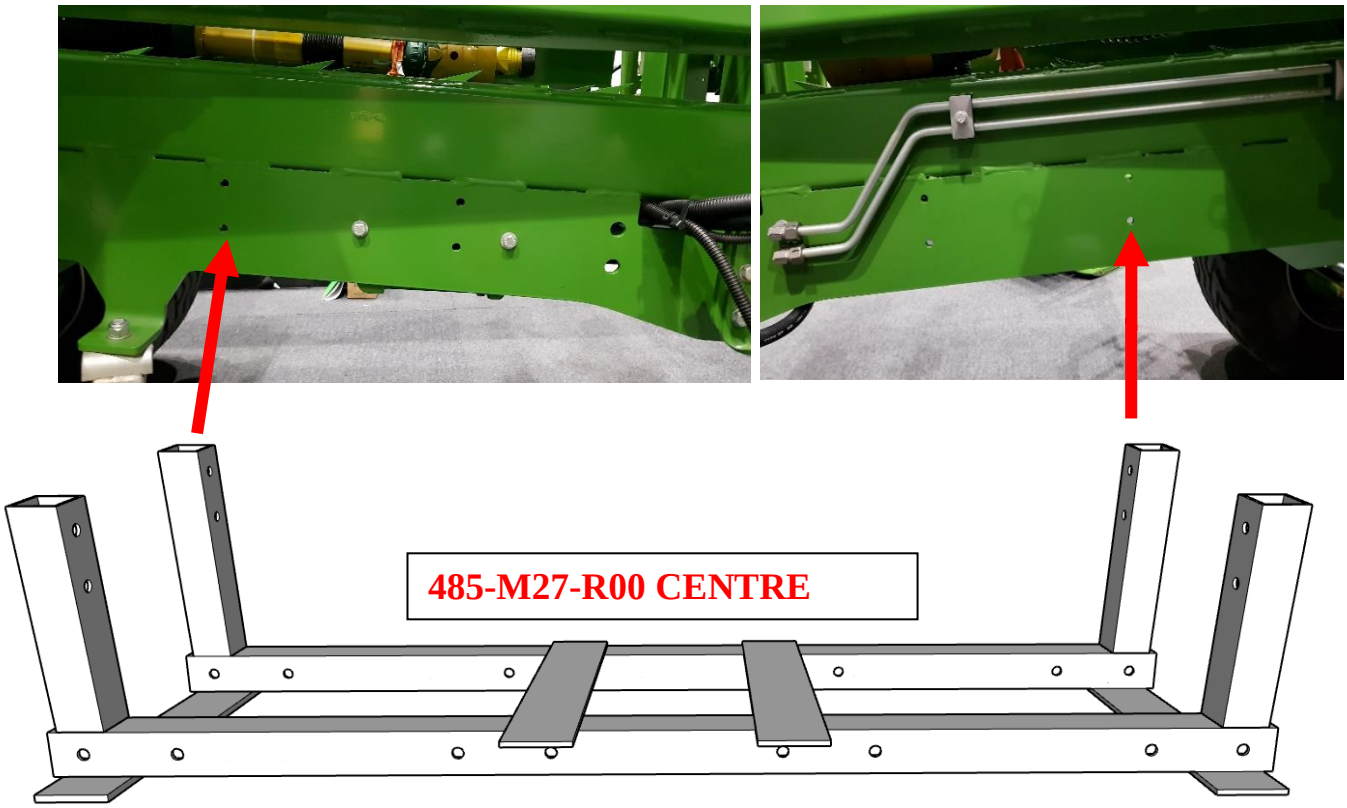
2.2 Installation Guide:

Step 1: 200L APPLICATOR BS200FGLM-485V21-N FITMENT

Fit 485-M27-R00 frame to bale chamber as shown below using the following

- 8 x M10 x 80mm bolts
- 16 x M10 flat washers
- 8 x M10 spring washers
- 8 x M10 hex nuts

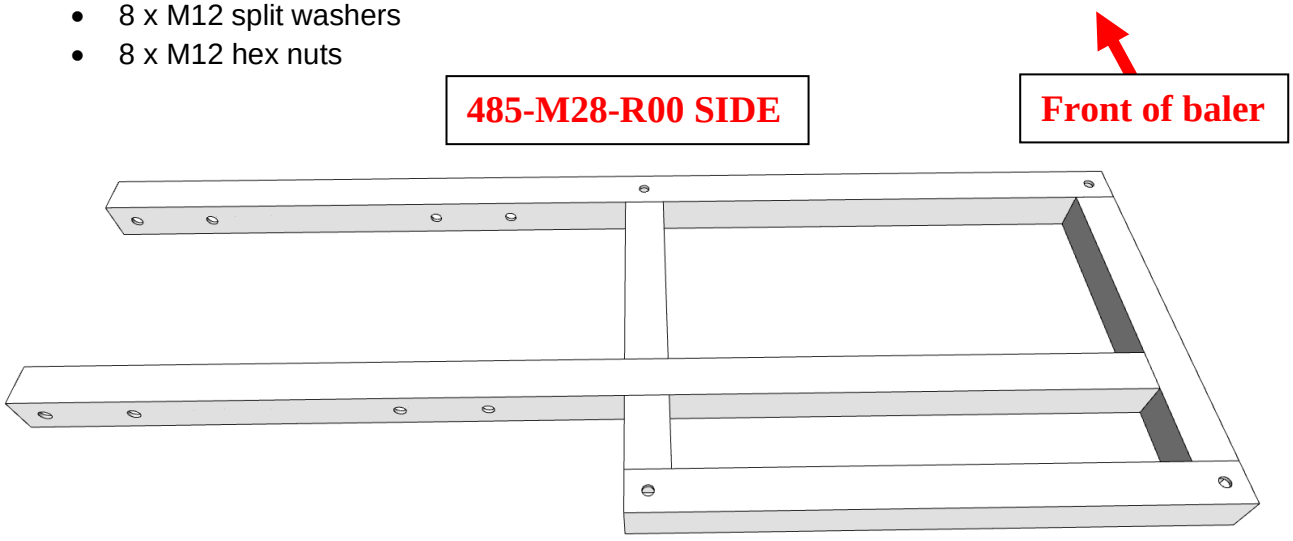
Note: The longer uprights are at the front of the baler



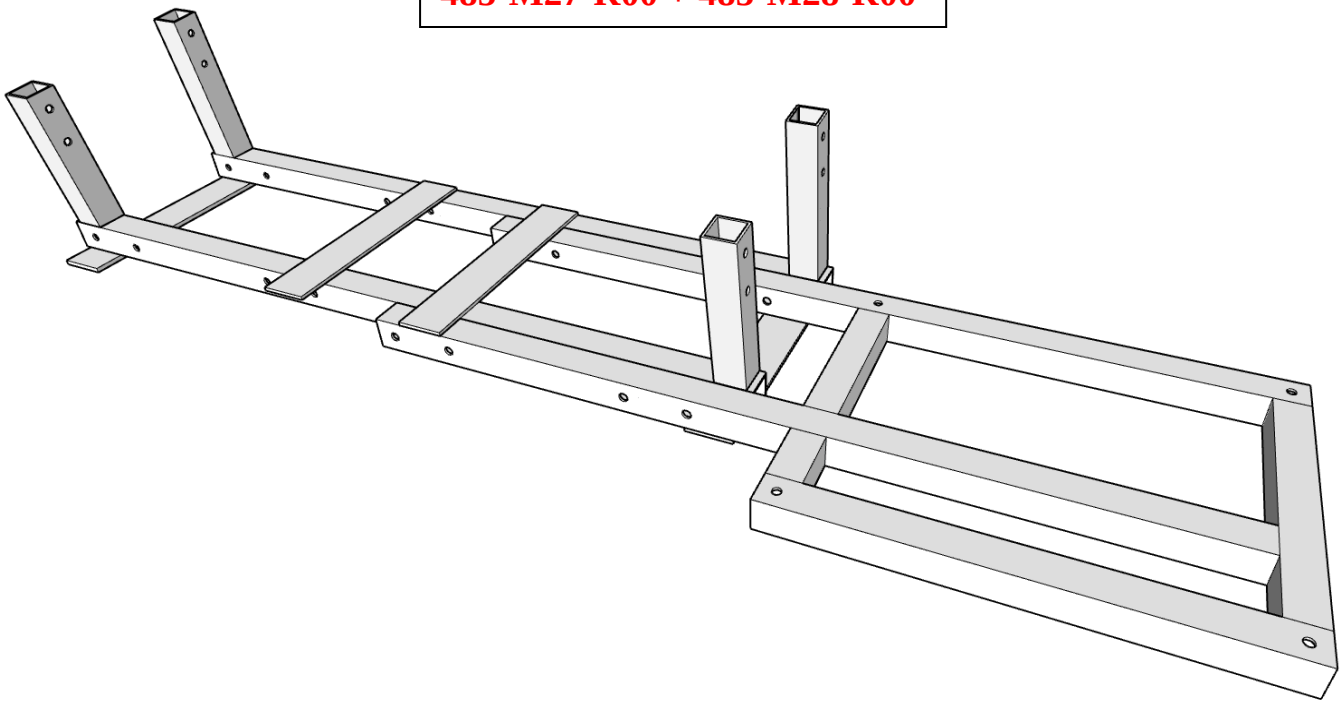
Step 2: FITMENT OF THE SIDE FRAME

Bolt 485-M28-R00 side frame to 485-M27-R00 frame as shown below using the following

- 8 x M12 x 120mm bolts
- 8 x M12 flat washers
- 8 x M12 split washers
- 8 x M12 hex nuts



485-M27-R00 + 485-M28-R00

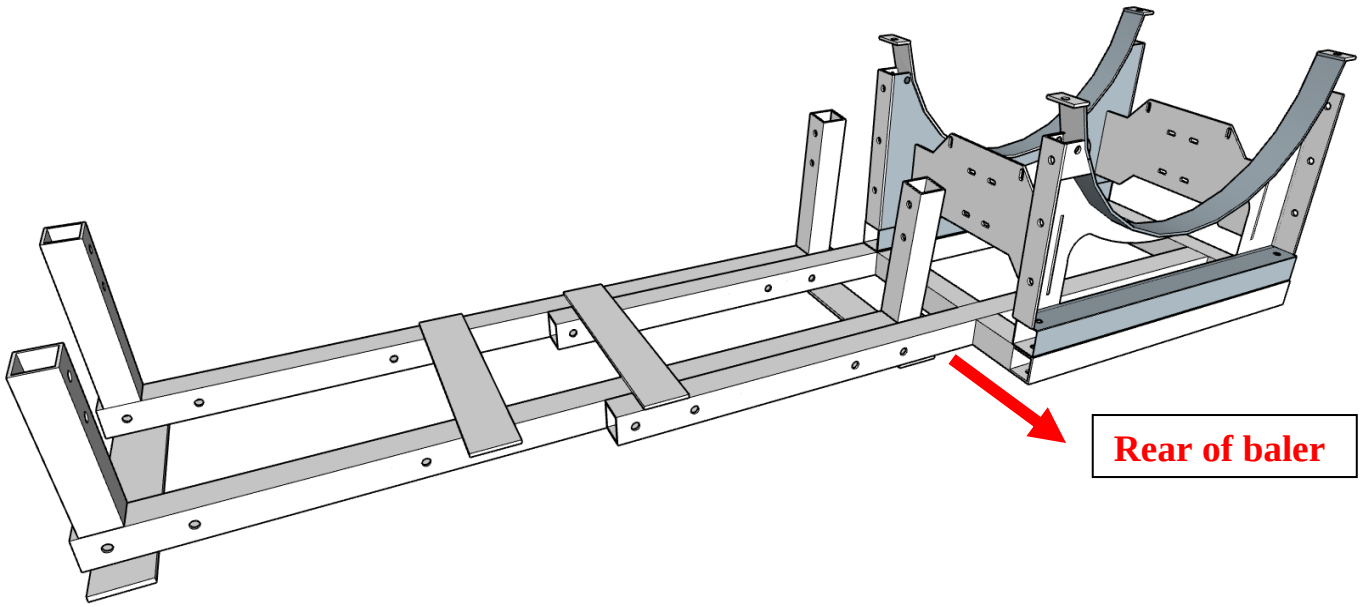


Step 3: FITMENT OF THE 200L TANK

Bolt the 200L tank & frame to the side frame using the following:

- 4 x M12 x 70mm bolts
- 8 x M12 flat washers
- 4 x M12 spring washers
- 4 x M12 hex nuts

Note: The side with the pump & electronics faces outwards



Step 4: APPLICATOR CONNECTION TO BALER/TRACTOR

Connect the hose to the nozzle and the cable from the electronics to the G-Link Gazeeka as per a standard applicator installation

Step 5: FITMENT OF 20L FLUSH TANK IF REQUIRED

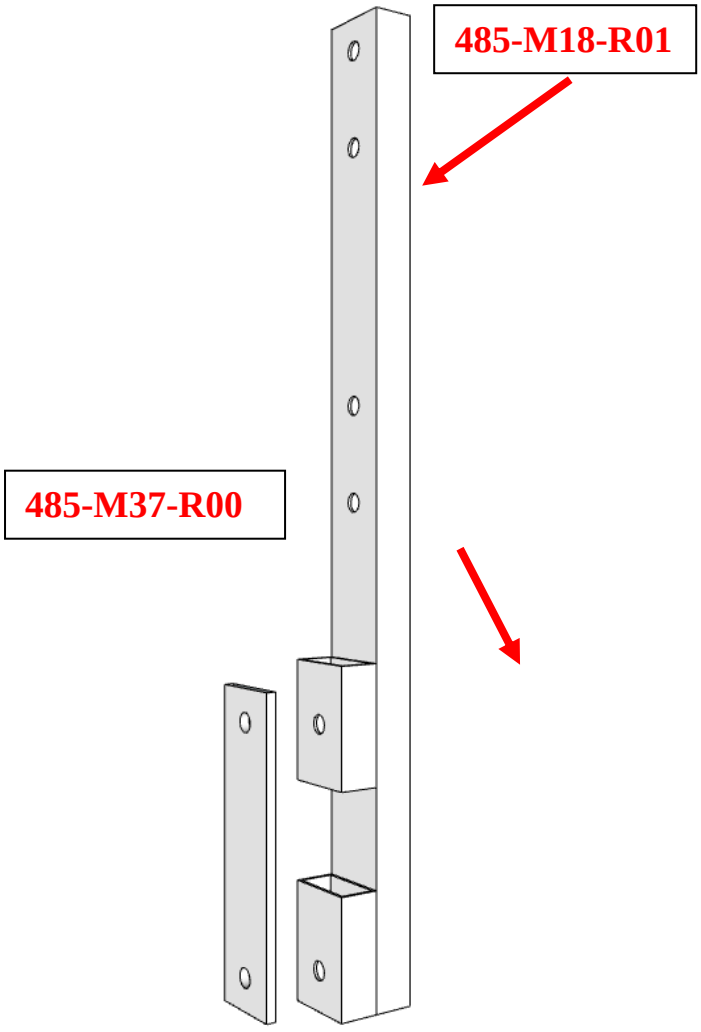
The 20L flush tank is supplied with a 485-M18-R01 mounting bar plus a 485-M37-R00 backing plate, which is designed to be mounted on the light frame of the baler in about the position shown below, but on the other side of the baler behind the 200L tank with the pump & electronics. If mounting on the light frame is not suitable it can be mounted in any convenient area of the baler.

If fitting the flush tank to the light bar frame the bar goes one side of the metalwork and the backing plate goes on the other. Two by 10mm holes require drilling.

The bracket is bolted the light frame using the following:

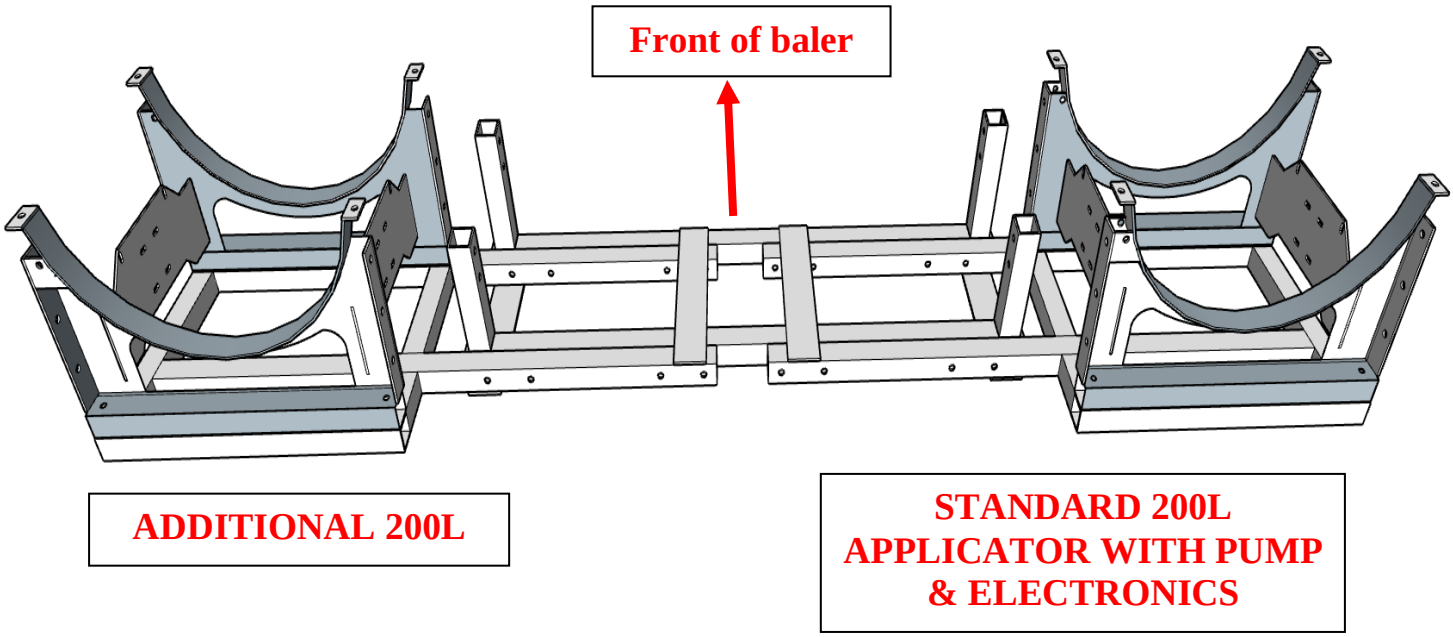
- 2 x M10 x 75mm bolts
- 4 x M10 flat washer
- 2 x M10 spring washers
- 2 x M10 hex nuts

The outlet of the flush tank is then connected to the flush inlet of the 200L applicator



STEP 6: UPGRADE TO 400L CAPACITY (FITMENT OF BS+200LM)

The procedure to upgrade the applicator to a 400L unit is basically a repeat of steps 2 & 3, but to the opposite side of the baler. The complete 400L installation is shown below.
The outlet of the additional 200L tank is connected by 12mm hose the outlet of the standard 200L tank.



2.3 Commissioning / Setup

Commissioning (sometimes referred to as setup) commences with a physical inspection of the installation. The checks shall include, but not be limited to the following:

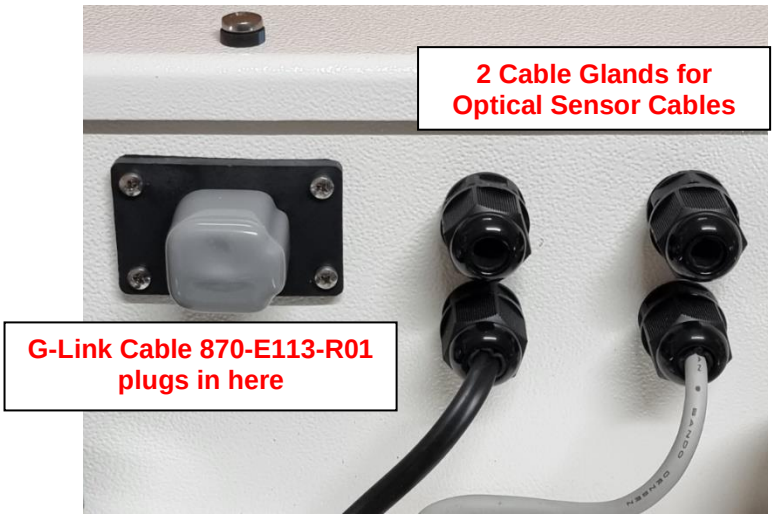
1. Make sure all the mounting fasteners are tight and the equipment is rigidly mounted.
2. With the baler connected to the tractor and the cables connected together, power up the tractor and baler. Switch the control system on using the switch on the side of the control panel, and immediately press F1 and check all the parameters to make sure they are correct for your operations (see the list in appendix A).
3. Put water into the tank for the following tests (or use preservative if you don't mind losing a little).
4. Make sure the breather filter for the preservative tank and flushing water tank is correctly installed and the tank lid is on and sealed. (The air filter should ensure no dust greater than 50 microns (270 US Mesh) is entering into the tank as the fluid level goes down)
5. Using the switch on the side of the control panel turn the system off then on again. The system should immediately go into "Prime" mode. As soon as you can see a good regular spray pattern coming from the spray nozzle, press ENT to stop the priming and start the flow control operation. Alternatively, if the priming is left on the system will automatically go to the flow control operation after the priming process has timed out. It is good to time how long it takes to prime and set this in the parameter listing, as this minimises waste of additive each time it primes.
6. The flow control operation should now operate at 60 TPH for a few seconds to quickly fill the hose and then fall back to the default TPH (typically 44 TPH) and indicate a flow rate appropriate to the additive you are using.
7. Whilst the spray operation is continuing, check for leaks and made good any problems.

8. Once the tests are complete, if you used preservative and are not ready to bale, flush the system out with water.

2.4 Initial operation and tank refilling from empty (either tank)

Although the pump manufactures say their pumps are self priming, this is sometimes not the case if there is a check valve at the end of the hose. So, if the pump will not prime, carry out the following procedure.

When the tanks are first filled, or filled from empty, remove (or loosen) the check valve from the spray nozzle body and power up to prime the pump and make sure fluid is flowing through the pump. Press the ENT key at any time to stop the priming. Switch the power off as soon as preservative is flowing through the pump. Replace the check valve, and flush the system again if preservative is not about to be use within the next 12 hours or so.



2.5 Using the Flow Stop optical sensor option

This input will stop the flow of preservative when there is no hay present at the pickup. Most new Agco big square balers have a cut out already on the pickup to mount the optical sensor. Wire the sensor in as per the wiring diagram at the end of this manual.

Wire in the optical sensors as per the drawing in the back of this manual.

To activate the sensor change the following parameters.

1. Press F1 to get into Setup mode.
2. Press the Menu key to get into the "Set Parameters" Menu
3. Press the Item Key until "Flow Stop Sensor" comes up (displays: “Flow Stop S”)
4. Use the UP or DOWN key to set this to "HIGH". (This sets the switch to active high or active low – High means the pump will operate when the switch is open)
5. Press Menu until "Setup Menu" comes up
6. Press F1 to put the system back into Control mode.
7. Note: When the orange LED in the receiver is on the pump should be on. If there is no orange LED showing on the receiver, the pump should be off (all within a few seconds time delay).

2.6 Using the Flow Stop input ***(i.e. not using the optical sensor option)***

This input will stop the flow of preservative when an external circuit is completed. Typically this is only used on round balers when the baler is stopped to wrap a bale. For example a limit switch could be used whenever the brake is applied.

Please note: this is an active wire system, so it must NOT be connected directly to any 12V source.

The contact closure is wired between terminals in the terminal box (see electrical drawing).

Note that an active sensor may be used as per the wiring diagram for the optical sensor.

To activate the sensor change the following parameters.

1. Press F1 to get into Setup mode.
2. Press the Menu key to get into the "Set Parameters" Menu
3. Press the Item Key until "Flow Stop Sensor" comes up
4. Use the UP or DOWN key to set this to "High". (This sets the switch to active high or active low – High means the pump will operate when the switch is open)
5. Press Menu until "Setup Menu" comes up
6. Press F1 to put the system back into Control mode.

Note, if the switch is wired in so the flow stops when there is hay (opposite to what you want to happen) then choose "Low" instead of "High" in the above steps.

2.7 Using the 485 bypass valve

The bypass valve can be used in the pressure control mode to optimize the performance of the applicator. Two things that can be optimized by utilizing the bypass valve are;

1. Operate the pump at its optimum control speed irrespective of the required nozzle flow rate. This will also allow the applicator to operate optimally at much lower nozzle flow rates.
2. Reduce the residual “bleed” past the non-drip valve at the nozzle when the pump stops. (Caused by residual pressure in the long warm hose acting like a balloon.)

How to set the bypass valve to achieve the above;
Set the applicator going. This can be done by setting the target moisture to zero and if you are using a hay sensor input, set this on (for example if an optical sensor is being used to detect the presence of hay, trick it by covering the sensor beam).

Once the nozzle is spraying, press the “Item” key until the pump speed is displayed in the bottom left-hand section of the screen.
This will be displayed as sXX where XX is the speed of the pump (percentage).

Now turn the bypass on slowly and let the pump gather speed. Set the bypass so the pump speed is more than 20 and less than 50 (typically a good value to aim for is approximately 30).

Turn the power off and reinstated the hay sensor to its operational state.
Power up and reinstate the moisture value set point for applying preservative.
At any time during baling, the “Item” key can be pressed to check pump speed.

Palmer Ag Applicators use two types of bypass valve (shown below). The operation as described above is the same for each type.

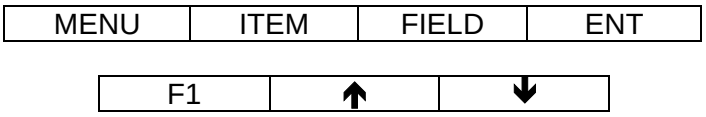
3. Operation

3.1 General Information

Note that the instrument will cease to control flow rates whilst its parameters are being edited.

3.2 Editing Parameters using the Keypad

The main interface for the flow control system is provided by a touchscreen, situated on the LCD display unit (Control Panel) in the tractor cabin and labeled as follows.



The functions of these keys are as follows:

MENU Used to move through the Menus while in Setup Mode.
ITEM Used to move through different items in each Menu
FIELD Used to move the cursor across the field when editing values.
ENT Used to initiate some Item actions.

F1 Used to move between modes at certain Items
↑ Used to increase the value being highlighted by the cursor.
↓ Used to decrease the value being highlighted by the cursor.

Your Model 485V21 Flow Controller can be in one of only two operational modes:

Setup Mode or **Control Mode**.

When power is first applied to the Flow Controller, the instrument automatically goes into Control Mode ready to control the preservative flow rate.

In Control Mode, use the F1 key to select the Setup Mode.
(Note that the system will cease to control the flow when this mode is chosen).

See Appendix A for the Menu structure, Item and Parameter listings.

You use the **[menu]** key to move through the menu list and the **[item]** key to move through the items on each menu. (See Appendix A for a complete list).

The Model 485V21 uses a 2 line, 16 characters per line LCD display to allow you to view the Items in different Menus and their values. You may also use the keys to change some of the values, to allow the Model 485V21 to adjust to your conditions.

3.3 Normal Operation

The Model 485V21 Flow Controller has two modes:

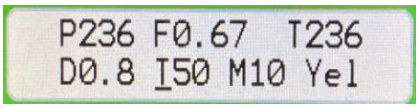
- Setup Mode and
- Control Mode

Upon power up, if there are no faults found during power up tests, the instrument automatically goes into Control mode.
Pressing F1 in Control mode will take you to the Setup mode.

3.4 Control Mode

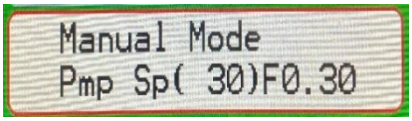
The status of the flow control system is shown on the LCD in this mode. If in the unlikely event the pressure sensor fails, the system will automatically take you to the manual control mode using the last stable pump speed used.

Pressure control mode ("P" top LHS)
↑ and ↓ arrows control TPH



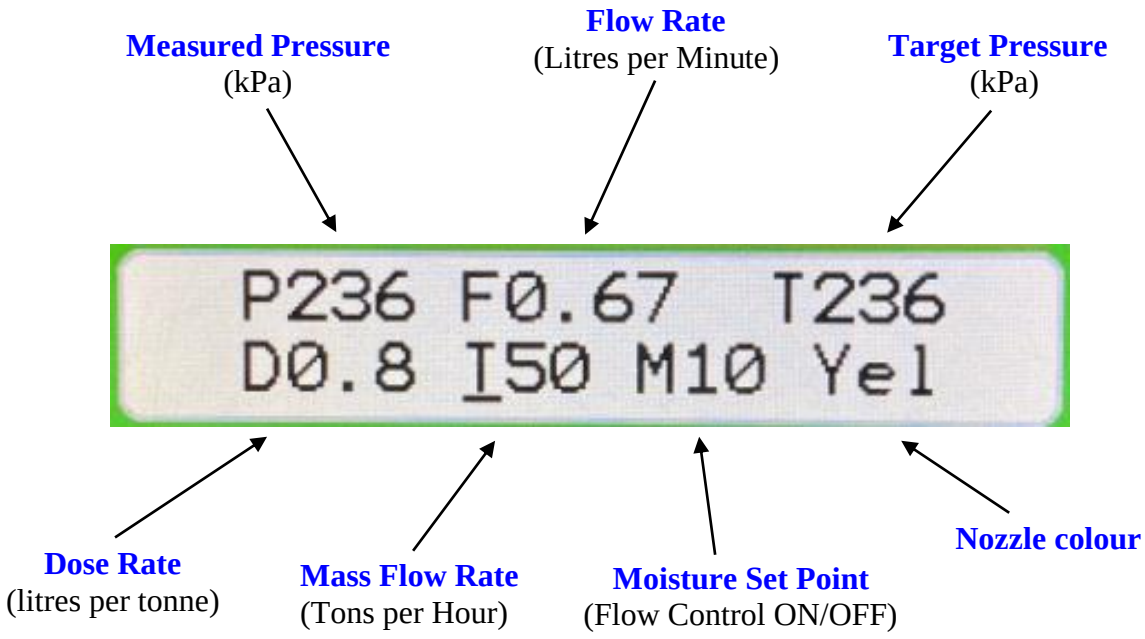
ENT to pause

Manual control mode
↑ and ↓ arrows control pump speed



ENT to pause

You may move between control modes using the "Menu" key, however, **this is not recommended unless there is a very compelling reason.**

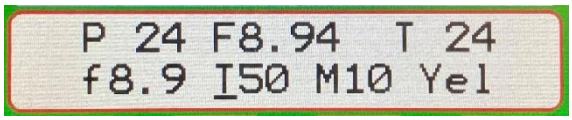


Typical operating screen.

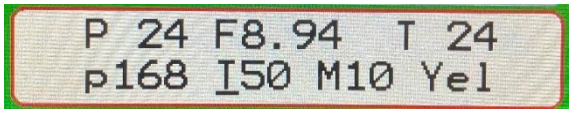
Use the ↑ and ↓ arrows to increase or decrease your estimate of the current mass flow rate (TPH).

Using the **Item** key will allow you to display a number of dynamic parameters in the lower LHS of the LCD.
When turned off then on again this will automatically go back to displaying the dose rate.

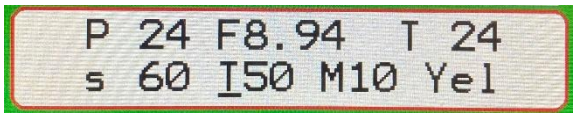
Displays the flow rate (Fx.x)



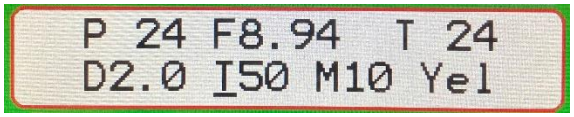
Displays the measured pressure (Pxxx)



Displays the current pump speed (S %)



Displays the dose rate (Dx.x)



3.5 Setup Mode

The Setup mode allows you to setup, check and calibrate the Flow Controller for your specific conditions. Use the "F1" key to enter into the Setup Mode from the Control mode. Note that in this mode the system will cease to control the flow.

3.6 Alarm Conditions

If a fault or alarm condition occurs, the LCD will indicate what type of fault has occurred. (See the fault finding section of this manual for a list of these conditions). If a sensor fails, a message such as the following screen may appear:

You will need to press ENT to clear this message.

3.7 Changing the dose rate, nozzle color etc. in Control Mode

In normal operation mode, pressing the **FIELD** key will move the cursor from the TPH section of the LCD screen to the Number of nozzles being used, then the colour of the nozzle(s) being used, then the Dose rate section, then back to the TPH section of the LCD screen. If there is no key operation for 5 seconds, then the cursor will automatically go back to the TPH section of the LCD screen. Note that any new value entered will normally only take effect once the cursor has been moved on from the changed value.

Changing the mass flow rate (tons per hour):
Whilst the cursor is in its home position under the TPH, the TPH can be changed by using the ↑ and ↓ keys. (This is defaulted to change in steps of 2 TPH).

Changing the number of nozzles being used:
Whilst the cursor is in the nozzle number section the number of nozzles can be changed by using the ↑ and ↓ keys. Note that this MUST match the number of nozzles you are physically using on the baler.

Changing the colour of nozzles being used:
Whilst the cursor is in the nozzle color section, the nozzle color may be changed by using the ↑ and ↓ keys. Note that this MUST match the colour of the nozzle(s) you are physically using on your baler.

Changing dose rate:
Whilst the cursor is in the dose rate section, the dose rate may be changed by using the ↑ and ↓ keys.
Note that if the newly chosen required flow rate cannot be achieved because of the nozzle size being used (color coded) at the new dose rate for the current selected TPH, then the nozzle colour will flash on and off. You will then have to physically change the nozzle(s) to the correct colour and tell the system you have selected the new colour.

3.71 Jump Start and Auto Rate

If Jump Start is “Yes”, then when the pump is activated by the hay sensor determining that hay is present at the pickup, the system applies preservative at the “High Rate” for the first “Jump Mins” minutes of operation. If Jump Start is “No”, the system applies preservative at the standard rate. Note, in order for Jump Start to operate correctly the correct “High Rate” must be entered. **If “Jump Start” is in use a “J” will appear in the last decimal place of the flow rate (F) screen readout (non-ISObus only).**

If Auto Rate is “Yes”, this turns on the step process to increase the rate to the “High Rate” at “Moist High” (the moisture level at which the “High Rate” is applied) and assuming the moisture read is above Mset. If using the solenoid nozzle system, this will turn the second nozzle on (outlined below). If using a single or double nozzle system without a solenoid nozzle, you may be required to get out of the cab and change the nozzle. If the moisture is below “Moist High” then the flow will be at “Dose Rate”. If the moisture is above “Moist High” then the flow is “High Rate”. **If “High Rate” is in use a “H” will appear in the last decimal place of the flow rate (F) screen readout (non-ISObus only).**

3.72 High Rate Solenoid Nozzle System (optional)

This option has the facility to automatically increase the additive flow rate if the moisture goes over a given moisture value (“Moist High” parameter), and at the same time open up a second nozzle using a solenoid valve so that the extra flow rate can be achieved without having to physically swap nozzle sizes to accommodate the extra flow rate.

Typically, this would involve systems with one nozzle being used in normal operation and a second solenoid driven nozzle being used during the high rate flow. For balers using 2 nozzles in normal operation, each of those two nozzles can each have a second solenoid driven nozzle to make 4 nozzles in operation for high flow rates. However, the applicator electronics can only drive one solenoid, so an interposing relay would need to be used to drive the two solenoids.

Setting the Parameters (ISObus and non-ISObus)

Note, for Jump Start (which also uses the High Rate) see elsewhere in this manual.
In the "Set Parameters" menu, edit the following:

- Set "Auto Rate" to YES.
- Set your "High Rate" (we suggest it is best to use double the dose rate (metric 1.6, US units 4lb per ton).
- Set "Moist High", the moisture level you wish the High Rate to commence at. (default is 19%).
- Set "Solenoid" to YES.
- "Number of Nozzles" does not include the solenoid nozzle(s). **Leave at 1 (or 2 if you have 2 extra dual solenoid nozzles).**

Solenoid Error Message (ISObus and non-ISObus)

When the High Rate is initiated, the system monitors the change in the pump speed. If the pump speed has not changed by "Pump Jump" percentage (typically set to 5%) within 5 seconds a solenoid error message will appear on the screen. This may indicate the wiring to the solenoid may not be connected or the solenoid or solenoid driver has failed. Note that this solenoid error detection algorithm only operates on the transition to and from the solenoid being operated.

3.8 Manual Operation (should the pressure sensor fail)

Typically, the Manual Mode will be selected automatically if all sensors fail.

- To force the Manual Mode, see the fault finding section of this manual.
- Use the 🡅 and 🡇 arrow to change the pump speed as required.

The pump will operate at a default setting (typically 26%) which is about where most balers operate for preservative at 50 TPH baling rate. Check your flow rate using a calibrated container and stop watch. Change the pump speed by using the 🡅 and 🡇 arrows until you are satisfied with the flow rate.
You can bale in this mode, however there will be no alarms for low (or no) flow. In this mode, the software is still trying to read in the sensors.

In Manual Mode, you can still use the ENT key to toggle the pump on and off just like in normal automatic flow control operation. The hay detector (if this option is being used) will also work in this mode.

If the pressure sensor starts working again, the system will automatically go back to pressure control mode when the system is restarted.

3.9 Flushing the preservative tank to protect the system.

When preservative is left undisturbed it may leave a fine white crystalline residue, coagulate with time, be corrosive or in other ways cause a problem for the normal operation of the application system. Follow the instructions from the applicator supplier to flush the system out and leave it in a ready state for next time it is to be used.

THE SYSTEM MUST BE FLUSHED WITH WATER AT THE COMPLETION OF EVERY SPRAYING SESSION.
AT THE END OF THE SEASON, THE PRESERVATIVE TANK MUST ALSO BE FLUSHED WITH WATER.

To flush the system leaving the chemicals in the additive tank:

1. Turn the regulator valve off (clockwise), else water will flow into the chemical tank. (This should be off anyway for the control system to work properly).
2. Connect a garden hose the flushing inlet of the three way tap between the tank and the pump.
3. Turn the three way tap under the tank to OFF (The middle position)
4. Turn the three way tap between the tank and the pump to the hose direction.
5. Turn on the pump and hose.
6. Run for at least 5 minutes through the spray nozzle.
7. Turn the pump off. Turn off the hose.
8. Turn the three way tap between the tank and the pump back towards the tank.
9. Leave the tap under the tank off until you are ready to use the system again.

To flush the system including the chemical tank:

1. Empty the chemical tank and fill with at least 5 litres of water.
   Squirting around the sides of the tank to make sure it is clean.
2. Turn on the pump and empty the tank via the spray nozzle.
3. Turn the pump off, and also turn the tap under the chemical tank off.

4. Safety Considerations

- When using preservatives always read the suppliers safety instructions and do as they recommend.
- When cleaning the spray tips always read the suppliers safety instructions and do as they recommend (gloves, eye protection etc.).
- Do not do any physical maintenance or repairs whilst the power is on the system.
- Always bleed any fluid pressure before doing any physical maintenance or repairs.
- Do not short out 12V supply, high currents and localised heating may occur.

5. Compliance issues

IMPORTANT NOTE.
To ensure that the instrument maintains its electromagnetic compatibility and electrical safety rating, the physical and electrical arrangements and component choice must remain as the instrument was supplied. All interfacing to the control system must be carried out as per the drawings supplied in this manual.

Safety Compliance
This instrument has be designed and tested where necessary to meet international standards for electrical safety.

Environmental Protection Compliance (IP / NEMA rating)
This instrument has be designed and tested where necessary to meet international standards for environmental protection.

IMPORTANT NOTE.
To ensure that the instrument maintains its environmental protection rating, any holes put in the outer skin of the enclosures, or use of cable glands etc. must be properly sealed up before use.
To ensure that your applicator remains compliant in terms of electromagnetic emissions and electromagnetic susceptibility, the instructions and procedures in this manual are recommended to be followed.

6. Maintenance Procedures

Spray Tip (nozzle) Wear

Tips (nozzles) don't last forever. With a flow control system, the control system will automatically lower the pump pressure to keep the same flow rate in a worn tip as it would be in a new tip, however, the distribution of the preservative in a worn tip can mean the preservative is not being distributed into the fodder well enough. If you cannot test the tips, then regular replacement is advised (e.g. each season). Contact a reputable tip supplier such as TeeJet to obtain more information. Tip suppliers can also provide you with special soft nylon tip cleaning brushes, calibration tip testers and specially coated papers to test spray tip distribution.

Plugging (blocking) of filter elements

The particulate filters should be checked and cleaned regularly. The particulate filter in the tank breather should also be checked and cleaned regularly.

Flush Out

Most preservative are slightly corrosive and also leave a residue if left inside the equipment. If the system is going to be left unused for more than a few hours, then the system should be fully flushed out with clean water.

Parameter checks

Prior to each season, check the parameters in the instrument by comparing them with the values that have been put into the manual. If there have been any changes to the equipment, operating procedures or fodder type, then some parameters may need to be changed.

Pressure Sensor

There are no maintenance procedures for the pressure sensor.

Calibration

The target pressure can be adjusted (offset) to make any fine adjustments to the calibration as follows.

1. Set the system running in its normal operating mode at the TPH you intend to operate at and wait until the measured pressure (Pxxx) and the target pressure (Txxx) a close in value (+/- 2).
2. Use a calibrated container to measure the liquid coming out of the nozzle for one minute (litres per minute).
3. Compare this value with the flow rate displayed on the LCD (Fx.xx).
4. If the amount of liquid is less, add 10 kPa to the parameter "Prs Offset" then go to step 1 again.

   If the amount of liquid is more, subtract 10 kPa from the parameter "Prs Offset" then go to step 1 again.
5. Repeat this process until the two numbers agree.

In the example above, steps of 10kPa were used. You can take bigger or smaller steps as you like to make big adjustments or finer tuning. If you are using more than 1 nozzle you will need to use some hoses to collect the flow from all nozzles at once.

7. Fault Finding

7.1 General fault finding procedures

As with most electronic equipment there are usually only two things that fail in the vast majority of cases. These are power supplies and electrical connections. Given this, these are the first two things to check if a fault is suspected.

12V power supply.
Check that the 12V dc supply is going to the control unit at the back of the baler and the control panel in the tractor (LCD will display something if the power is on it).

Connections.
Connections can be checked with a meter, and by gentle movement of the wires, plugs, connectors or terminals. Depending on the fault conditions (symptoms), logic should tell you generally where to check.

"Finger Problems"
The third most common fault in instruments such as these is the "finger problem". Sometimes an instrument is left with a wrong value entered into the memory. This can be a particularly difficult problem, as often the wrong value which has been keyed in will only affect the operation in a subtle way, and it is often some time before someone notices that the "performance do not seem right". By this time the fact that the numbers were edited has been forgotten. The only solution is to re-check all the Parameters against the values as logged in the back of this manual. This is why it is important that whenever a change is made that the change is noted in the space provided in the parameter listing in this manual.

If the system cannot maintain an accurate flow rate, the following needs to be examined:

"No Connection" may sometime be displayed on the terminal LCD. This message comes from the terminal itself, and indicates that the terminal is not communicating with the controller on the baler. The controller will overwrite this message on power up. Check the wiring between the terminal and the controller with particular attention to the connectors.

If the No Connection message come on intermittently, it means that he power connection in the tractor is faulty. Remember it may need to take 10 Amps at times.

Wildly fluctuating or 'Pulsing" pressure reading.
This may be caused by the wrong choice of pump. This system is limited to 10Amps. If a pump is being used that has a maximum current rating of greater than 10 Amps, then the electronic over current detection will continually cut the pump out, then back in again as the over current switch is automatically reset.

To force the Manual Mode:
If for some diagnostic reason you wish to operate the system in manual mode, then do the following:

Press **Menu**, then **ENT** then ↑ in rapid succession and the system will go into Manual Mode where the speed of the pump is controlled by the ↑ and ↓ keys and if the pressure sensor is operating the measured pressure in kPa will be displayed.

To go back to the pressure mode (or flow mode if a flow sensor is connected) press the **Menu** key. Pressure control mode is indicated with a "P" in the top left of the LCD.

If the system goes into Flow Control mode ("F" in the top left of the LCD, even though you do not have a flow sensor) it will eventually automatically go to Pressure Control mode, but you can force it to go into Pressure Control mode from Flow Control Mode immediately by pressing **Menu**, then **ENT** then ↑ in rapid succession.

Error Codes: **Error codes appear on the top line of the LCD. These include:**

High and low pump speed (HiSpeed, LoSpeed)

High and Low pressure (HiPres, LoPres)

High and low flow rate if a flow rate sensor is used (HiFlow, LoFlow).

Some typical examples are as below.

LoSpeed | HiPres (Low pump speed and High pressure)

- Something is blocking the flow of the liquid.
- May be a blocked nozzle
- or a tap turned off which should be on
- or a blocked filter

HiSpeed | LoPres (high pump speed and low pressure)

- **If the pump is running** this could mean the fluid is flowing too easily **after** the pressure measurement point (a leak).
- Could be a loose check valve.
- or an open bypass valve
- or a hose fallen off etc.
- or the hose has air not liquid in it (see section 2.4 in this manual).
- If this occurs after priming, then it probably means the pump has not self primed. See section 2.4 in this manual.
-
- **If the pump is running** this could also mean the fluid flow is being blocked or partially blocked **prior** to the pressure measurement point.
- Could be a blocked filter
- or the tank tap turned off when it should be on
-
- **If the pump is not running:**
- it could be a pump failure.
- it could be the wires to the pump.
- it may be a pump driver electronics failure
-

HiSpeed | HiPres (high pump speed and high pressure)

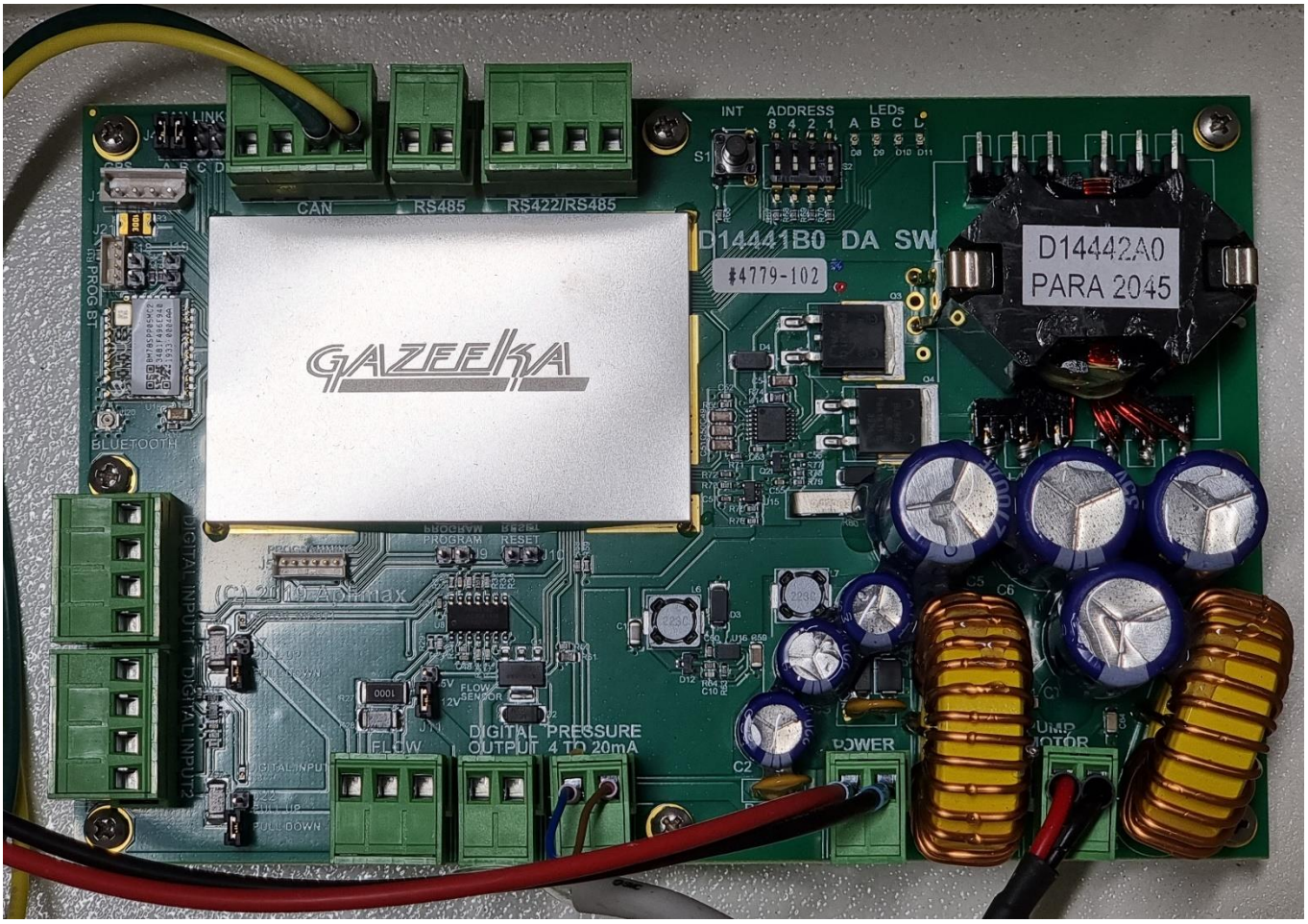
- Means lack of control, and probably means there is some parameter in the flow controller memory that is not set properly.
-

LoSpeed |LoPres (low pump speed and low pressure)

- Means lack of control, and probably means there is some parameter in the flow controller memory that is not set properly.
-

7.2 PCB Links

See below and drawing in the back of this manual.



8. Typical Specifications [1]

PARAMETER	UNITS	VALUE
Operational		
Flow control range	Litres per minute Oz per minute	0.3 to 8.0 10 to 270
Maximum pressure	Bar	5 (70 PSI)
Flow Control precision	% of flow	+/- 10%
Fluids density	SG units	1 to 1.2
Viscosity	Centistokes	0.8 to 16
Maximum particulate size	microns US Mesh	150 (best at 50) 100 (best at 270)
Tons of hay per hour	Tonnes per hour	20 min – 70 max
Environmental (baler part)		
Protection	IP	IP55 (NEMA 4)
Humidity	% relative humidity	0 to 100 non condensing
Vibration	G's 10 to 100 Hz, 0.5mm	0 to 2.5
Shock	G's 3 times in 3 directions	5
Temperature	degrees Celsius	0 to 55 ($32\text{-}130^0$F)
Orientation (Control System)	Degrees	Upright +/- 15^0
Power		
Voltage	Volts	12V dc (min 11.8, max 13.5)
Control System (excluding pump)	6 Watts	(500 mA at 12V)
Control Panel (in Tractor)	1 Watt	(100mA at 12V)
Electrical Noise	milli Volts	less than 300 from 0 to 1MHz
Maximum disconnect voltage	Volts	30V (for 500 milli seconds) (load dumping)
Pump	Amps	10.0A max
Connections		
Hose barbs	suitable for 12mm ID (1/2") hose	
Pump electrical	2 way "Narva" connector.	
Control Panel in Tractor	12 volt Auxiliary plug	

Specifications subject to change without notice.

[1] These are typical performance specifications for an ideal site, and may differ from any contractual agreement.

APPENDIX A – Parameter Listing (END USER)

Menu	Item	Options	Explanation	Range	Default Metric	Default US Units	Your Record
Setup Menu	F1 = Control		Enters the Control Mode	N/A	N/A		
	Version		Current software version	Read only	V21.00		
Set Parameters							
	Dose Rate		Sets the dose rate in Litres per Ton In US units Pounds per ton.	0 .0 - 10.0	0.8	2.0	
	SG		Specific Gravity of the additive being used. This is important as it is used to convert mass dose rates to flow dose rates (e.g. lbs/ton to Gallons per hour)	0.8 to 1.50	1.34		
	Nozzle		Select the nozzle colour you are using. This will determine the minimum & maximum allowable flow rates	Orange to White	Yellow		
	Nozzle Qty	1,2 or 3	Selects number of nozzles being used	1-3	1		
	Prime Time		Time to prime system (seconds)	0 to 600	90		
	Spray Hold		Number of seconds to hold the pump on after Mchoice moisture drops below Mset	0 to 300	60		
	Mset-pt		Moisture Set Point (units only) Above which the applicator will turn ON (if hay is present)	0 - 30	0		
	Jump Start	Yes / No	Turns the Jump Start high glow rate option on	Yes / No	No	No	
	Jump Mins		Time in minutes for the Jump Start high flow rate to continue	1 to 10	3	3	
	Auto Rate	Yes / No	Turn the Auto Rate on	Yes / No	No	No	
	High Rate		Sets the high application rate (L/min or Lbs/ton)	0.4 to 2.5 1.0 to 6.0	1.6	4.0	
	Moist High		Triggers the High Rate flow if Auto Rate is on	1.0 to 35.0	19.0	19.0	
	Mchoice	Ave / Now	Choice between Average and “Now” moisture	n/a	Avge		
	Mwait		Seconds allowed to receive a new moisture value before the systems decide no value is coming and	0 - 30	30		

Menu	Item	Options	Explanation	Range	Default Metric	Default US Units	Your Record
			it turns ON				
	Mignore		The 485 is on all the time, so long as hay is detected	Yes / No	No		
	Press Contr	Yes / No	This sets the system to Pressure Control Mode. If the pressure sensor fails the system will automatically go into Manual Mode. Press ENT to accept this mode change.				
	Flow Contr	Yes / No	This parameter will only be displayed if the system was manufactured with a flow sensor. Flow sensors are NOT a standard supply. This sets the system to Flow control mode. If the Flow control sensor fails, the system will automatically go into pressure sensor mode.				
	Manual Contr	Yes / No	This sets the system to Manual control Mode where the ⬆⬇ arrows can be used to change pump speeds (%)				
	Press Low		Lower limit for a pressure alarm. (Target Press – measured Press) > Press low (kPa / PSI) 0= not being used (no alarm)	0 to 100	20	2.9	
	Press High		Upper limit for a pressure alarm. (measured Press - Target Press) > Press Hi (kPa / PSI) 0= nor being used (no alarm)	0 to 100	20	2.9	
	Prs Offset		This Pressure Offset value can be changed to correct the target pressure (Txxx) if you do a flow test and find the flow rate does not match the target flow rate.	-200 to 200	0.000		
	Hay Sensor	No / High / Low	From this item you can select if you are using a sensor to automatically stop the flow when there is no hay and if it is active high or active low.	N/A	No		
	Solenoid	Yes / No	Select yes if you have a “High Rate” solenoid(s) fitted and wired in.	Yes / No	No	No	
Service Menu A							
	Service Code	N/A	Proprietary	N/A	8000		

Appendix B – Bluetooth Connection

General Bluetooth Information

Palmer Ag Model 485 units from serial number 610 on which have the D1444 controller Printed Circuit Modules have a Bluetooth connection option.

The Bluetooth antenna is at the bottom of the electronic housing. The antenna is connected via an SMA connector. To prevent damage, this antenna may be packaged separately and a rubber dust cap fitted to the SMA connector. To operate the Bluetooth connection the antenna is required to be attached.

We recommend that the cover of the control box be removed during these operations so that the diagnostic LEDs can be viewed. This is especially true if updating software because if the link is disconnected during the uploading of new code, there is a good chance that only returning controller to the factory can resurrect the code.

Each of these instruments will have been loaded with a unique Bluetooth name which includes the instrument's serial number.

This Bluetooth connection can be used for the following:

- Operate the 485 from a device such as a Smartphone.
- Allow remote access over the Internet for servicing.
- Allow remote software upgrades over the Internet.

Operation via a Smart phone or iPhone

The Palmer Ag Model 485 can be operated via the Bluetooth connection for servicing.

This can be done as follows:

1. Download and install App "Model 870 Remote Control".
2. **Android:** In Settings on phone, scan for Bluetooth devices and pair to device with phone. The 485 Bluetooth name will be "Model485-**year**-***serial number of device"***.
3. Once paired with the instrument, open the App. In the top right-hand corner press the menu icon and select "Connect to 870/485". Now control access via Smartphone is active.
4. **iPhone,** open Remote Control App. In the top right-hand corner press the menu icon and select "Connect to 870/485". Scan of Bluetooth devices will find "Model485-**year**-***serial number of device"***. Select this and now control access via iPhone is active.

Remote Operation via Bluetooth

The Palmer Ag Model 485 can be remotely operated via the Bluetooth connection and a Smartphone connected to the Internet.

This can be done as follows:

1. Turn your mobile data on so to access the internet or use a WiFi network if within access range.
2. Download and install the App "Model 870 Remote Control".
3. In Settings on the phone scan for Bluetooth devices and pair the 485 with the phone. Bluetooth name "Model485-**year**-***serial number of device"***.
4. Once paired with the instrument, open the App. In the top right-hand corner press the menu icon and select "Connect to 870/485". Now control access via Smartphone is active.
5. Now press the menu icon again and select "Enable Remote Access". Now Remote access from a remote Web Service Site will be active.

For the remote PC:

Your authorized Palmer Ag service centre should now be able to access your instrument via the Internet for service or assistance.

Remote Software Upgrade via Bluetooth

The Palmer Ag Model 485 can have its software upgraded remotely via the Bluetooth connection and a Smartphone connected to the Internet.

This can be done as follows:

1. Turn your mobile data on so to access the internet or if within access range to connect to a WiFi Network.

2. Download and install App “Model 870 Remote Control”.

3. **Android**, go to Settings on phone, scan for Bluetooth devices and pair device with phone. The 485 Bluetooth name will be “Model485-**year**-***serial number of device”***.

4. Once paired with the instrument, open the App. In the top right-hand corner press the menu icon and select “Connect to 870/485”. Now control access via Smartphone is active.

5. **iPhone,** open Remote Control App. In the top right-hand corner press the menu icon and select “Connect to 870/485”. Scan of Bluetooth devices will find “Model485-**year**-***serial number of device”***. Select this and now control access via iPhone is active.

6. Select “**Check for Updates**” from the dropdown menu. *Note:* **Mobile Data or active WiFi Network is required for this process**.

7. Install update version and reboot instrument.

8. Reconnect to 485 via the App and check again for updates. There should be none.

9. **The instrument now needs to be treated as a new instrument requiring complete setup. Refer to the Commissioning / Setup section of this manual.**

Android Mobile Phone App

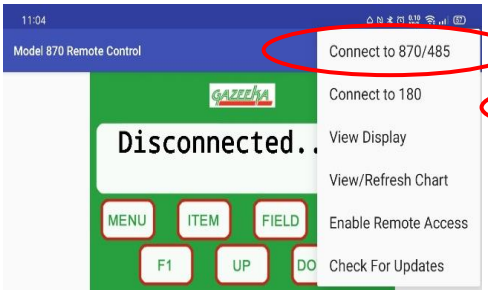
Gazeeka Remote App can be downloaded using your phone from Google Play Store simply search "**Model 870 Remote Control**"

https://play.google.com/store/apps/details?id=com.ccic.model870remotecontrol

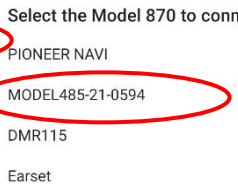
Android Phone first needs to be pair with Bluetooth device before accessing Gazeeka App.

This can be done via phone Settings, Connections, Bluetooth.

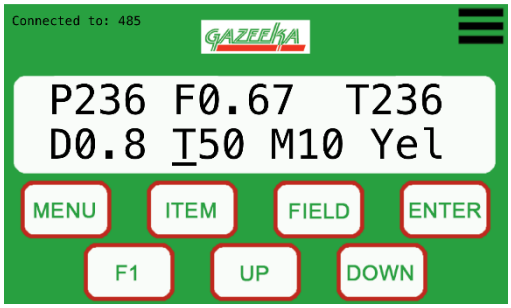
1. After pairing in settings top right corner



2. Bluetooth name



3. Remote Control Access select 3 dots

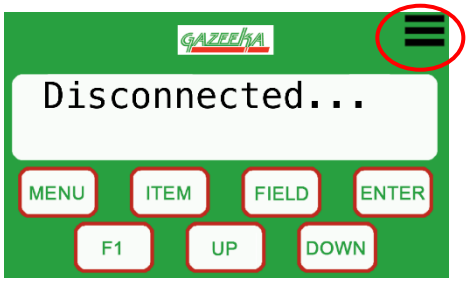


8.6 iPhone Mobile Phone App

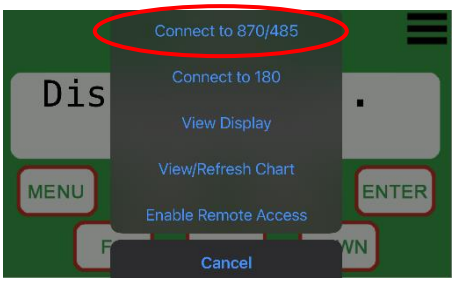
Gazeeka Remote App can be downloaded using your phone from iTunes store simply search "**Model 870 Remote Control**"

https://itunes.apple.com/au/app/model-870-remote-control/id1404666679

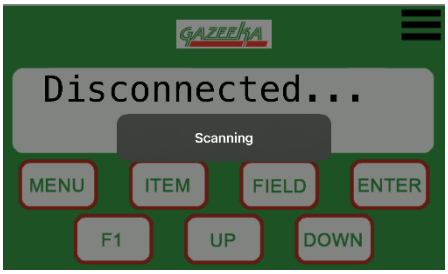
1. Open iPhone App



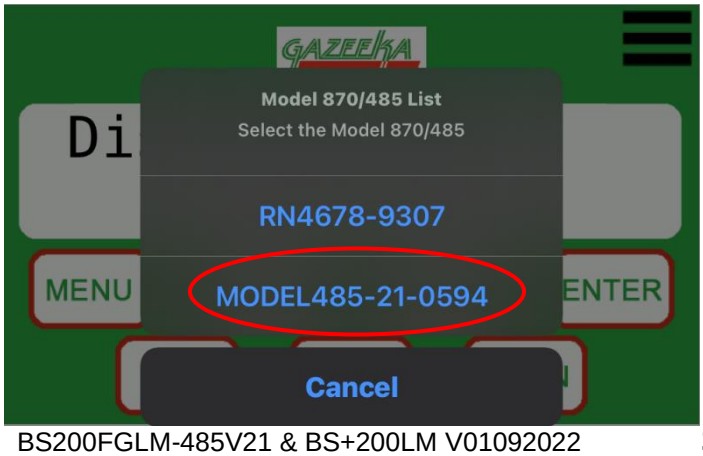
2. Select "Connect to 870/485"



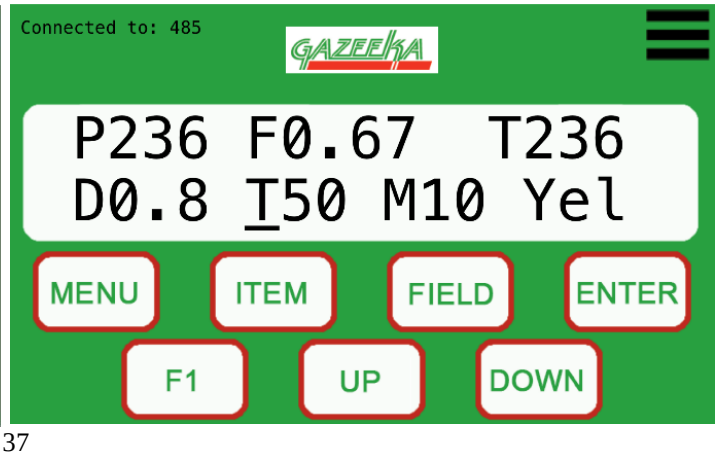
3. App will scan for device



4. Select Serial No:



5. Now remote is active



Appendix C – Notes on making hay using additives

These notes are put together by Palmer Ag from information gathered from various sources including some experienced hay baler operators, additive (preservative) suppliers and experts in the fodder field including Frank Mickan Pasture & Fodder Conservation Specialist Victorian Department of Primary Industries.

These notes are not an endorsement of the product and are only guidelines, not recommendations, as each situation is likely to be slightly (or very) different.

1. *Bugs:* Keep in mind that one of the determining factors in hay making is the quantity and type of microbial content in the hay (bacteria, yeast and moulds - or "bugs") when it is stored. So long as there is moisture, water soluble carbohydrates (mainly sugars) and oxygen the bugs will grow in numbers exponentially, that is, at an ever increasing rate. Test have shown that approximately 10 days after a mown crop has been "down", the microbial count (usually measured as the number of colonies per gram) will have grown to a dangerous level, and the hay will have to be very dry (say less than 14%) to be baled safely at these microbial count levels. If the hay is left down for an even longer time, then this critical moisture level can be even lower and explains why some hay at 11% moisture has been known to spontaneously combust after it was left down for over 6 weeks before baling.
   The microbes use the sugars for food and generate heat, carbon dioxide and moisture, hence the "increase" in moisture content measured several days after baling and reference to the bales "sweating".

2. *Moisture distribution within the bale:* What often happens, is that hay is cut and windrowed and left for several days to dry. Hay dries rapidly in the first 24 to 36 hours. What appears to happen is the top and sides of the windrow dry much more then the centre and the bottom of the windrow (depending on weather, etc.). If this hay is baled, without being teddered out, or without conditioned windrows being flipped over after a few days, then the moisture tests using conductivity probes will often show very variable moisture contents from samples just a short distances apart, and it is difficult to get an accurate average moisture. Don't forget that lower sections and the outside double rows of paddocks, often have much heavier windrows and there may be other causes of wet sections of paddocks. These wet spots assist more rapid breeding of the bugs

3. *Moisture distribution within the plant:* When the moisture of a sample is analysed in the laboratory (24 hour laboratory oven-dried or microwave oven-dried) this is a measure of any free moisture remaining between plants, albeit small levels, but also includes the total moisture within the plant. The microwave moisture gauge on a baler also measures this total moisture. What these results do not tell you is the distribution of the moisture within the plant itself (often called stem and dew moisture). Moisture in the nodes is much less slowly evaporated off than the moisture in the stems, which in turn is slower than the leaves. This is the main reason for using a conditioning or super conditioning machine to speed up the evaporation in the nodes and of course the stems as well.
   Failed cereal crops have been a large source of spontaneous combustion in recent years, mainly due to "hard-to-dry" moisture contained in the nodes and immature grain heads curled up in the boot or swollen section near the top of the plant stem.
   Thus even if the stem is dry, moisture and sugars in the nodes and immature heads can continue to encourage the build up in the number of bugs. When the moisture in the nodes goes down to a suitable level the hay is usually termed "cured". If you are using an additive, the hay does not have to be cured to quite the same moisture content as with hay that has not had additive applied. Generally a Total Moisture of less than 18% with no dew is acceptable when using an additive on large square bales of typical density. With round bales and small square bales the total moisture content may go a few points more.

4. *When to cut:* The timing for cutting the hay is the same as it always has been whether using an additive or not. Typically for legumes this is when there is 5 to 10 percent flower. For cereal it is at the late clear

liquid stage or milk stage depending on the temperature to maximise grain formation, but not to the extent of getting grain drop during harvest of the hay.

5. *Drying procedures prior to baling:* Considering the way most farmers in the USA bale hay with additives, and the excellent results we have seen here in Australia using the following technique, we should consider the adoption of the following process:-

   After cutting, conditioning and windrowing, tedder out the hay for 24 to 36 hours (depending on the weather) to apply the initial rapid drying process to the hay evenly, then windrow back up again. **Certainly, this is an extra procedure, but the dollar benefit in doing this is considerable when in the end you will get higher ME, lower NDF better leaf retention on the stem in the bale (i.e. better Relative Feed Value), better colour and just nicer looking and smelling hay. Also bleaching won't be an issue in such a short time frame. Ideally hay should be baled within 5 to 7 days from cutting before bug growth grows to dangerous levels.**

6. *Moisture levels and when to bale using additives:* All of the following moisture numbers are based on total moisture readings taken using an on baler moisture meter such as properly set up microwave moisture gauge (such as a Gazeeka).
   a. Always try and bale the hay using the additive before the hay has been down for 10 days.
   b. If you are baling into the dew at night with hay that commenced at 14% moisture or less during the day, you can go up to 23% before pulling out.
   c. If the hay has a higher base moisture level than 14% at commencement, then baling during the day (no dew) is achievable using an additive, however, be sure that the moisture does not exceed 20% under these conditions.

7. *Storage of hay with additive:* How you store the hay is also important when using additives. Stack the hay baled with dew in single rows in the shed no higher than 5 bales high for 4x3 and 4 bales high for 4x4 and about half a meter apart. After the stacks of bales have ceased changing temperature (at least 3-4 weeks), they may be stacked closer together. Hay baled with only stem moisture (on dry down) should be left out in the field for 7 days then follow previous stacking procedure for hay baled with dew.

8. *Bale weights:* Experience has shown that the hay bales should be packed to a minimum weight as follows:

	3 x 3 x 8	4 x 3 x 8	4 x 4 x 8
Lucerne and similar	425 Kg	625 Kg	830 Kg
Cereal and similar	400 Kg	575 Kg	760 Kg
Straw and similar	300 Kg	420 Kg	560 Kg

9. *Improving this document - Feedback:* If we are to improve these notes on making hay using additives, we will need feedback from hay makers who are using additives (of any brand), so that we can gradually improve these notes and eventually make it into a more definitive document on how to make quality hay in Australia using additives. We encourage other suppliers of hay additive to give us their input into refining this document to cover all types and brands of hay additive. In this way we can:
   - Improve the quality of hay and improve returns to producers.
   - Improve the quality of hay and improve the returns to the users.
   - Get more food value per Mega-litre of water used to produce irrigated fodder.
   - Greatly lower the risk of spontaneous combustion of hay.

Appendix D – Useful Conversions

L/Tonne *	0.8

Lbs / Ton ** 2

Ton(nes) / hr	20	25	30	35	40	45	50	55	60	65	70	75
Litres / Min *	0.27	0.33	0.40	0.47	0.53	0.60	0.67	0.73	0.80	0.87	0.93	1.00
Oz / min **	11	13	16	19	21	24	27	29	32	35	37	40

Gallons per minute to Litres/minute to ounces per minute (of water)
(1 gallon = 128 ounces of water) (1 litre = 33.8 ounces of water)

G / min	0.05	0.1	0.15	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
L / min	0.19	0.38	0.57	0.76	1.14	1.51	1.9	2.3	2.7	3.0	3.4	3.8
Oz/min	6.4	12.8	19.2	25.6	38.4	51.2	64.0	76.8	89.6	102	115	128
Gal / hr	3	6	9	12	18	24	30	36	42	48	56	60

Gallons to Litres (1 gallon = 3.785 litres) (1 quart = 0.946 litres)

Gallons	1	25	10	30	40	50	52.8	75	100	105.7	150	200
Litres	3.8	18.9	37.9	114	151	189	200	284	379	400	568	757

Pounds to Kg (1 pound = 0.4536 Kg)

Pounds	10	50	100	200	400	500	750	1000	1323	1500	1763	2000
Kg	4.54	22.7	45.4	90.7	181	227	340	454	600	680	800	907

1 Bar = 14.5 PSI = 100kPa

Bar	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	2	3	4
PSI	1.45	2.9	4.4	5.8	7.3	8.7	10.2	11.6	13	29	43.5	58
kPa	10	20	30	40	50	60	70	80	90	200	300	400

Particle size US Mesh to Microns

Mesh	20	30	40	50	70	100	140	200	230	270	325	400
Microns	840	590	420	297	210	149	105	74	62	53	44	37

beach sand ≈ 25 Mesh, fine sand ≈ 60 Mesh, cement ≈ 200 Mesh, plant pollen ≈ 400 Mesh

1 fluid ounce = 1.2 ounces mass
1 gallon weighs 10 Lbs (1 gallon of water weighs 8.33 Lbs)
1 litre weighs 1.2 Kg (1 litre of water weighs 1 Kg)
Viscosity: SSU x 0.216 = centistokes, centistokes x SG = centipoise

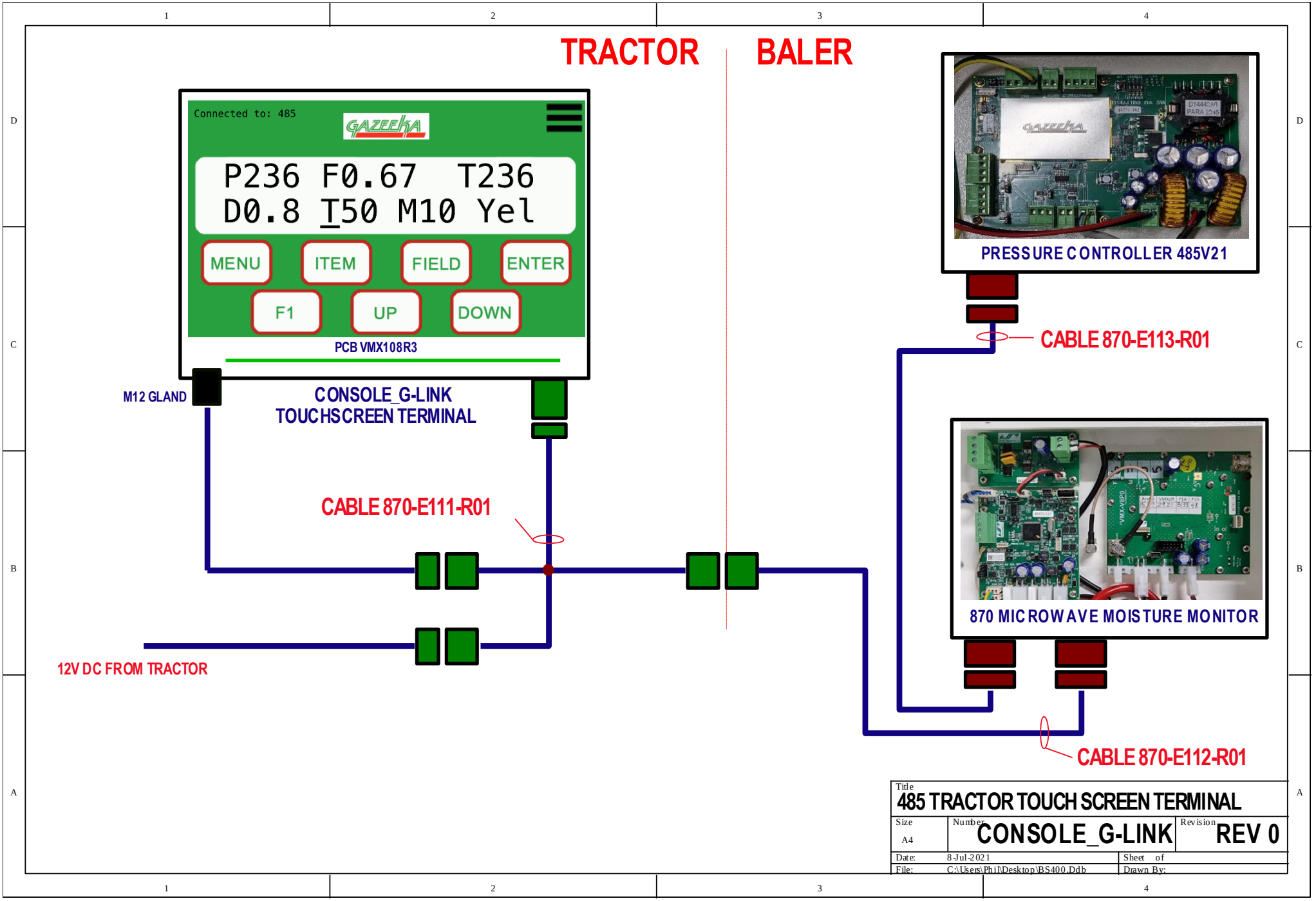
Copper cross sections for 12 Volt systems
The cross section size of the copper wires to take the power from the tractor battery to the pump (Control System) on the baler should be chosen to ensure that during normal operation the voltage at the flow Controller is kept above 11.8 Volts. If the tractor produces 13 Volts during normal operation, then the allowable voltage drop will be 1.2 Volts.

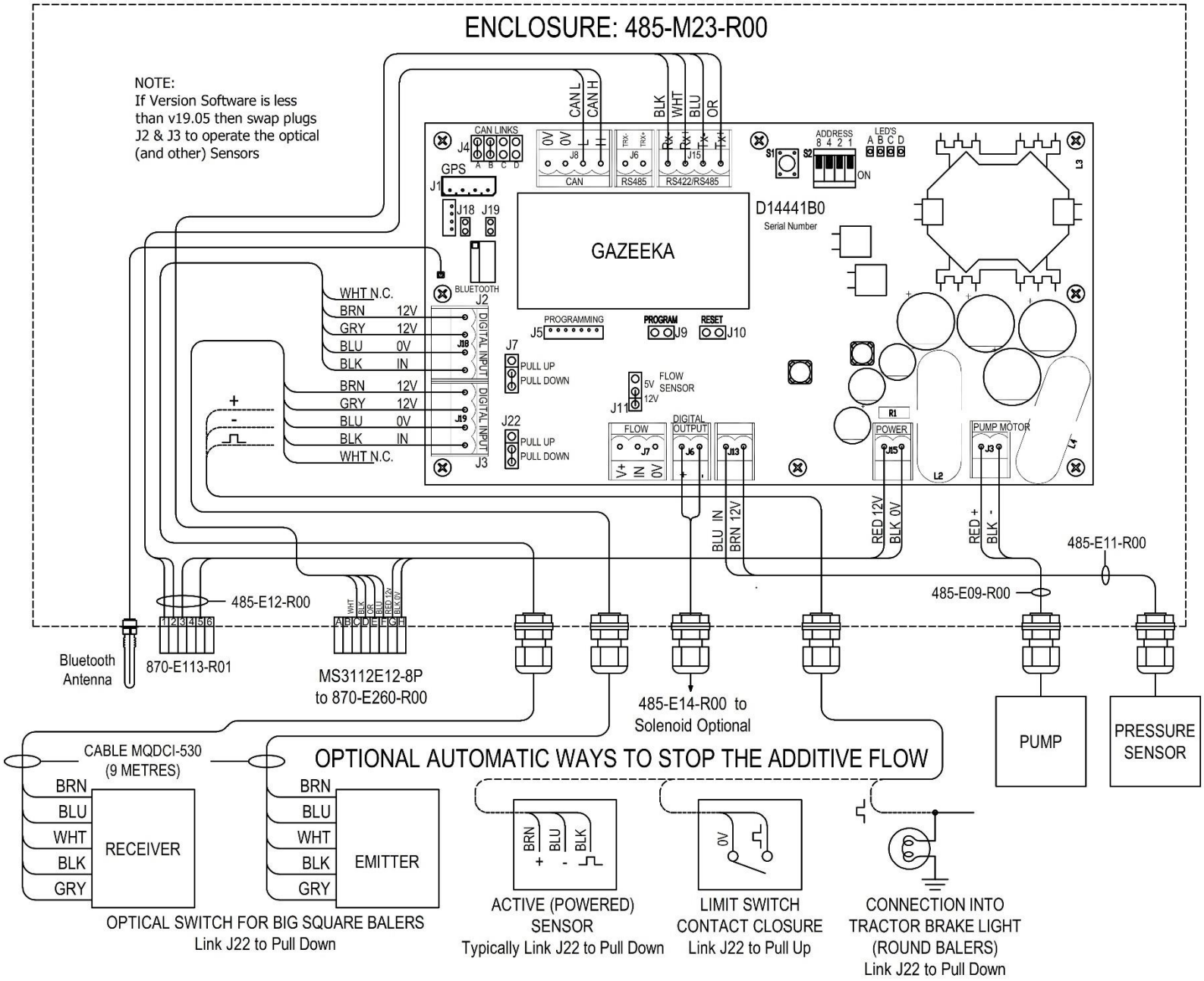
Note: copper cross section (square mm) = (0.0164 x Amp x Metres) / Vdrop
For 15 Metre cable run (30M there and back), 8 Amp supply and 1.2V drop
= 0.0164 x 8 x 30 / 1.2 = 3.3 [use 3.2mm^2 cable (12 AWG is 3.2mm^2)]
(14 AWG is 2.0mm^2)

Appendix E – Standard Terms and Conditions

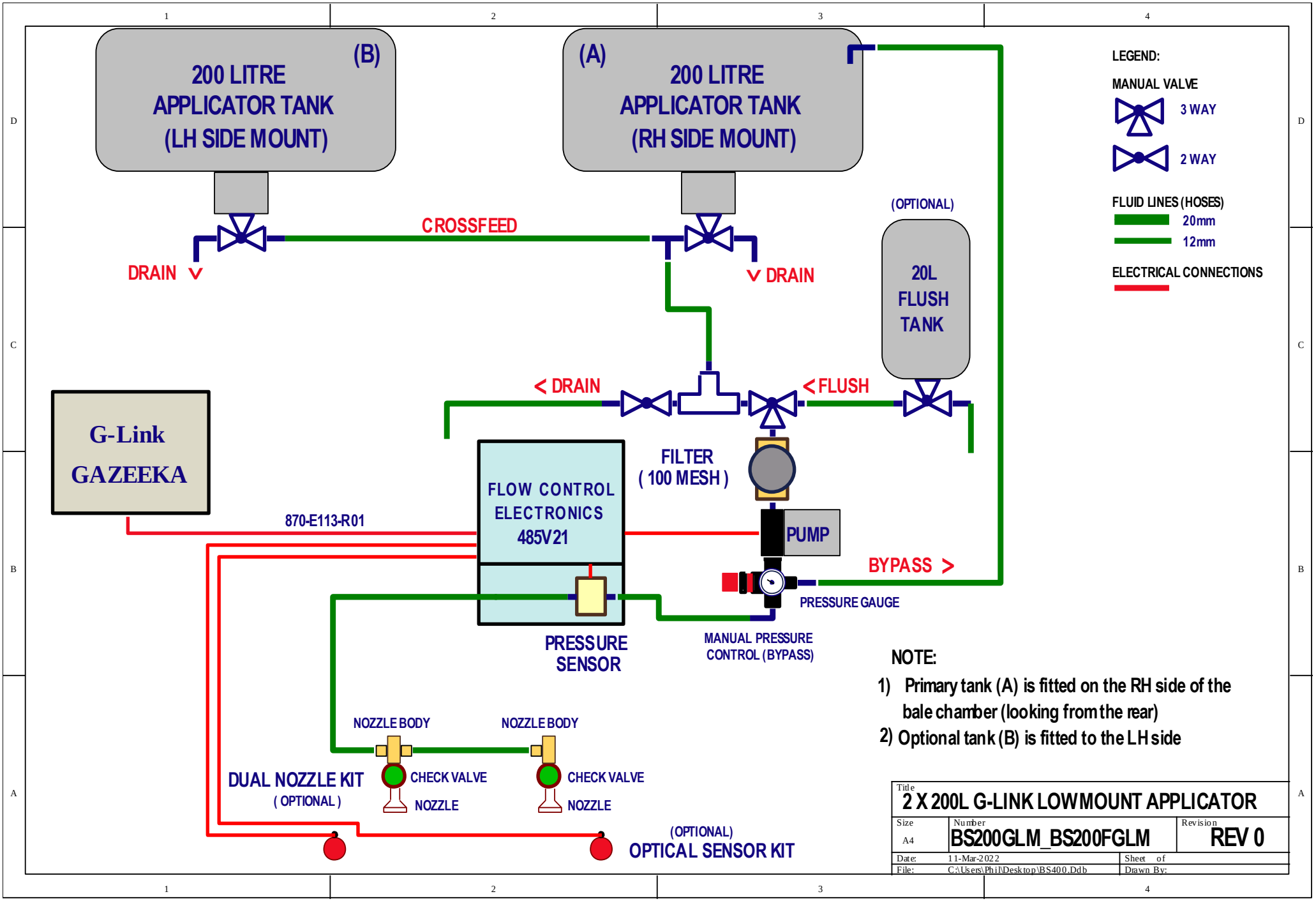
STANDARD TERMS AND CONDITIONS OF CONTRACT
Palmer Ag (ABN 87 008 292 920)

Refer to the current Terms and Conditions on the web site: www.palmerag.com.au


TRACTOR
BALER
Connected to: 485
GAZEEKA
P236 F0.67 T236
D0.8 I50 M10 Yel
MENU
ITEM
FIELD
ENTER
F1
UP
DOWN
PCB VMX108R3
M12 GLAND
CONSOLE_G-LINK
TOUCHSCREEN TERMINAL
CABLE 870-E111-R01
12V DC FROM TRACTOR
PRESSURE CONTROLLER 485V21
CABLE 870-E113-R01
870 MICROWAVE MOISTURE MONITOR
CABLE 870-E112-R01
Title
485 TRACTOR TOUCH SCREEN TERMINAL
Size
A4
Number
CONSOLE_G-LINK
Revision
REV 0
Date: 8-Jul-2021
Sheet of
File: C:\Users\Phil\Desktop\BS400.Ddb
Drawn By:



SCALE:	DATE:	INSTRUMENT:	ENCLOSURE WIRING G-LINK 485 V20 - D1444 WITH FLOW STOP SWITCHES	DRAWING No:	ApliMax and Vomax Inst^n. Under Licence
N.T.S.	30-08-22	485 V20		485-E13-R03	


200 LITRE
APPLICATOR TANK
(LH SIDE MOUNT)
(B)
200 LITRE
APPLICATOR TANK
(RH SIDE MOUNT)
(A)
CROSSFEED
DRAIN
DRAIN
(OPTIONAL)
20L
FLUSH
TANK
< DRAIN
< FLUSH
G-Link
GAZEEKA
FLOW CONTROL
ELECTRONICS
485V21
FILTER
(100 MESH)
870-E113-R01
PUMP
BYPASS >
PRESSURE GAUGE
PRESSURE
SENSOR
MANUAL PRESSURE
CONTROL (BYPASS)
NOZZLE BODY
NOZZLE BODY
DUAL NOZZLE KIT
(OPTIONAL)
CHECK VALVE
NOZZLE
CHECK VALVE
NOZZLE
(OPTIONAL)
OPTICAL SENSOR KIT
LEGEND:
MANUAL VALVE
3 WAY
2 WAY
FLUID LINES (HOSES)
20mm
12mm
ELECTRICAL CONNECTIONS
NOTE:
1) Primary tank (A) is fitted on the RH side of the bale chamber (looking from the rear)
2) Optional tank (B) is fitted to the LH side
Title
2 X 200L G-LINK LOWMOUNT APPLICATOR
Size
A4
Number
BS200GLM_BS200FGLM
Revision
REV 0
Date:
11-Mar-2022
Sheet of
File:
C:\Users\Phil\Desktop\BS400.Ddb
Drawn By: