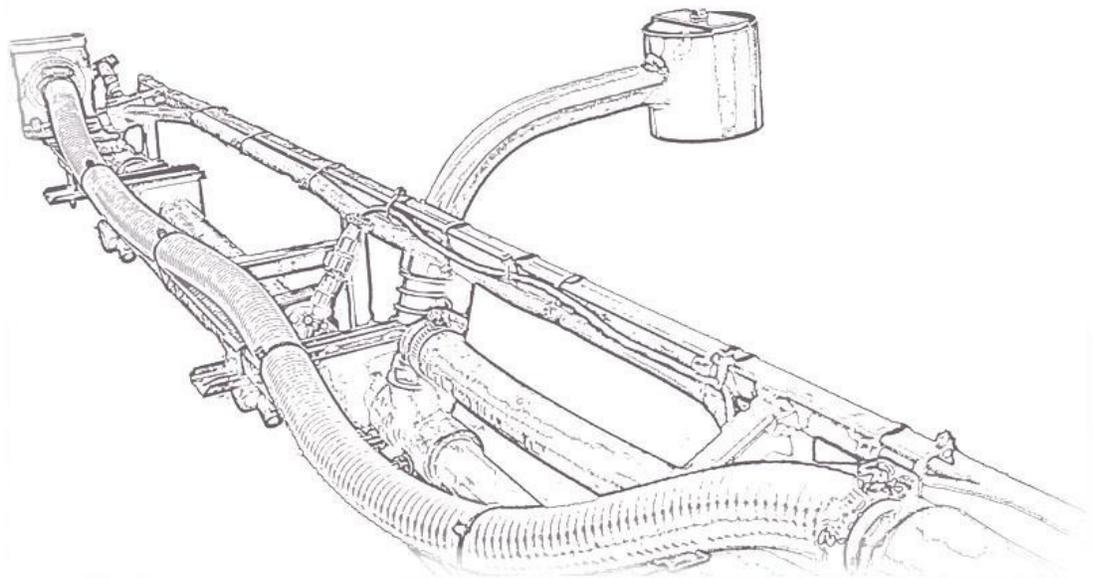




# UC5<sup>TM</sup> CAN BUS Spray Height Control System



Goldacres  
Passive Roll – G6  
Installation Manual

Printed in Canada

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Reorder P/N: UC5-BC-GA01-INST Rev C (Goldacres Passive Roll – G6)

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**NOTICE:** NORAC Systems International Inc. reserves the right to improve products and their specifications without notice and without the requirement to update products sold previously. Every effort has been made to ensure the accuracy of the information contained in this manual. The technical information in this manual was reviewed at the time of approval for publication.

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## I Introduction

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Congratulations on your purchase of the NORAC UC5 Spray Height Control System. This system is manufactured with top quality components and is engineered using the latest technology to provide operating reliability unmatched for years to come.

When properly used the system can provide protection from sprayer boom damage, improve sprayer efficiency, and ensure chemicals are applied correctly.

Please take the time to read this manual completely before attempting to install the system. A thorough understanding of this manual will ensure that you receive the maximum benefit from the system.

Your input can help make us better! If you find issues or have suggestions regarding the parts list or the installation procedure, please don't hesitate to contact us.

### Important

**Every effort has been made to ensure the accuracy of the information contained in this manual. All parts supplied are selected to specially fit the sprayer to facilitate a complete installation. However, NORAC cannot guarantee all parts fit as intended due to the variations of the sprayer by the manufacturer.**

**Please read this manual in its entirety before attempting installation.**

## 2 Technical Specifications

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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

This Class A digital apparatus complies with Canadian ICES-003.

Pursuant to EMC Directive – Article 9, this product is not intended for residential use.

**Table 1: System Specifications**

Supply Voltage (rated)	12VDC
Supply Current (rated)	10A
Hydraulic Pressure (maximum)	3300 psi
Baud Rate	250 kbps
Clock Frequency (maximum)	96 MHz
Solenoid Valve PWM Frequency	300 Hz
Ultrasonic Sensor Transmit Frequency	50 kHz
Operating Temperature Range	0°C to 80°C

### 3 General UC5 System Layout

Figure 1 illustrates the general layout of the UC5 system components:

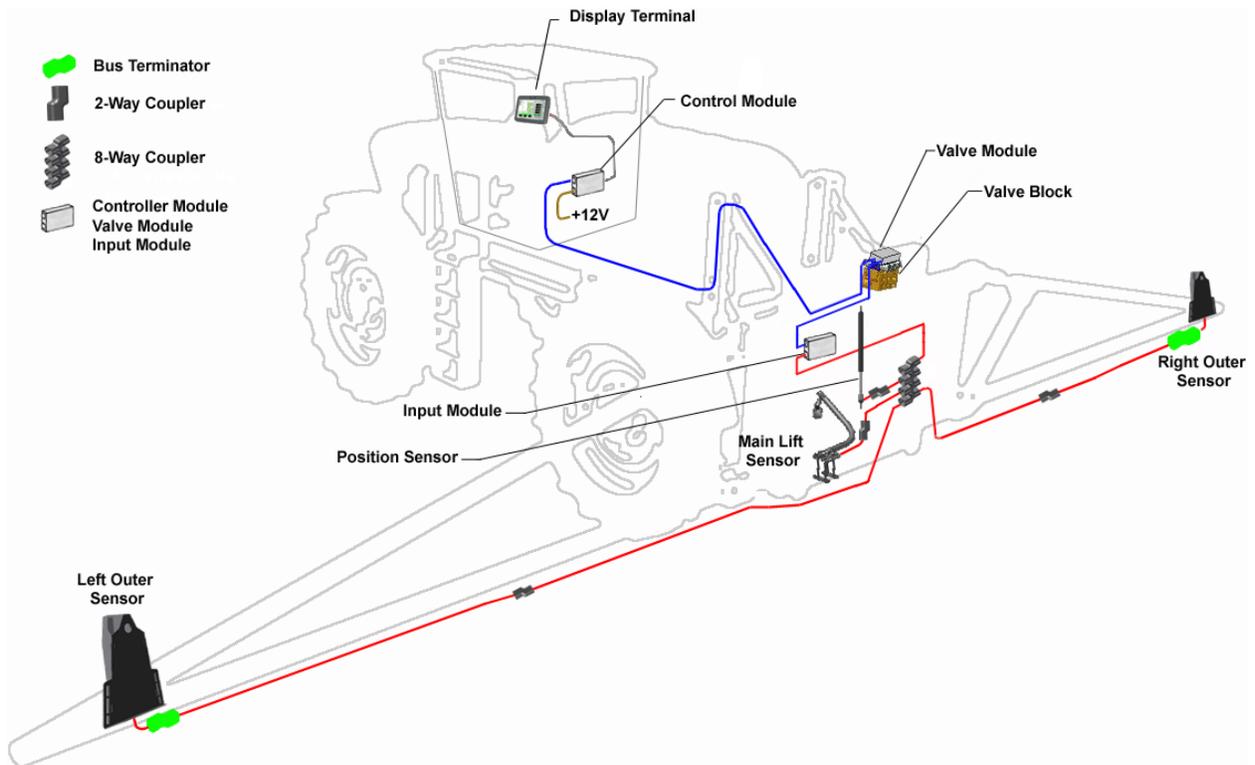


Figure 1: General UC5 System Layout

## 4 Kit Parts

### 4.1 Kit Overview

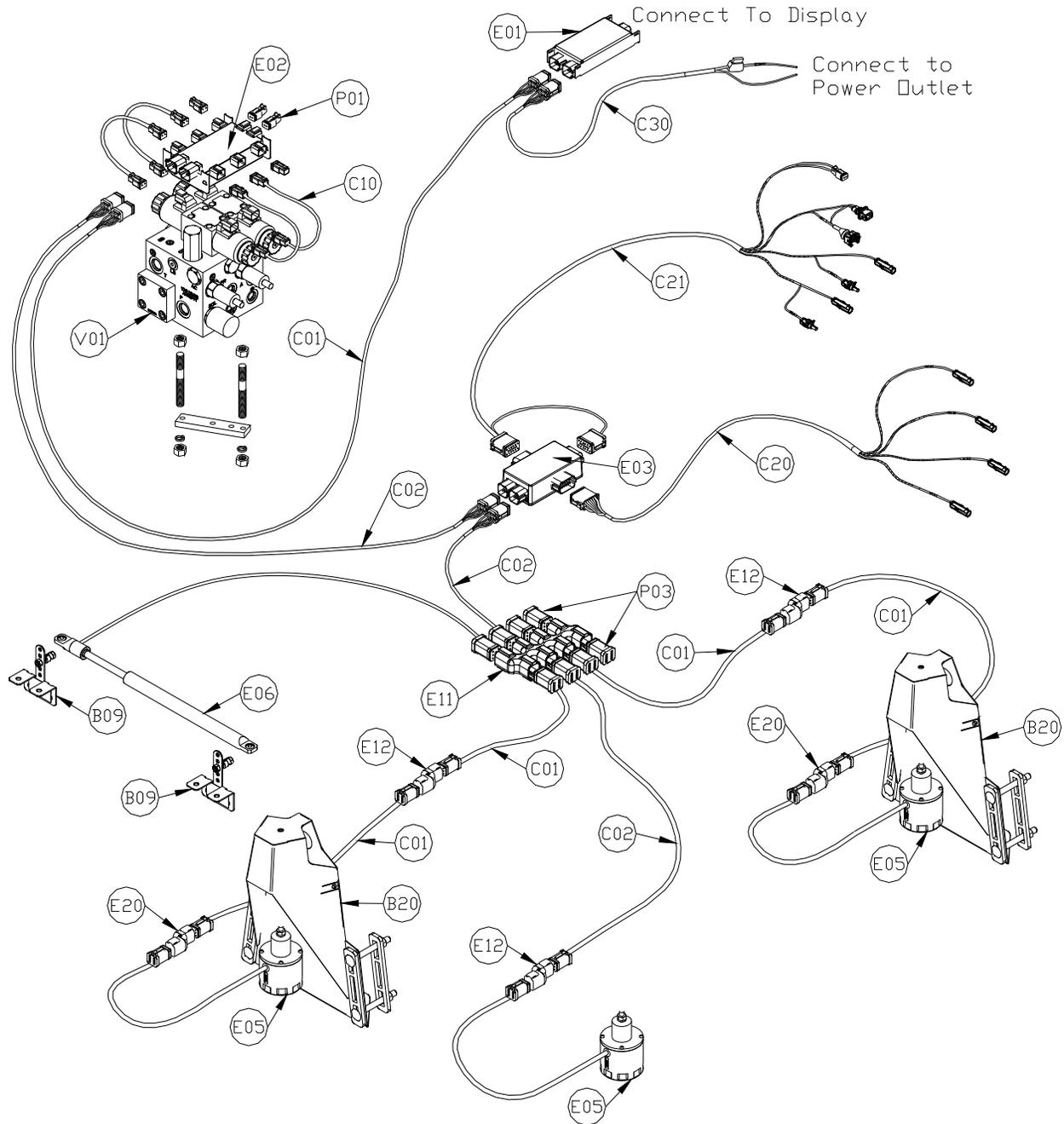
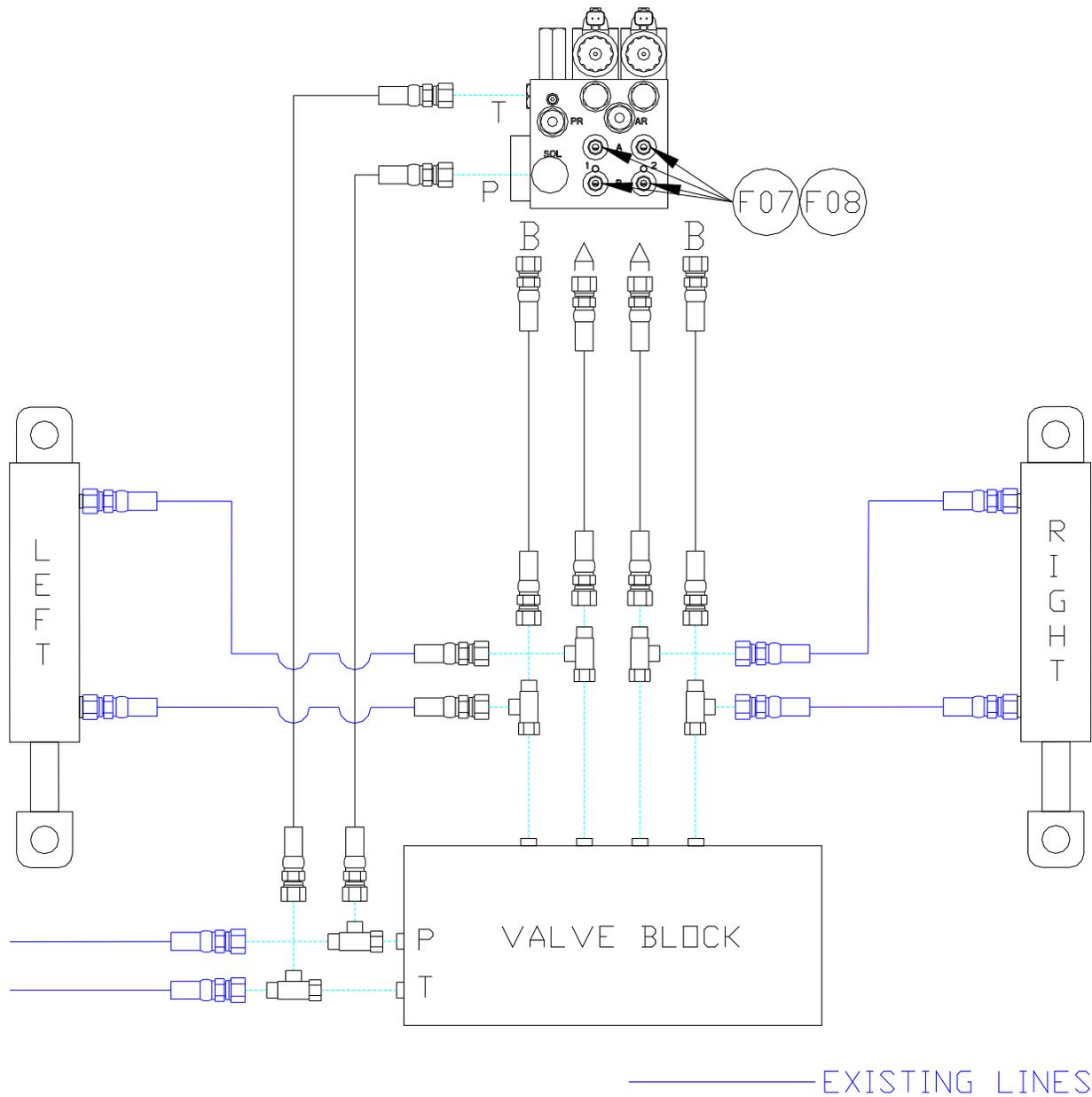


Figure 2: GA01 System Parts

## 4.2 Hydraulic Plumbing



**Figure 3: GA01 Hydraulic Plumbing**

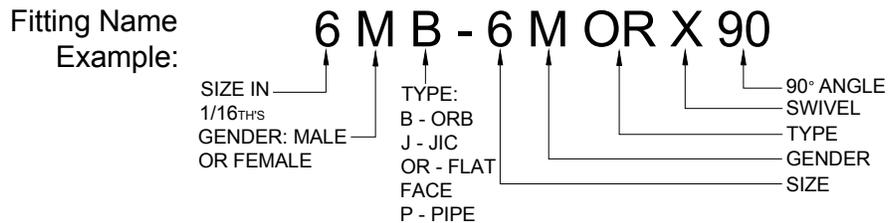
**NOTE:** Only fittings F07 and F08 are included with this kit. All other hydraulic hoses and fittings are supplied by Goldacres.

### 4.3 List of Parts

Item	Part Number	Name	Quantity
B05	44706-01	KIT CABLE TIE BLACK 10 PCS 21 IN 150 PCS 7.5 IN	1
B09	45032-1	BRACKET UC5 POSITION SENSOR MOUNT	2
B12	44747	SPACER 2IN SQUARE TUBING 8IN	2
B20	44971	SENSOR MOUNTING BRACKET LOW PROFILE 16GA	2
C01	43220-10	CABLE NETWORK 14 AWG 10M	5
C02	43220-01	CABLE NETWORK 14 AWG 1M	3
C10	43230-04	CABLE UC5 VALVE 2PIN DT TO 2PIN DT	4
C20	43240-44	CABLE UC5 INTERFACE TILT GP (WEATHERPACK - SINGLE)	1
C21	43240-45	CABLE UC5 INTERFACE MAIN GP (WEATHERPACK - SINGLE)	1
C30	43250-06	CABLE BATTERY PIGTAIL FUSED	1
E01	43710	UC5 CONTROLLER MODULE	1
E02	43720	UC5 VALVE MODULE	1
E03	43732	UC5 INPUT MODULE PASS THRU	1
E05	43750	ULTRASONIC SENSOR	3
E06	45030	UC5 POSITION SENSOR NF W/O HARDWARE	1
E11	43765	NETWORK COUPLER 8-WAY	1
E12	43764	NETWORK COUPLER 2-WAY	3
E20	43764T	NETWORK COUPLER 2-WAY WITH TERMINATOR	2
H10	44865-34	HYDRAULICS FITTING KIT - GN1	1
M02	UC5-BC-GA01-INST	MANUAL INSTALLATION UC5 GOLDACRES PASSIVE ROLL - G6	1
P01	106034	NETWORK 2 PIN PLUG	4
P03	105882	NETWORK 6 PIN PLUG	3
V01	44959D	VALVE BLOCK ASSEMBLY 2 STATION OC/LS PROP DT 4 BOLT	1

## 4.4 Hydraulic Fitting Kit Details (P/N: 44865-34)

Item	Part Number	Name	Quantity	Picture
F07	103312	MALE ADAPTER - 6MB 6MJ	6	
F08	44928	ORIFICE INSERT .047 IN ONE WAY	4	
F09	104369	PLUG - 6MBP	2	



### Important

Not all fittings are used for this installation.

### Important

Do not use high speed power tools/drills when installing hardware.

### Important

The use of dielectric grease is not recommended on any NORAC electrical connections.

### Important

To ensure all stainless steel hardware does not gall or seize apply a light coating of the supplied Permatex Anti-seize grease to all threaded parts upon installation. Permatex Anti-seize lubricant is preferred, but other similar anti-seize products may be used.

## 5 Pre-Install Checklist

The pre-install checklist is necessary to check the existing sprayer functionality before the installation.

1. Unfold the sprayer over a flat, unobstructed area (i.e. no power lines...etc.).
2. Ensure all boom-fold operations are functional (place a check mark in boxes below).
3. Bring engine to field-operational RPM and record below.
4. Record the time (seconds) it takes for a full stroke for all boom functions. To ensure repeatable measurements, take the average of 3 trials.
5. Not all sprayers will have the functions listed below in **Figure 4**.

### ⚠ Important

Ensure the boom has sufficient travel so it does not contact the ground during these tests.

<input type="checkbox"/>	<input type="checkbox"/>	Inner Fold	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Outer Fold	<input type="checkbox"/>
	IN	OUT	Engine RPM
Left Tilt Up Full Stroke	<input type="checkbox"/>	<input type="checkbox"/>	Right Tilt Up Full Stroke
	↑	↑	↑
	Main Lift Up, Full Stroke		
	Main Lift Down, Full Stroke		
Left Tilt Down Full Stroke	<input type="checkbox"/>	<input type="checkbox"/>	Right Tilt Down Full Stroke
	↓	↓	↓
	<input type="checkbox"/>	<input type="checkbox"/>	
	↶	↷	
	Roll CCW (Slant Left)	Roll CW (Slant Right)	

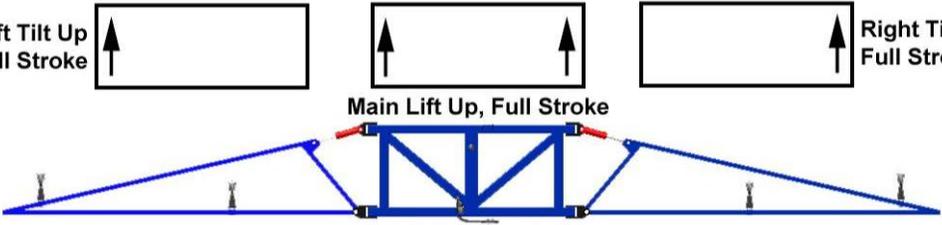


Figure 4: Pre-Install Boom Speeds

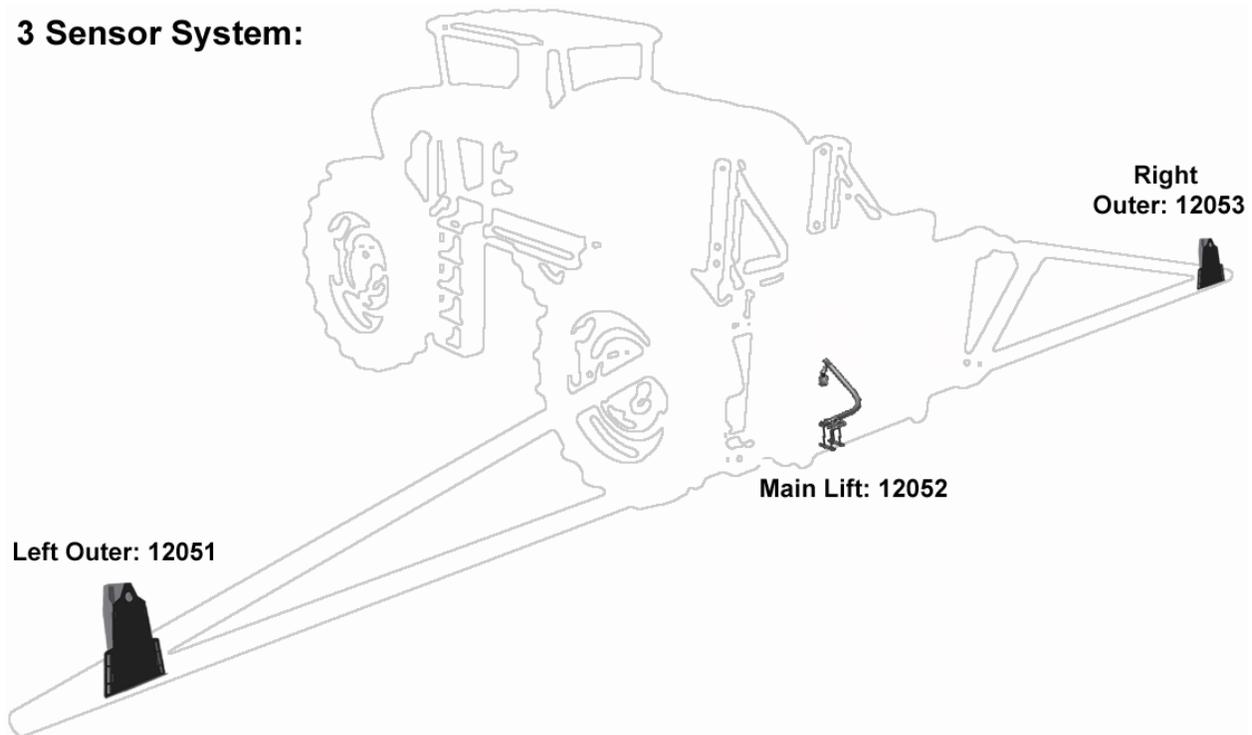
## 6 Ultrasonic Sensor Installation

### 6.1 Ultrasonic Sensor Serial Number Arrangement

When installing the UC5 sensors, start with the smallest serial number on the left-hand side, and proceed to the largest serial number on the right hand side. Each UC5 sensor has a serial number stamped on the sensor housing.

**Apply a light coating of the supplied Permatex Anti-seize grease to all threaded parts upon installation.**

#### 3 Sensor System:



**Figure 5: Sensor Serial Number Arrangement**

## 6.2 Ultrasonic Wing Sensor Mounting Guidelines

The following guidelines will ensure optimal sensor performance and prevent sensor measurement error. These rules should be followed for both the wing sensors and the main lift (middle) sensor.

1. In its lowest position, the sensor must be 9 inches (23 cm) or more from the ground.
2. Ensure that there are no obstructions within a 12-inch diameter circle projected directly below the center of the sensor.
3. The sensor should be approximately vertical at normal operating heights.

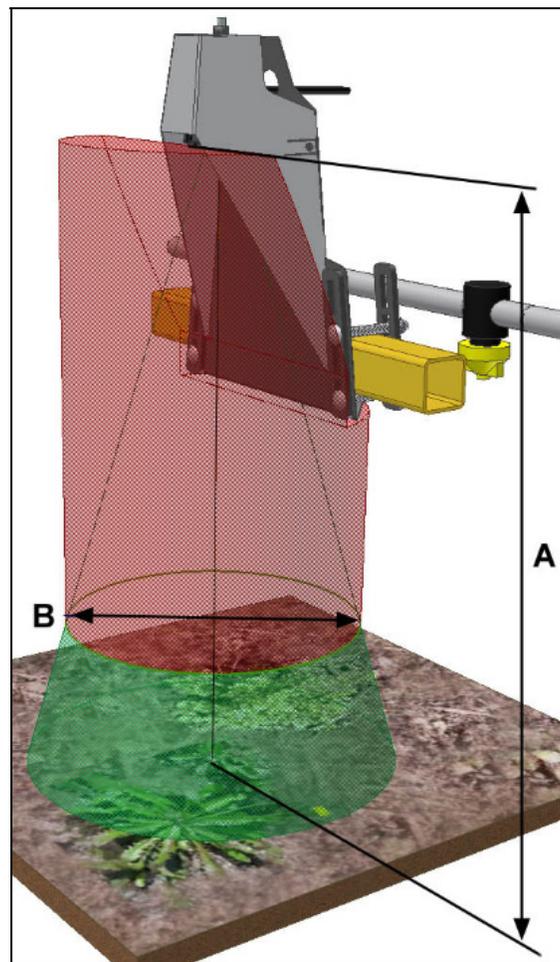


Figure 6: Sensor Mounting Guidelines

### 6.3 Low Profile Bracket Mounting Guidelines

1. Minimize the distance between the bolts to prevent bending the bracket and prevent the bracket from loosening over time.
2. Ensure the bracket is mounted tight against the bottom of the boom, minimizing the distance between the boom structure and the angled flange.

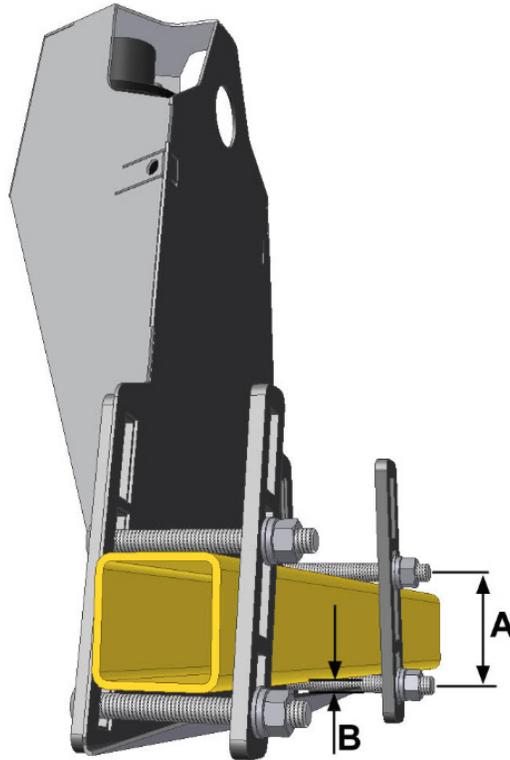


Figure 7: Bracket Mounting Guidelines

#### Important

A problem can arise if a sensor is not mounted correctly. It is possible for the sensor to read off of the boom instead of the ground. This may only become apparent once the control system is switched from soil to crop mode.

Also be careful that the sensor bracket does not collide with any other part of the boom when the boom is folded to transport position. If possible, mount the sensor brackets while the booms are folded to ensure they will not cause interference.

## 6.4 Wing Sensor Installation

1. The sensor bracket should be oriented forward (ahead of the boom).
2. Typically the best mounting location for the wing sensor brackets will be near the end of the boom tips, approximately two feet (60cm) from the end. Use spacers (B12) to mount the brackets (**Figure 9**).
3. Depending on the boom design, some breakaway sections will lift upwards as they break back. If the sensor is mounted to this portion of the boom, the system will force the boom downwards towards the ground as the boom folds backwards.
4. Mount the NORAC UC5 ultrasonic sensor into the sensor bracket and run the sensor cable either through hole in the back or through the side cut-out and behind the bracket. Ensure the cable is clear of moving parts and will not be damaged during folding.

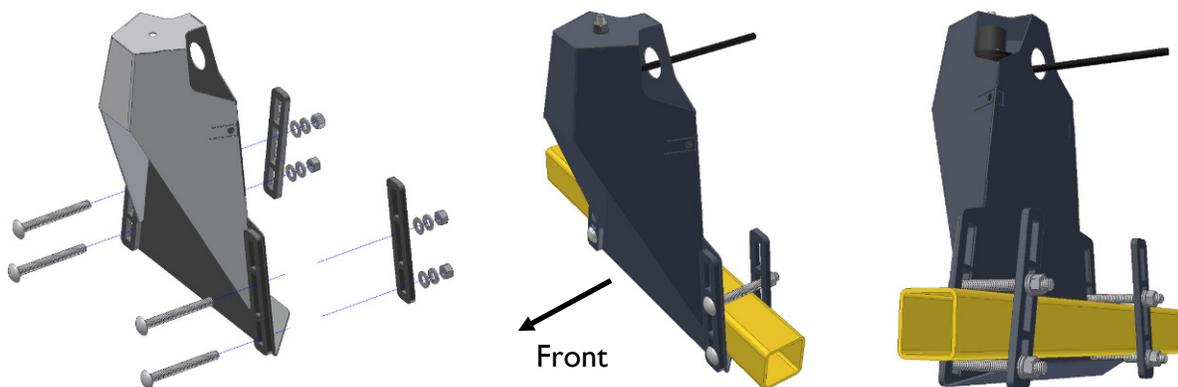


Figure 8: Bracket Mounting Example

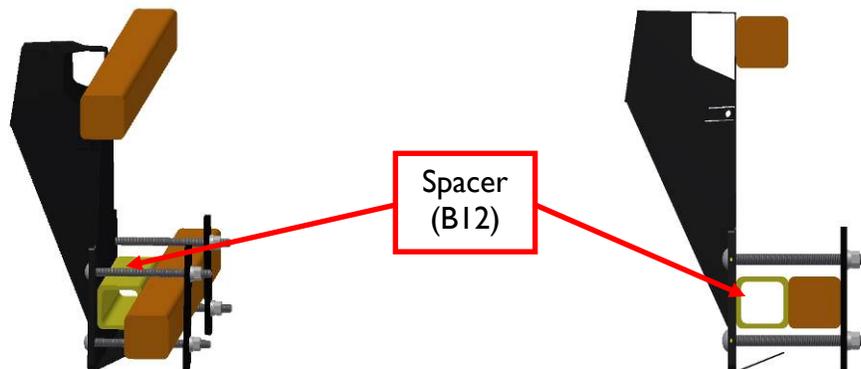


Figure 9: Spacer Placement

## 6.5 Ultrasonic Main Lift Sensor Mounting Guidelines

The following guidelines will ensure optimal sensor performance and prevent sensor measurement error.

1. In its lowest position, the sensor must be 9 inches (23 cm) or more from the ground.
2. The centerline of the acoustic cone should be approximately vertical at normal operating heights.
3. The bottom of the sensor must be at least 9 inches above the spray nozzles.
4. Ensure there are no other obstructions with a 12 inch (23 cm) diameter circle projected directly below the sensor.

## 6.6 Main Lift Sensor Installation

1. There are a variety of ways to mount the main lift bracket on most sprayers. The bracket should position the sensor approximately in the center of the sprayer, forward of the boom. An example of this mounting is illustrated in **Figure 10**.
2. Mount the ultrasonic sensor to the main lift bracket.

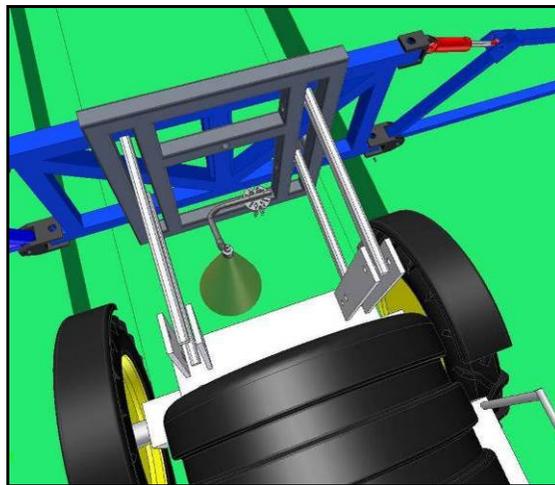


Figure 10: Main Lift Bracket Example Mounting

### Important

**Avoid mounting the main lift sensor over or near a wheel-track. Measurements from the wheel-track do not provide an accurate crop height and will cause measurement and control error.**

**Ensure the bracket does not collide with any other part of the sprayer throughout the full range of main lift motion.**

## 7 Position Sensor Installation

1. The position sensor (E06) should be mounted such that the largest amount of travel of the sensor can be utilized without exceeding the travel limit. The sensor install length is 17" (430mm) center to center with  $\pm 3.5"$  ( $\pm 90\text{mm}$ ) travel recommended. The travel limit is indicated by red bands on the position sensor.
2. It should be mounted in a location where the sensor will mount without binding or contacting and that is perpendicular to the direction of travel. Roll the boom fully in each direction and take measurements to ensure the travel limit is not exceeded.
3. Install the position sensor using the brackets (B09). Use the mounting hardware as shown in **Figure 11**. Mount so that the black band on the position sensor lines up with the outer sleeve when the boom is level.

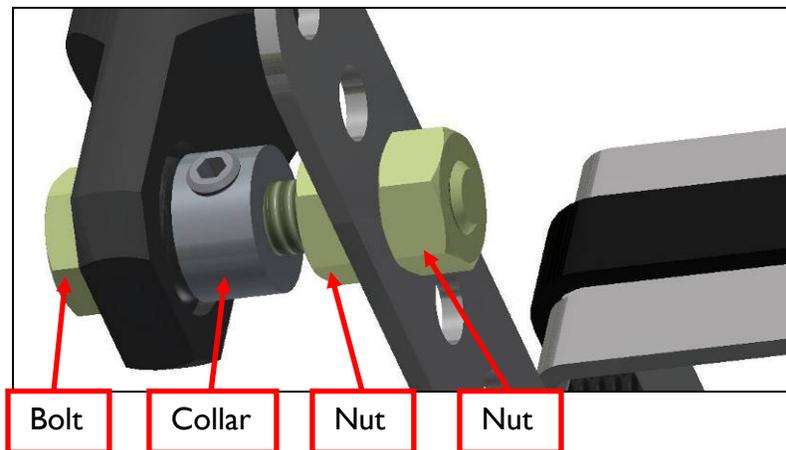


Figure 11: Mounting Hardware



Figure 12: Position Sensor Mounting

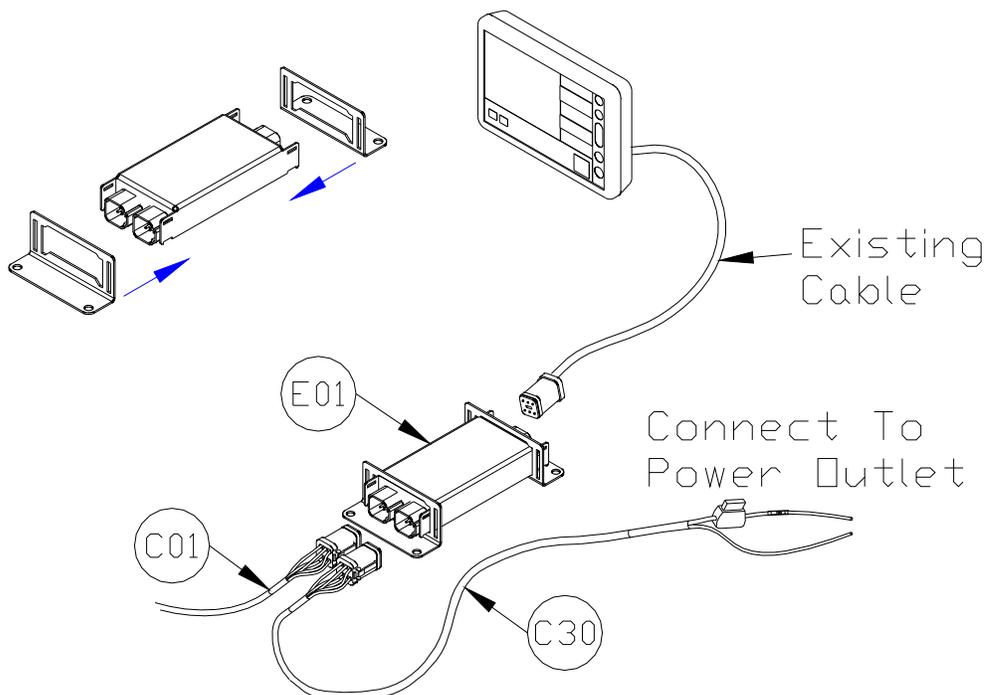
## 8 Module Installation

An optional module mounting bracket kit is available for purchase from NORAC. The mounting brackets are compatible with control modules and input modules. One kit is needed per module.

Item	Part Number	Name	Quantity
B20	43708	UC5 MOUNTING BRACKET KIT (CONTROL AND INPUT MODULES)	1

### 8.1 Control Module

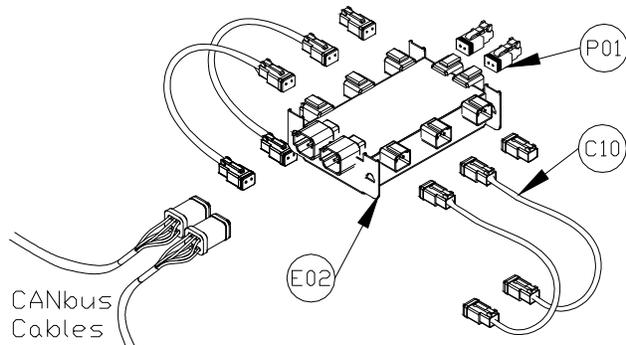
1. Refer to **Figure I** and **Figure I3**.
2. Securely mount the control module (E01) inside the sprayer cab using screws, cable ties or optional brackets.
3. Connect the display terminal to the control module using the existing display cable. This cable must be connected to the end of the control module with only one Deutsch connector.
4. Connect the power cable (C30) to one of the two CANbus connectors on the control module. Connect the other end of the power cable to an appropriate power source.
5. Route cable C01 from the other CANbus connector towards the rear of the sprayer.



**Figure I3: Control Module Mounting**

## 8.2 Valve Module

1. Install the valve module (E02) to the top of the NORAC valve block. Orient the 6-pin Deutsch (CANbus) connectors towards the “P” and “T” ports with the label facing up.



Output Number	Normal Function
1	Left Up
2	Left Down
3	Right Up
4	Right Down
5	Option 1
6	Option 2
7	Option 3
8	Option 4

Figure 14: Valve Module

2. Verify the valve coil connectors are oriented vertically (Figure 15).

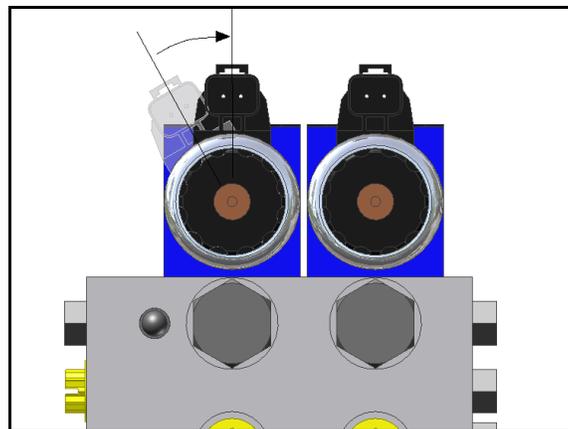
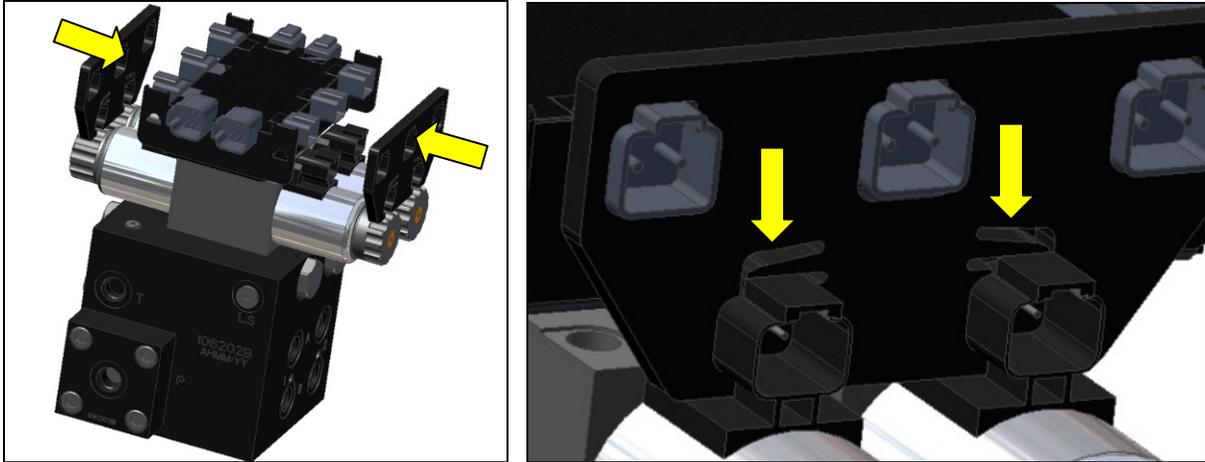


Figure 15: Align Coils

3. Place the valve module between the valve coils. Slide a valve mounting bracket over the connectors of the valve module and the valve coil connectors. This may require flexing the plastic bracket slightly (Figure 16).
4. Ensure the bracket is pushed over the connectors far enough to allow the clips to engage behind the valve connectors.

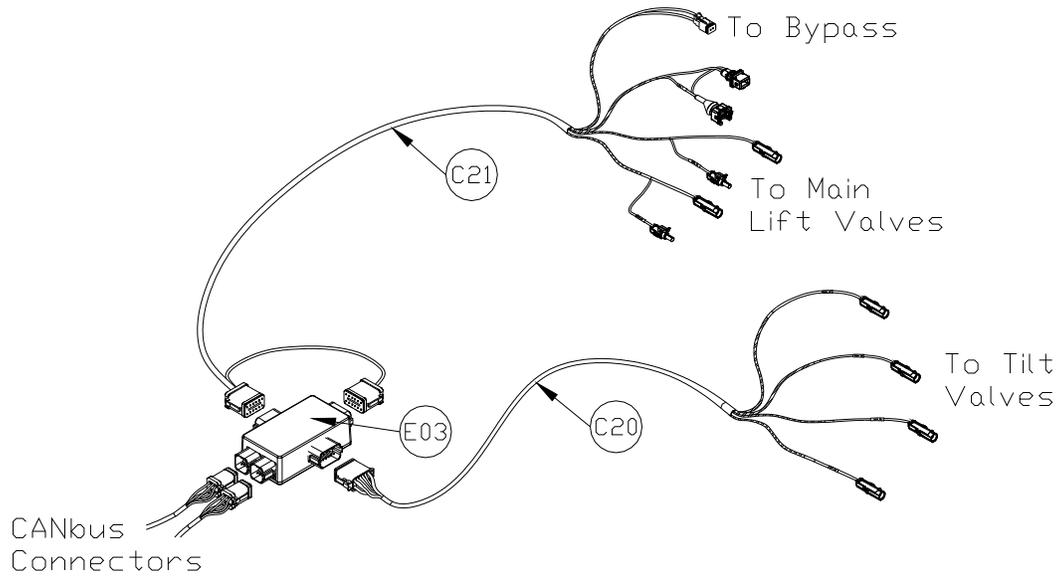


**Figure 16: Valve Module Bracket Installation**

5. Connect the valve module CANbus to cable C01 from the control module. Route cable C02 from the other CANbus connector to the input module.
6. With the valve module securely mounted to the valve block, connect the valve cables (C10), to the valve coils.
7. Insert the 2-pin plugs (P01) into the unused 2-pin connectors on the valve module.
8. Connect the temperature probe to the valve block using the supplied 3/8" x 1/2" hex bolt.

### 8.3 Input Module

1. Install the input module (E03) on the boom near the sprayer valve block. Secure it to the boom using cable ties or optional brackets.
2. Connect the CANbus cable (C02) from the valve module to the input module. Connect cable C02 to the other CANbus connector and route to the 8-way coupler.



**Figure 17: Input Module Connections**

3. Connect the 12 pin connector on the tilt interface cable (C20) to the *Thru 2* connector on the side of the input module. Insert the single pin connectors on C20 into the tilt connections on the sprayer valve block.
4. Connect the 12 pin connector on the main lift interface cable (C21) to the *Thru 1* connector on the side of the input module. Connect the second 12 pin connector to the *OEM 3* connector on the end of the input module. Insert the single pin connectors on C21 into the main lift connections on the sprayer valve block. Insert the 2-pin AUX I connectors into the sprayer bypass connection on the sprayer valve block.



**Figure 18: Goldacres Bypass Connection**

5. The 2 pin Deutsch connector on cable C21 connects to the NORAC bypass valve located on the end of the NORAC valve block.



**Figure 19: NORAC Bypass Connection**

## 9 Connecting the Sensors to the CANbus

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1. Fasten the 8-way coupler to the boom with cable ties.
2. Connect cable C02 from the input module to the 8-way coupler (E11).
3. Connect the position sensor to the 8-way coupler.
4. Connect the main lift sensor to the 8-way coupler using cable C02 and a 2-way coupler (E12). Cable C02 and item E12 may not be needed if the 8-way coupler is mounted close enough to the main lift sensor.
5. Connect two cables C01 together with a 2-way coupler (E12). Connect one end to the 8-way coupler and route along the boom to the outer wing sensors. Position the 2-way coupler (E12) approximately half-way between the chassis and the outer wing sensors.
6. At the sensor brackets, attach a 2-way coupler with terminator (E20) to the sprayer boom. The 2-way coupler with terminator is the white two way coupler. Plug the sensor and the CANbus cable into the 2-way coupler.
7. Insert the 6-pin plugs (P03) into the remaining connectors on the 8-way coupler.

### Important

**Ensure that all unused connectors are plugged with the plugs provided.**

## 10 Hydraulic Installation

### ⚠ Warning!

Ensure all pressure has been bled from the system before disconnecting any lines or fittings. Hydraulic pressure will exist on the wing tilt circuits unless the wings are being supported by other means. The hydraulic installation may be performed with the wings in transport position, resting on the ground or with the tilt cylinders fully extended.

### ⚠ Important

Component failure due to oil contamination is not covered under the NORAC UC5 system warranty. It is recommended that a qualified technician perform the hydraulic installation.

### 10.1 Valve Assembly

1. On a clean surface remove the plastic plugs from the block.
2. Insert the two orifices (F08) into the “B” ports with the notch facing out.
3. Install the 6MB-6MJ (F07) fittings into the “B” ports. Tighten to 18 ft-lbs (24 Nm).
4. Insert the two orifices (F08) into the “A” ports with the notch facing in.
5. Install the 6MB-6MJ (F07) fittings into the “A” ports. Tighten to 18 ft-lbs (24 Nm).

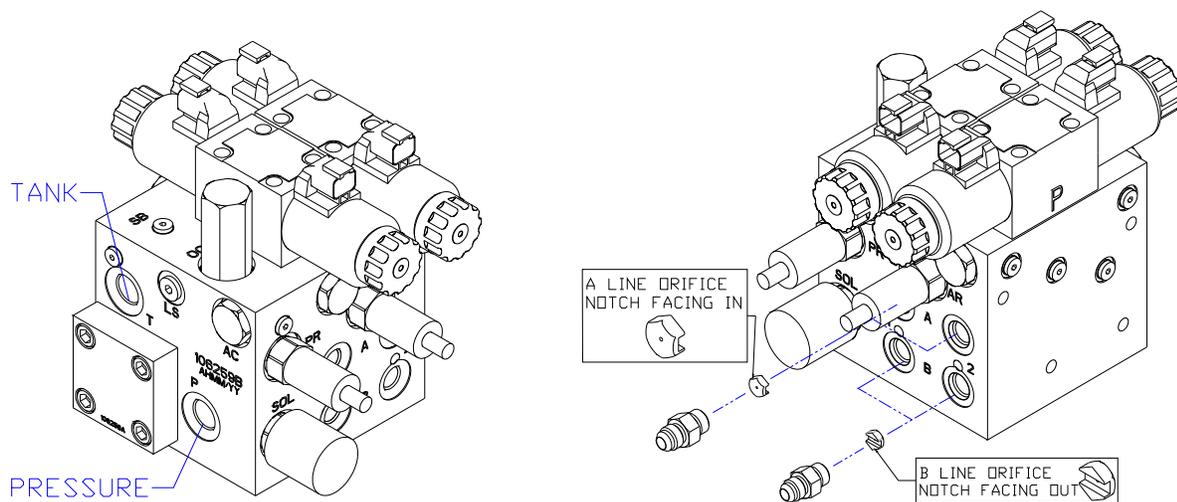


Figure 20: NORAC Valve Block Details

## 10.2 Valve Block Mounting

1. Mount the valve block on the sprayer near the existing valve block.
2. Use the supplied valve bracket to install the valve block.
3. Insert the threaded rod into the block and use a hex nut to hold the rod. The block holes are 3/8" NC-1" deep. If bolts are used instead of the threaded rod, ensure the bolts thread in at least 3/8".
4. Use the remaining hardware to secure the block to the sprayer.
5. Cut off excess threaded rod, if necessary.



Figure 21: Valve Block Mounting

## 10.3 Hydraulic Plumbing

### **Warning!**

**From this point on in the installation the booms will be inoperative until the hydraulics are fully installed.**

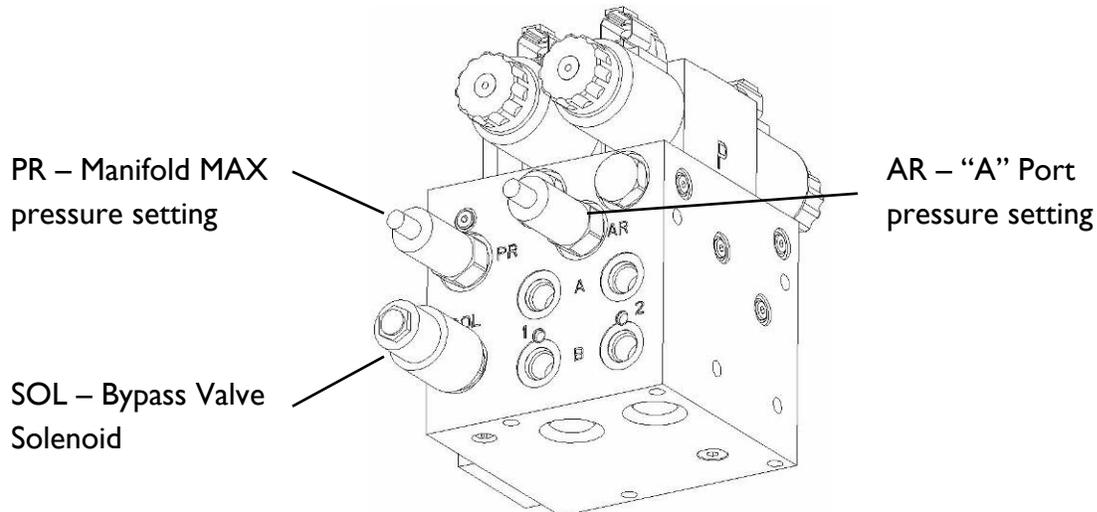
1. After the NORAC valve is mounted, the hydraulic hoses and fittings can be plumbed. The plumbing for the hydraulic circuit is shown schematically in **Figure 3**.

**NOTE:** Only fittings F07 and F08 are included with this kit. All other hydraulic hoses and fittings are supplied by Goldacres.

2. Disconnect the tilt raise and lower lines from the sprayer valve block and insert four tees between the hoses and the valve block.
3. Connect four hydraulic hoses from the free ends of the tees to the NORAC valve block. The raise lines must be connected to the “B” ports and the lower lines must be connected to the “A” ports.
4. Disconnect the tank line from the sprayer valve block and insert a tee between the hose and the valve block. Connect a hydraulic hose from the free end of the tee to the tank port on the NORAC valve block.
5. Disconnect the pressure line from the sprayer valve block and insert a tee between the hose and the valve block. Connect a hydraulic hose from the free end of the tee to the pressure port on the NORAC valve block.

## 10.4 Pressure Adjustment

1. Proper adjustment will reduce the system pressure to an optimal level for all functions connected to the NORAC manifold.



**Figure 22: Valve Component Locations**

2. Adjustments should be made with the system in operating position and at operating temperature.
3. Determine which function can be operated that will activate the bypass valves and will not cause any movement of the sprayer such as a fully extended unfold function.
4. Disconnect the SOL bypass wire from the NORAC manifold.
5. If required, activate and hold the function found in step 3 and ensure the sprayer bypass valve is closed and the hydraulic system pressure is being controlled by the NORAC manifold.
6. Manually activate a boom circuit valve by pushing the manual override on the end of the valve to determine which direction is raise. This is done by inserting a small blunt 1/8” object into the end of the solenoid valve.
7. Loosen the locking nut on the PR relief valve. Turn the adjustment screw counterclockwise two turns.
8. Manually activate a boom valve to raise the boom. While the valve is active turn the PR adjustment screw clockwise until the boom begins to lift. If the boom begins moving before any adjustment is made, turn the screw out one turn and retry.

9. Once the boom begins to lift, stop activating the valve and turn the PR adjustment  $\frac{3}{4}$  turn more clockwise and lock the adjustment nut.
10. Minimize the amount of “A”-line pressure by adjusting the “A” relief valve (AR). Loosen the locking nut on the AR relief valve. Turn the adjustment screw counterclockwise about two turns. Manually activate a boom valve to lower the boom. While the valve is active turn the AR adjustment screw clockwise until the boom begins to lower. Once the boom begins to lower, stop activating the valve and turn the AR adjustment  $\frac{3}{4}$  turn more clockwise and lock the adjustment nut.
11. Reconnect the SOL bypass wire.
12. Once these pressure adjustments have been complete, operate all functions of the machine to the full extents of travel to ensure proper operation. In the event a function requires more pressure than the PR or AR setting in steps 3-11 follow the same procedure while operating the highest pressure function.

**Note:** It is possible that a function connected to the NORAC manifold will be operated by the control system using the pressure compensator and may also be operated manually by the sprayer function. This can cause, for example, a boom lift cylinder to manually be raised at max system pressure when in automatic it would run at a lower pressure. This may require the AR pressure to be increased and ensure the required pilot pressure is available to lower the boom in the event the cylinder because locked under the higher system pressure.

## II Software Setup

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1. Start up the sprayer and test the sprayer's functionality. The display terminal does not need to be powered on for the original boom function switches to operate. Unfold the booms and raise/lower each boom and the main section.

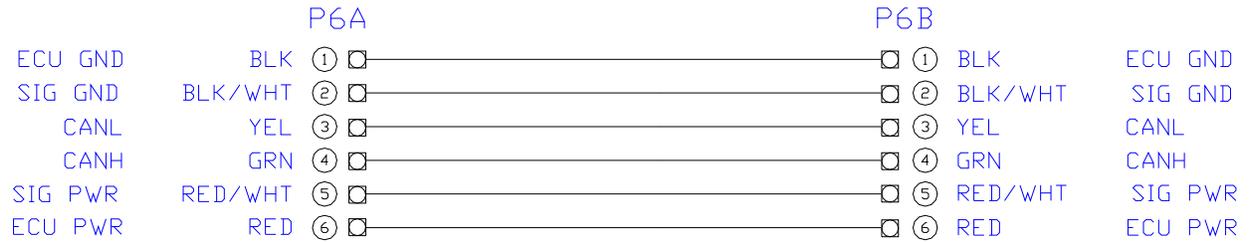
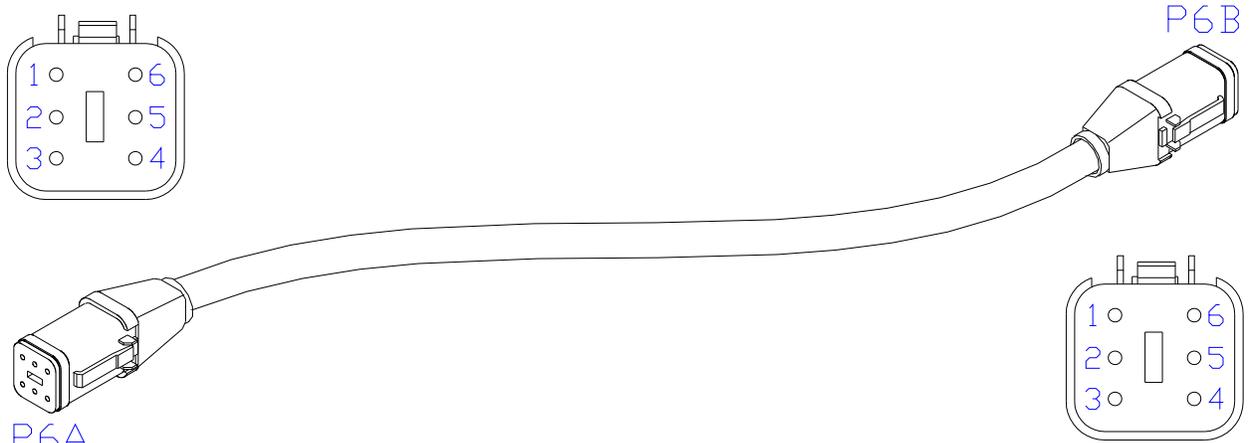
### Important

**Confirm that the cabling and hoses are agreeable to the entire range of motion.**

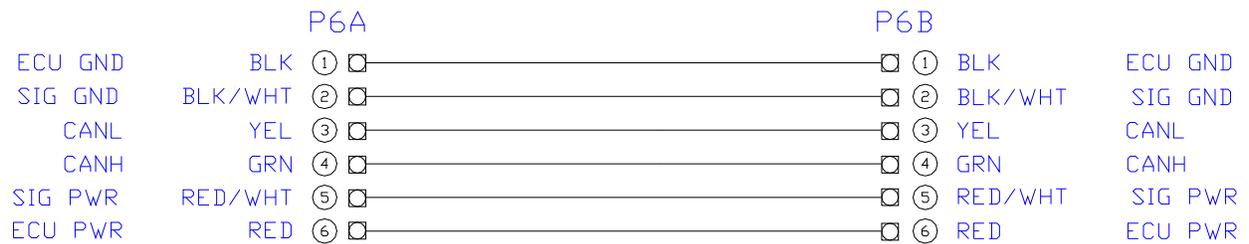
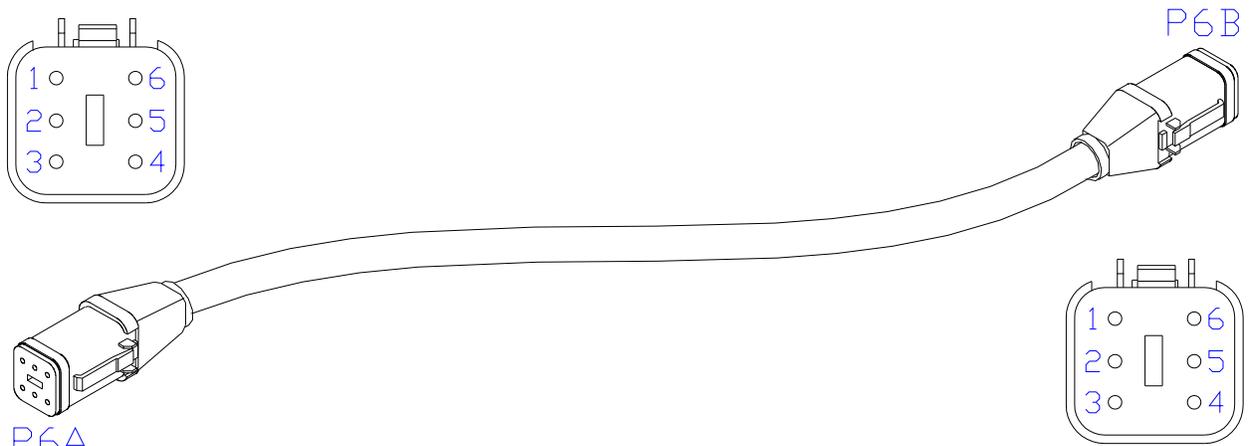
2. If any functions do not work, review the hydraulic and electrical portions of this manual to check for proper installation.
3. Turn on the power for the display terminal using the switch on the side.
4. The procedure for the installation of the UC5 Spray Height Control system is now complete. Begin the AUTOMATIC SYSTEM SETUP procedure as described in the UC5 Spray Height Control Operator's Manual.

## 12 Cable Drawings

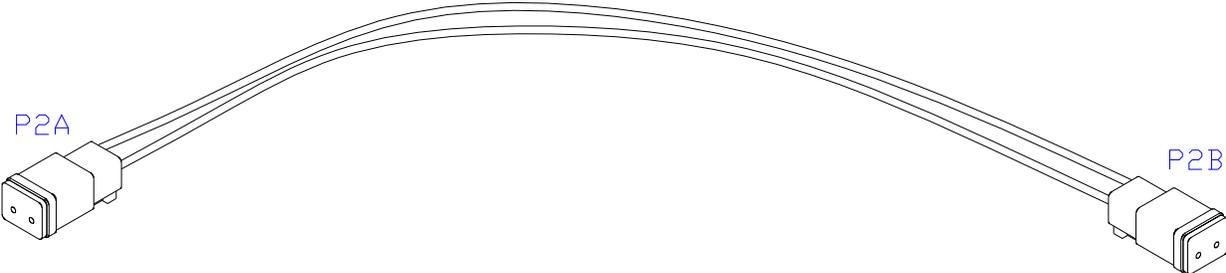
### 12.1 ITEM C01: 43220-10 - CABLE UC5 NETWORK 14 AWG - 10M



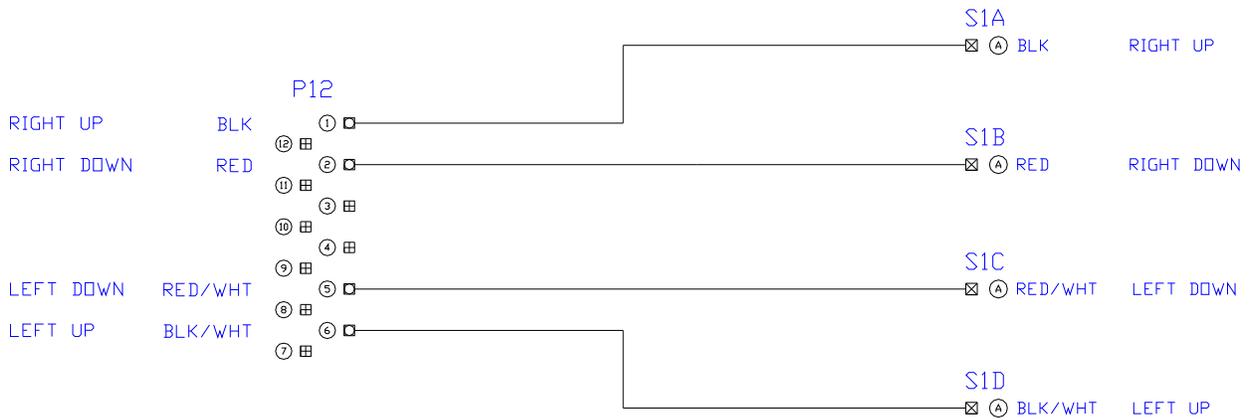
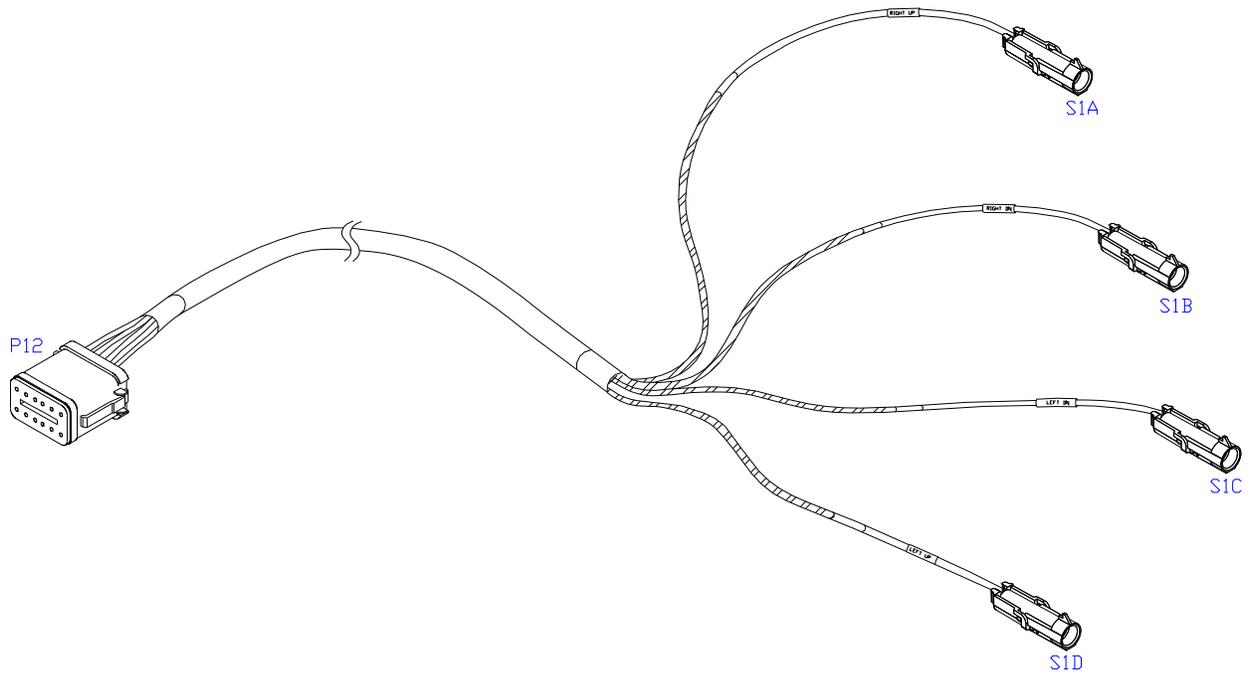
### 12.2 ITEM C02: 43220-01 - CABLE UC5 NETWORK 14 AWG - 1M



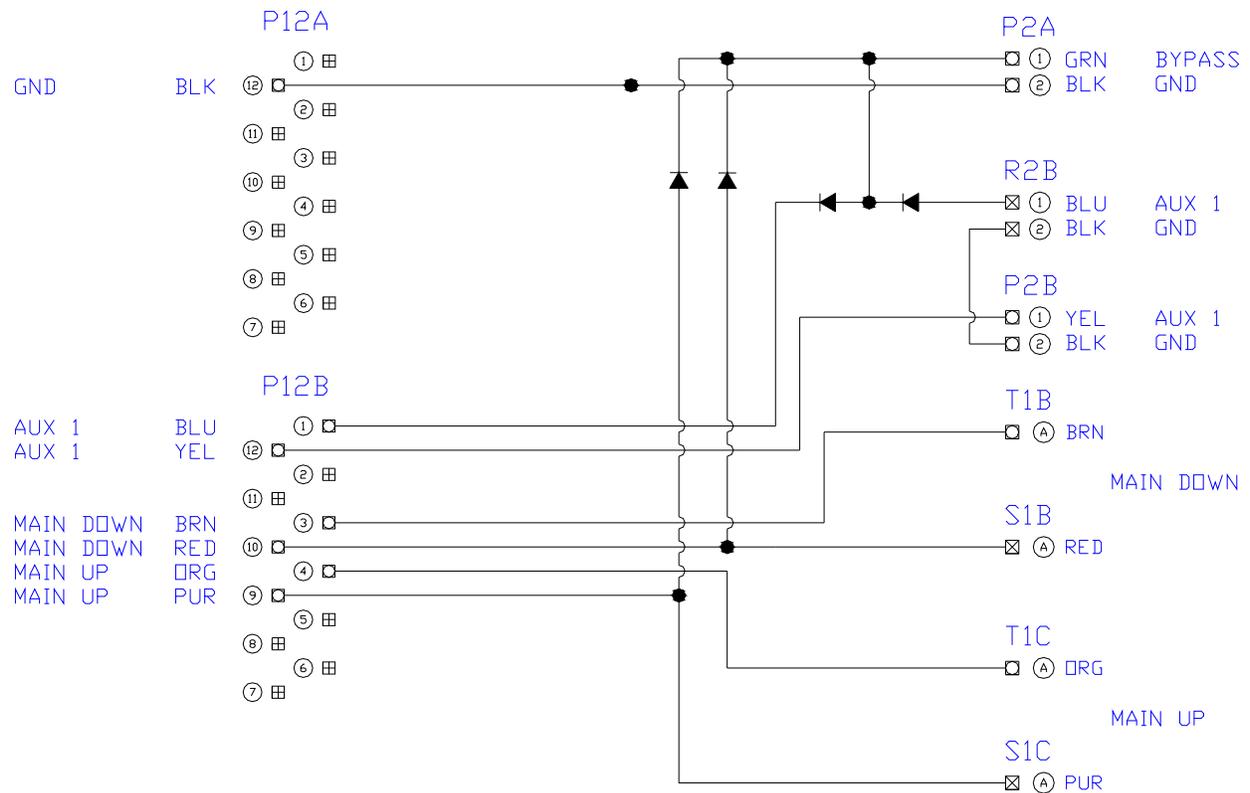
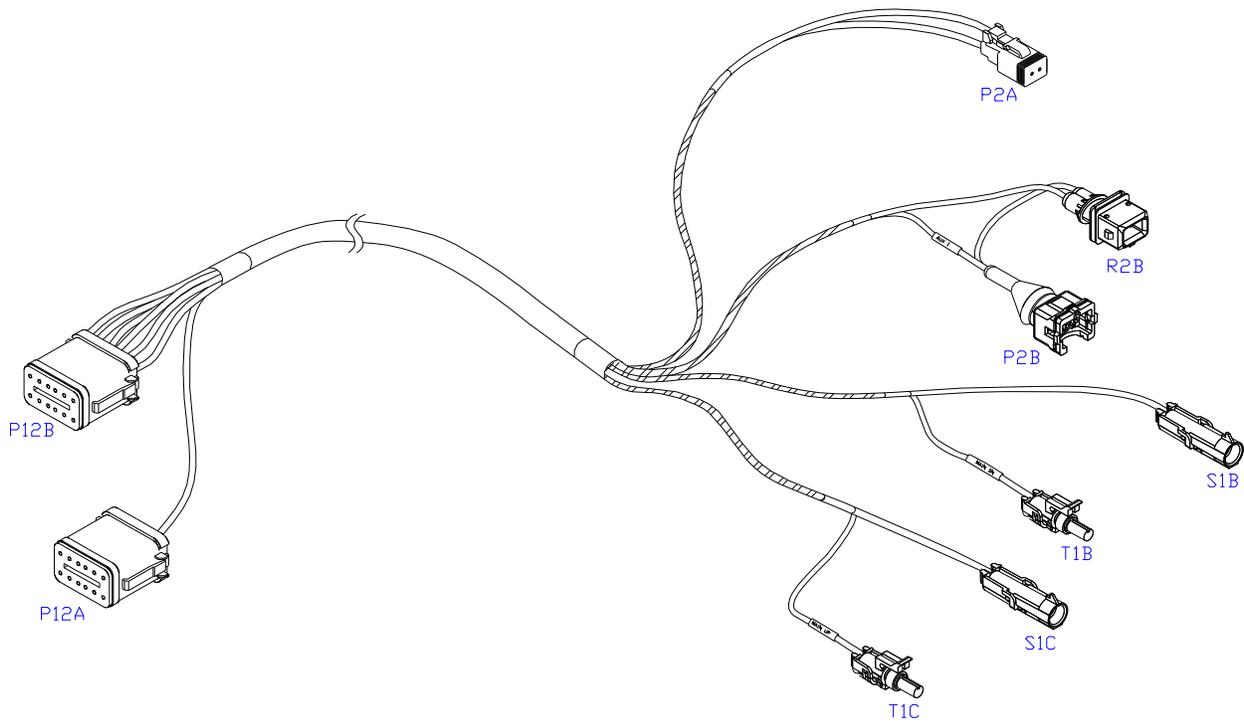
**12.3 ITEM C10: 43230-04 – CABLE UC5 VALVE DT TO DT**



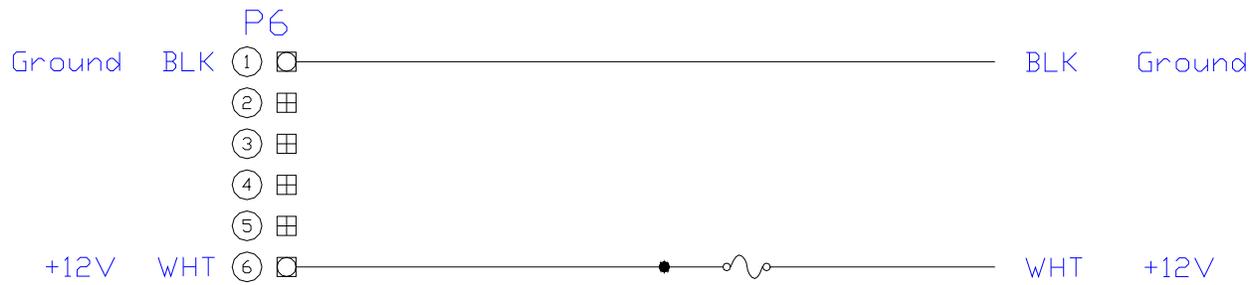
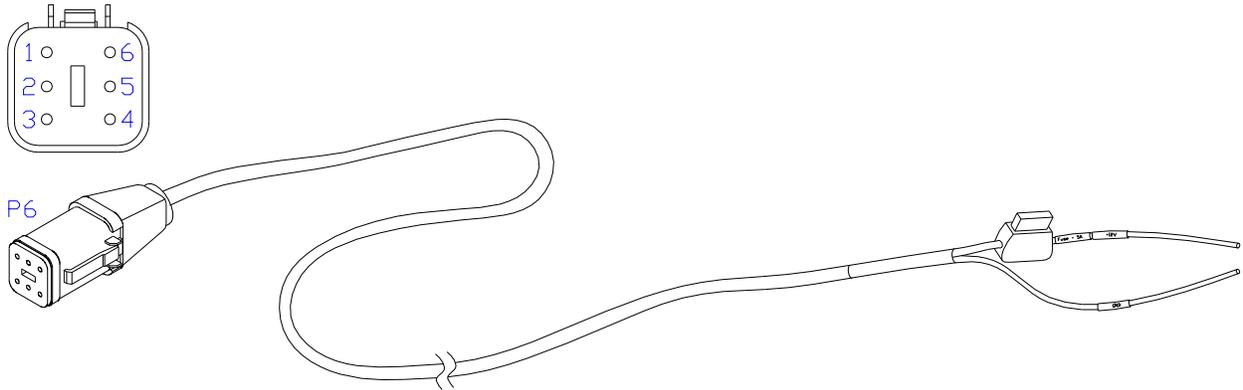
## 12.4 ITEM C20: 43240-44 – CABLE UC5 INTERFACE TILT GP (WEATHERPACK - SINGLE)



## 12.5 ITEM C21: 43240-45 – CABLE UC5 INTERFACE MAIN GP (WEATHERPACK - SINGLE)



## 12.6 ITEM C30: 43250-06 – CABLE BATTERY PIGTAIL FUSED



## 13 Appendix A: Severe Terrain Option

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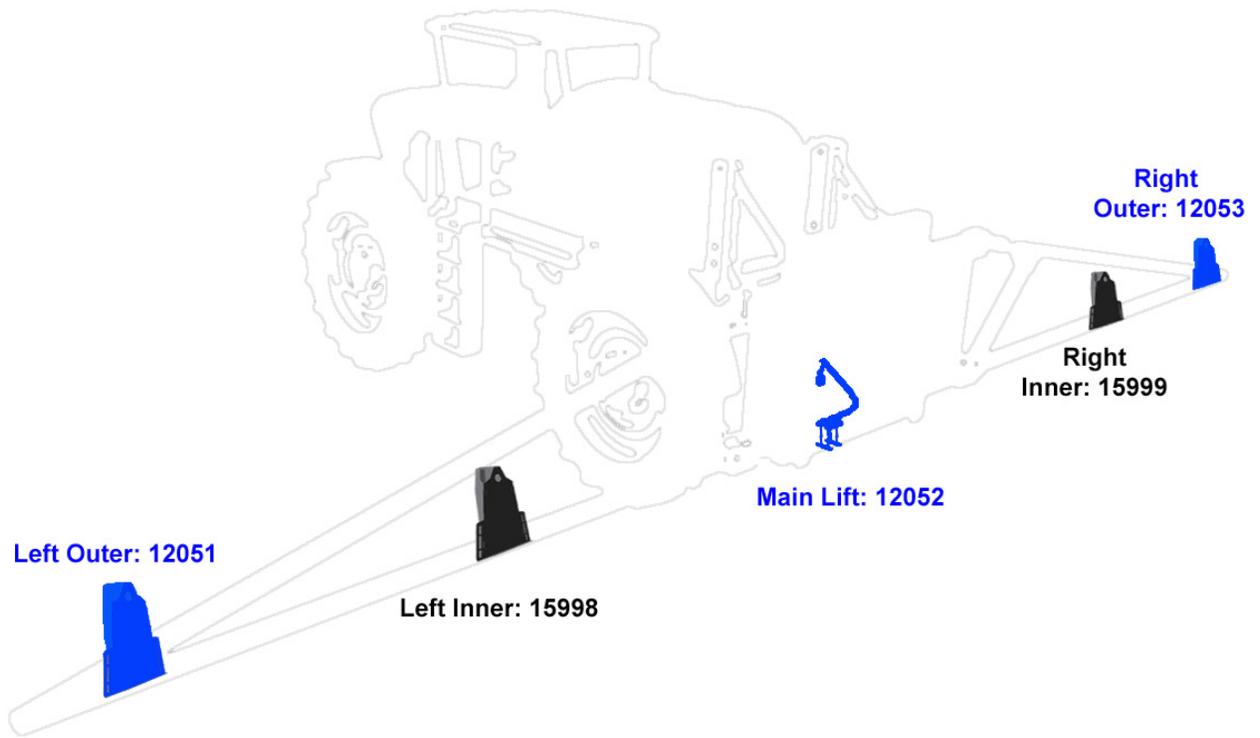
The following parts are not included with this kit. They are purchased separately if the severe terrain option is desired.

### 13.1 Severe Terrain Option List of Parts

Item	Part Number	Name	Quantity
B20	44971	SENSOR MOUNTING BRACKET LOW PROFILE 16GA	2
E05	43750	ULTRASONIC SENSOR	2
E10	43760	NETWORK COUPLER 3-WAY	1

### 13.2 Severe Terrain Option Installation

1. The sensor bracket should be oriented forward (ahead of the boom).
2. Mount the sensor brackets (B20) approximately half-way between the chassis and the outer wing sensors following the mounting guidelines outlined in Sections 6.2 and 6.3.
3. Remove the existing 2-way coupler (E12) connecting the cables to the outer wing sensors together.
4. Install the 3-way coupler (E10) where the 2-way coupler was removed. It may be necessary to move this connection closer to the inner wing sensor bracket to connect the sensor.
5. Mount the NORAC ultrasonic sensor into the sensor bracket and run the sensor cable either through hole in the back or through the side cut-out and behind the bracket. Ensure the cable is clear of moving parts and will not be damaged during folding.
6. Connect the sensor to the 3-way coupler (E10).



**Figure 23: Sensor Serial Number Arrangement (Severe Terrain Sensors shown in Black)**

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