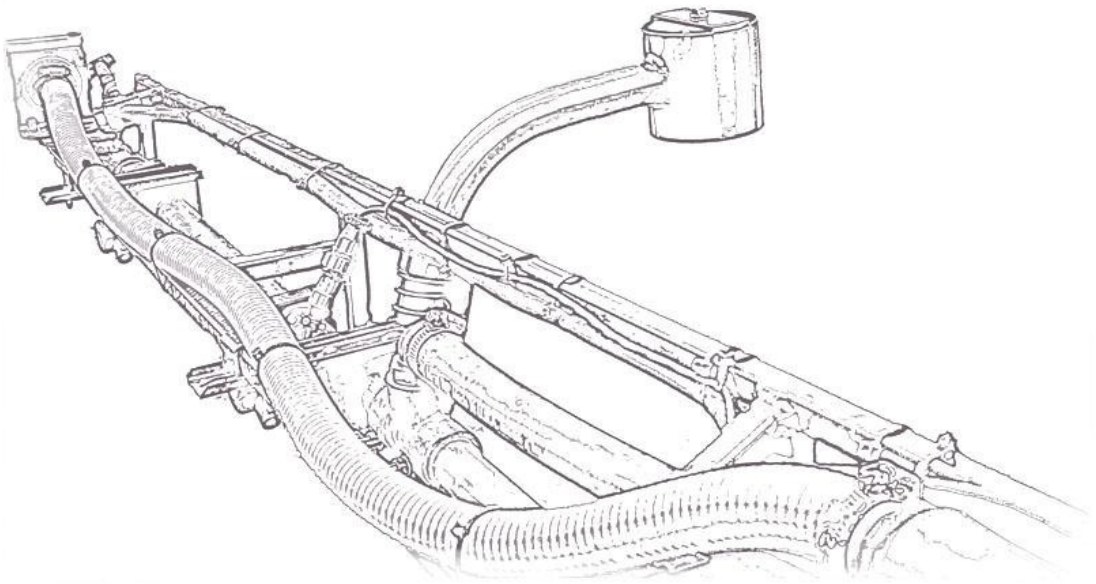
NORAC®

UC5™ CAN BUS Spray Height Controller



HARDI DAH09 V.G.
Installation Manual

HD06

Printed in Canada

Reorder P/N: UC5-BC-HD06-INST Rev B (HARDI)

Contents

1 Introduction

Congratulations on your purchase of the NORAC UC5 Spray Height Controller. 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.

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Important

Every effort has been made to ensure the accuracy of the information contacted 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 General UC5 System Layout

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

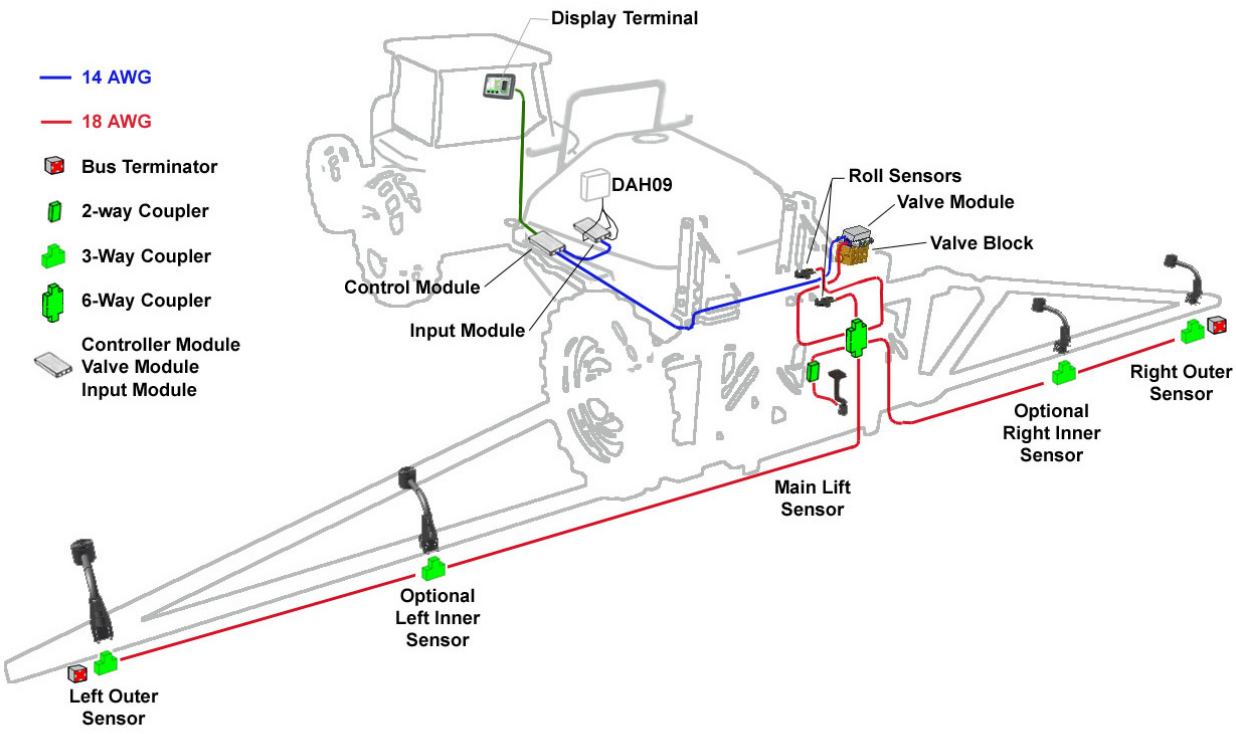


Figure 1: General UC5 System Layout

3 Kit Parts

3.1 Kit Overview

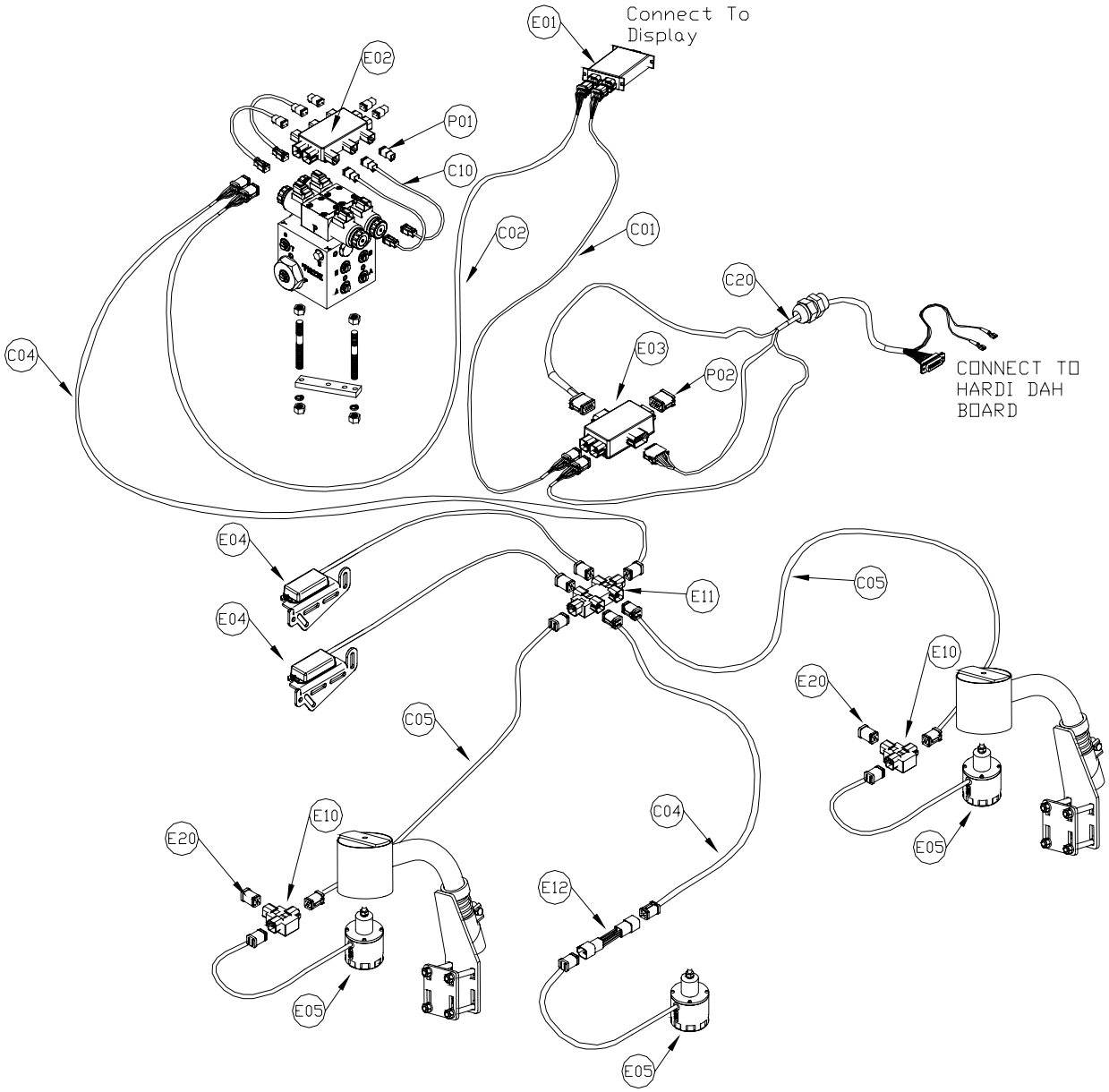


Figure 2: HD06 System Parts

3.2 Hydraulic Plumbing

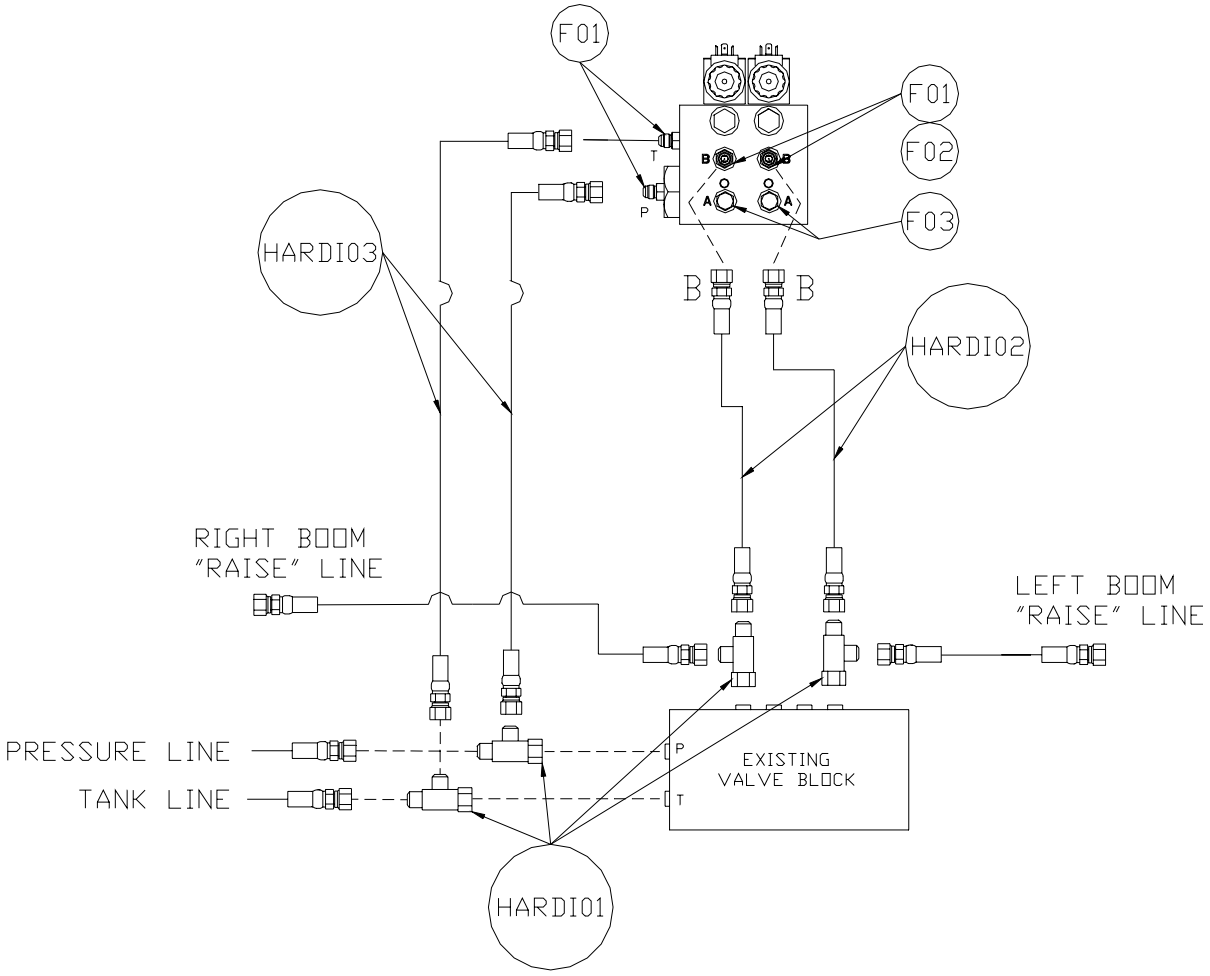
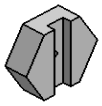


Figure 3: HD06 Hydraulic Plumbing

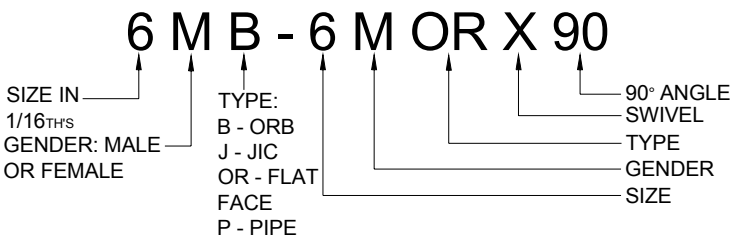
3.3 List of Parts

Item	Part Number	Name	Quantity
P01	106034	UC5 NETWORK 2 PIN PLUG	4
P02	106035	UC5 NETWORK 12 PIN PLUG (A-KEY)	1
C04	43210-01	CABLE UC5 NETWORK 18 AWG 1M	2
C05	43210-20	CABLE UC5 NETWORK 18 AWG 20M	2
C01	43220-03	CABLE UC5 NETWORK 14 AWG 3M	1
C02	43220-10	CABLE UC5 NETWORK 14 AWG 10M	1
C10	43230-04	CABLE UC5 VALVE 2PIN DT TO 2PIN DT	4
C20	43240-30	CABLE UC5 BC HARDI DAH09	1
E01	43710	UC5 CONTROLLER MODULE	1
E02	43720	UC5 VALVE MODULE	1
E03	43732	UC5 INPUT MODULE PASS THRU	1
E04	43740	UC5 ROLL SENSOR	2
E05	43750	UC5 ULTRASONIC SENSOR	3
E10	43760	UC5 NETWORK COUPLER 3-WAY	2
E11	43762	UC5 NETWORK COUPLER 6-WAY	1
E12	43764	UC5 NETWORK COUPLER 2-WAY	1
E20	43780	UC5 NETWORK TERMINATOR PLUG	2
B05	44706-01	KIT CABLE TIE BLACK 10 PCS 21 IN 150 PCS 7.5 IN	1
B10	44728	MOUNTING BRACKET COMPLETE UC4 BREAKAWAY EXTENDED	2
H20	44865-43	HYDRAULICS FITTING KIT - HD4	1
M02	UC5-BC-HD06-INST	MANUAL INSTALLATION UC5 HARDI DAH09	1

3.4 Hydraulic Fitting Kit Details (P/N: 44865-12)

Item	Part Number	Name	Quantity	Picture
F02	501304	COUPLING HYD 6MB 4MBSPP	4	
F03	104369	COUPLING HYD 6MBP	2	
F01	44928	ORIFICE INSERT .047 IN ONE WAY	2	

Fitting Name Example:



3.5 HARDI Supplied Kit

The required HARDI Parts necessary for the UC4+ install are listed below.

Item	Part Number	Name	Quantity
HARDI01	232109	1/4" BSP FITTING	4
HARDI02	784030	4FBSP-4FBSP HYD HOSE (350MM LENGTH)	2
HARDI03	784022	4FBSP-4FBSP HYD HOSE (650MM LENGTH)	2
HARDI06	284846	CABLE TIES	175

4 Pre-Install Checklist

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

1. Before beginning the install, ensure all hydraulic boom functions are operating properly on the sprayer.

    - All Fold Functions
    - Main Lift Function
    - Wing Tilt Functions
    - Slant Function

2. Inspect boom suspension slide/wear pads for functionality.

3. Ensure the boom guide-rods are set to the “tapered” position (factory setting).

4. Set boom suspension to be critically damped (Figure 4). Adjust the boom damper accordingly.

    A) Unlock the boom, and push boom tip down approximately 75 cm (30 inches).

    B) Hold the boom steady for a moment, and release.

    C) Ensure the boom returns to its relaxed state as quickly as possible, with little to no overshoot.

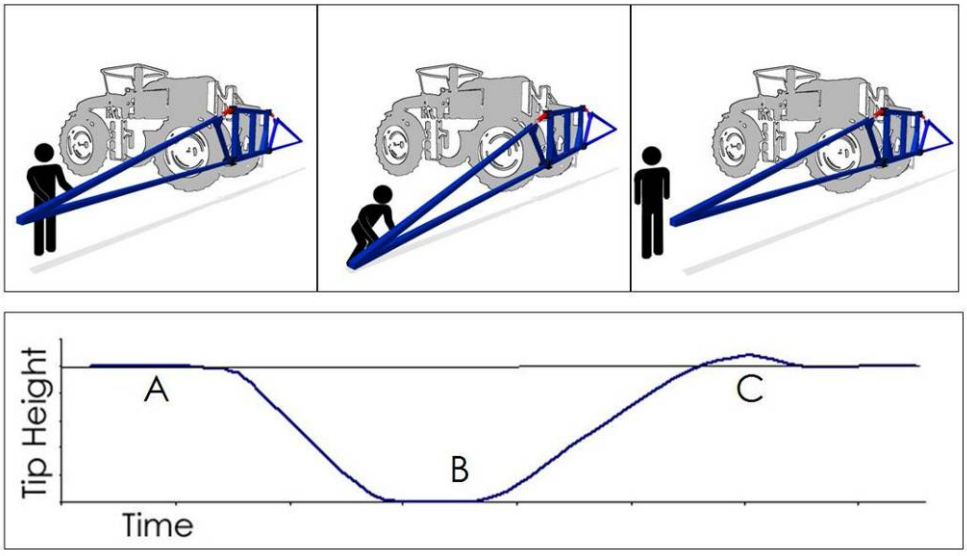


Figure 4 –Boom push test- critically damped

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

Important

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

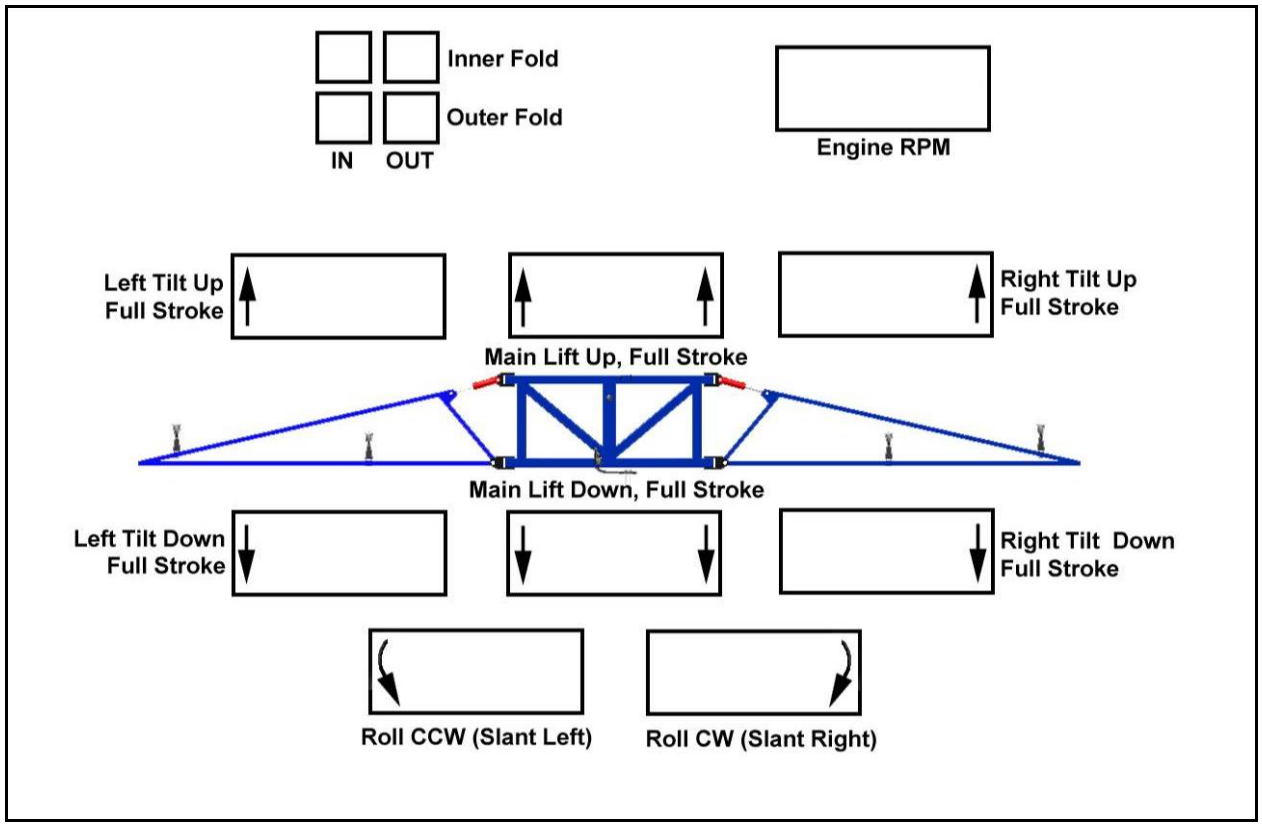


Figure 5: Pre-Install Boom Speeds

5 Ultrasonic Sensor Installation

5.1 Bracket Assembly

Assemble the breakaway sensor bracket as illustrated in **Figure 6**, following the instructions below.

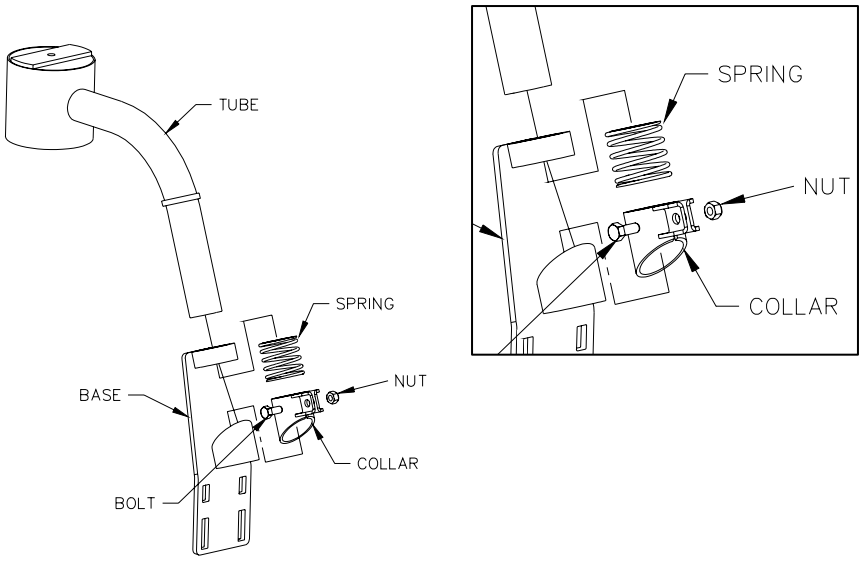
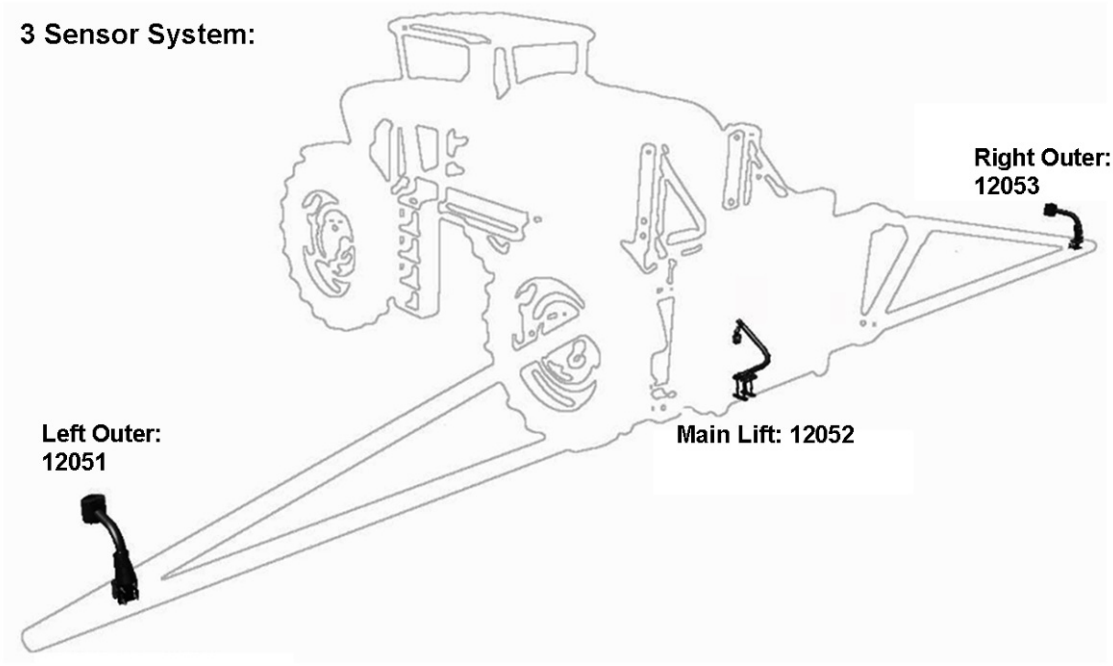


Figure 6: Breakaway Bracket Assembly

1. Compress the spring and insert it together with the collar into the base.
2. Slide the tube through the assembled part.
3. Using the bolt and nut, tighten the collar to the tube with the sensor tube centered.
4. Apply a small amount of grease to the rotating surfaces of the bracket.

5.2 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.



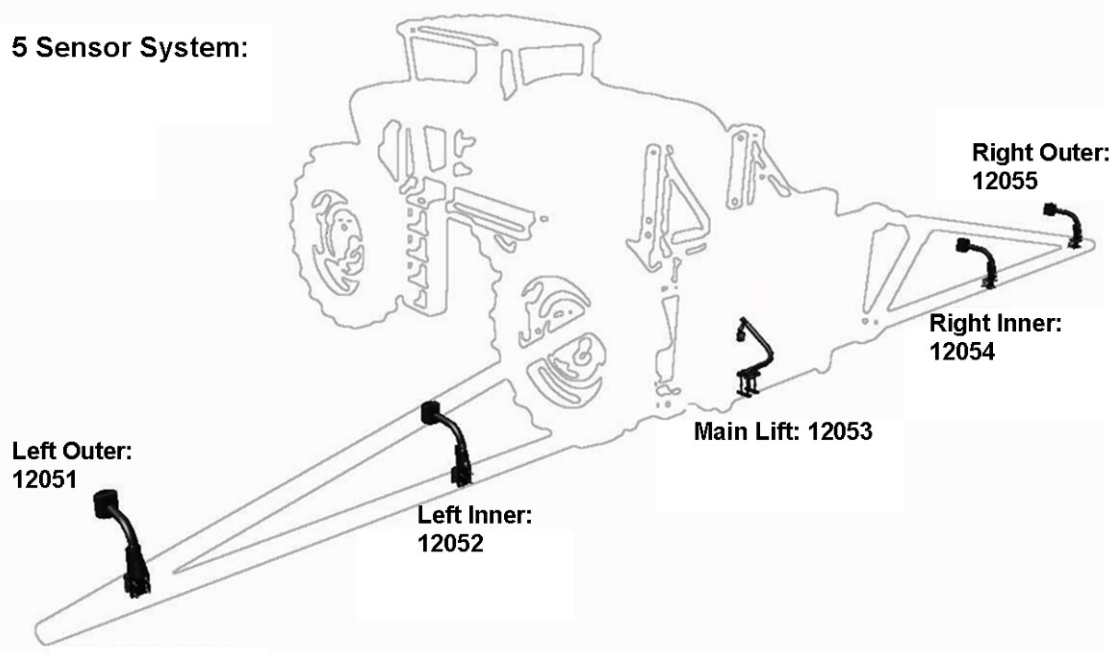


Figure 7: Sensor Serial Number Arrangement

5.3 Ultrasonic 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 **(A)**.

2. The centerline of the acoustic cone should be approximately vertical at normal operating heights **(A)**.

3. The bottom of the sensor must be at least 9 inches in front of the spray nozzles and boom structure **(B)**. (This does not apply for the main lift sensor)

4. The bottom of the sensor must be at least 9 inches above the spray nozzles **(C)**.

5. Ensure there are no other obstructions with a 12 inch (23 cm) diameter circle projected directly below the sensor **(D)**.

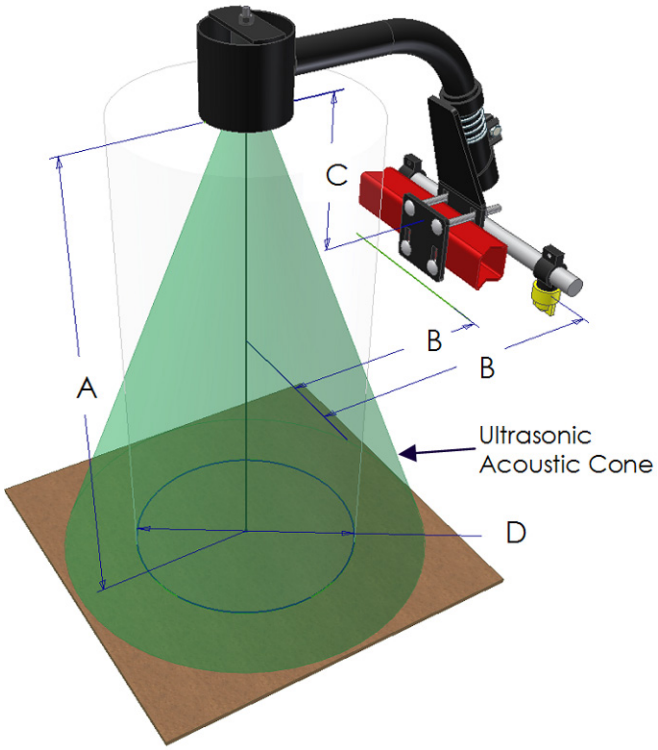


Figure 8: Sensor Mounting Guidelines

5.4 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 just inside of the boom tip break-away sections.

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 through the sensor tube.

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 controller 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.

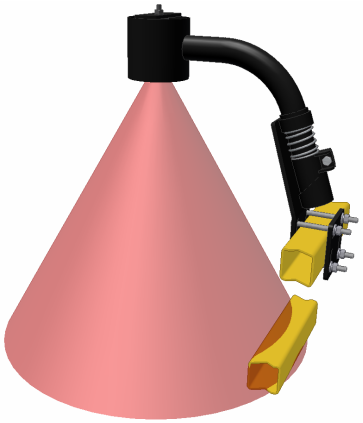


Figure 9: Sensor Reading Off Boom

5.5 Suggested wing bracket mounting on HPZ (all), HAZ (<30m)

Below is the suggested mounting location for the UC4 brackets on the HPZ (24-36m) or HAZ (18-30m) booms. Mounting location is just inside of the boom break-away section (A).

Figure 10: Suggested Bracket Mounting Location (viewed from front) on 24m HAZ

⚠ Important

Avoid mounting the bracket too close to the touch-down wheel (B).

5.6 Suggested wing bracket mounting on HAZ (>30m)

Below is the suggested mounting location for the UC4 brackets on the HAZ 32-36m booms. Mounting location is just inside of the boom break-away section (A).

Figure 11 - Suggested Bracket Mounting Location (viewed from front) on 36m HAZ

5.7 Suggested wing bracket mounting on LPZ

Below is the suggested mounting location for the UC4 brackets on the LPZ boom. Mounting location is just inside of the boom break-away section (A).

Figure 12 - Suggested Bracket Mounting Location on LPZ Boom

5.8 Main lift sensor installation on HAZ/HPZ

Important

The general mounting rule for UC4+ ultrasonic sensors must be followed for the main lift sensor.

1. Mount the ML bracket (Item B11) as illustrated in Figure 13. Ensure sensor cable is routed properly and securely fastened.

2. Mount the Ultrasonic sensor to the bracket. Ensure the sensor has a clear view of the ground. Ensure sensor cable is securely fastened with cable-ties.

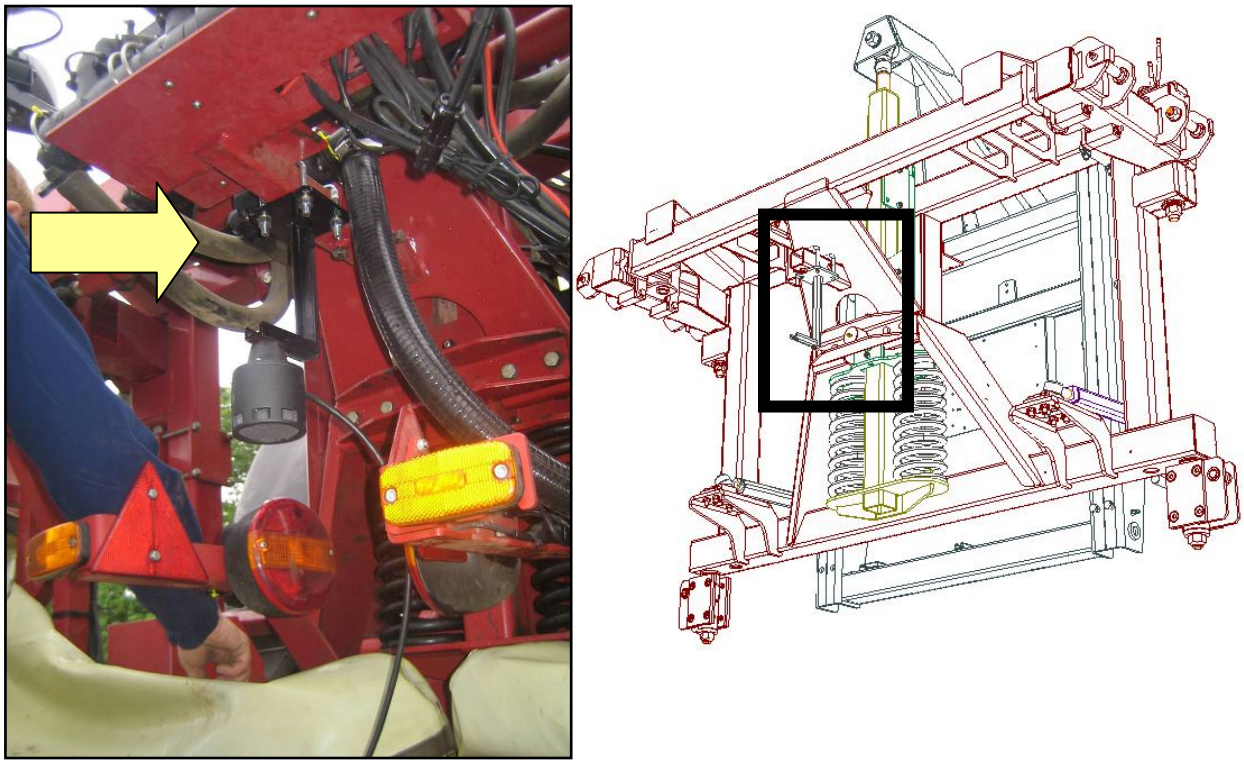


Figure 13: Main Lift Sensor Mounted to the HPZ/HAZ Center Part

5.9 Main lift sensor installation on LPZ

No mounting bracket is required. Mount the ML sensor as illustrated in Figure 14. Ensure sensor cable is securely fastened with cable ties.

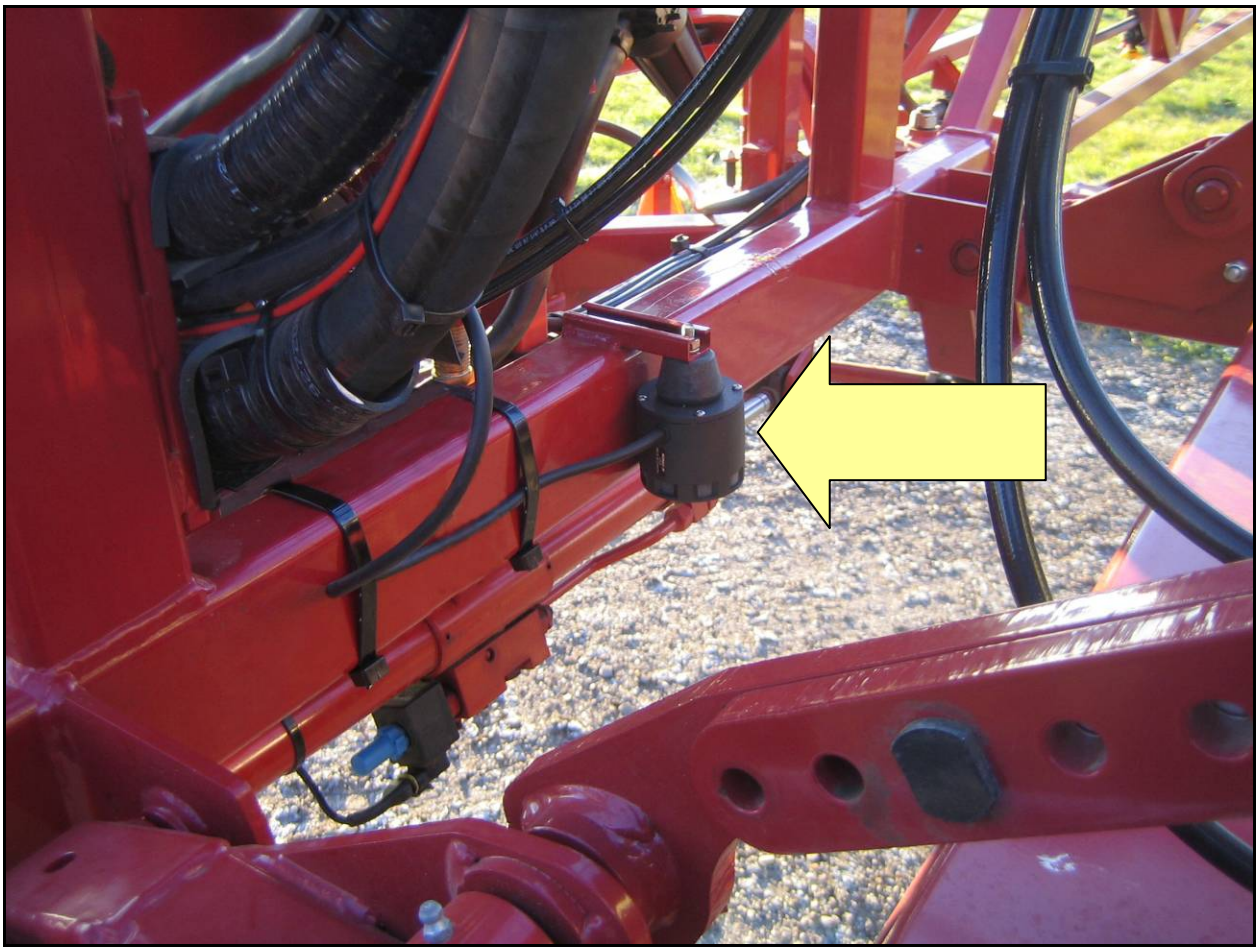


Figure 14: Main Lift Sensor Mounting on LPZ Center Part

6 Roll Sensor Installation

6.1 Bracket Assembly

1. Securely mount the roll sensors to the included roll sensor brackets using the #6 machine screw and nylon lock-nuts.

2. The orientation of the mounted roll sensor to the roll sensor bracket will depend on the bracket mounting. The roll sensor CAN-bus connector must be pointing towards the right side of the sprayer.

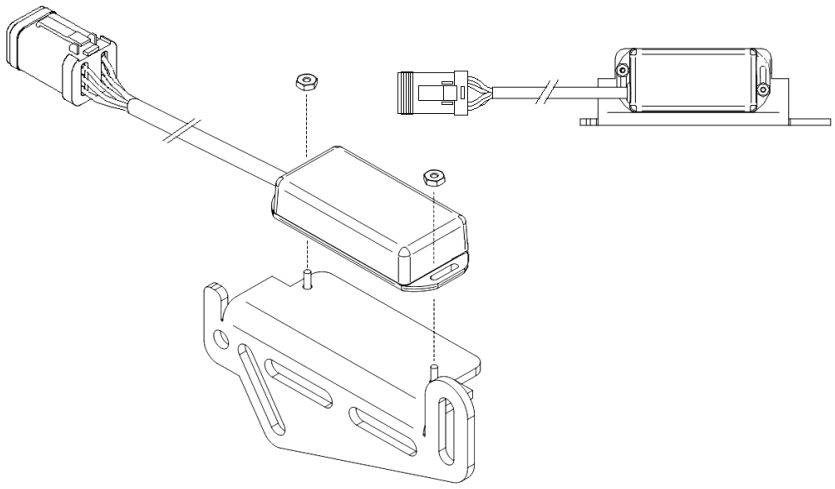


Figure 15: Mounting Roll Sensor to Bracket

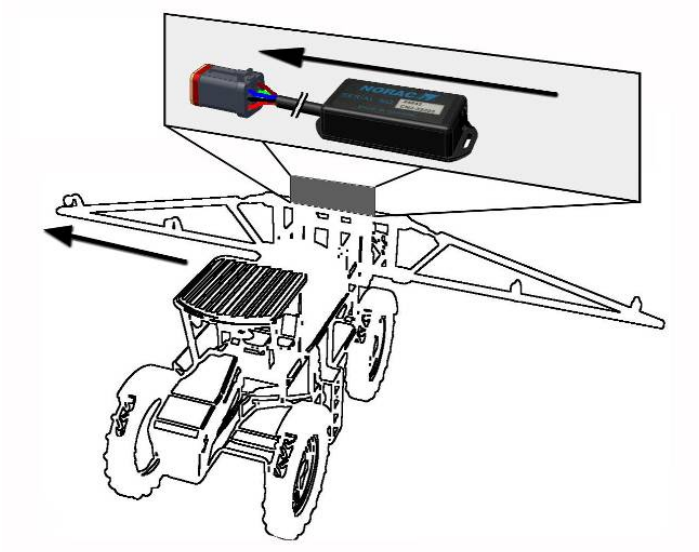


Figure 16: Roll Sensor Orientation - Connector Facing Right Wing

6.2 Roll Sensor Mounting on HPZ/HAZ

Mount the roll sensors to the boom center section, as illustrated below. Ensure the Deutsch connector is pointing towards the right hand wing. Fasten with cable ties.

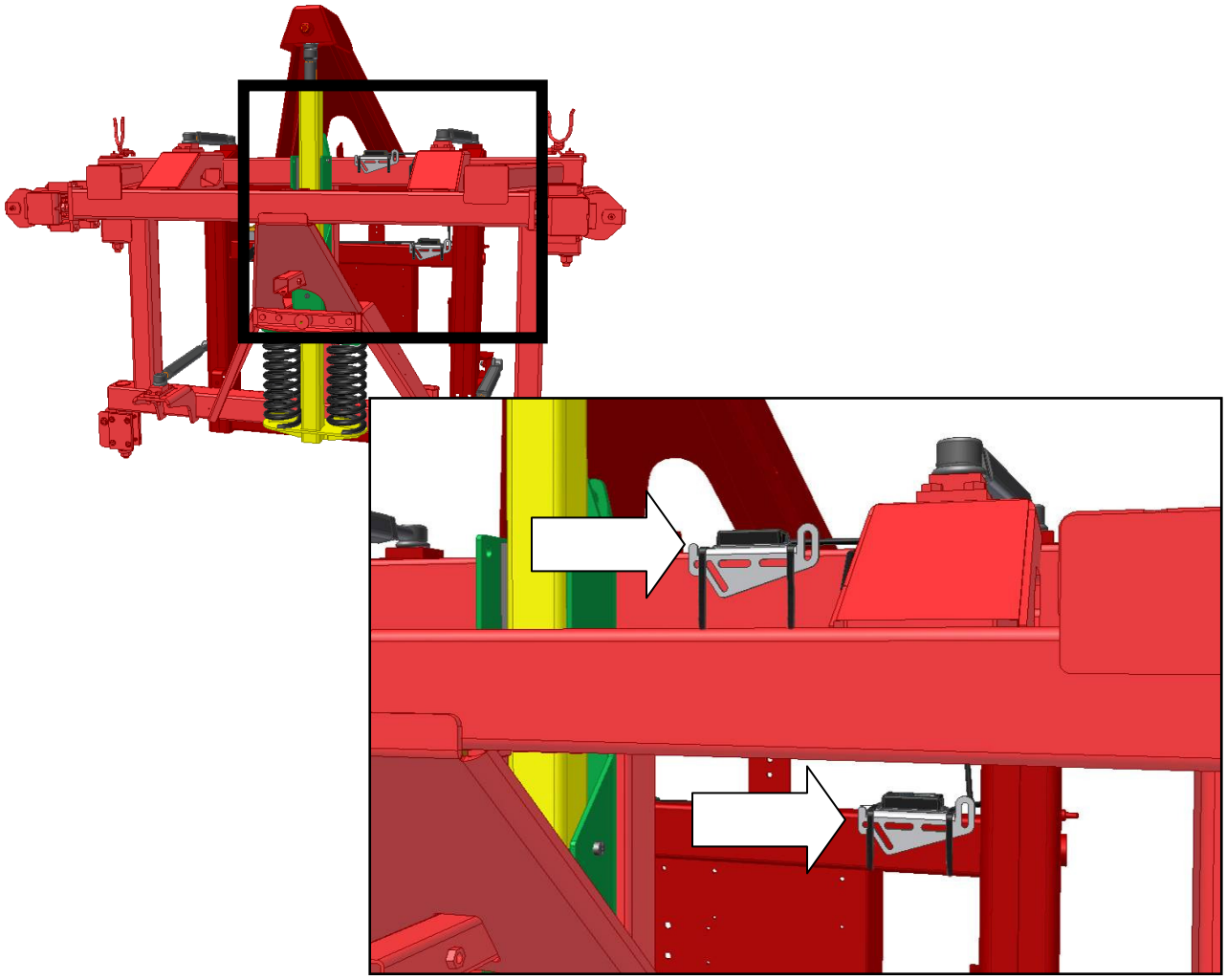


Figure 17: Boom Roll Sensor Mounting (viewed from rear of sprayer)

6.3 Roll Sensor Mounting on DELTA (LPZ)

Mount the roll sensors to the boom center section, as illustrated below. Ensure the Deutsch connector is pointing towards the right hand wing. Fasten with cable ties.

Figure 18: Boom Roll Sensor Mounting (viewed from rear of sprayer)

7 Module Installation

7.1 Control Module

1. Refer to **Figure 1** and **Figure 19**.

2. Securely mount the control module (E01) near the hitch of the sprayer, within reach of the display terminal connections.

3. Connect the display terminal to the control module using the existing display CAN-bus cable. This cable must be connected to the end of the control module with only one Deutsch connector.

4. Route cable C02 from one of the control module CAN connectors towards the valve block. This will connect to the valve module.

5. Route cable C01 from the other CAN-bus connector towards the DAH09 enclosure. This will connect to the input module.

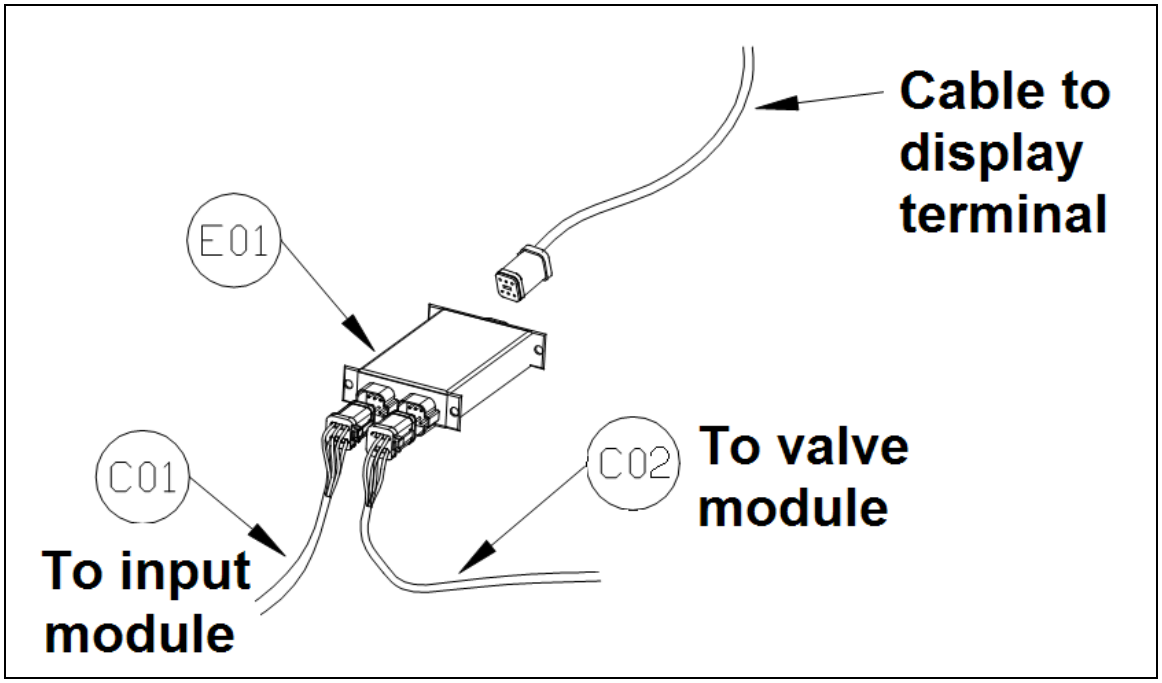
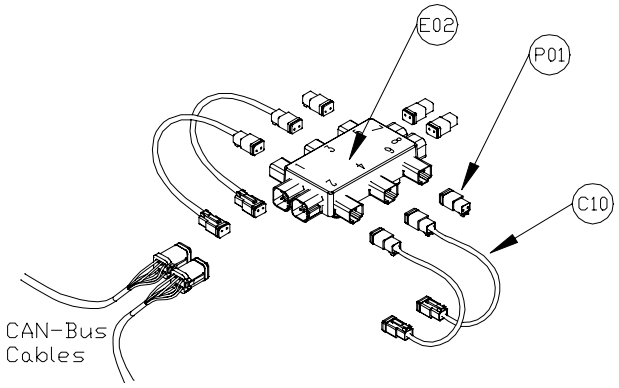


Figure 19: Control Module Mounting

7.2 Valve Module

1. Install the valve module (E02) to the top of the NORAC valve block. Orient the 6-pin Deutsch (CAN-bus) connectors towards the P and T ports.



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 20: Valve Module

2. Verify the valve coil connectors are oriented vertically (**Figure 21**).

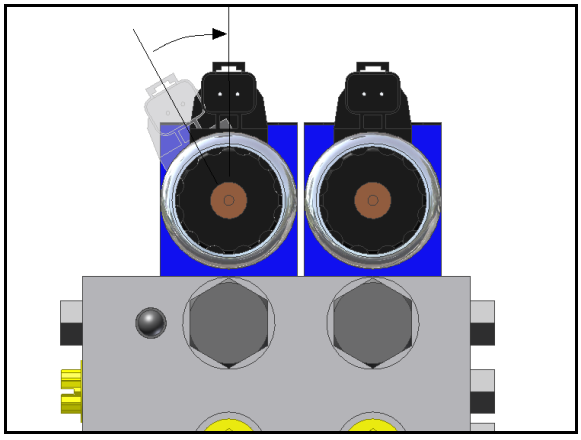


Figure 21: Align Coils

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 22**).

4. Ensure the bracket is pushed over the connectors far enough to allow the clips to engage behind the valve connectors.

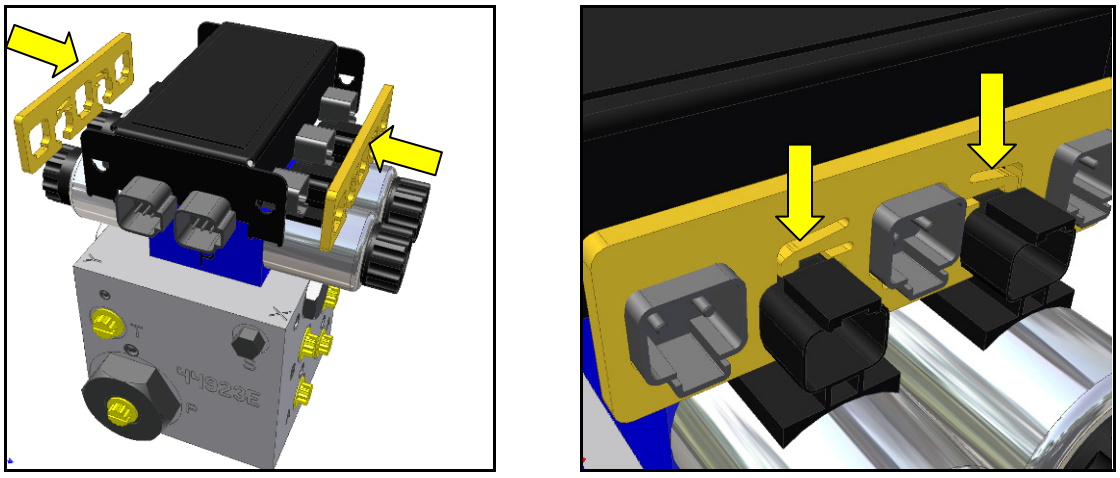


Figure 22: Valve Module Bracket Installation

5. Connect the valve module CAN-bus to cable C02 from the control module. Route cable C04 from the other CAN-bus connector to the 6 way coupler.

6. With the valve module securely mounted to the valve block, connect the valve cables (C10), to the valve coils. Insert the 2-pin plugs (P01) into the unused 2-pin connectors on the valve module.

7. Connect the temperature probe to the valve block using the supplied 3/8” x 1/2” hex bolt.

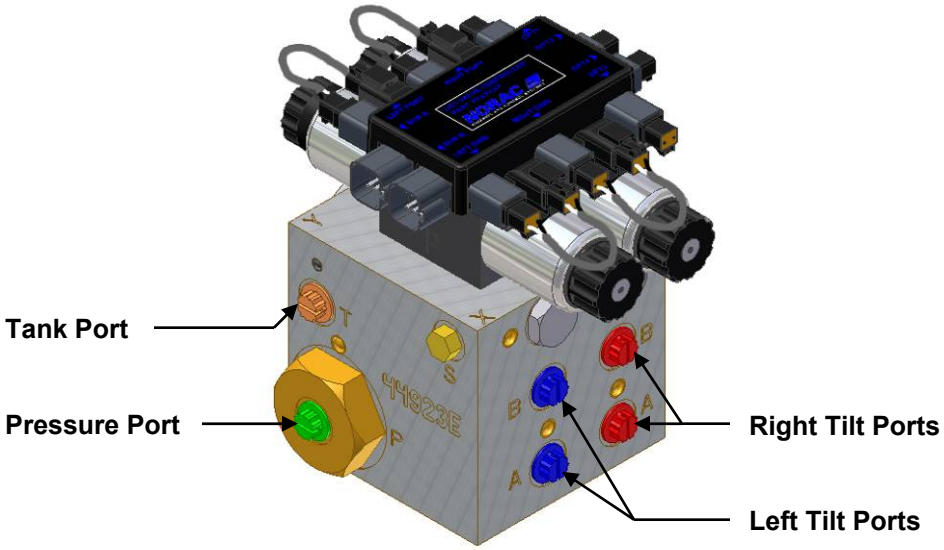


Figure 23: Valve Module - Valve Coil Connections

7.3 Input Module

1. Install the input module (E03) on the boom near the enclosure that houses the HARDI DAH09 PCB. Secure it to the sprayer with cable ties.

2. Connect the free end of the CAN-bus cable (C01) from the control module to the input module.

3. Insert the 12 pin plug (P02) into the grey connector on the end of the input module

4. Connect all 3 connectors of C20 to the input module.

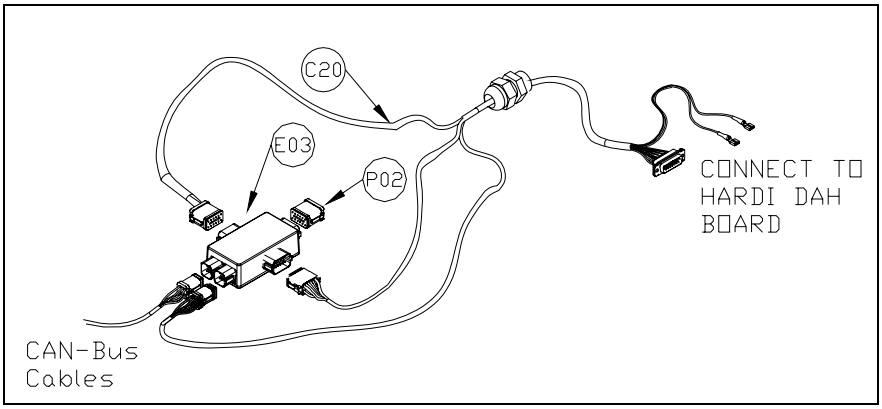


Figure 24: Input Module Connections

5. Pass the DB15 connector and spade connectors through the HARDI enclosure and connect to the DAH09 board. Connect the spades to J13 and J14 (+12V power and ground).

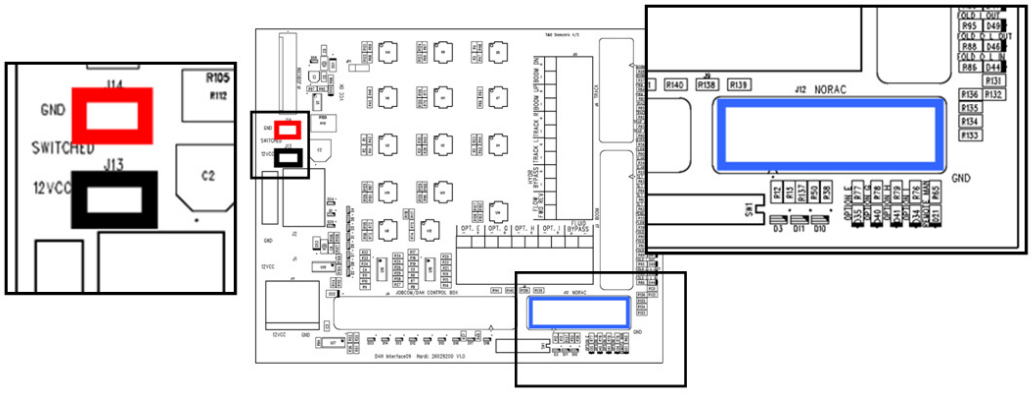


Figure 25: Input Module Connections

8 Connecting the Sensors to the CAN-Bus

1. Connect cable C04 from the input module to the 6-way coupler (E11).

2. Connect both roll sensors to the 6-way coupler. Fasten the 6-way coupler to the boom with cable ties.

3. Connect the main lift sensor to the 6-way coupler using cable C04 (#2) and a 2-way coupler (E12). Cable C04 and item E12 may not be needed if the 6-way coupler is mounted close enough to the main lift sensor.

4. Connect two cables (C05) to the 6-way coupler and route along the booms to the wing sensors. Follow existing cables and hoses to be sure the cable will not be pinched or stretched.

5. At the sensor brackets, attach a 3-way coupler (E10) to the sprayer boom. Plug the sensor and the CAN-bus cable into the 3-way coupler.

6. Insert a CAN-bus terminator plug (E20) into the open connector on the 3-way coupler at the left outer and right outer sensors.

9 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. You may wish to perform the hydraulic installation 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.

9.1 Valve Assembly

1. On a clean surface remove the plastic plugs from the block.

2. Install two 3/8" x 1/4" BSPP (HD01) fittings into the P and T ports on the NORAC block. Tighten to 18 ft-lbs (24 Nm).

3. Insert the two orifices into the "B" ports. Note the orifice orientation in Figure 26.

4. Install two 3/8" x 1/4" BSPP (HD01) fittings into the B ports on the NORAC block. Tighten to 18 ft-lbs (24 Nm).

5. Install the 6MBP (F03) plugs into the "A" ports on the NORAC block and tighten to 18 ft-lbs (24 Nm).

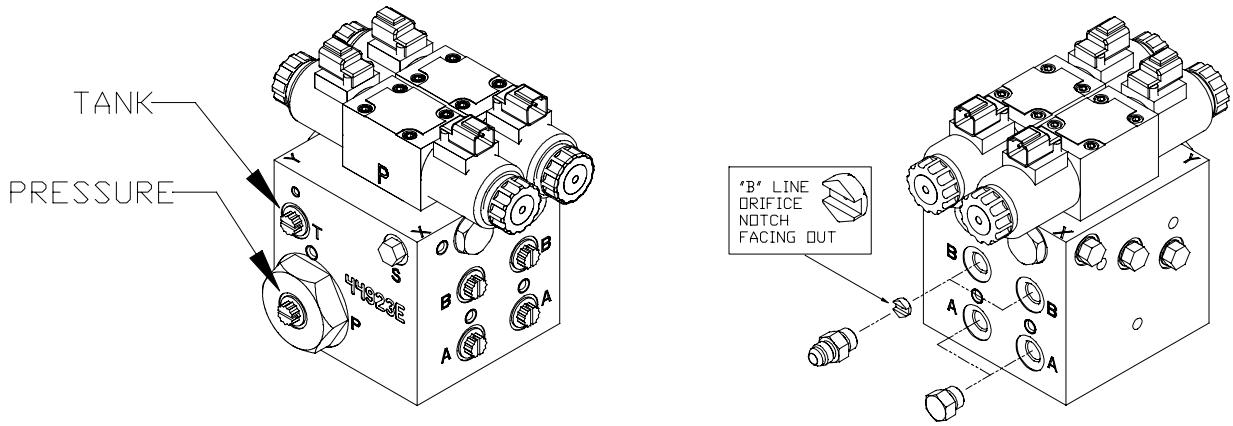


Figure 26: NORAC Valve Block Details

9.2 Valve Mounting Hardware for HPZ and HAZ

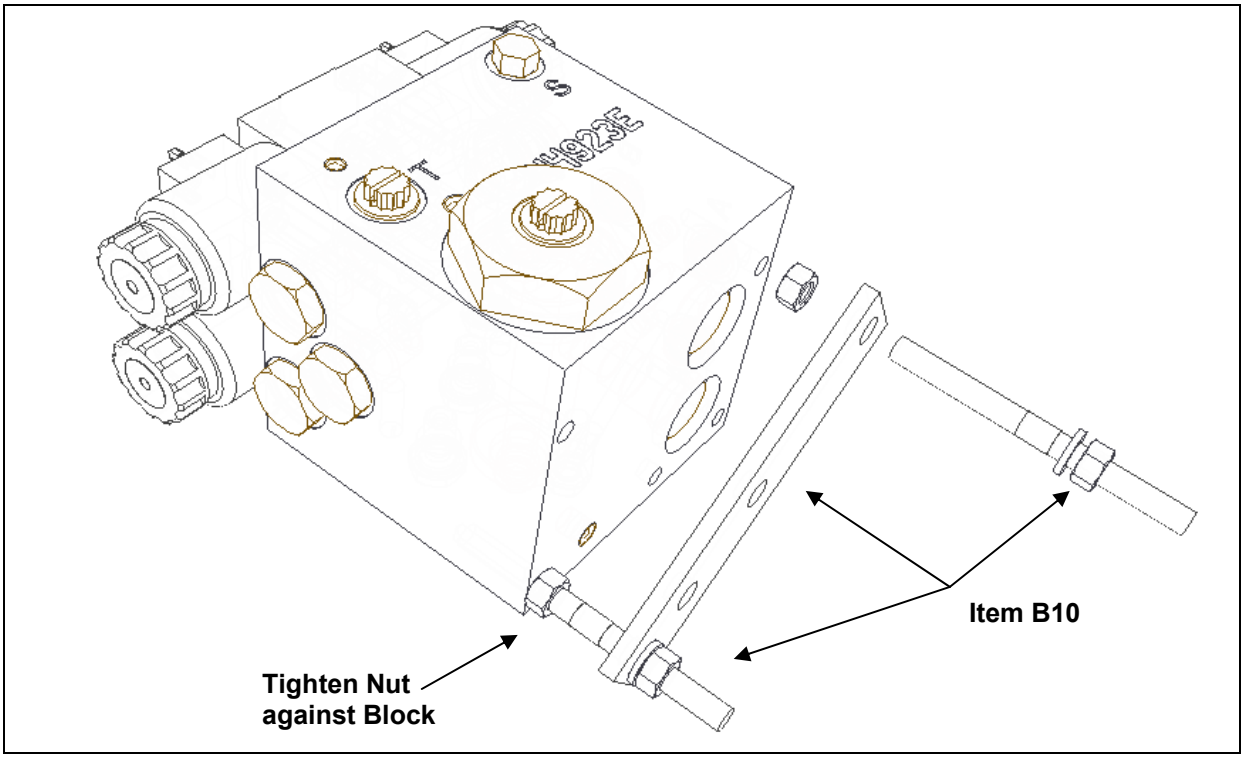


Figure 27: NORAC Valve Block Mounting Hardware for HPZ/HAZ Install

9.3 HPZ / HAZ Valve Block Mounting

Mount the Valve block using the mounting plate and hardware as illustrated. Suggested mounting location on the HPZ / HAZ center-part is shown in **Figure 28**.

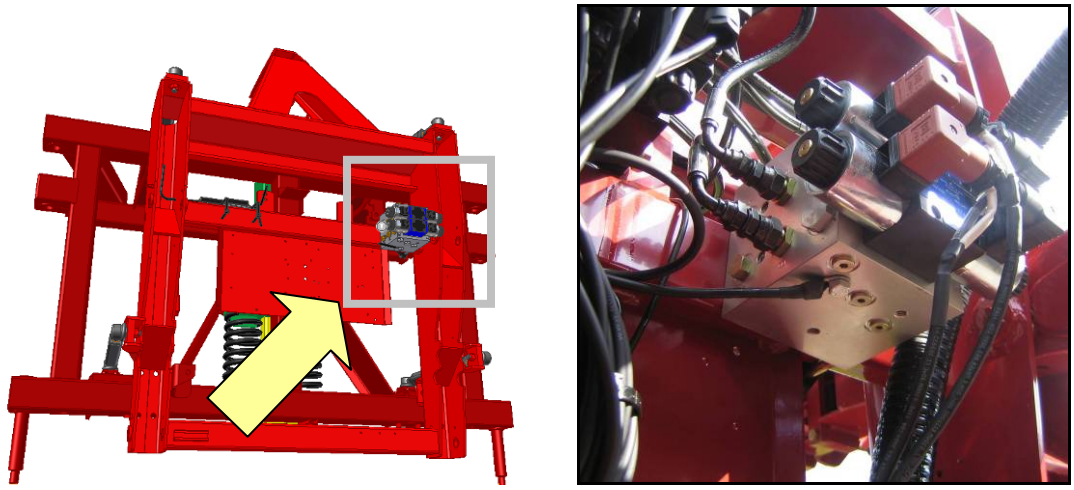


Figure 28 - Valve Mounting on HPZ / HAZ

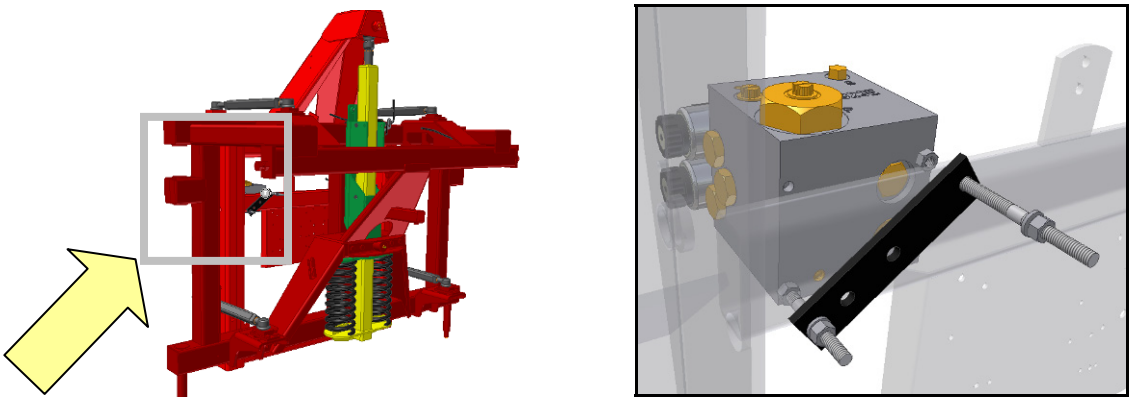


Figure 29: Mounting Valve Block with Mounting Bracket and Hardware

9.4 LPZ Valve Block Mounting

Mount the block as illustrated in **Figure 31**. This will require drilling holes though the sheet-metal on the boom. Use Item B14 and B15 (do not use Item B10 mounting hardware).

Figure 30 – Valve Block Mounting Location on LPZ

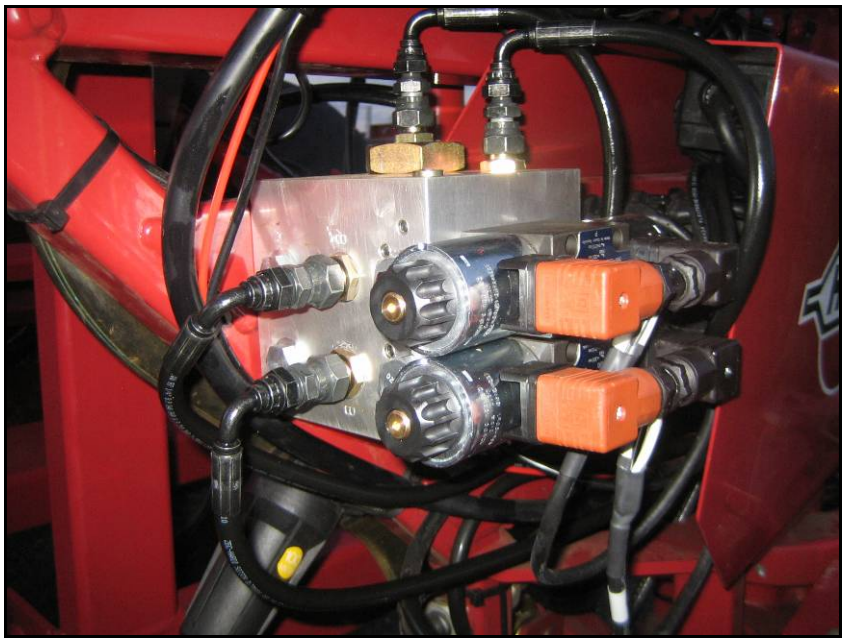


Figure 31 – Valve Block Mounted on LPZ

Use the dimensioned drawing below as a guide for drilling the valve block mounting holes for the LPZ boom. Drill holes large enough to accommodate 3/8" bolts.

See Section 12 for a drilling stencil.

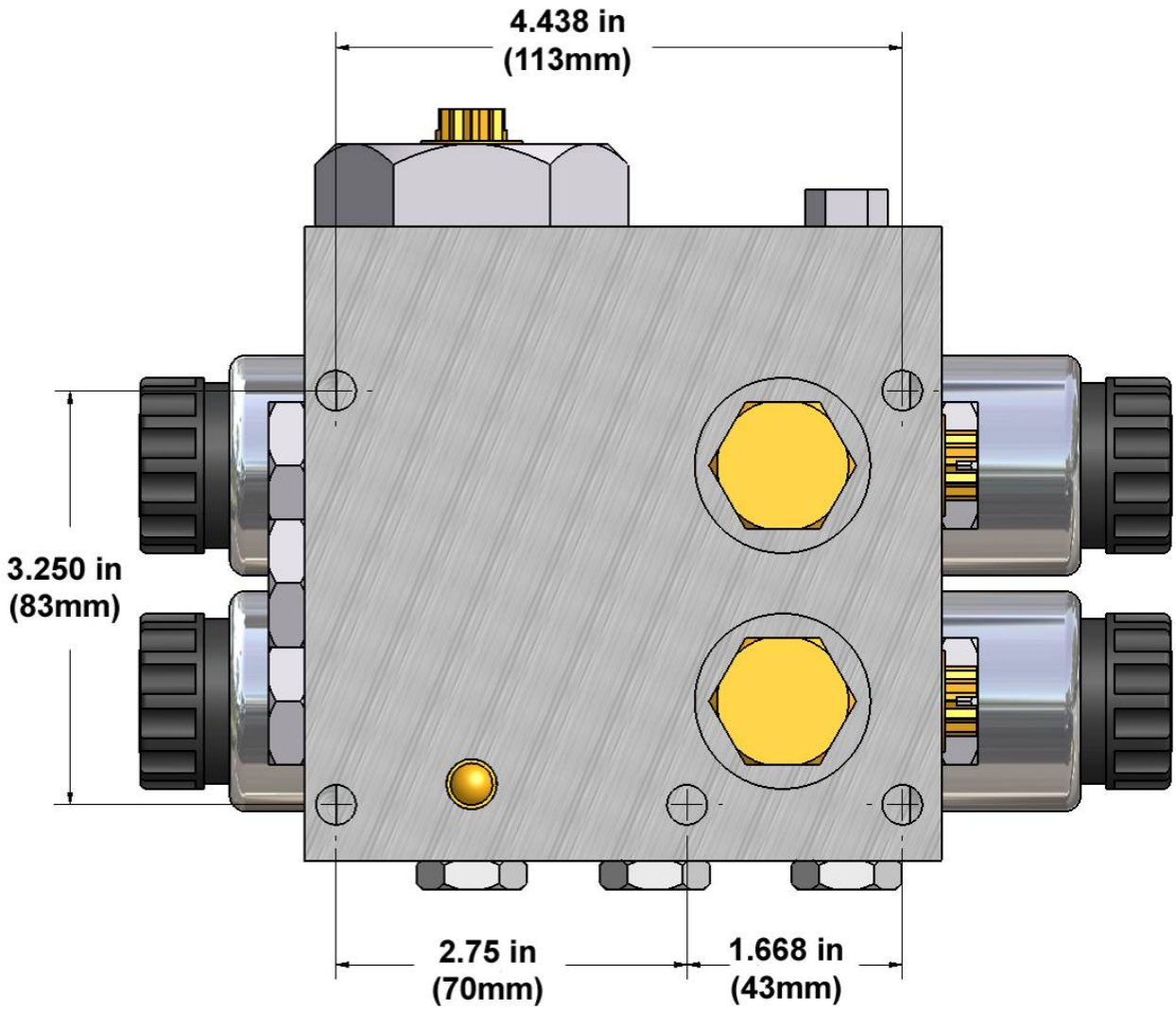


Figure 32 – NORAC Valve Block Mounting Hole Dimensions

9.5 Hydraulic Plumbing

Warning!

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

1. After the valves are mounted on the sprayer, the hydraulic hoses and fittings can be installed (plumbed).

2. Put HARDI01 fittings over the P, T, and B port fittings

3. Connect pressure and tank lines between the HARDI block and the NORAC block.

   - Install tee fittings (item HARDI01) between the pressure and tank ports on the existing valve block and the respective lines.
   - Connect hoses (item HARDI03) from the tee fittings to the pressure (P) and tank (T) ports on the NORAC block.

4. The wing tilt "raise" must be connected to the "B" ports of the NORAC block in parallel with the existing HARDI valve block.

   - Connect tee fittings (item HARDI01) between the HARDI block and the HARDI wing tilt lines.
   - Connect the "B" ports of the NORAC block to the wing raise lines by connecting HARDI02 between the "B" ports and the tee fittings installed in the HARDI block.

5. The "A" ports on the NORAC block are plugged. The "lower" lines of the cylinders are to remain attached to the HARDI sprayer valve block.

10 Software Setup

1. Start up your 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.

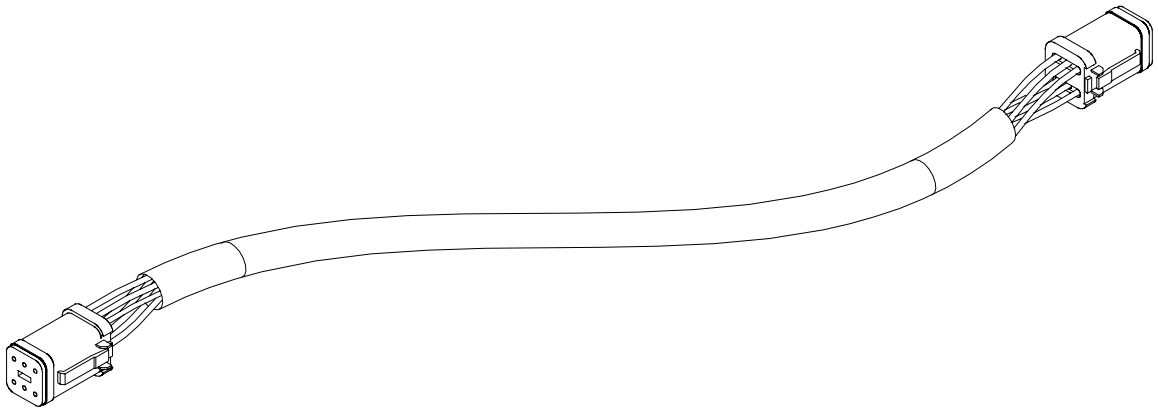
2. If any functions do not work, review the hydraulic and electrical portions of this manual to check for proper installation.

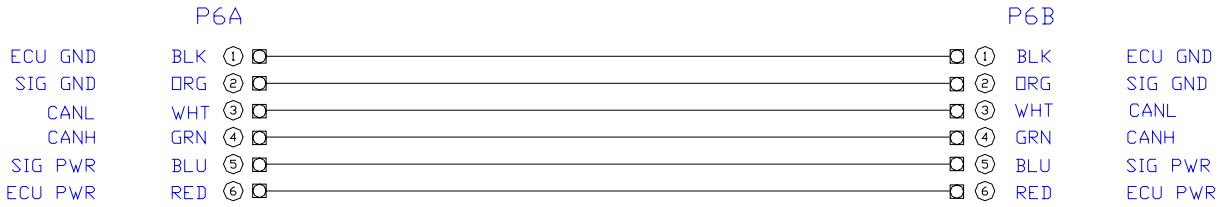
3. Turn on the power for the display terminal using the switch on the side.

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.

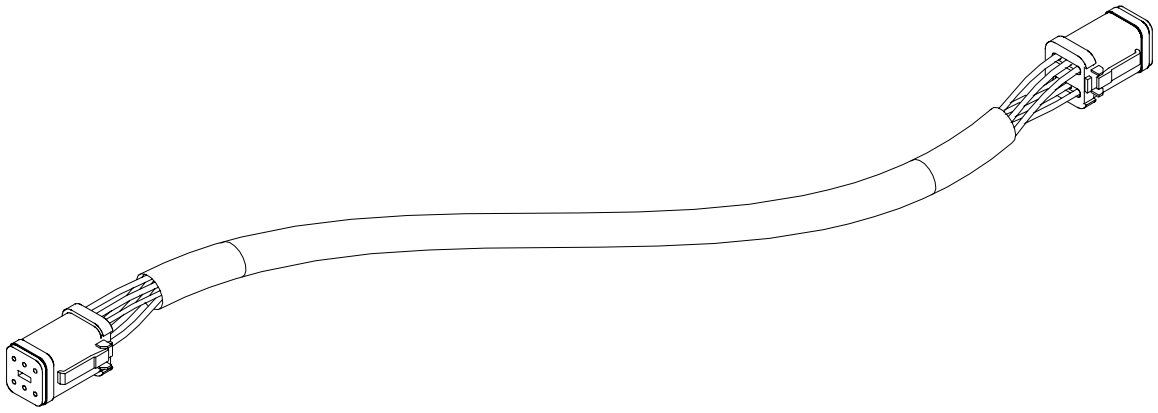
11Cable Drawings

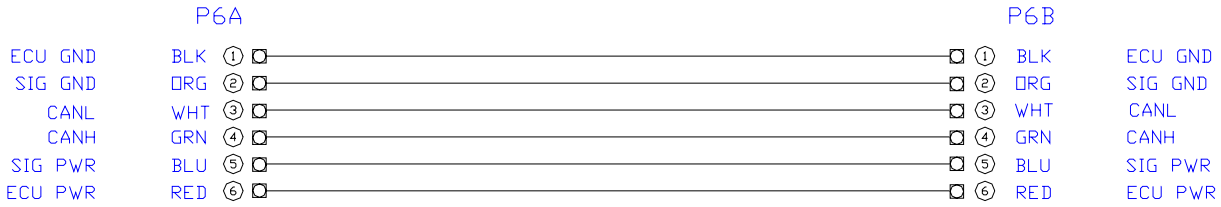
11.1 ITEM C01: 43220-10a - CABLE UC5 NETWORK 14 AWG - 10M



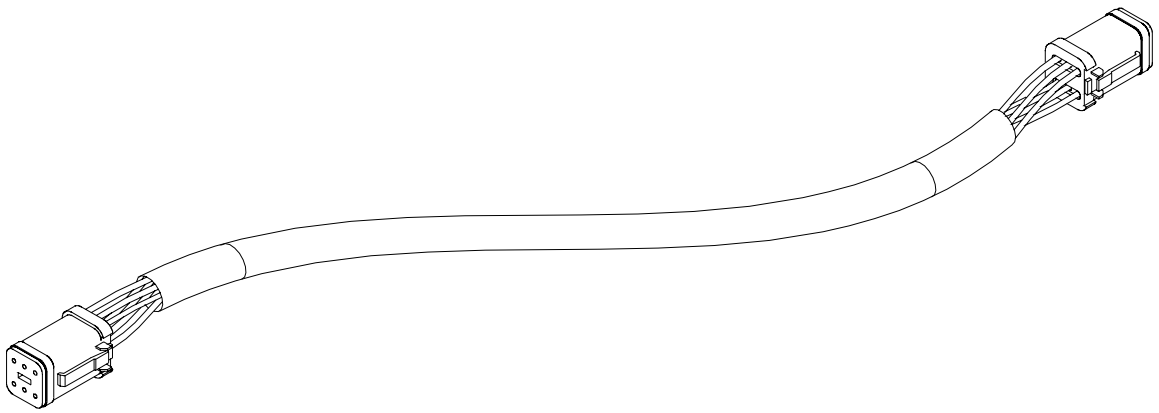


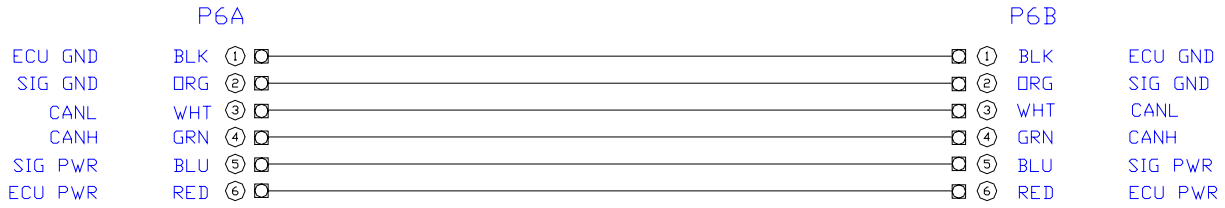
11.2 ITEM C02: 43220-03a - CABLE UC5 NETWORK 14 AWG - 3M



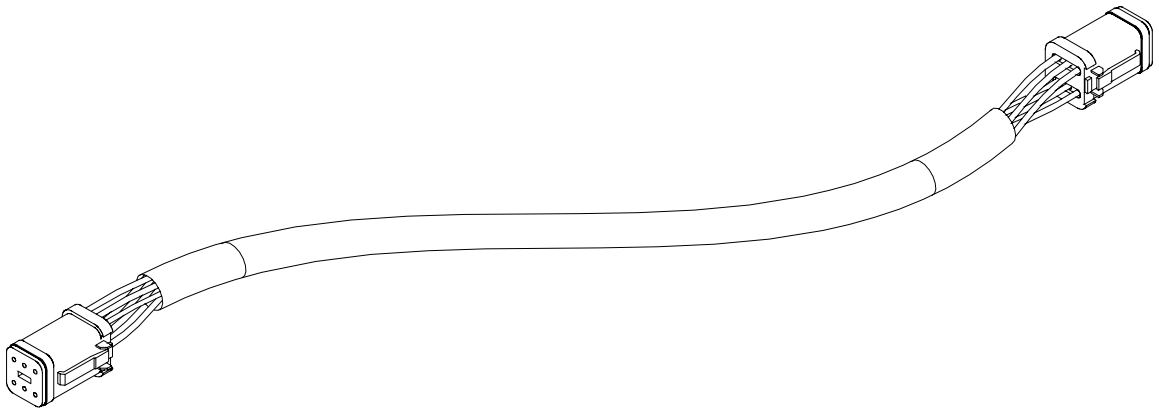


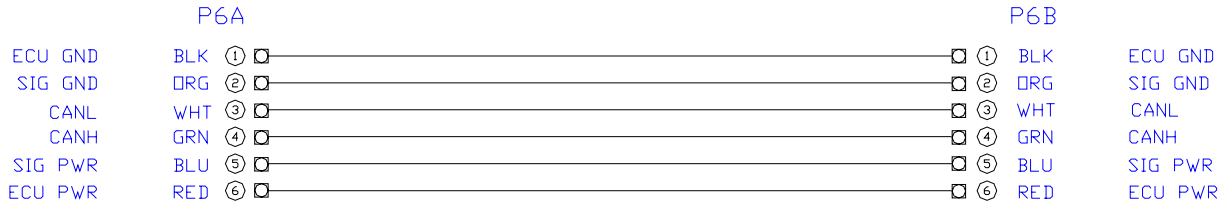
11.3 ITEM C04: 43210-01a - CABLE UC5 NETWORK 18 AWG - 1M



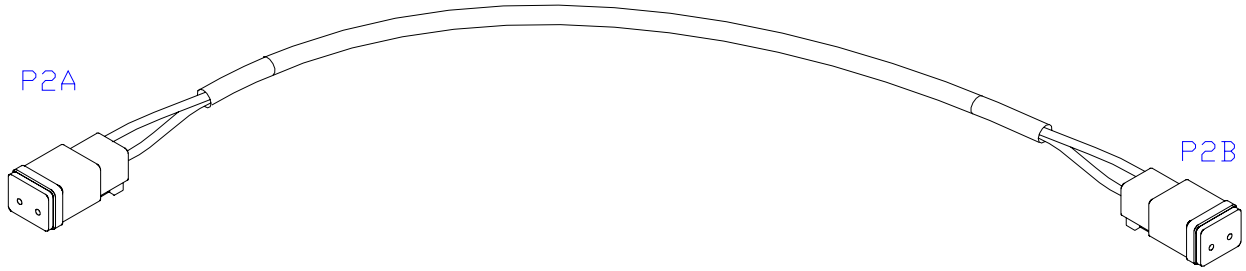


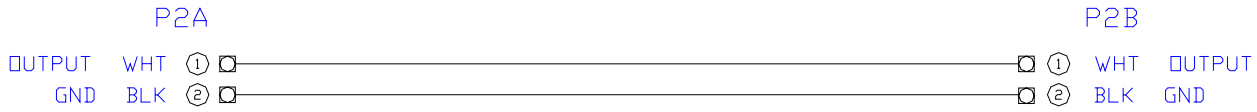
11.4 ITEM C05: 43210-20a - CABLE UC5 NETWORK 18 AWG - 20M



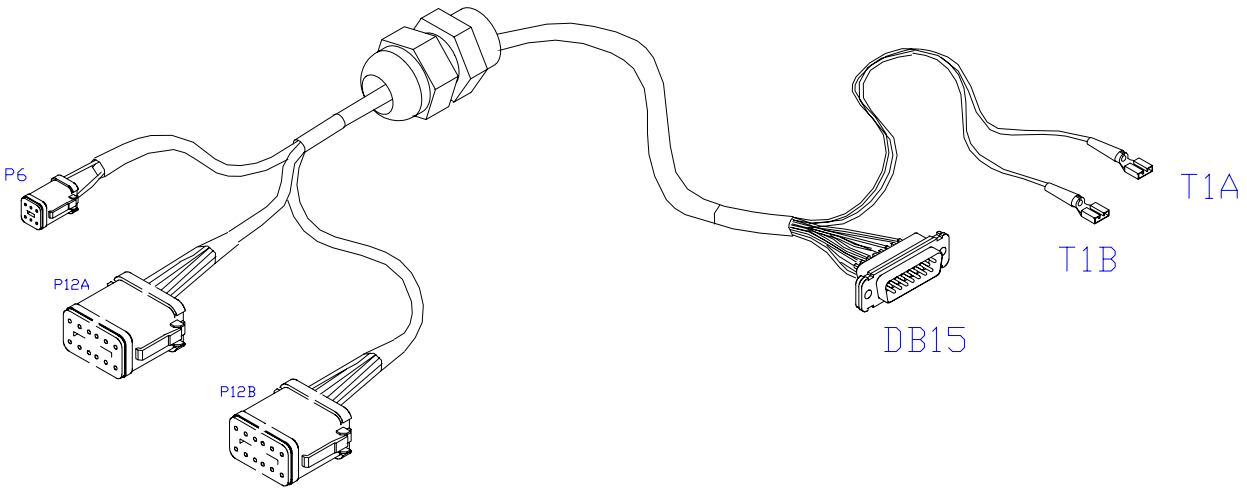


11.5 ITEM C10: 43230-04a – CABLE UC5 VALVE DT TO DT

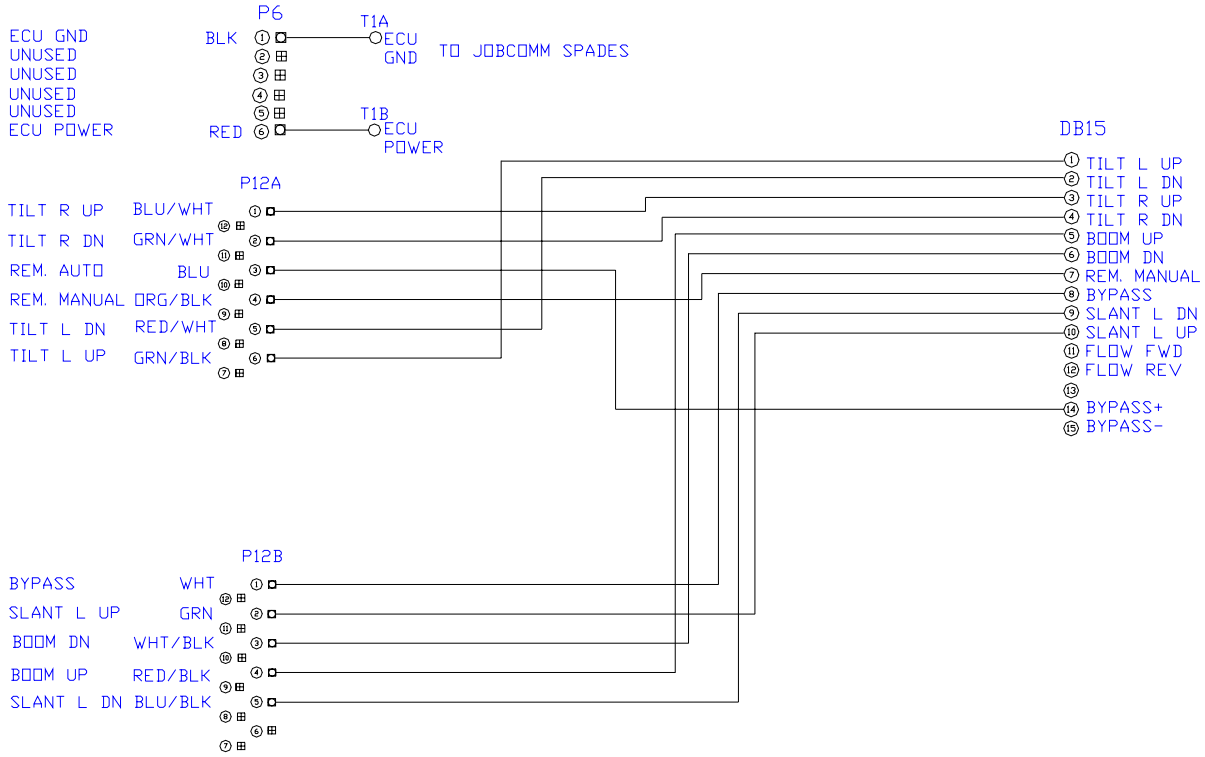




11.6 ITEM C20: 43240-30a– CABLE UC5 BC HARDI DAH09

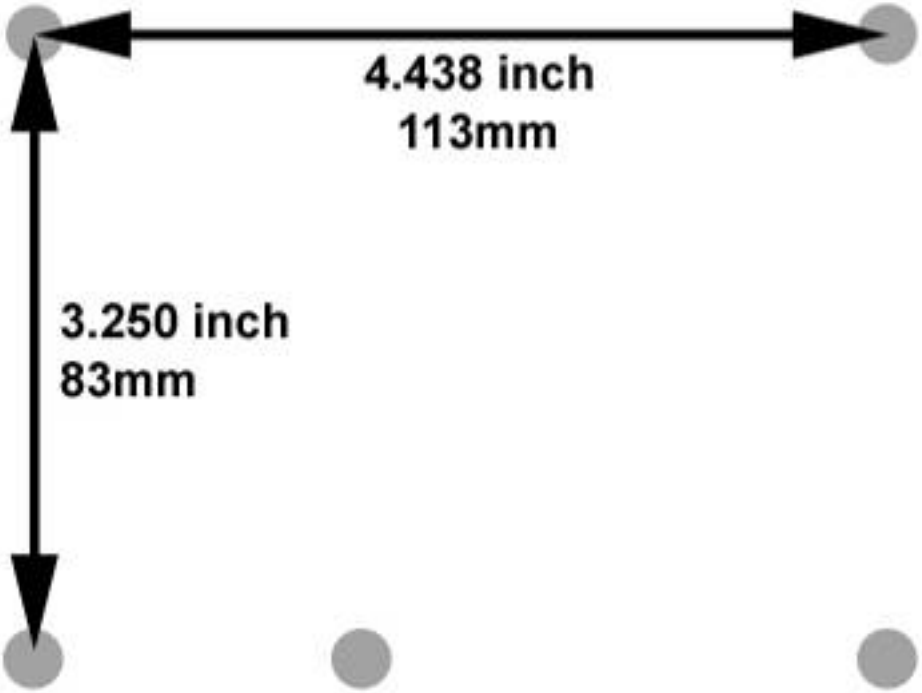


SYMBOL ⊠ DENOTES PIN CONTACT
SYMBOL ◘ DENOTES SOCKET CONTACT
SYMBOL □ DENOTES EMPTY CAVITY
SYMBOL ⊞ DENOTES CAVITY PLUG



12 Valve Block Stencil

Ensure true dimensions match as labeled below.



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