NORAC®
WEIGHING AND CONTROL SYSTEMS

UC4

Total Control Automatic Boom Height System

Generic Unit
Installation Manual

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Reorder P/N: UC4-BC-AN2-INST Rev F (Generic Unit)

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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1 INTRODUCTION

Congratulations on your purchase of the NORAC UC4 automated sprayer boom height control system. This system is manufactured with top quality components and is engineered using the latest technology to provide operating features and 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.

NOTICE:

Every effort has been made to ensure the accuracy of the information contained in this manual. All parts supplied are selected to fit the sprayer and supply the customer with 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.**

⚠ ATTENTION:

When installing the UC4 system please be aware that at a point in the installation your sprayer booms will be inoperative until the installation is complete. **Any installation procedure requiring boom movement will need to be done first.** Once the hydraulics have been disconnected, you must complete the electrical installation before the booms become operative.

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 via the information given below:

Phone:	**1-800-667-3921**	**in Canada (Toll Free)**
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E-mail:	**service@norac.ca**	
Website:	**www.norac.ca**	

2 GENERAL SYSTEM DESCRIPTION

2.1 SYSTEM LAYOUT

Figure 1 and **Figure 2** depict the general system layout of the UC4 Sprayer Boom Control System for the self-propelled type and the pull type, respectively.

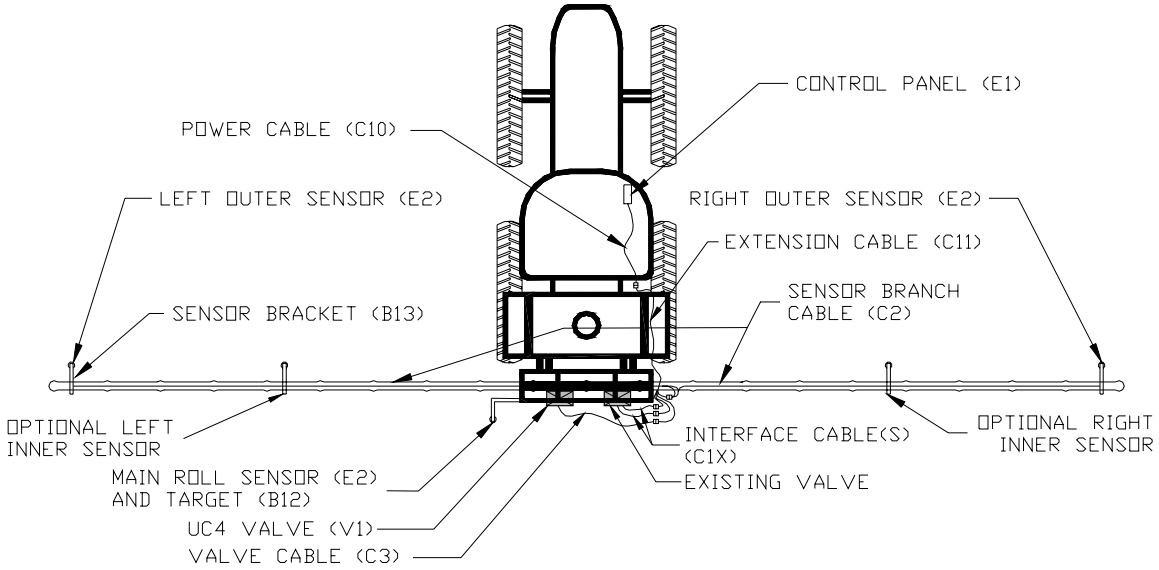


Figure 1 – System Components and General Location: Self-Propelled Type

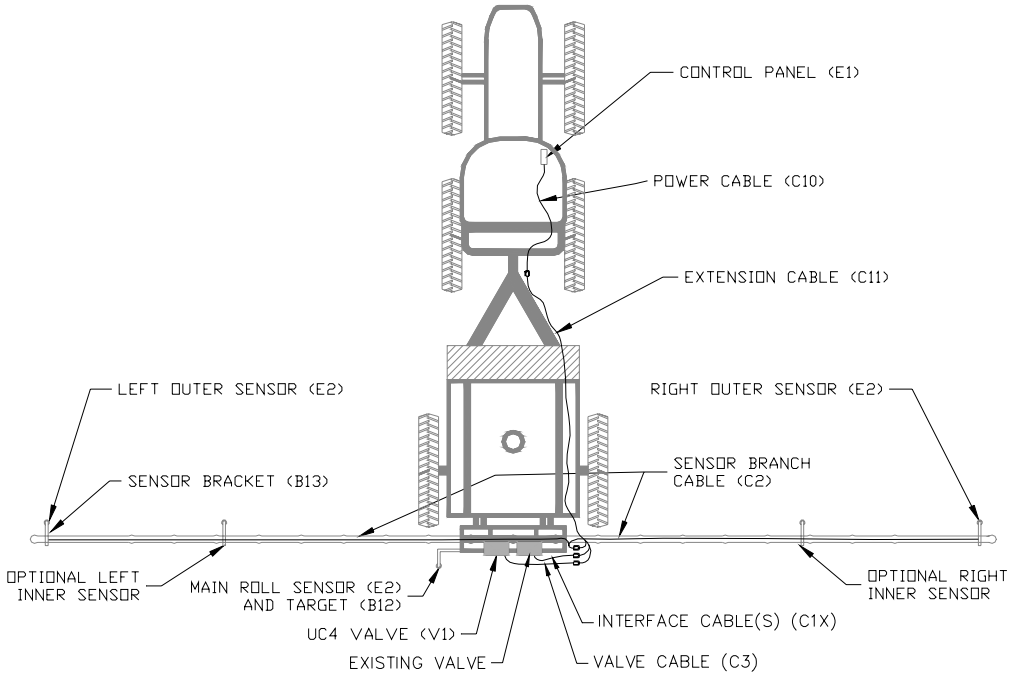


Figure 2 – System Components and General Location: Pull Type

2.2 DETERMINING THE STYLE OF INSTALLATION

In general, there are two styles of installation that can be done with the NORAC UC4 Boom Control System: Electrically Teed Installation and Hydraulically Teed Installation.

2.2.1 Electrically Teed Installation

Electrically Teed Installation is the **preferred** style of installation. However, this style can be done only if the sprayer valve block has individual electrical wiring to control each boom function (e.g. left up, left down, right up, right down, main up, main down).

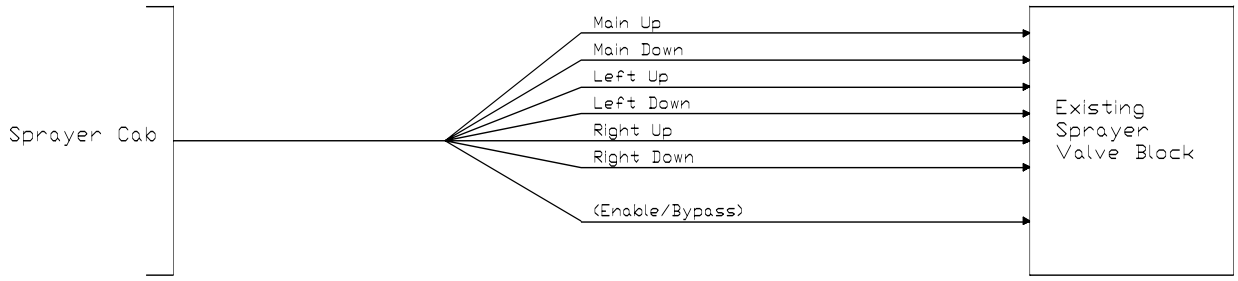


Figure 3 – Electrical Wiring Applicable for Electrical Teed Installation

2.2.2 Hydraulically Teed Installation

Hydraulically Teed Installation must be done if the sprayer valve block does **NOT** have individual electrical wiring to control each boom function. For example, your sprayer may have signal lines to select a boom (left, right and main) and separate electrical signals for the direction (up and down).

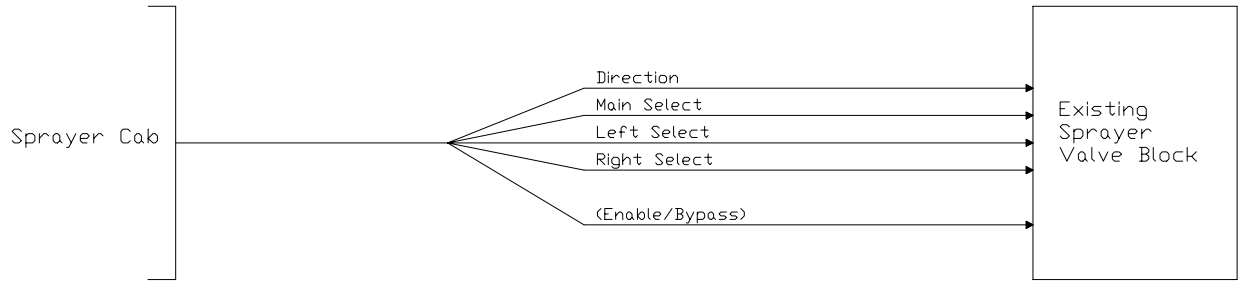


Figure 4 – Typical Electrical Wiring for which Hydraulically Teed Installation is Needed

For Hydraulically Teed Installation, **MANUAL** mode of the UC4 Control System does not operate the same as with Electrically Teed Installation. Electrically Teed Installation will allow the operator to trigger individual boom movements into **MANUAL** mode while maintaining **AUTO** mode for the other boom movements (e.g. left boom can be in **MANUAL** mode while right boom is still in **AUTO** mode). Hydraulically Teed Installation does not support this function. If the operator triggers any boom movement, the whole NORAC system will convert to **MANUAL** mode.

NOTE: Hydraulically Teed Installation may also be done if the operator wants the existing sprayer valves, instead of the NORAC valves, to operate the booms when the NORAC system is in MANUAL mode.

3 PARTS LIST

The parts that come with your UC4 Sprayer Boom System are listed in **Table 1**. In this document, the item number shown on the left side of this table references each part.

Please ensure that all parts in your kit are present before proceeding with your installation.

Table 1 – BC Generic Kit Parts

Item	Part Number	Description	Pcs	Len	
	UC4-BC-AN2	**KIT HARDWARE UC4 BOOM CONTROL GENERIC**	**1**		**EA**
		□* BRACKET PARTS *□			
B10	44704	MOUNTING BRACKET UC3-BC VALVE	1		EA
B11	44740	MOUNTING BRACKET ROLL SENSOR UC4	1		EA
B12	44741	MOUNTING BRACKET ROLL SENSOR TARGET UC4	1		EA
B13*	44728	MOUNTING BRACKET COMPLETE UC4 BREAKAWAY EXTENDED	2		EA
		□* CABLE PARTS *□			
C1	44662B-40	CABLE UC4 SENSOR TRUNK AMPF TO AMPF BLACK STANDARD 40FEET	1		EA
C2	44668	CABLE UC4 SENSOR 1 AMP RECEPT 3 AMP PLUG BC	1		EA
C3	44656	CABLE VALVE VARIABLE RATE	1		EA
C4	44651	CABLE VALVE EXTENSION	1		EA
C10	44650-39	CABLE POWER GENERIC SELF-PROPELLED	1		EA
C11	44651-03	CABLE EXTENSION VALVE GENERIC	1		EA
C12A	44658-35	INTERFACE CABLE UC4 C12A GENERIC GND2	1		EA
C12B	44658-36	INTERFACE CABLE WINGS UC4 C12B GENERIC GND2	1		EA
C13	44658-37	INTERFACE CABLE MAIN UC4 C13 GENERIC GND2	1		EA
C15	44658-31	CABLE INTERFACE UC4 BC C15 HAND CONTROL PIGTAIL	1		EA
		□* ELECTRONIC PARTS *□			
E1	4461BC	UC4 BOOM CONTROL PANEL	1		EA
E2	44631	UC4 ULTRASOUND SENSOR	3		EA

Item	Part Number	Description	Pcs	Len	
		□* HYDRAULIC PARTS *□			
V1**	44933 or 44933S	VALVE PACKAGE CC LS PROP 2 STATION EXPANDABLE W/FILTER VALVE BLOCK ASSEM UC4-BC 2-STATION CC/LS VARIABLE RATE	1		EA
H50	44928	ORIFICE INSERT .047 IN ONE WAY	4		EA
H51	103312	COUPLING HYD 6MB 6MJ	6		EA
H52	104369	COUPLING HYD 6MBP	2		EA
H53**	44920	SANDWICH BLOCK KIT - SINGLE ACTING	2		EA
		□* MISC. PARTS *□			
M1A	446BC-MAN-1	MANUAL UC4 BOOM CONTROL TECHNICAL LARGE BOOKLET	1		EA
M1B	446BC-MAN-2	MANUAL UC4 BOOM CONTROL QUICK REFERENCE SMALL BOOKLET	1		EA
M2	100084	TIE CABLE 21 IN BLACK	10		EA
M3	100091	TIE CABLE 7.5 IN BLACK	150		EA
M4	104409	FOAM DISC 45 PPI CONDUCTIV 1/2 X 2-5/8 DIA	6		EA
M5	105435	CHAIN 1/2 IN PLASTIC	3	42	IN
M6	100660	BOLT HEX NC GR5 PLTD 1/4 IN	3		EA
M7	100853	NUT HEX NC GR5 PLTD 1/4 IN	3		EA
M10	UC4-BC-AN2-INST	MANUAL INSTALLATION UC4 GENERIC	1		EA
M11	100645	BOLT HEX NC GR5 PLTD 3/8X4	2		EA
M12	100947	WASHER LOCK SPRING PLTD 3/8 IN	2		EA
M14	105436	TUBE CLEAR PLASTIC 2-3/4" ID	1	16	IN

*** In a kit shipped prior to February 1, 2007, the part number for Item B13 is 44722.**

**** If the part number for Item V1 (NORAC valve block) is 44933S, Items H53 are not included in the kit. The #44933S valve block has solenoid valves whose engraved part number is "105723". Please see Section 4.5.1.2 for further details.**

Figure 5 and **Figure 6** show the Electrically Teed Installation in its general installation configuration.

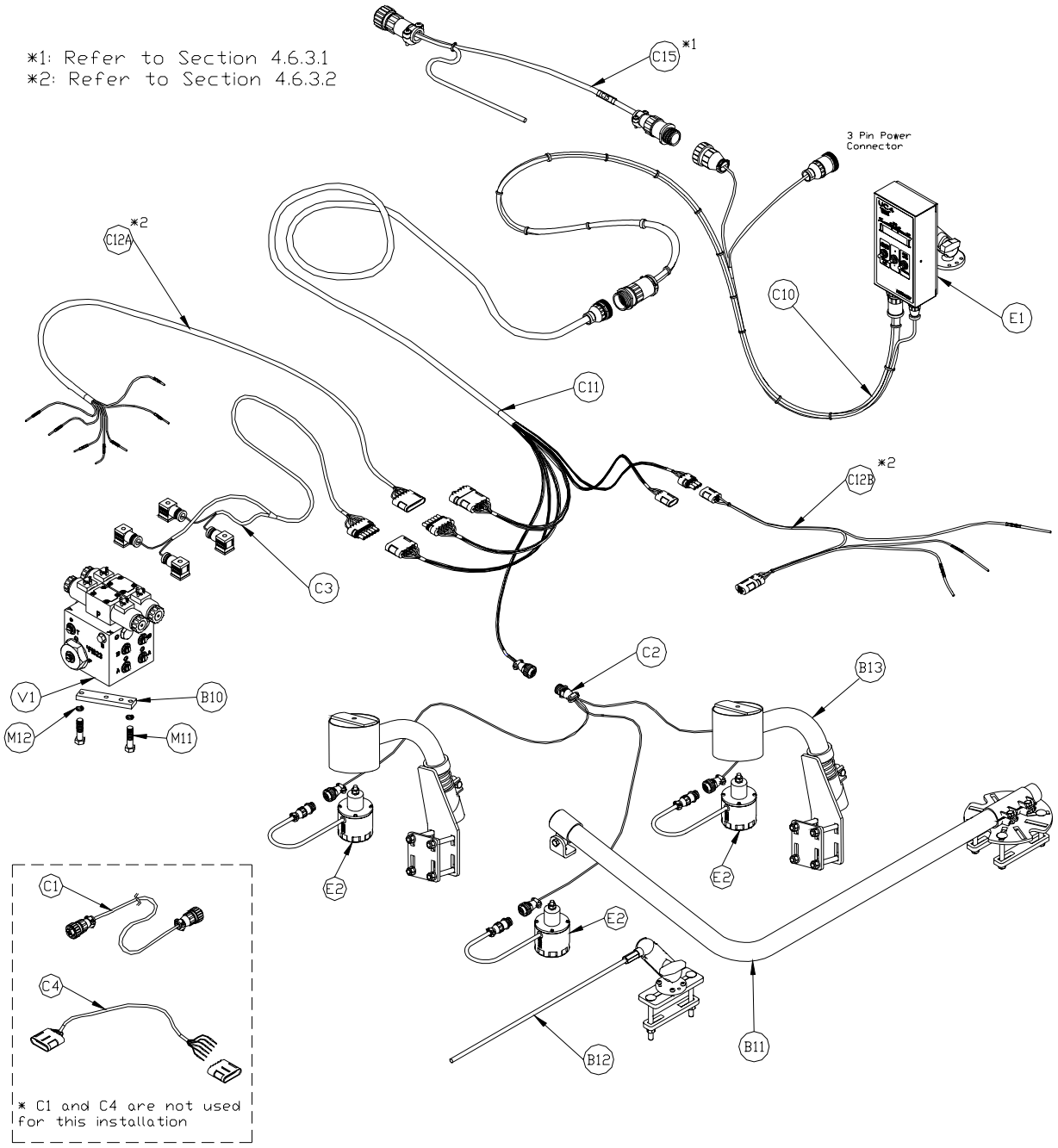


Figure 5 – UC4-BC Components: Electrically Teed Installation

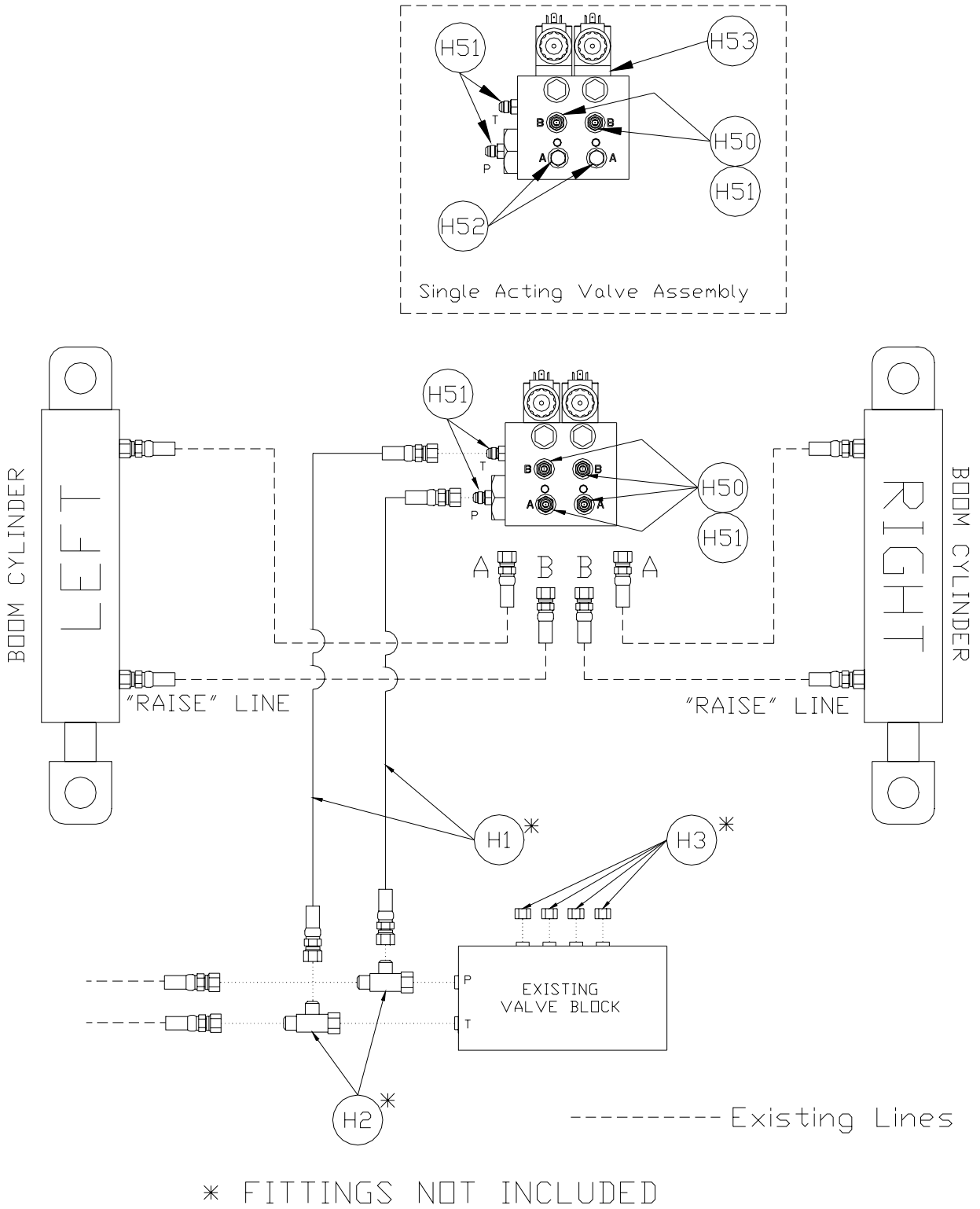


Figure 6 – Hydraulic Components: Electrically Teed Installation

NOTE: If the part number of Item V1 is 44933S, Items H53 are not included in the kit.

Figure 7 and **Figure 8** show the Hydraulically Teed Installation in its general installation configuration.

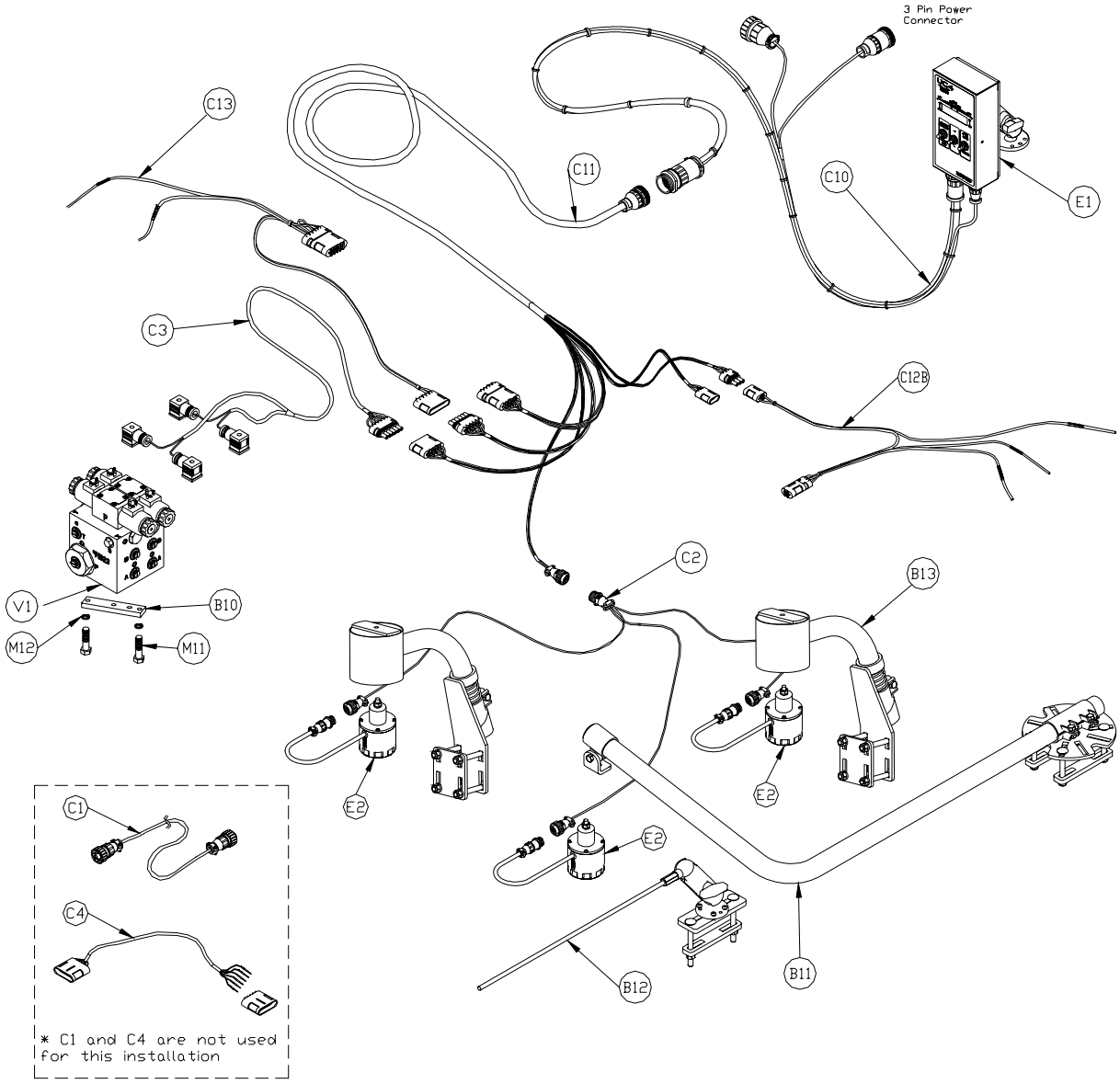


Figure 7 – UC4-BC Components: Hydraulically Teed Installation

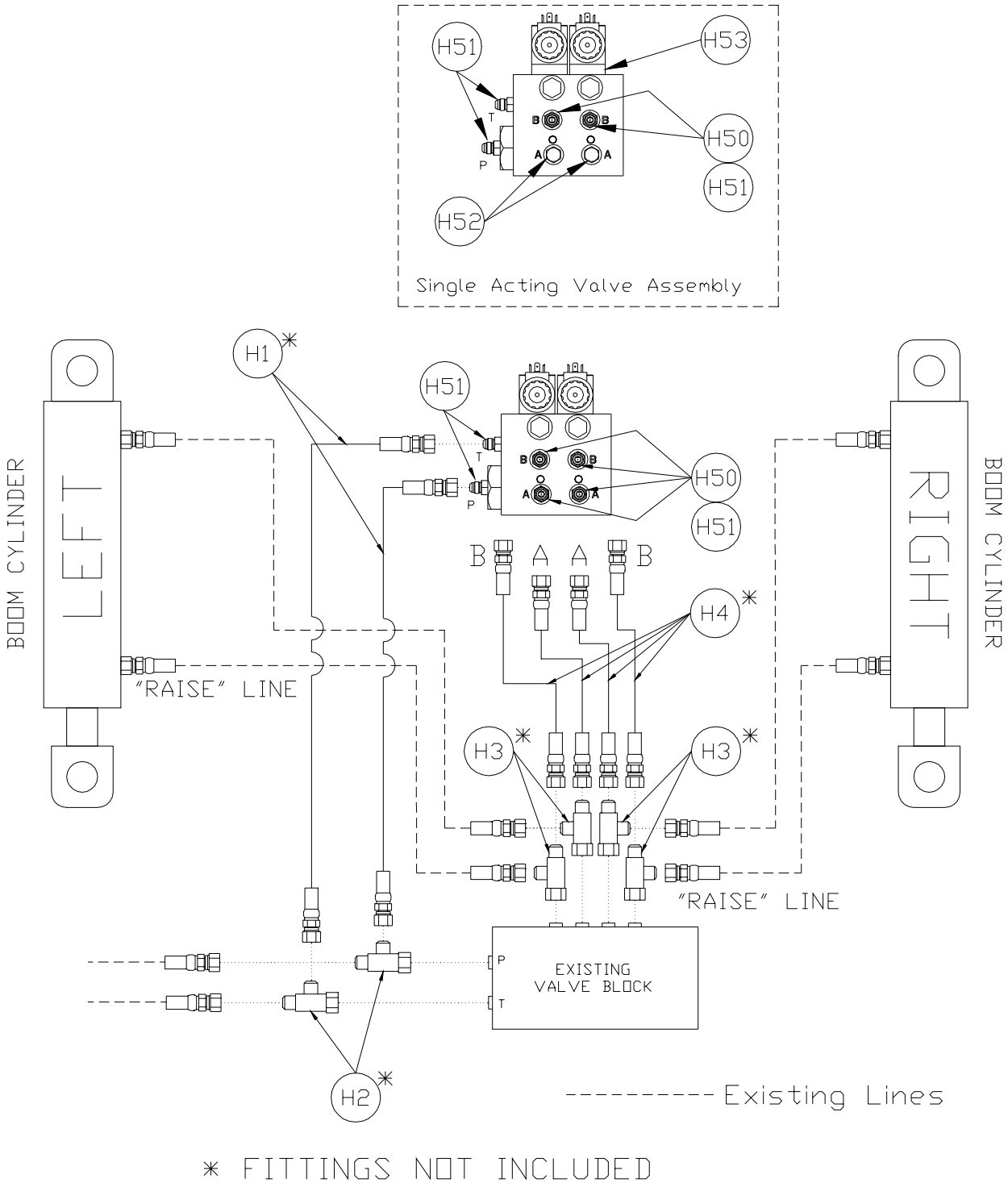


Figure 8 – Hydraulic Components: Hydraulically Teed Installation

NOTE: If the part number of Item V1 is 44933S, Items H53 are not included in the kit.

4 INSTALLATION PROCEDURE

Before installing the NORAC UC4 Boom Control System to your sprayer, it is necessary to check that all functions of the existing hydraulic system are working properly.

Furthermore, it is informative to determine how quickly your sprayer booms and main (center) section are able to change their position without the UC4 System installed. Doing so may illustrate the design strengths and constraints of your sprayer's mechanical and hydraulic configuration.

This information may also prove valuable when troubleshooting the installation, and if you need to contact NORAC for installation support. For example, NORAC support staff may use this information to determine if there are unwanted orifices (or backwards orifices) remaining in the hydraulic system when the UC4 System is installed.

Drive your sprayer onto a flat piece of land, without any obstructions in the way of boom movement (e.g. power lines). Try to gain the best view of the booms and involved cylinders as you can. **This may be best done with two people: one in the cab, and one outside.** Perform the following Function Check and Boom Speed Test.

4.1 EXISTING HYDRAULIC SYSTEM FUNCTION CHECK

Check all functions of the existing hydraulic system of your sprayer on **Table 2**. There may be more functions in the existing hydraulic system. Please refer to the sprayer's operation manual and check additional functions, if necessary.

Table 2 – Hydraulic System Function Check Sheet

HYDRAULIC SYSTEM FUNCTION								
	INNER		OUTER		TIP*		FIELD OPERATION	
	FOLD	UNFOLD	FOLD	UNFOLD	FOLD	UNFOLD	UP	DOWN
LEFT BOOM								
RIGHT BOOM								
MAIN BOOM	N/A	N/A	N/A	N/A	N/A	N/A		
ROLL*	N/A	N/A	N/A	N/A	N/A	N/A		

* Some sprayers may not have this function/section.

4.2 BOOM SPEED TEST

⚠ **IMPORTANT:**

Let the sprayer run for several minutes to heat up the hydraulic oil. Raise/lower the left and right booms, main and hydraulic roll sections several times to help get the system (hydraulic oil, valve solenoids) warmed up. This will simulate field conditions and makes QUITE a difference in some cases. Grease all moving parts for consistent results.

1. Lower each boom and main section as close to the ground as possible.

2. Set your sprayer at field working RPM on the throttle and mark this value in **Table 3**.

NOTE: You will need a stopwatch or a watch that displays "seconds" for the next step.

3. Individually raise the LEFT boom from its extreme LOW position to the very TOP of its travel. Note the length of time it takes for this and record this in **Table 3**, "Trial #1" for "Left UP".

4. Individually lower the LEFT boom from its extreme HIGH position to the BOTTOM of its travel. Note the length of time it takes for this and record this in **Table 3,** Trial #1, for "Left DOWN".

NOTE: You will need to be careful when lowering the booms at full speed to the bottom of their travel so that they don't hit the ground. You may want to mark positions on the cylinder pistons at which to stop the test while using another person as a spotter. Raising your main section will give you more working height to do this test. Please use common sense to avoid damage!

5. Similarly, record two more time trials (Trial #2 & #3) for the LEFT boom and record in **Table 3**.

6. Repeat **Steps 3** through **5** for the RIGHT boom and the MAIN section.

7. Repeat a similar procedure for the hydraulic (active) roll feature (if your sprayer supports this) for the clockwise (CW) and counter-clockwise (CCW) rotations.

8. Average the times of the three trials recorded for each boom movement function (e.g. LEFT, RIGHT, etc.) and record this calculation in the appropriate "Average Time" slot in **Table 3**.

9. These "Average Times" now represent how quickly your system can react to

manual control of boom functions. In **Section 4.7 Completing the Installation**, this procedure is repeated with the UC4 System installed for comparison and troubleshooting purposes.

Table 3 – Boom Test Record (WITHOUT UC4 System)

Working RPM:				
Section:	***Trial #1*** [Seconds]	***Trial #2*** [Seconds]	***Trial #3*** [Seconds]	***Average Time*** [Seconds]
Left UP				
Left DOWN				
Right UP				
Right Down				
Main UP				
Main DOWN				
Roll CW				
Roll CCW				

Table 4 – Boom Test Record (WITH UC4 System)

Working RPM (Set this the same as in Table 3):				
Section:	***Trial #1*** [Seconds]	***Trial #2*** [Seconds]	***Trial #3*** [Seconds]	***Average Time*** [Seconds]
Left UP				
Left DOWN				
Right UP				
Right DOWN				
Main UP				
Main DOWN				
Roll CW				
Roll CCW				

4.3 WING SENSOR INSTALLATION

1. Assemble the Breakaway Sensor Mounting Brackets as show in **Figure 9** and **Figure 10**.

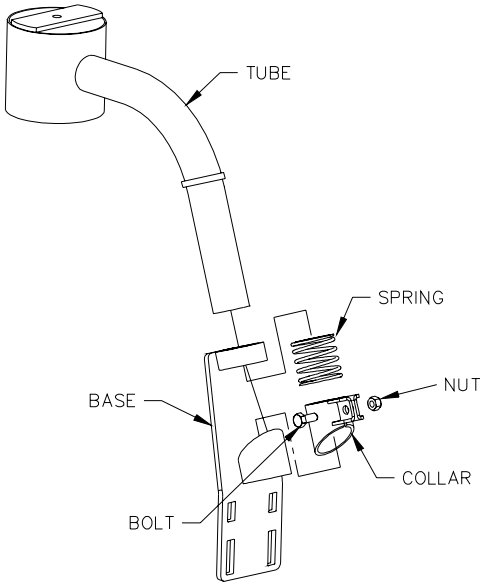


Figure 9 – Breakaway Sensor Bracket Exploded View

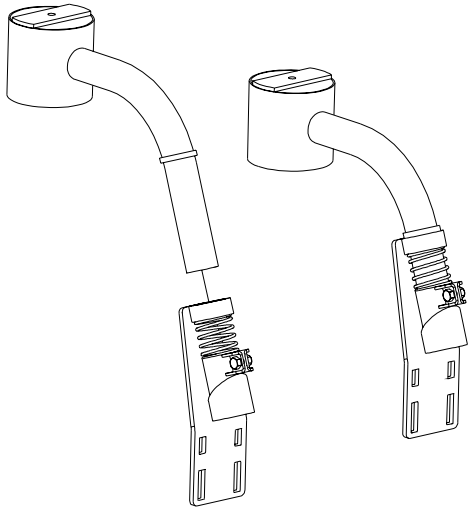


Figure 10 – Breakaway Sensor Mounting Bracket Assembly

To assemble the breakaway sensor bracket:

a) Assemble the bolt and nut into the collar of the bracket.
b) Grease the bottom edge of the collar and the angled tube of the base.
c) Place the collar onto the angled tube of the mounting base.
d) Compress and install the spring between the collar and the upper ring of the base.

e) Install the tube as shown and, for now, lightly tighten collar around the tube you will need to aim the sensor bracket later.

2. In order to reduce the chance of problems, inspect the booms in their folded position. Mark the locations where the sensor brackets can be mounted **without contacting the sprayer**. Then the booms can be unfolded and the sensors mounted without having any mechanical interference.

   NOTE: If possible, mount the sensor brackets while the booms are in their folded position to ensure that the sensor and bracket will not interfere with anything when the boom is folded for transport.

   NOTE: Please be aware of the maximum length of the sensor branch cable (Item C2) for each branch. Note that the sensors can not be mounted outside of this range on each boom. It might be wise to route the branch cable at this time to ensure that the cable reaches to the sensors. (Please refer to Section 4.6 Electrical Installation)

   ⚠ **IMPORTANT:**

   Provide enough slack in the sensor branch cable to account for the movement of the main section, parallel lift, and FOLDING boom movement.

3. Mount one NORAC UC4 ultrasonic sensor (**Item E2**) near the tip of each boom with the brackets provided (**Item B13**). Use the 8-mm nuts and lock washers provided with the sensor, to attach the sensor to the bracket. The sensors should be oriented forward (ahead) of the boom.

   General mounting rules for UC4 ultrasonic wing sensors:

   - When the boom is in its lowest position, the sensor mouth must be 9 inches or more from the ground.
   - The bottom of the sensor must be at least 9 inches in front of the spray nozzles.
   - The bottom of the sensor must be at least 9 inches above the spray nozzles.
   - The sensor should be approximately vertical at normal operating heights.
   - Ensure that there are no obstructions within a 12-inch diameter circle projected directly below the center of the sensor.

   Improved boom tip protection and control may be obtained by mounting the sensor as close to the end of the boom as possible. **However, if the sensors are**

mounted to the breakaway portion of the boom, the operator must be aware that, due to boom geometry, a breakaway action may cause the UC4 Control Panel to force the boom dangerously close to the ground. For this reason, you may want to avoid mounting on a breakaway section.

Please refer to the UC4 system warranty at the end of the **UC4 Sprayer Boom Control Operator's Manual** (**Item M1**) for implications.

NOTE: When installing the UC4 sensors (Item E2), start with the smallest serial number on the left hand side proceeding to the largest serial number on the right hand side (Figure 11). This will allow for a more intuitive setup when tuning the system. This arrangement is also REQUIRED when using the "QUICK SETUP" feature available via the UC4 Control Panel software (this feature is typically used by NORAC technical support staff).

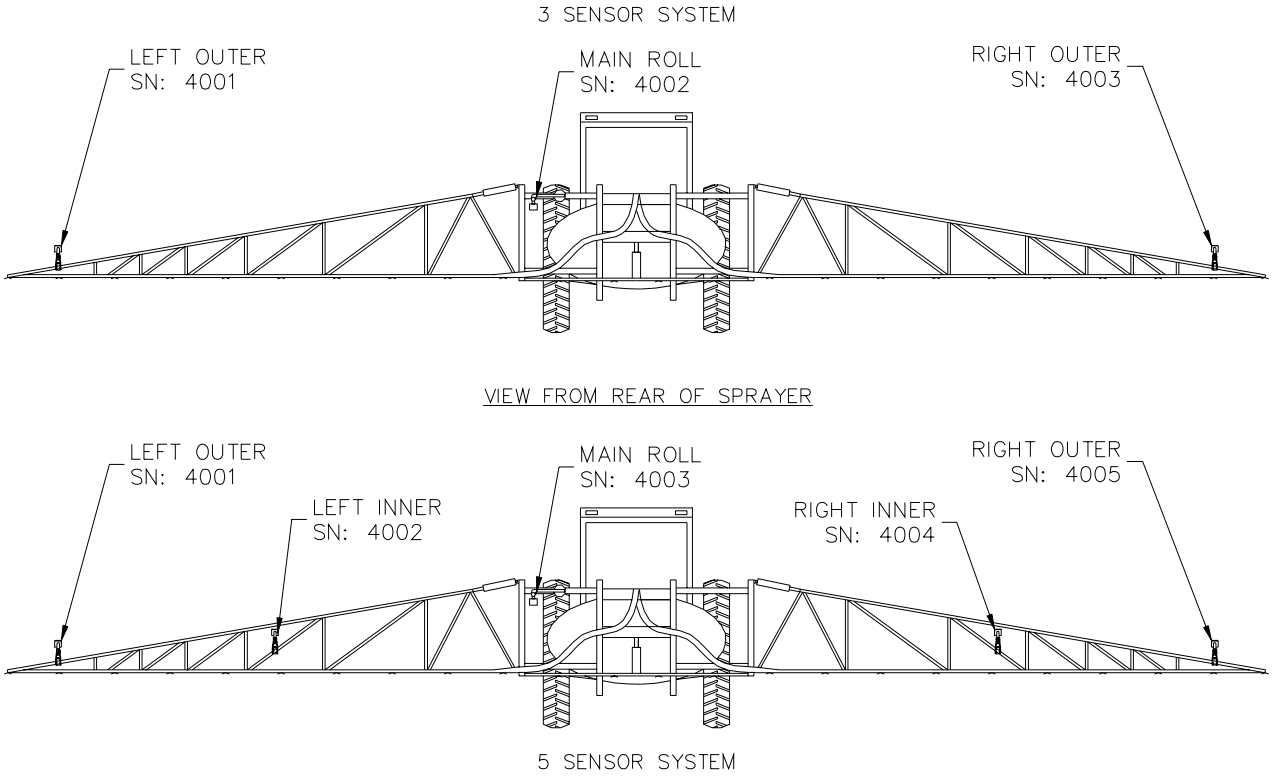


Figure 11 – Sensor Serial Number Installation Location

4. The sensor mounting brackets can be installed two basic ways. One with the base behind the tube (**Figure 12**), which is preferred, or with the base mounting in front of the tube (**Figure 13**). Both mountings are acceptable however the preferred mounting will be less likely to damage the bracket in the event of a boom contacting a post or obstruction.

5. The sensor cable should be run down through the tube of the mounting bracket and then behind the member the bracket is mounted onto. Cable-tie (**Items M3** and/or **M2**) the connector in place. The cable must not be allowed to hang below the boom (**Figure 13**).

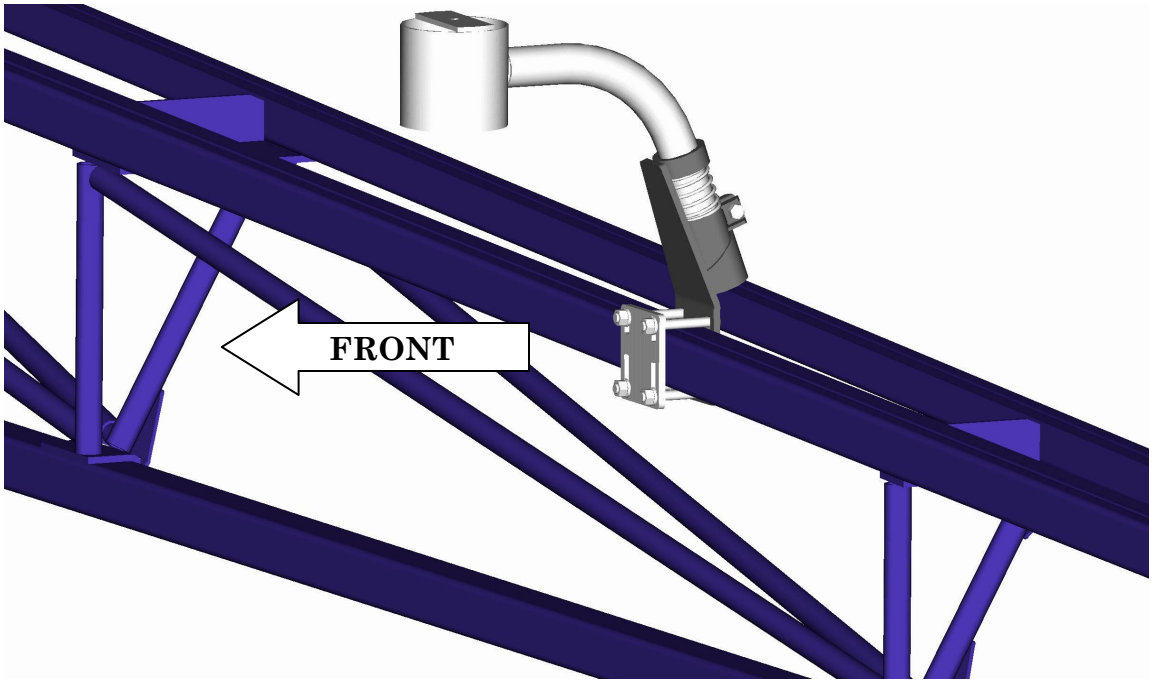


Figure 12 – Sensor Mounting (Preferred)

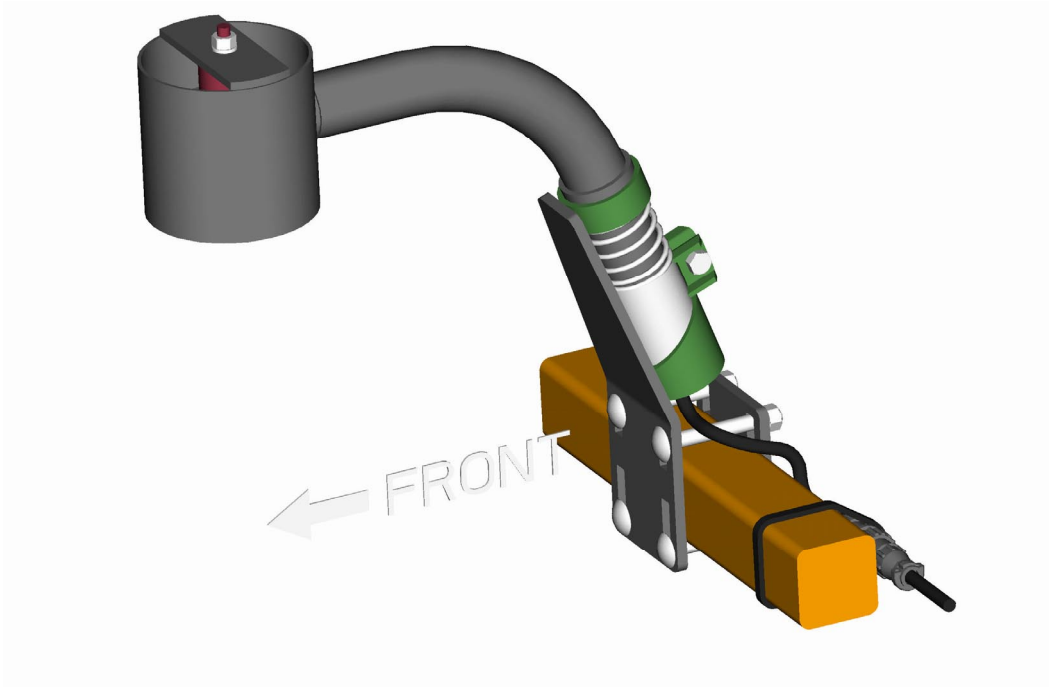


Figure 13 – Another Acceptable Mounting

4.4 MAIN ROLL SENSOR AND TARGET INSTALLATION

4.4.1 The Mounting Brackets

The brackets are designed to be very adaptable and allow for a wide range of installations.

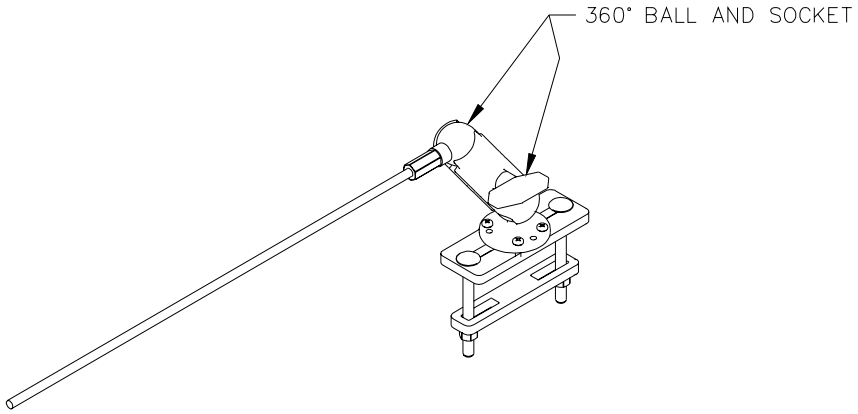


Figure 14 – Target Bracket

The Target Bracket (**Item B12**) can be mounted in any direction around most sizes of sprayer frame member and aimed using two ball and socket connections. The dual ball connection also allows for a few inches of height adjustment while allowing the rod to remain horizontal.

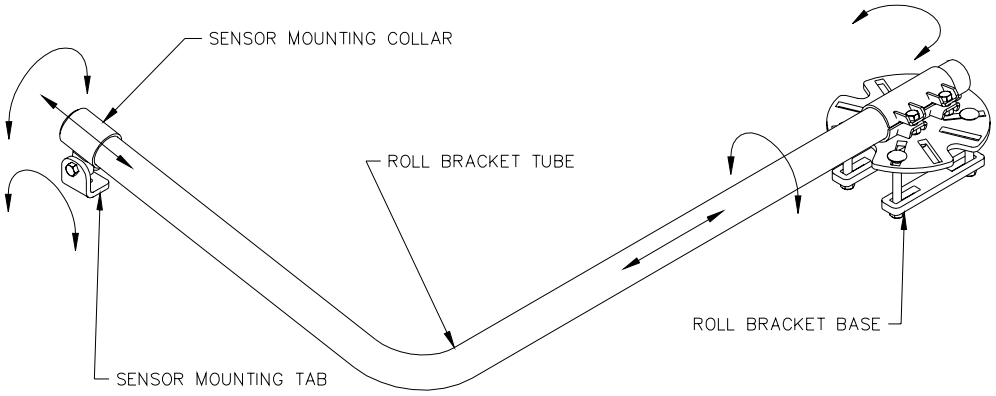


Figure 15 – Sensor Bracket

The Roll Sensor Bracket (**Item B11**) can be mounted in any orientation on most any frame member. The base can be mounted horizontal or vertical and be rotated about 20 degrees. The tube can slide in and out of the base and be rotated to give a great deal of mounting options. The mounting collar can also be slid along the tube and rotated. The mounting tab can rotate perpendicular to the collar giving full range of motion allowing the sensor to point directly towards the ground no matter the angle or direction of the tube.

4.4.2 Mounting on the Boom

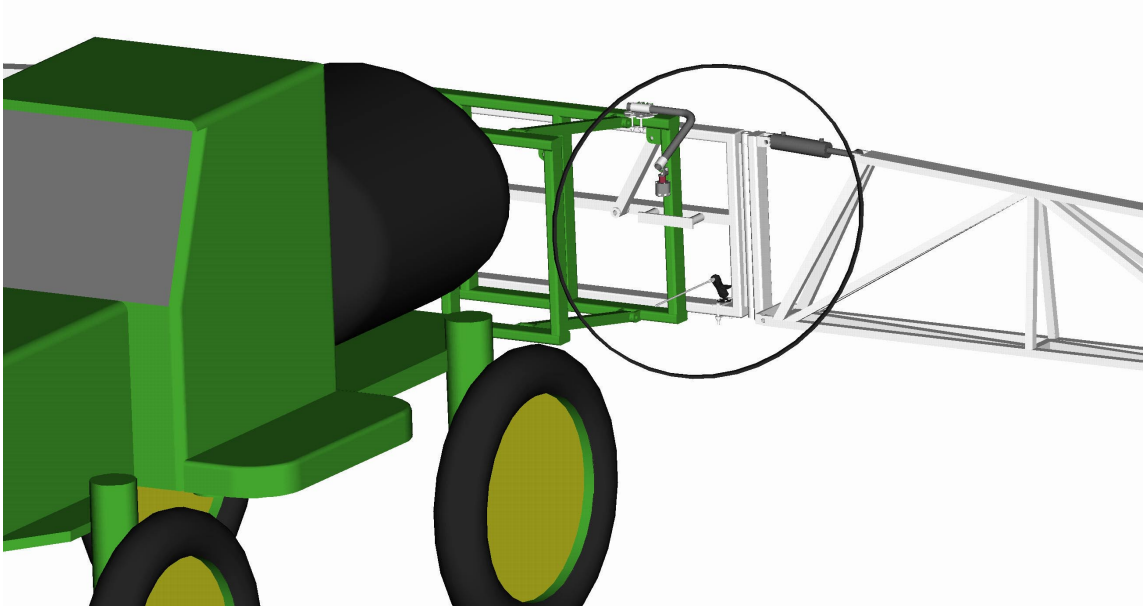


Figure 16 – Main Roll Sensor Mounting Locations

1. When mounting the UC4 main roll sensor and target, first, determine whether your sprayer will allow the roll sensor to be mounted in front of the boom (preferred).

   NOTE: Sprayers that use parallel links to move the main section usually allow for the sensor and target to be mounted in front of the boom. Some sprayers using a vertical main rack system will not allow them to be mounted in front of the boom.

2. Determine a proper mounting location for the main roll sensor and target. Following are **General Mounting Rules** for the sensor and target, and the details are shown in **Figure 17** and **Figure 18**:

   - The sensor must have a 12-inch diameter clear view of the ground without any obstructions (e.g. Nozzles, Hoses, Fenders).
   - The sensor and target are to be mounted as far outward from the center of the boom as possible (See FRONT VIEW of **Figure 18**).
   - The sensor and target are to be mounted as low as possible while maintaining the height requirements as shown in **Figure 17**.
   - The bottom of the sensor should be between 18" to 22" above the target as shown in **Figure 17**.
   - Ensure that there will be no contact between the sensor/target and the booms when folding and unfolding.

- **Do not mount the sensor and target directly behind the tire.** If mounted behind the tire there will be inadequate crop canopy to reflect the unwanted ultrasonic signal causing an error when using **CROP** mode.

  NOTE: For more information, please refer to the <u>UC4 Sprayer Boom Control Operator's Manual</u> (Item M1).

⚠ **<u>IMPORTANT</u>**:

The sensor must NOT be mounted on the same frame section as the target. The target must move independently of the sensor.

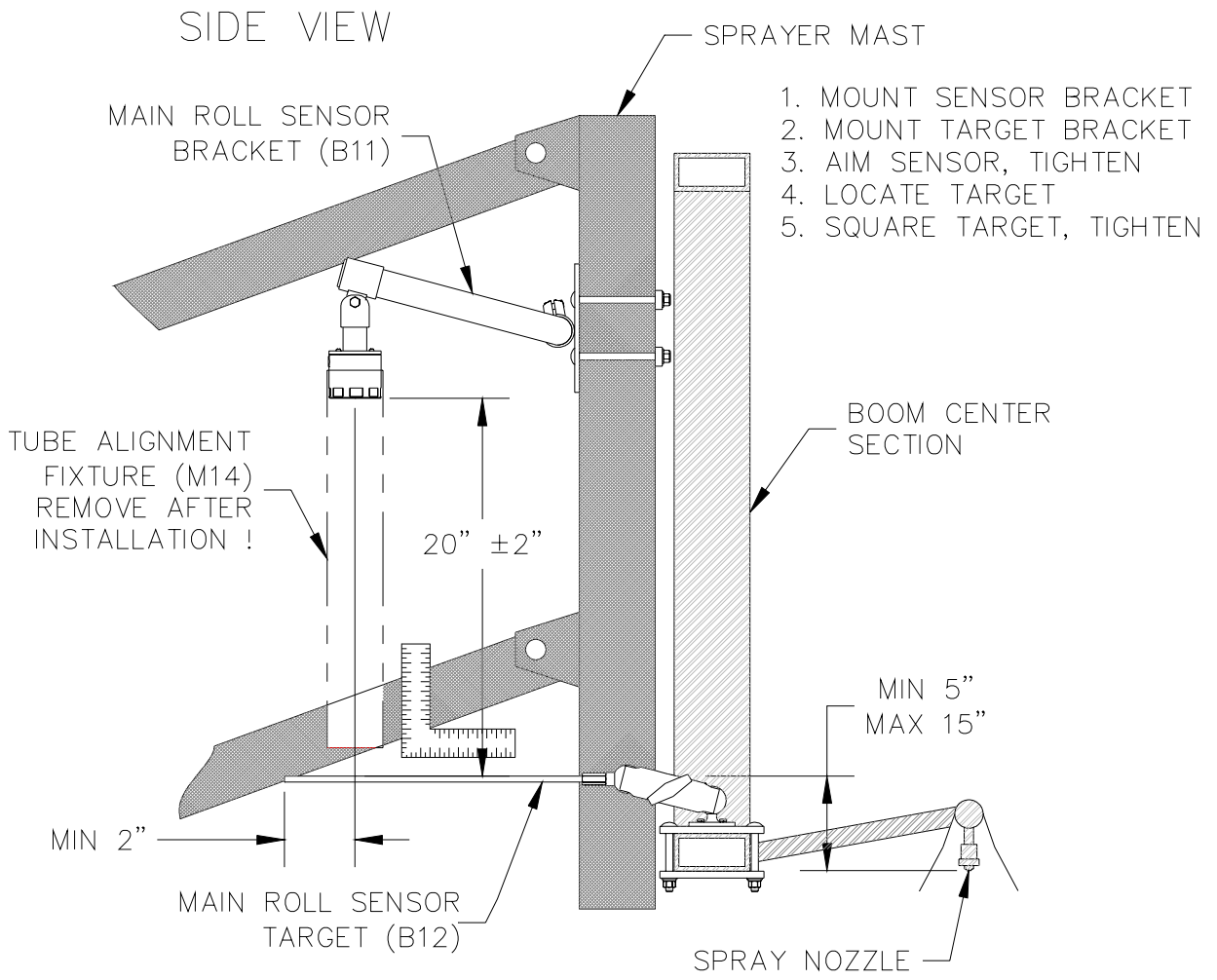


Figure 17 – General Mounting Dimensions

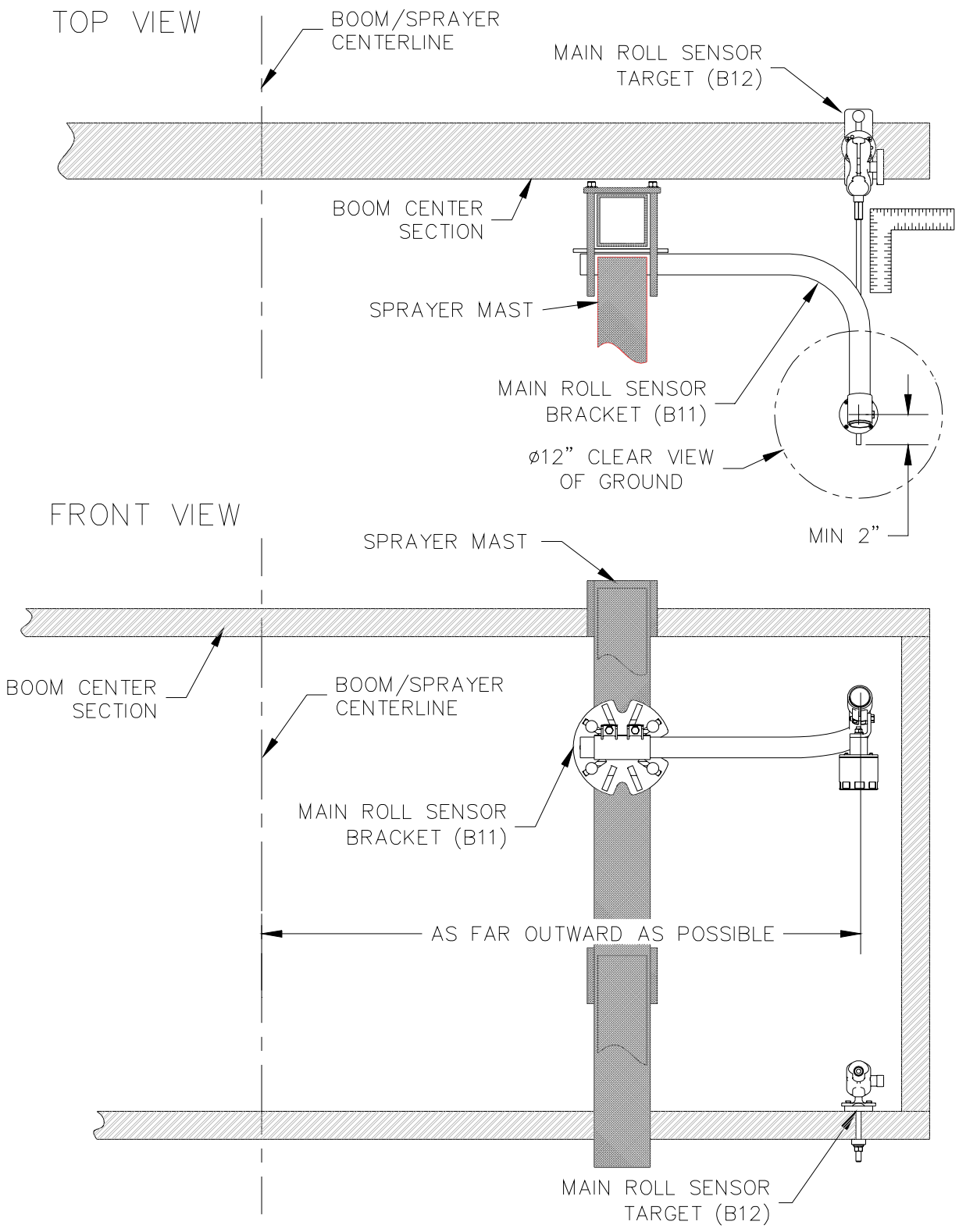


Figure 18 – Installation Details

Figure 19 through **Figure 22** are the examples of mounting the sensor and target.

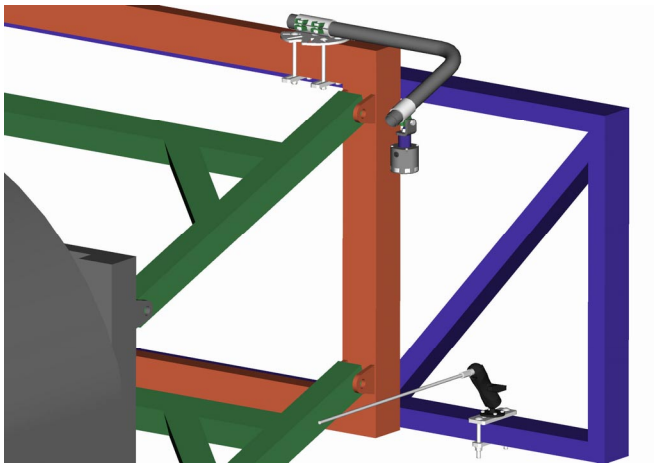


Figure 19 – Forward Sensor / Target Mounting #1

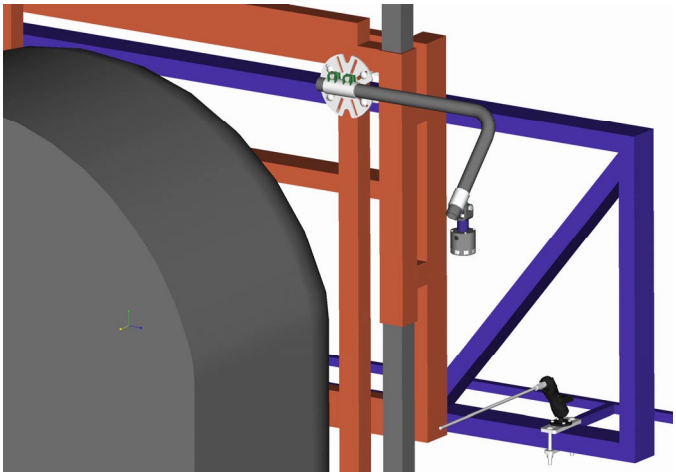


Figure 20 – Forward Sensor / Target Mounting #2

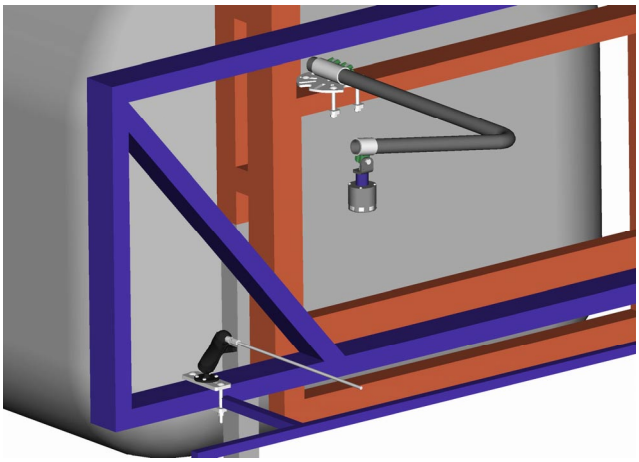


Figure 21 – Rear Sensor / Target Mounting

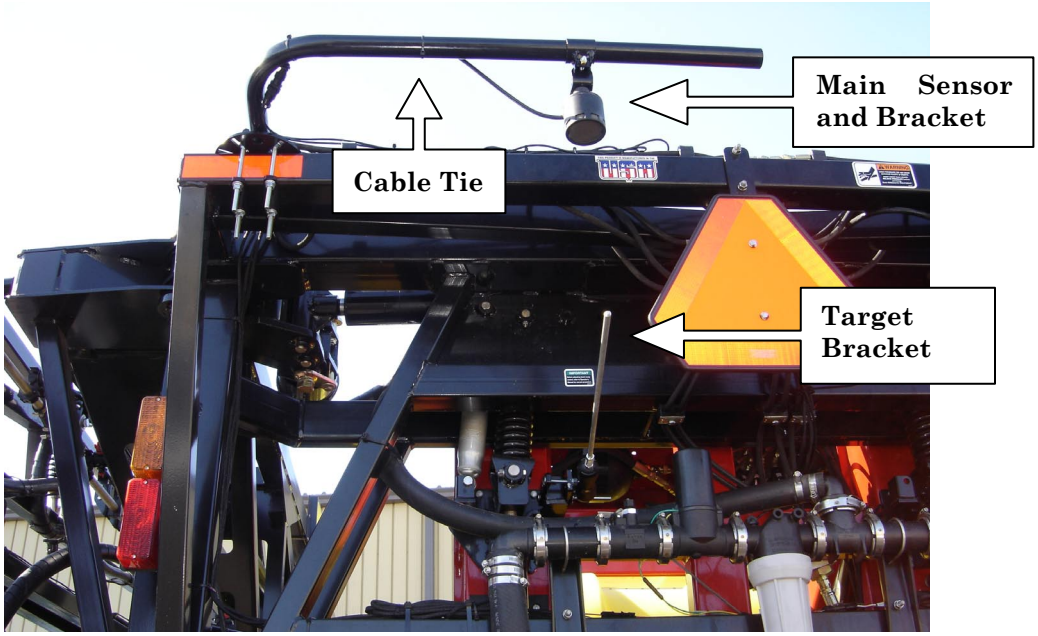


Figure 22 – Main Sensor Mounting Example

3. Mount the sensor and target loosely in place. The sensor should hang vertically without any stress because the sensor direction is critical. To avoid the stress, cable-tie (**Items M2/M3**) the cable from the sensor (and the sensor branch cable (**Item C2**)) to the mounting bracket tube (**Figure 22**) or insert them into the tube.

4. Adjust the sensor bracket to achieve the dimensional requirements in **Figure 17** and **Figure 18**.

5. Place the tube alignment fixture (**Item M14**) on the sensor. Slide the tube over the sensor up to its cable.

   NOTE: If the tube refuses to stay on the sensor apply a piece of tape to hold it in place.

6. Aim the sensor perpendicular to the ground. Tighten all the sensor bracket bolts.

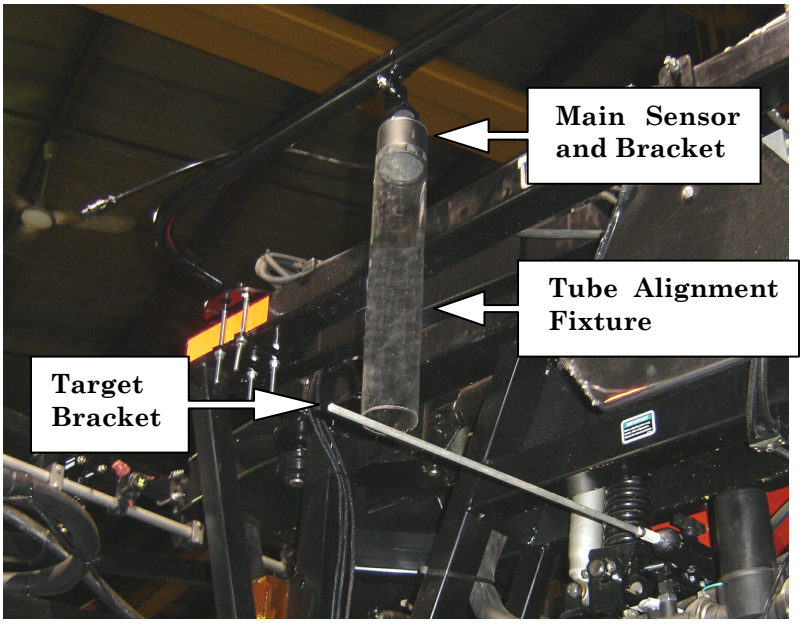


Figure 23 – Sensor-Target Alignment

7. Use a square to adjust the target rod perpendicular to the sensor and to the boom. The target should be directly under the center of the sensor. Tighten the ball mount about a half turn past snug.

8. Check that all the mounting bolts are tight and the dimensional requirements are satisfied.

9. After securing the mounting, any excess tube from the mounting bracket and excess length on the mounting bolts can be cut off.

10. The target rod can also be shortened. The target must extend at least 2" past the center of the sensor.

11. After all procedures are complete, check all dimensional requirements and tightness of bolts again. If necessary, repeat **STEP 3** through **8**.

<u>IMPORTANT</u>:

Remove the tube alignment fixture (Item M14) after completing main roll sensor installation.

4.5 HYDRAULIC INSTALLATION

⚠ WARNING!

The hydraulic system creates very high pressure that can injure. Before disconnecting any hydraulic lines ensure that all pressure has been bled from the system. When changing the boom hydraulic hoses leave the booms in the TRANSPORT POSITION.

NORAC provides proportional hydraulic valves for sprayer boom applications. For the generic installation kit, the customer must supply all hoses and fittings required. The fittings (**Item H51**) on the NORAC valve block are #6 MB (male ORB) to #6 MJ (male JIC). You will need the mating female JIC fitting on your hoses. If an adapter is required, add it after the JIC portion of these fittings. For a typical hydraulic layout, refer to the installation instructions and **Figure 6** or **Figure 8**.

⚠ IMPORTANT:

Hydraulic component failure due to oil contamination is not covered under the warranty of your UC4 system. Therefore, it is strongly recommended that a qualified technician, using proper installation techniques, do the hydraulic installation.

4.5.1 Valve Assembly

1. On a clean surface remove the plastic plugs from the "A", "B", "P", and "T" ports of the NORAC hydraulic valve (**Item V1**) (**Figure 24**). Install the 6MB-6MJ fittings (**Item H51**) on the "P" and "T" ports and tighten to 18 ft-lbs.

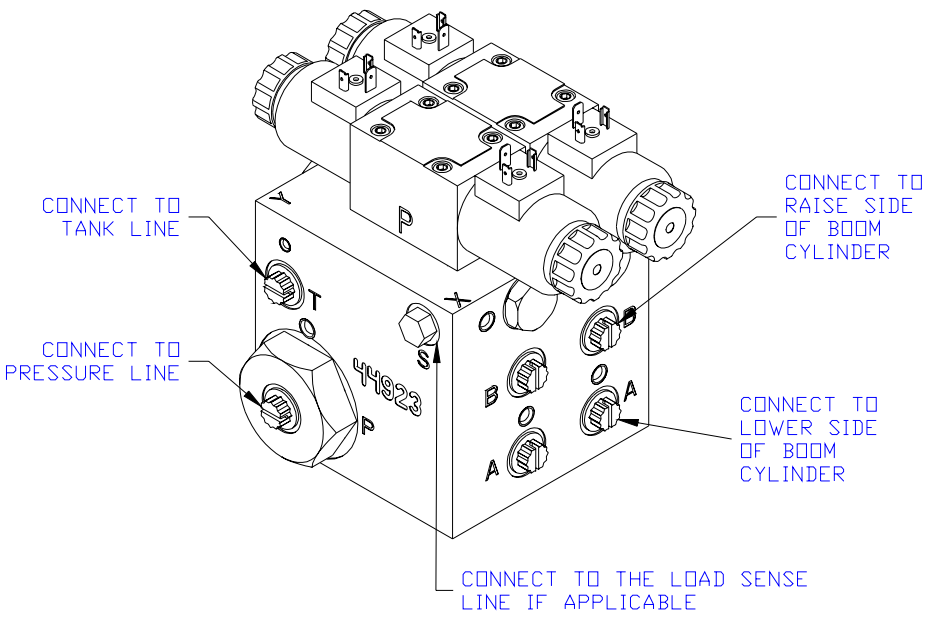


Figure 24 – NORAC Valve Block

2. At this point the sprayer hydraulic system must be identified as being single acting or dual acting. Refer to the appropriate section (**4.5.1.1** or **4.5.1.2**) for assembly details.

4.5.1.1 Dual Acting Assembly

1. Install the orifices (**Item H50**) into the "A" and "B" ports as shown in **Figure 25**. Install the "B" port orifices with **the notch facing outward** and "A" port orifices with **the notch facing inward**.

2. Install the 6MB-6MJ fittings (**Item H51**) into the ports and tighten to 18 ft-lbs.

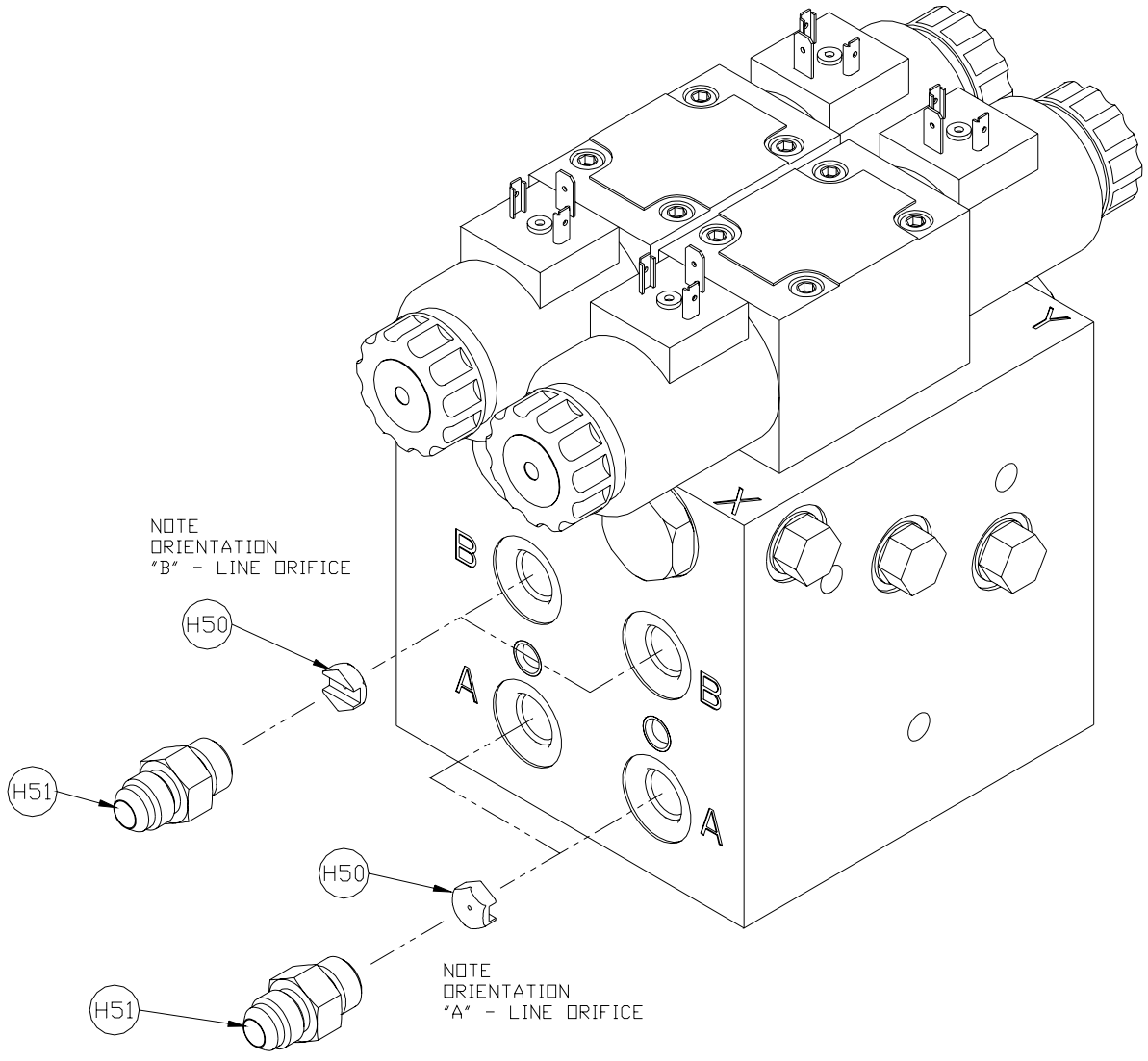


Figure 25 – Dual Acting Valve Block Port Assembly

4.5.1.2 Single Acting Assembly

1. Install the orifices (**Item H50**) into the "B" ports **with the notch facing outward** as shown in **Figure 26**. An O-ring pick can be used to ease installing the orifices into their locations.

2. Install the 6MB-6MJ fittings (**Item H51**) into the "B" ports and tighten to 18 ft-lbs.

3. Install the 6MBP plugs (**Item H52**) into the "A" ports and tighten to 18 ft-lbs.

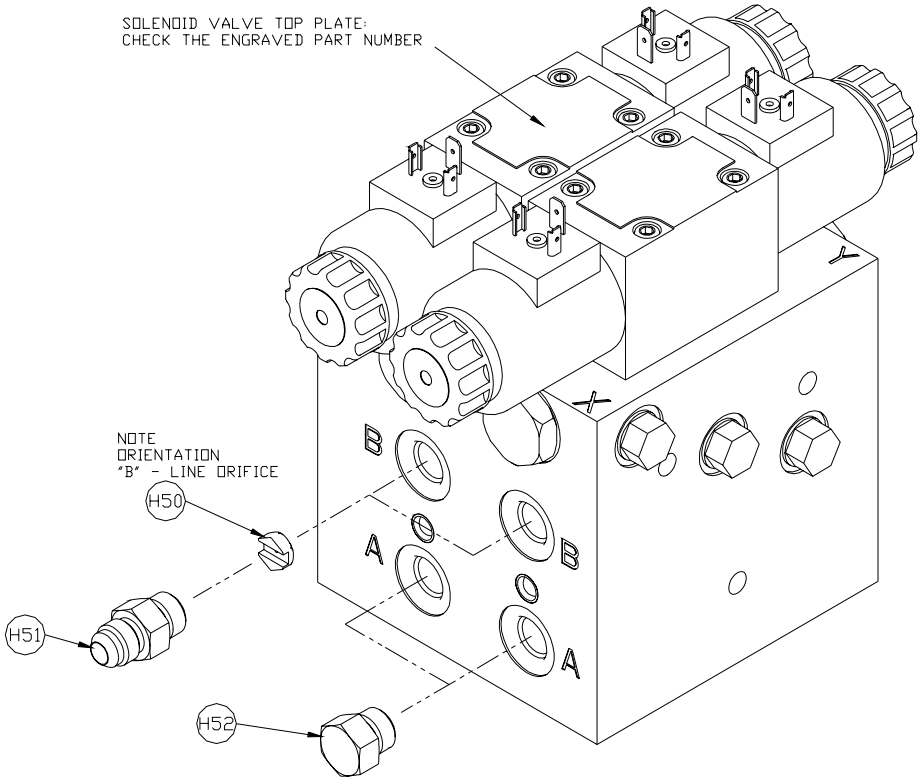


Figure 26 – Single Acting Valve Block Port Assembly

<u>IMPORTANT</u>:

Check the engraved part number on the top plate of the solenoid valves (Figure 26). If the number is "105723", proceed to Section 4.5.2 (page 30). STEP 4 through STEP 10 are required for all other pert numbers.

4. Assemble the Single Acting Sandwich Block (**Item H53**). Remove the 2 solenoid valves from the top of the valve block by removing the 4 Hex Socket Cap Screws from each valve and discard these 2" long bolts (**Figure 27**).

5. Coat the top and bottom of the sandwich block in clean hydraulic oil.

6. Install the 4 O-rings into the bottom of the sandwich block.

7. Place the sandwich onto the valve block with the O-rings facing downward.

8. Align the sandwich with the alignment holes. The “A” stamped into the sandwich faces the port side of the valve block.

9. Place the solenoid valves on top of each sandwich and install the 2-1/2" long bolts supplied with the sandwich.

10. Tighten the bolts in a corner to corner pattern to 31 in-lbs. Finish tightening the bolts in a circular pattern and torque the bolts to 62 in-lbs.

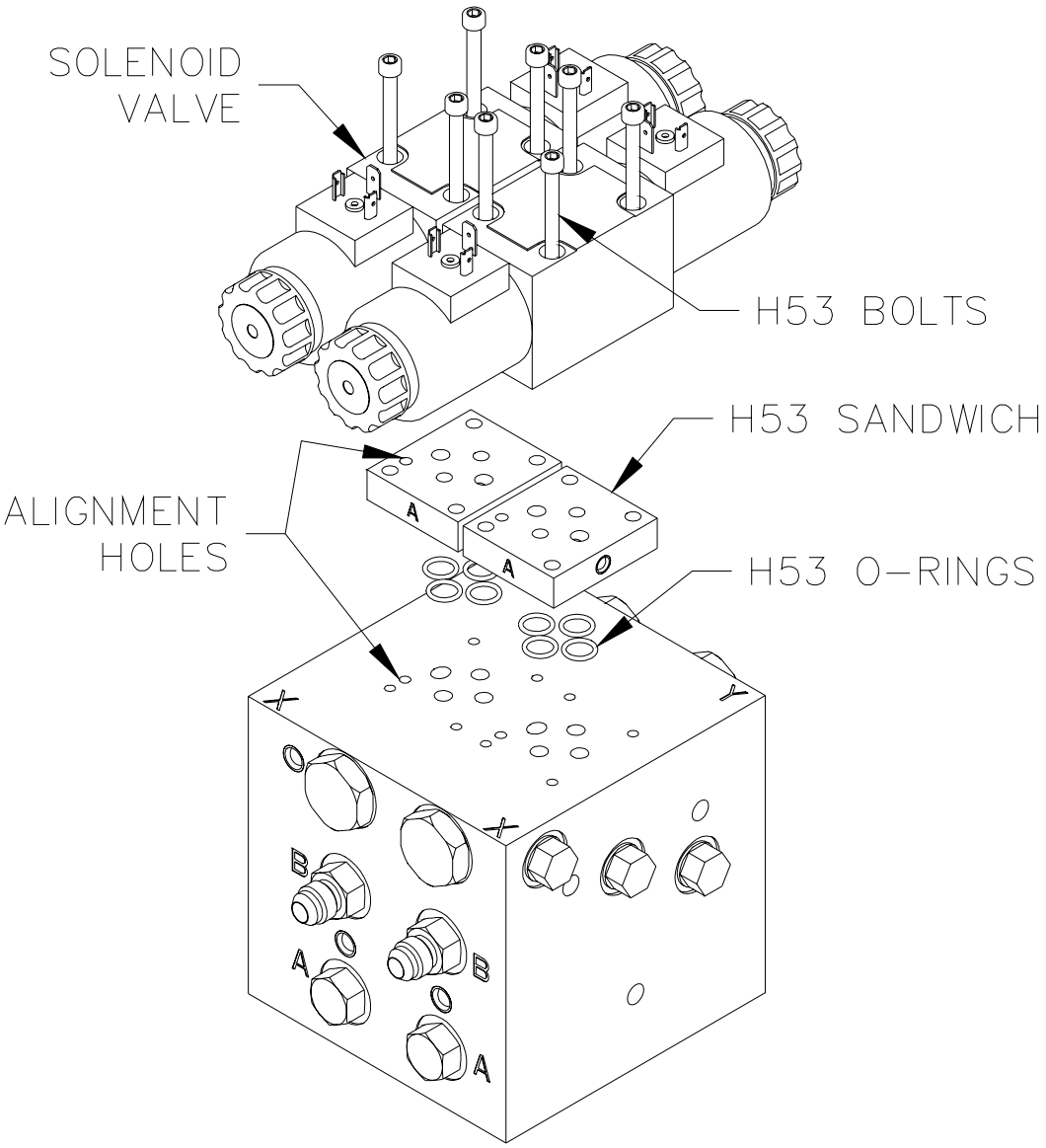


Figure 27 – Sandwich Block Installation

4.5.2 Valve Mounting

Mount the NORAC valve (**Item V1**) using the mounting flat, bolts, and lock washers (**Item B10**, **Item M11**, and **Item M12**) to bolt around the square tube on the sprayer (**Figure 28**). The bolts should thread into the valve block at least 3/8". The valve mounting holes are drill and tap 3/8 NC- 1" deep. The rule of thumb for the valve mounting bolt length is 1-1/2" longer than the tube size.

NOTE: You must ensure the valve manifold, solenoids, and hoses will not interfere with any moving parts of the sprayer. Also, you must ensure proper routing of the hoses such that they will not be pulled tight at any time.

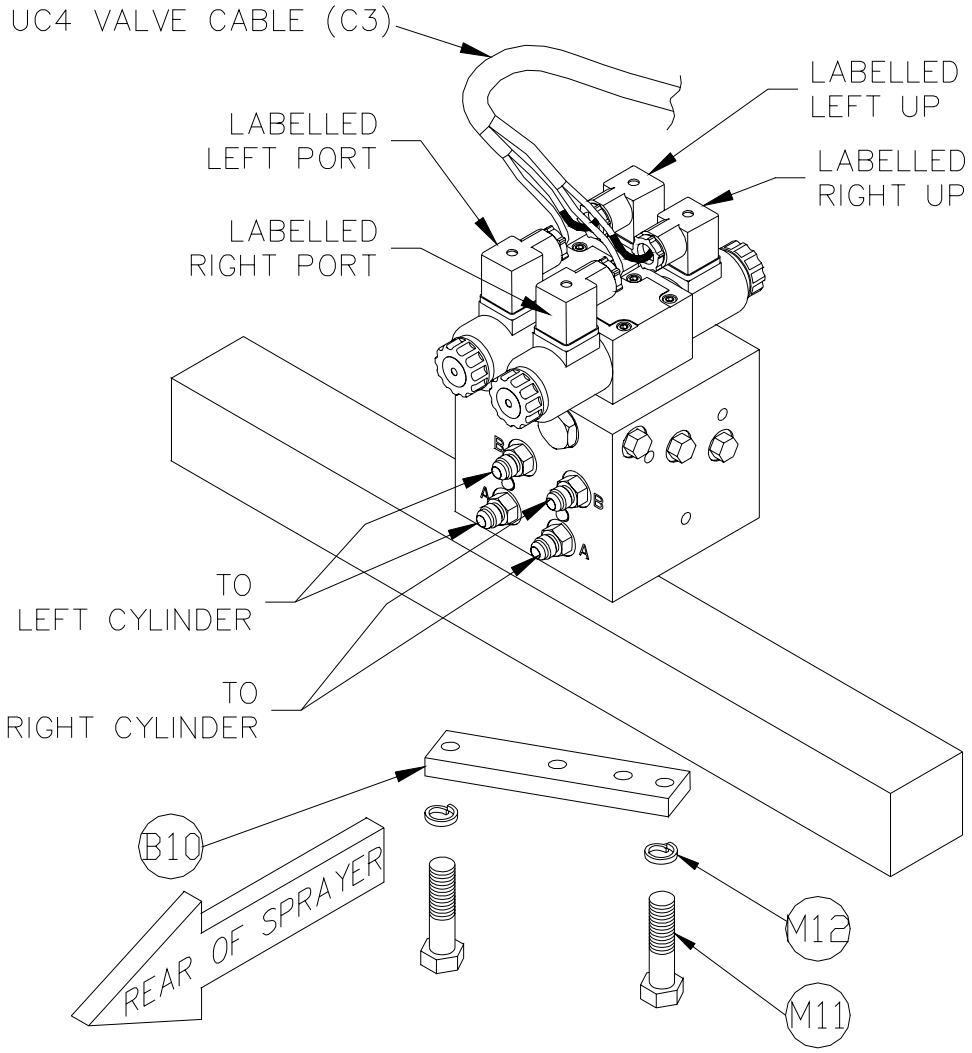


Figure 28 – Valve Block Mounting Location

4.5.3 Hydraulic Plumbing

⚠ WARNING!

The hydraulic system creates very high pressure that can injure. Before disconnecting any hydraulic lines ensure that all pressure has been bled from the system. When changing the boom hydraulic hoses leave the booms in the TRANSPORT POSITION.

NOTE: From this point in the installation the booms will be inoperative until the electronics are fully installed.

After the valves are mounted on the sprayer, the hydraulic hoses and fittings can be installed (plumbed). The plumbing for the typical hydraulic circuit is shown schematically in **Figure 6** or **Figure 8**.

NOTE: Do NOT remove the fittings installed in the NORAC valve block in Section 4.5.1. Any adapting required must be done after these components.

NOTE: You must ensure there are no other orifices present in the circuit between the NORAC valve block and the boom cylinders.

4.5.3.1 Hydraulic Plumbing: Electrically Teed Installation

1. Follow **Figure 6** to plumb the hydraulic components (**Items H1 – H3**: customer supplied).

2. Tee in pressure ("P") and tank ("T") lines to the NORAC valve block with **Items H1** and **H2**.

3. The existing hoses that run to the boom tilt cylinders should be disconnected from the sprayer valve block and reconnected to the NORAC valve block.

    a. The "raise" lines from the side of the boom tilt cylinders, which raise the booms, must be connected to the "B" ports of the NORAC valve block. The ports on the sprayer block must then be plugged/capped with **Item H3**.

    b. If the sprayer is Dual Acting, the "A" ports of the NORAC block must be connected to the "lower" lines of the cylinders. The ports on the sprayer block must then be plugged/capped with **H3**.

    c. If the sprayer is Single Acting, the "A" ports on the NORAC block are plugged (**Section 4.5.1.2**). The "lower" lines of the cylinders can remain attached to the sprayer valve block.

4.5.3.2 Hydraulic Plumbing: Hydraulically Teed Installation

1. Follow **Figure 8** to plumb the hydraulic components (**Items H1 – H4**: customer supplied).

2. Tee in the pressure ("P") and tank ("T") lines to the NORAC valve block with **Items H1** and **H2**.

3. The existing hoses that run to the boom tilt cylinders should be disconnected from the sprayer valve block and teed in to the NORAC valve block with **Items H3** and **H4**.

    a. The "raise" lines from the side of the cylinders, which raise the booms, must be connected to the "B" ports of the NORAC valve block. Insert **H3** to the sprayer block and reconnect the "raise" lines. Connect **H4** to the open port on **H3** and the "B" ports of the NORAC block.

    b. If the sprayer is Dual Acting, the "A" ports of the NORAC block must be connected to the "lower" lines of the cylinders. Insert **H3** to the sprayer block and reconnect the "lower" lines. Connect **H4** to the open port on **H3** and the "A" ports of the NORAC block.

    c. If the sprayer is Single Acting, the "A" ports on the NORAC block are plugged (**Section 4.5.1.2**). The "lower" lines of the cylinders can remain attached to the sprayer valve block.

4.6 ELECTRICAL INSTALLATION

NOTE: While installing the electrical parts of the system you may need to refer to Section 5 for identification of cables and connectors.

4.6.1 Control Panel Mounting

Install the UC4 Control Panel (**Item E1**) in the cab of the sprayer with the supplied mounting bracket. Mount the panel where it will be clearly visible and within easy reach of the operator. The location must facilitate connecting the UC4 power cable (**Item C10**) to the bottom of the UC4 Control Panel.

Generally, a good spot to mount the UC4 Control Panel is on the right hand side of the cab to the ROP (Roll Over Protection) Bar. Four pilot holes for the screws provided need to be drilled to facilitate the mounting of the control panel.

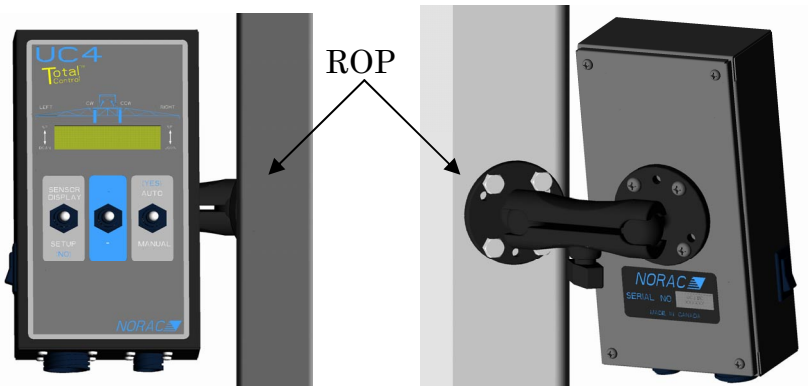


Figure 29 – Control Panel Mounting

NOTE: Sometimes it is convenient to fabricate a bracket of some sort to mount the panel. Figure 30 shows an example using an angled bracket.



Figure 30 – Mounting the Control Panel with a Bracket

4.6.2 Cable Installation

4.6.2.1 Inside Cab

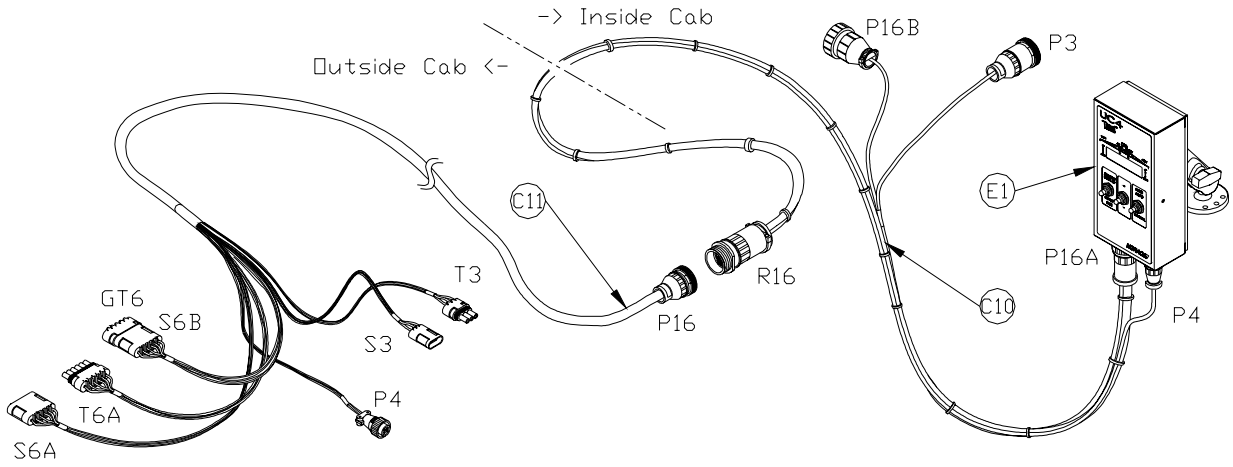


Figure 31 – Cable Configurations: C10 and C11

1. Connect the UC4 power cable (**Item C10**) to the UC4 Control Panel in the sprayer cab. Ensure that both plugs (**P16A** and **P4**) are connected to the panel (**Figure 31**).

   NOTE: Ensure the UC4 control panel's power is OFF for the remaining installation (Bottom of switch pressed IN). Use caution when handling the 12 V power line of the sprayer wiring.

2. Connect the 3-pin AMP connector (**P3**) of **C10** to an auxiliary power connection inside the cab. If an appropriate connector can not be found, it may be necessary to cut off the connector(s) and splice into the existing wiring.

   NOTE: For a clean connection to the 12 V power supply, NORAC provides optional power interface cables. Please see Appendix A for details.

3. For Electrically Teed Installation, please read **Section 4.6.3**.

4. Route the receptacle end (**R16**) of **C10** to the exterior of the cab.

5. Connect the 16-pin AMP plug (**P16**) of the valve extension cable (**Item C11**) to **R16** of **C10** (**Figure 31**).

   NOTE: For a pull type sprayer, connect at the hitch. This connection will provide your hitch disconnect.

4.6.2.2 Outside Cab

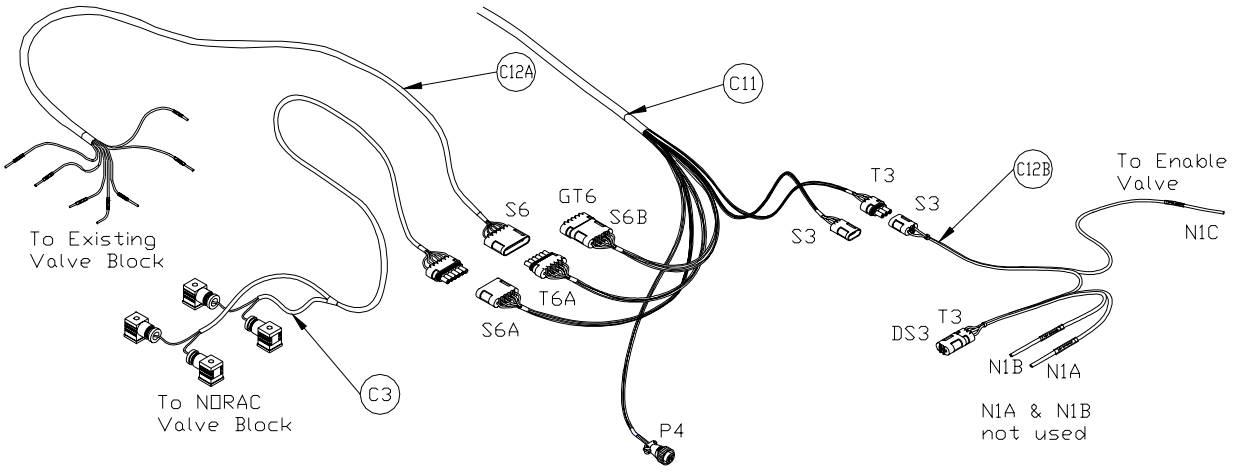


Figure 32 – Cable Configurattions: Electrically Teed Installation

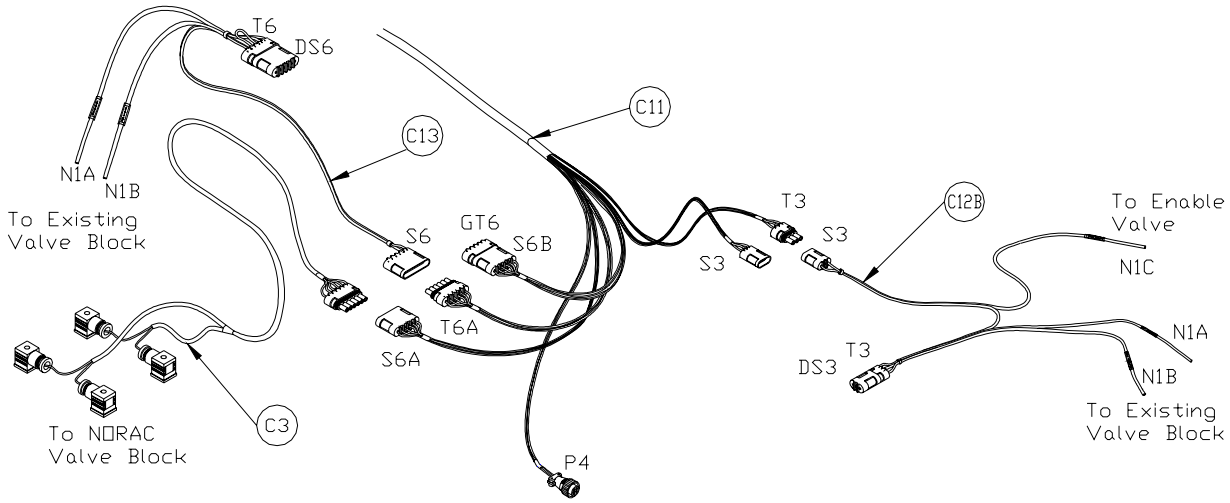


Figure 33 – Cable Configurations: Hydraulically Teed Installation

1. Route **C11** to the rear of the sprayer near the vicinity of the sprayer valve block.

2. For Electrically Teed Installation, please read **Section 4.6.3**. For Hydraulically Teed Installation, please read **Section 4.6.4**.

3. Connect the 6-pin Tower on the valve cable (**Item C3**) to the mating 6-pin Shroud (**S6A**) on **C11** (**Figure 32 / Figure 33**).

4. Install the square DIN connectors from **C3** onto each NORAC valve as shown in **Figure 34**. The connectors on **C3** are marked **RIGHT UP, LEFT UP, RIGHT PORT** ("right down"), and **LEFT PORT** ("left down"). Fasten with the included rubber seals and screws. Ensure that the cables are oriented as

shown, with the cable labels **RIGHT PORT** and **LEFT PORT** on the SAME side as the hydraulic hoses (the "port-side" of the block).

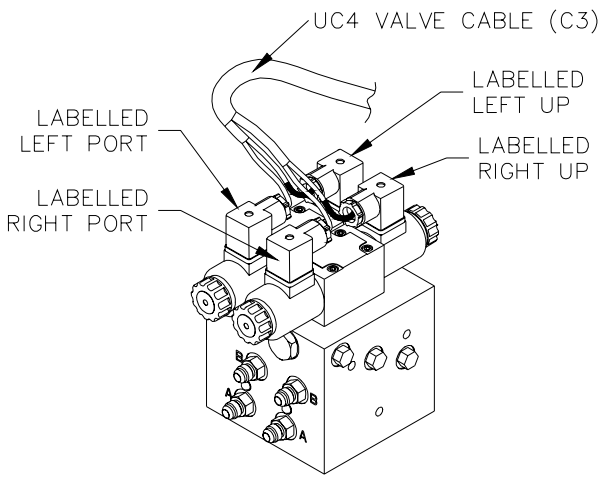


Figure 34 – Valve Cable Connections

5. Connect the sensor branch cable (**Item C2**) to the 4-pin AMP plug (**P4**) on **C11** (**Figure 35**).

6. If not done already, route **C2** out to the wing and main sensors. Connect them using the 4-pin AMP connectors. Follow existing cables and/or hydraulic lines along the boom.

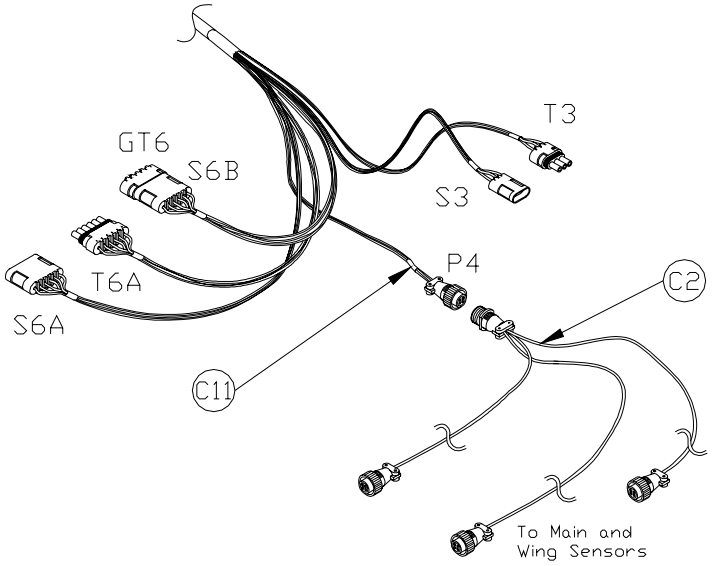


Figure 35 – Cable Configurations: C11 and C2

7. Cable-tie (**Items M3** and/or **M2**) the installed cables every 12 inches.

⚠ **IMPORTANT:**

Provide enough slack in the valve extension cable (Item C11), interface cables (Items C12A, C12B, and/or C13), valve cable (Item C3) and sensor branch cable (Item C2), to account for the movement of the main section, parallel lift, and FOLDING boom movement.

4.6.3 Cable Installation: Electrically Teed Installation

For Electrically Teed Installation, there are two different methods of cable installation to tee in to the sprayer's control system. The first is teeing the NORAC system in to the sprayer's wiring inside the cab (**Section 4.6.3.1**). The second is teeing the NORAC system in to the sprayer's wiring at the valve block (**Section 4.6.3.2**). Choose one of the two methods, whichever is suitable for your sprayer.

4.6.3.1 Cable Connections Inside Cab

1. Connect the 16-pin AMP plug (**P16B**) of **C10** to the 16-pin AMP receptacle (**R16**) of **C15** (**Figure 36**).
2. Strip the cable jacket of the pigtail (**N15**) on **C15**.

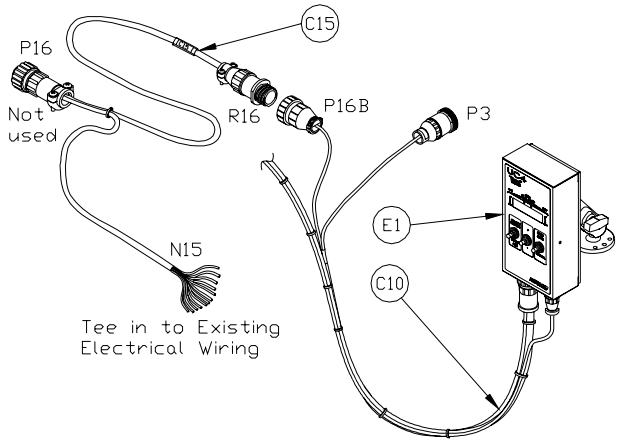


Figure 36 – Cable configurations: C10 and C15

3. Splice the wires (**N15**) of **C15** into the existing wiring to tee in to appropriate functions of the sprayer's control system. The wire colors and functions are shown in **Table 5**. Some wires may not be used for this installation. Before connecting the wire of **N15**, check each sprayer wire you will be splicing to.

Table 5 – N15: Wire Colors and Functions

COLOR	FUNCTION
Green / White	**Main Up**
Blue / White	**Main Down**
Green	**Left Up**
White	**Left Down**
Green / Black	**Right Up**
White / Black	**Right Down**
Orange / Black	**Bypass**
Blue	Remote Manual
Blue / Black	Remote Auto
Orange	Motion Inhibit
Red / White	Bias Down
Red / Black	12 V
Black	Bias Up
Red	N/A
Black / White	N/A

4. Disconnect the electrical connections of the left/right boom tilt functions: Left Up, Left Down, Right Up and Right Down, from the sprayer's existing valves.

4.6.3.2 Cable Connections at Valve Block

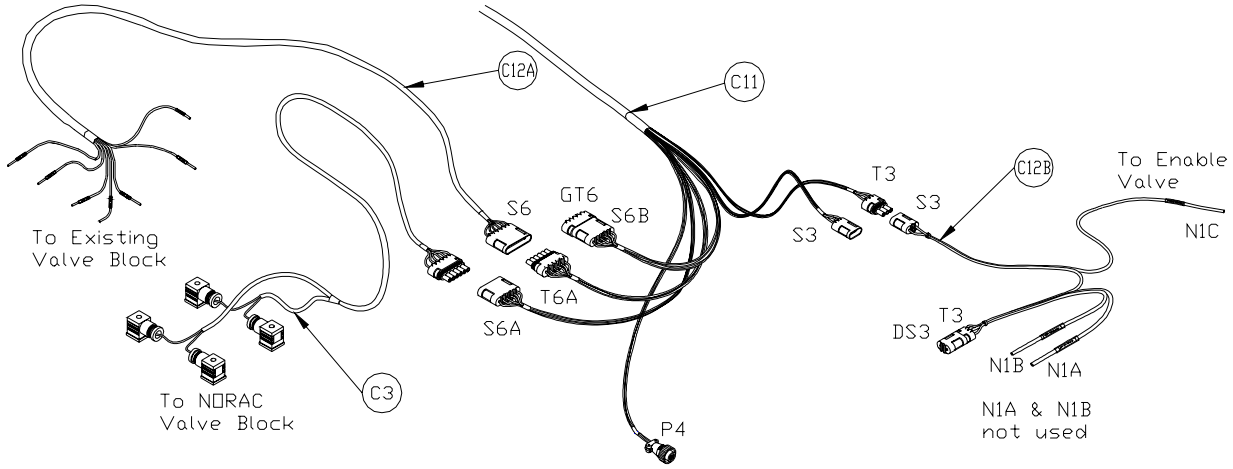


Figure 37 – Cable Configurations: Electrically Teed Installation

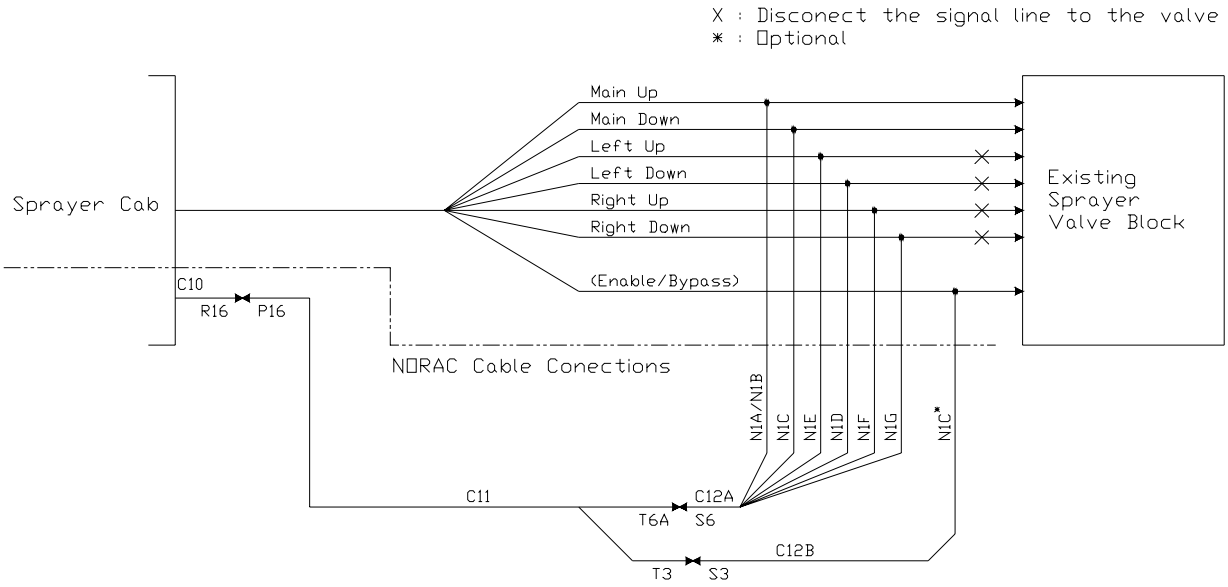


Figure 38 – Schematic Diagram: Electrically Teed Installation

1. Connect the 6-pin Shroud (**S6**) on the generic interface cable (**C12A**) to the mating 6-pin Tower (**T6A**) on **C11**.

2. If there is an enable valve on the sprayer block, connect 3-pin Shroud (**S3**) of **C12B** to the mating 3-pin Tower (**T3**) on **C11**.

3. Route the free end(s) of **C12A** (and **C12B**) to the existing valve block.

4. Splice the loose wires of **C12A** (and **N1C** of **C12B**) into the existing wiring to tee in to appropriate functions of the sprayer's control system. Each function is labeled on the wire of NORAC cables. Check each sprayer wire you will be

splicing to before connecting the wires. **Figure 38** is the typical schematic diagram of cable connections for Electrically Teed Installation.

NOTE: N1A and N1B of C12B are not used for this installation.

5. Disconnect the electrical connections of the left/right boom tilt functions: Left Up, Left Down, Right Up and Right Down, from the sprayer's existing valves.

4.6.4 Cable Installation: Hydraulically Teed Installation

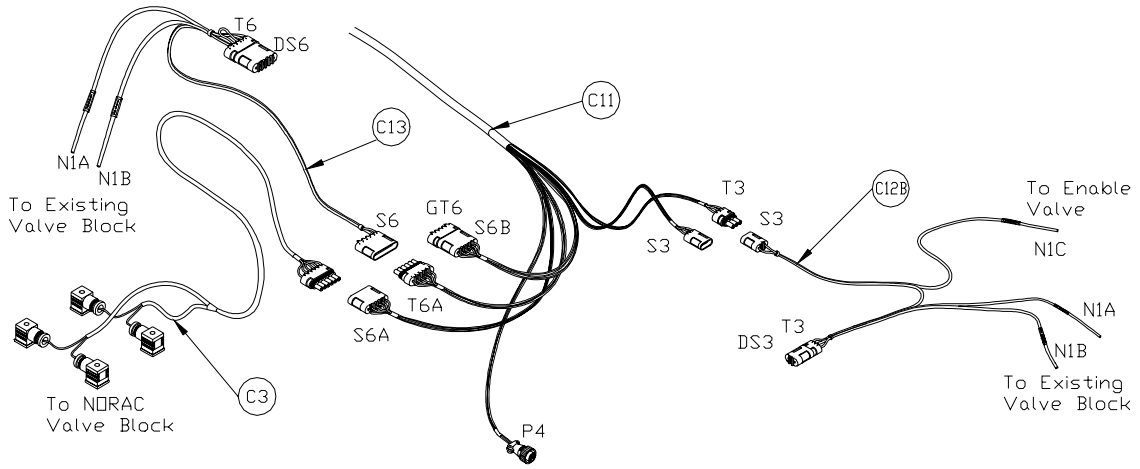


Figure 39 – Cable Configurations: Hydraulically Teed Installation

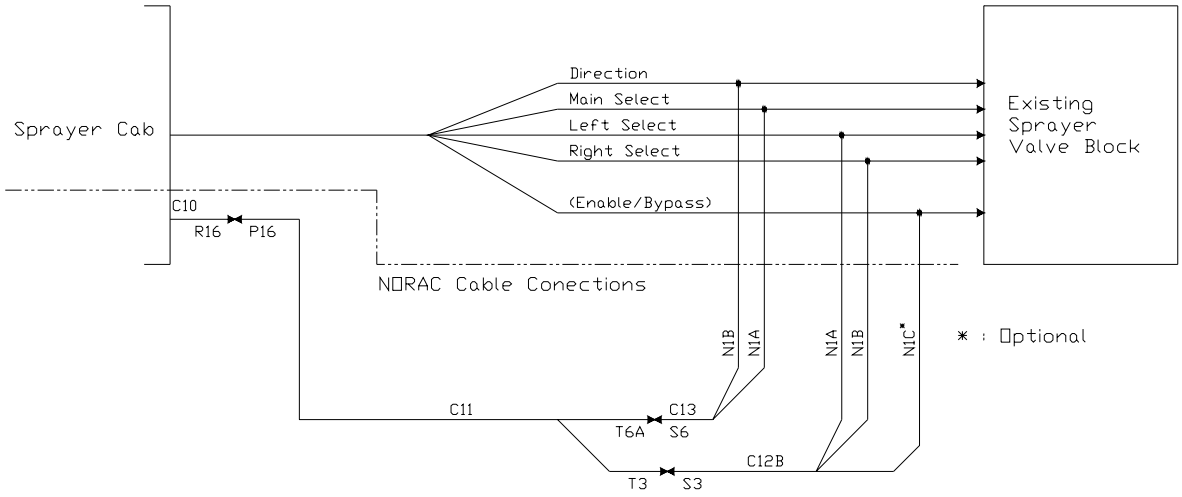


Figure 40 – Schematic Diagram: Hydraulically Teed Installation

1. Connect the 6-pin Shroud (**S6**) on the generic main interface cable (**C13**) to the mating 6-pin Tower (**T6A**) on **C11**.

2. Connect 3-pin Shroud (**S3**) of **C12B** to the mating 3-pin Tower (**T3**) on **C11**.

3. Route the free ends of **C12A** and **C12B** to the existing valve block.

4. Splice the loose wires of **C12A** and of **C12B** into the existing wiring to tee in to appropriate functions of the sprayer's control system. Each function is labeled on the wire of NORAC cables. Check each sprayer wire you will be splicing to before connecting the wires. **Figure 40** is the typical schematic diagram of cable connections for Hydraulically Teed Installation.

4.7 COMPLETING THE INSTALLATION

1. Start up your sprayer and test the functionality of the original manufacturer's boom controls. The NORAC Control Panel does not need to be powered up for the original switches to function. Unfold the booms and raise/lower each boom and main section. **Again confirm that the cabling/hoses are agreeable to the entire range of motion.**

2. If one or more of these functions do not work, review the hydraulic and electrical portions of this manual to check for proper installation. Also refer to **Section 5** in this manual for the electrical pin-outs of the NORAC cables. You can use this information to try to pinpoint where the problem is occurring. If you still have trouble, contact NORAC for assistance.

3. Turn on the power for the UC4 Control Panel using the switch on the side of its chassis. Ensure that the display lights up to confirm that the panel has proper +12 Volt power.

4. Repeat the Boom Speed Test as described in **Section 4.2 Boom Speed Test** with the NORAC UC4 System installed. Record the results for comparison in **Table 4**.

5. The procedure for the installation of the UC4 system is now complete. Begin the AUTOMATIC SYSTEM SETUP procedure as described in the **UC4 Total Control Automatic Boom Height Technical Manual** (**Item M1A**).

6. For a pull type sprayer, there should be very little play at the hitch clevis for optimal performance of the UC4 system. The addition of polymer washers can help tighten up this connection (**Figure 41**).

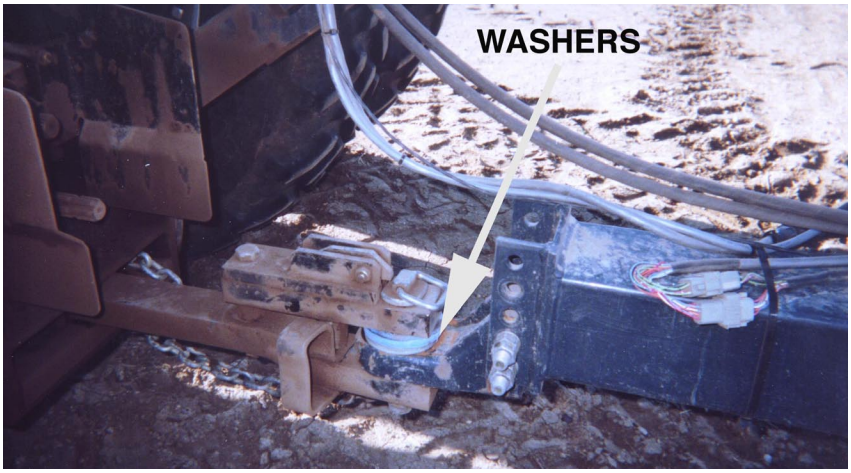


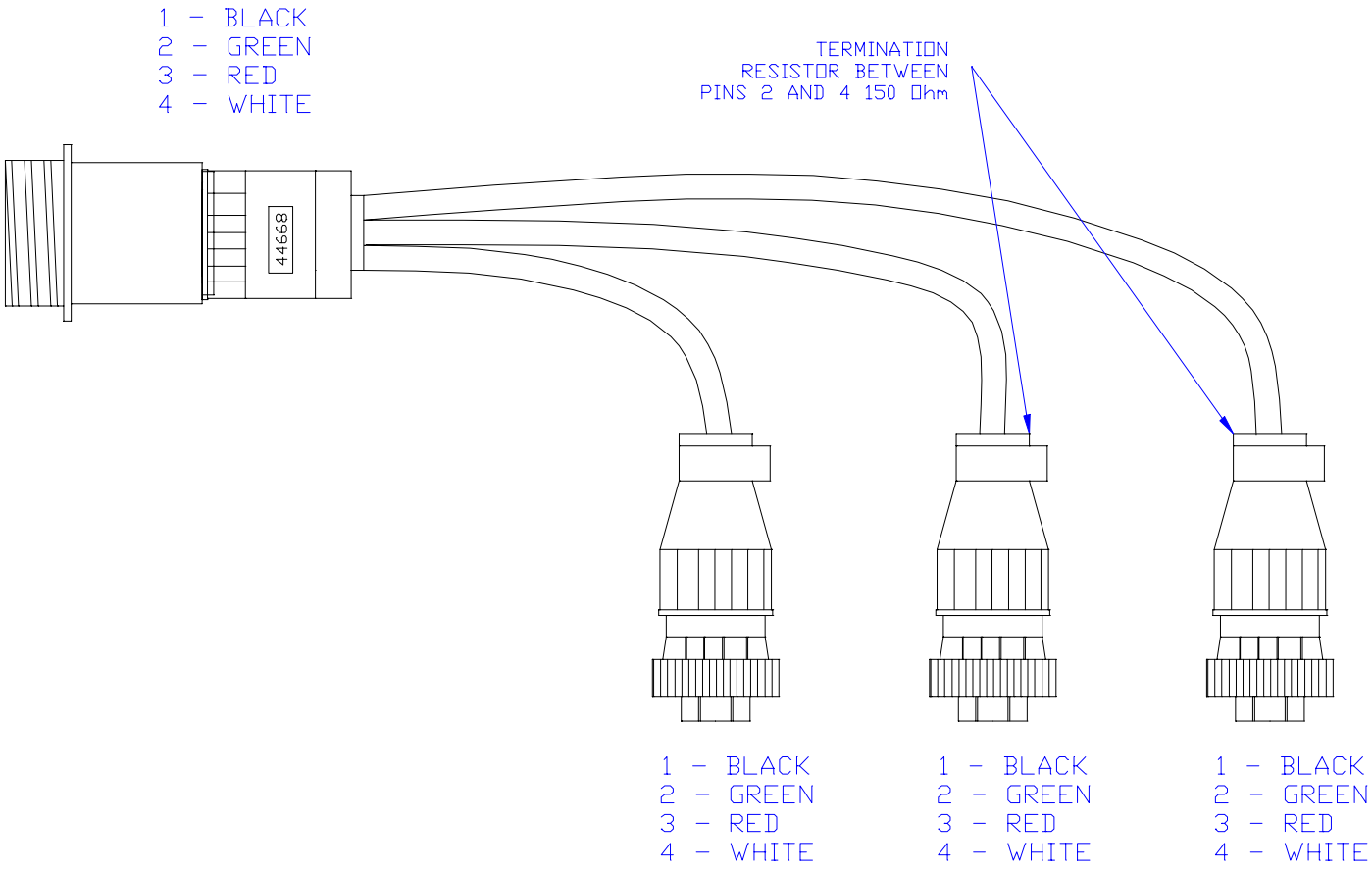
Figure 41 – Hitch Point

5 ELECTRICAL REFERENCE – CABLE DRAWINGS

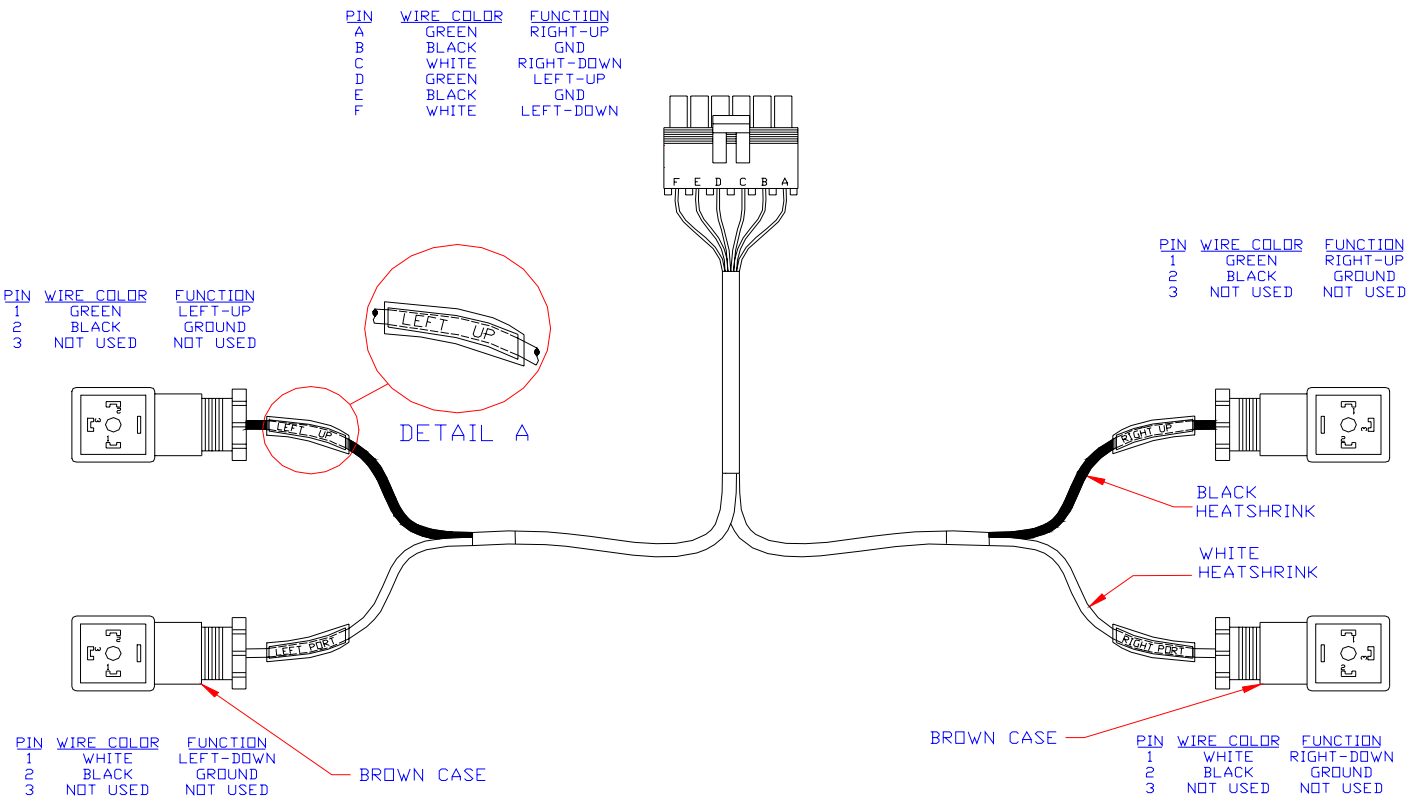
5.1 ITEM C1: 44662B – SENSOR TRUNK CABLE



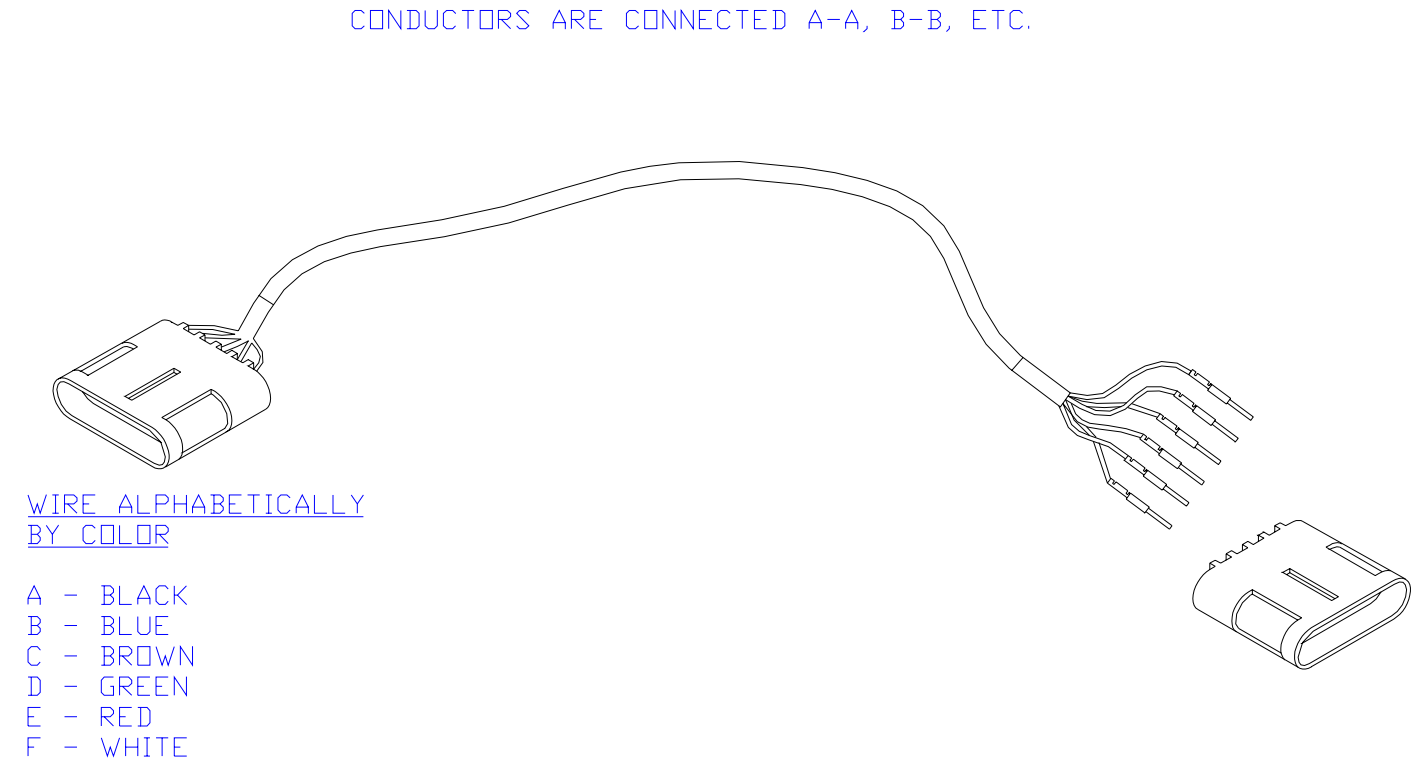
5.2 ITEM C2: 44668 – SENSOR BRANCH CABLE



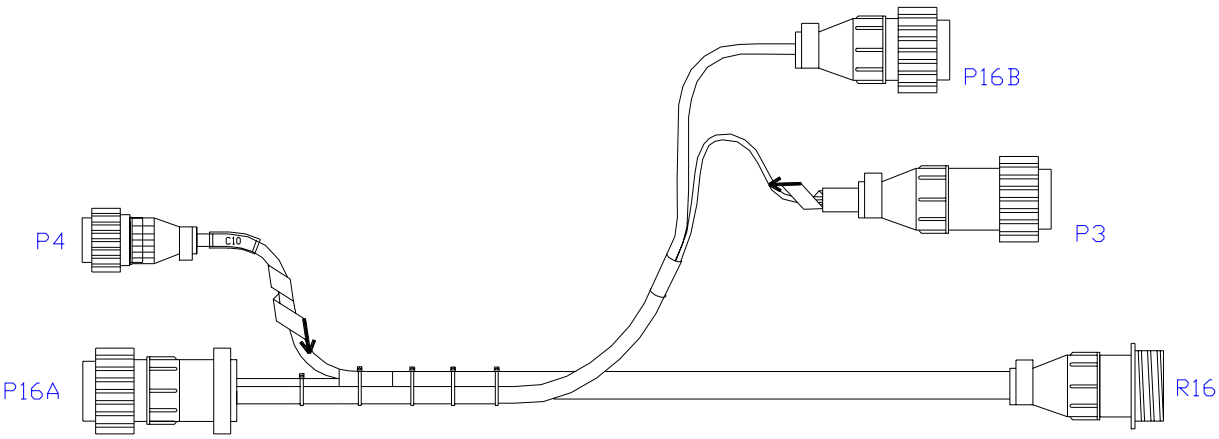
5.3 ITEM C3: 44656 – VALVE CABLE (VARIABLE RATE)

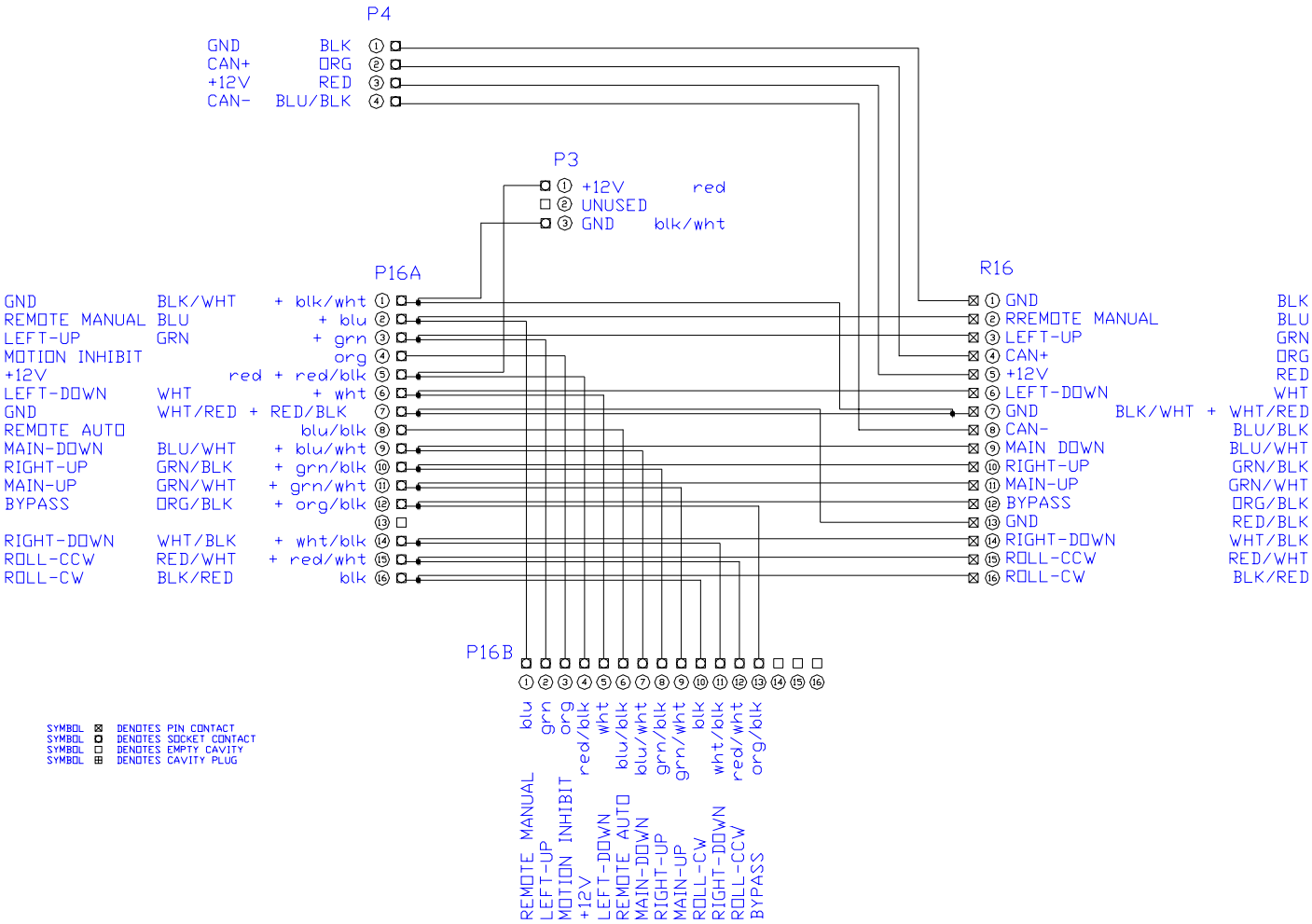


5.4 ITEM C4: 44651 – VALVE EXTENSION CABLE

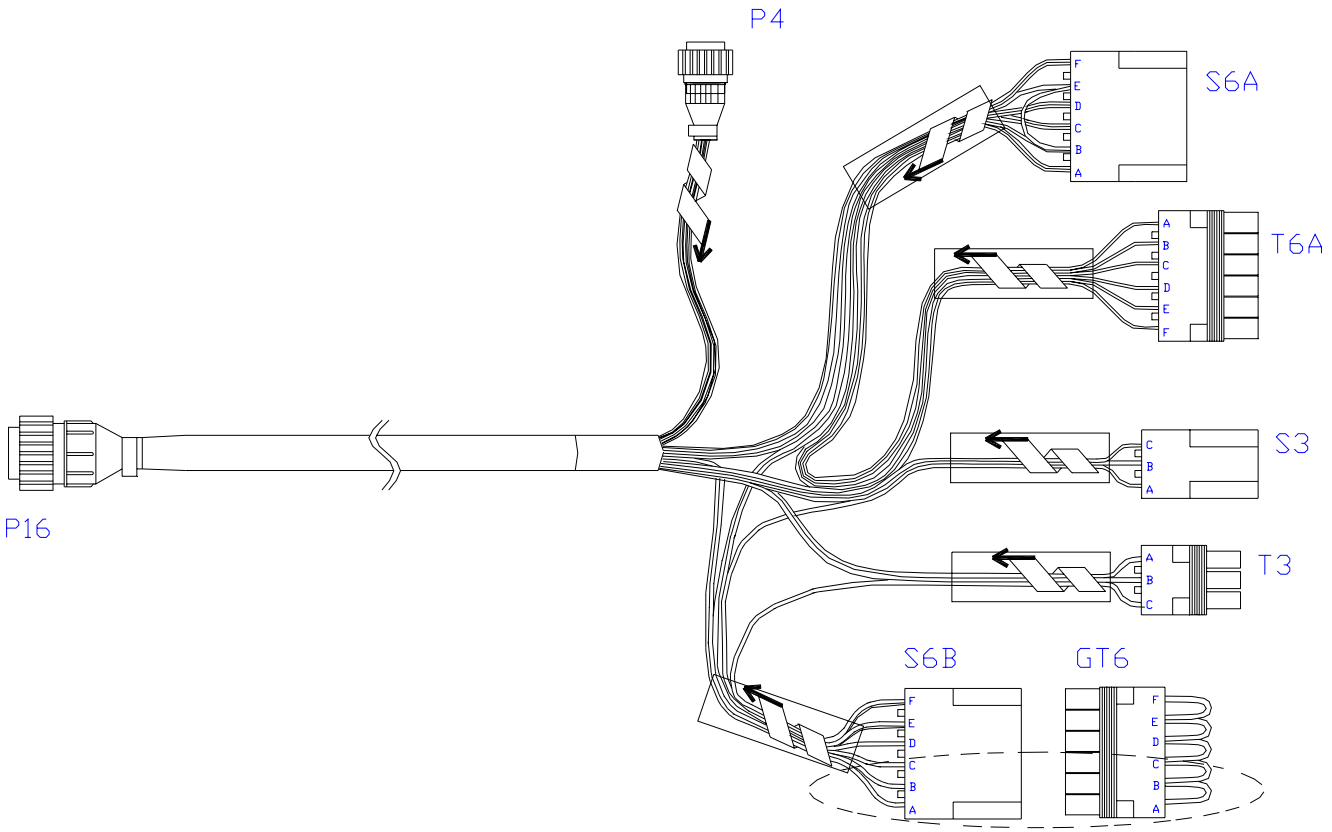


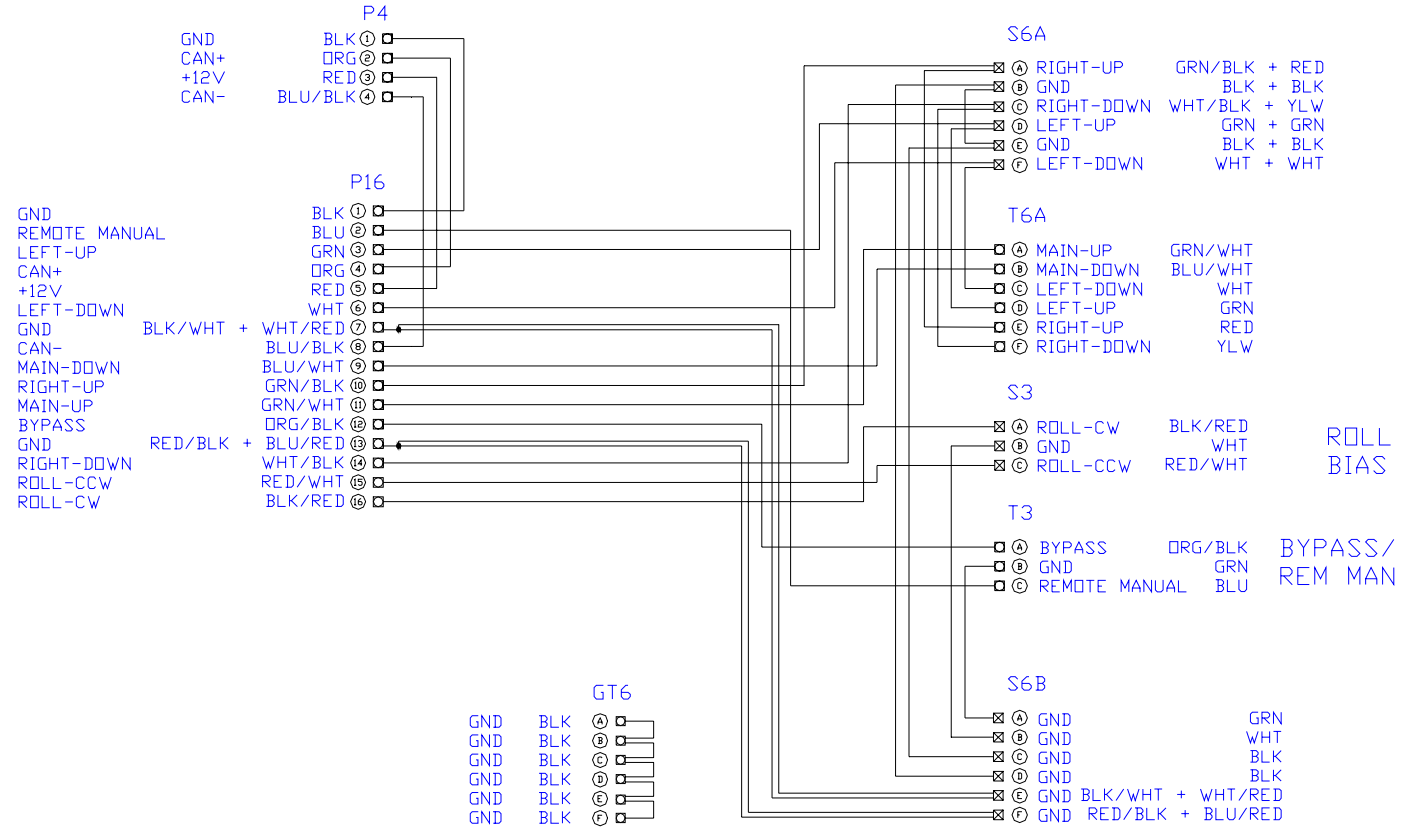
5.5 ITEM C10: 44658-39 – POWER CABLE GENERIC SELF – PROPELLED



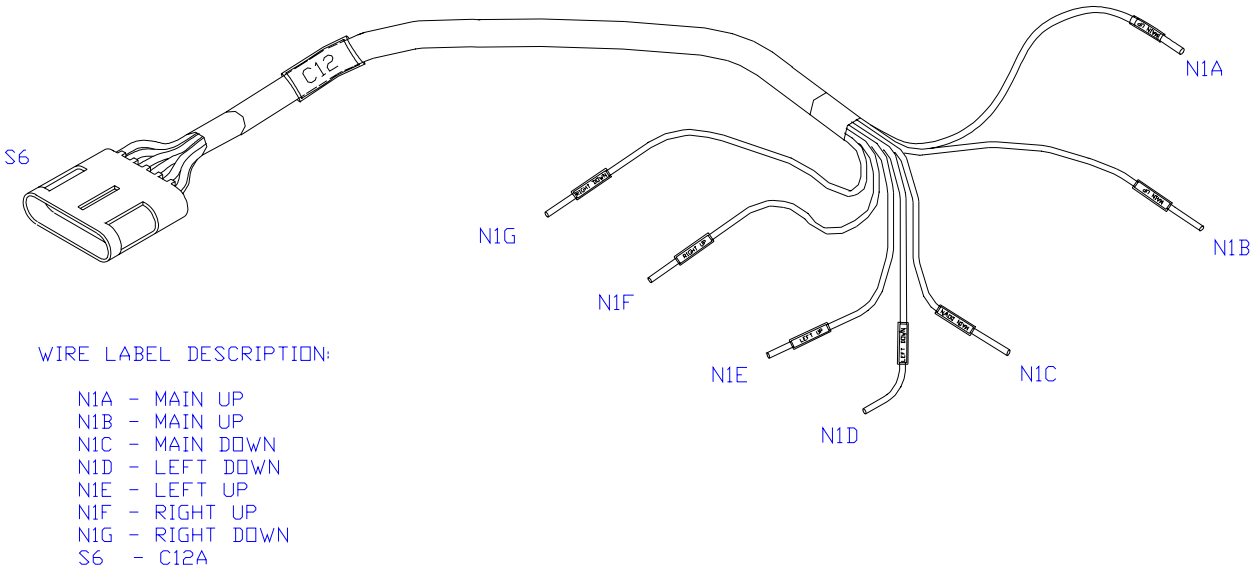


5.6 ITEM C11: 44651-03 – EXTENSION CABLE VALVE GENERIC



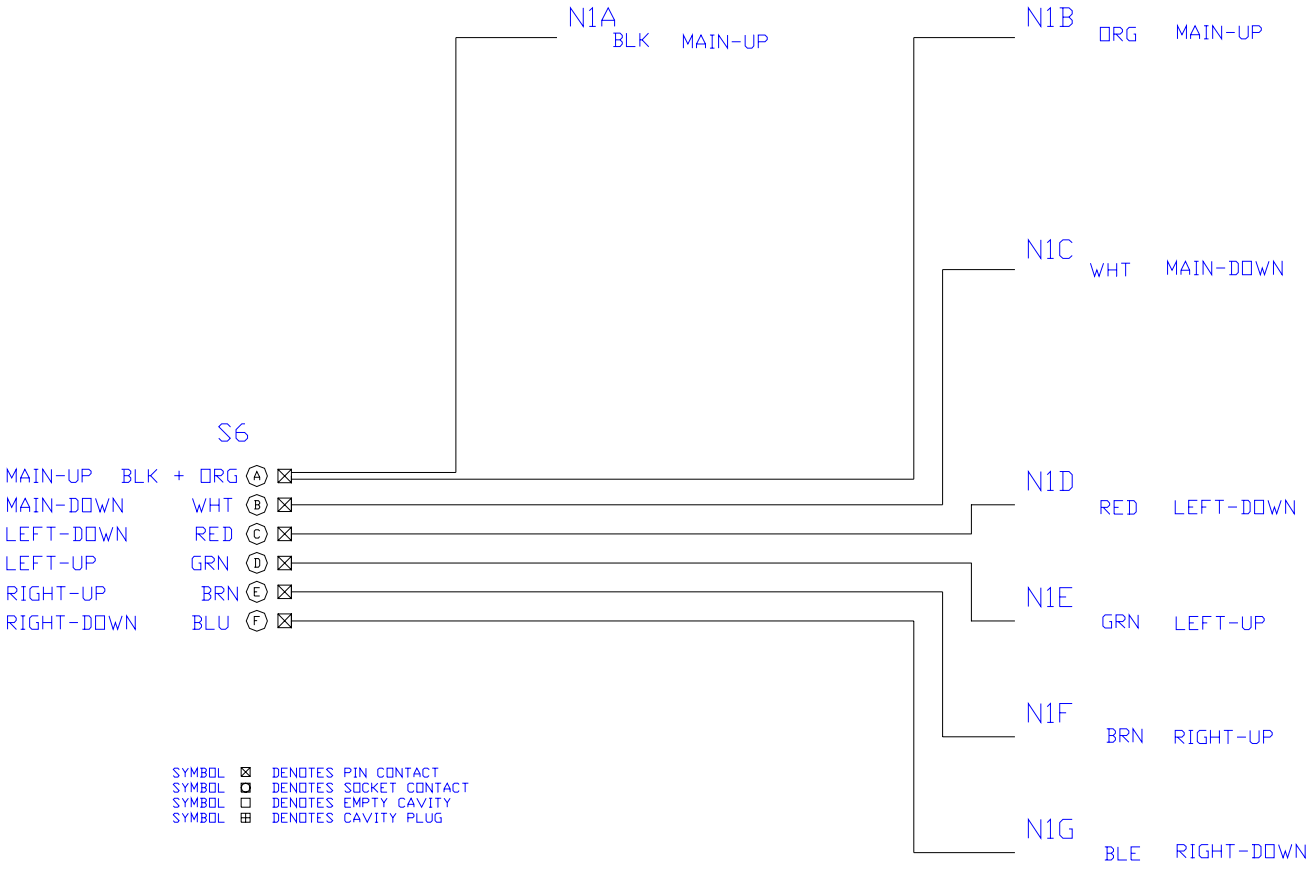


5.7 ITEM C12A: 44658-35 – GENERIC INTERFACE CABLE GND2

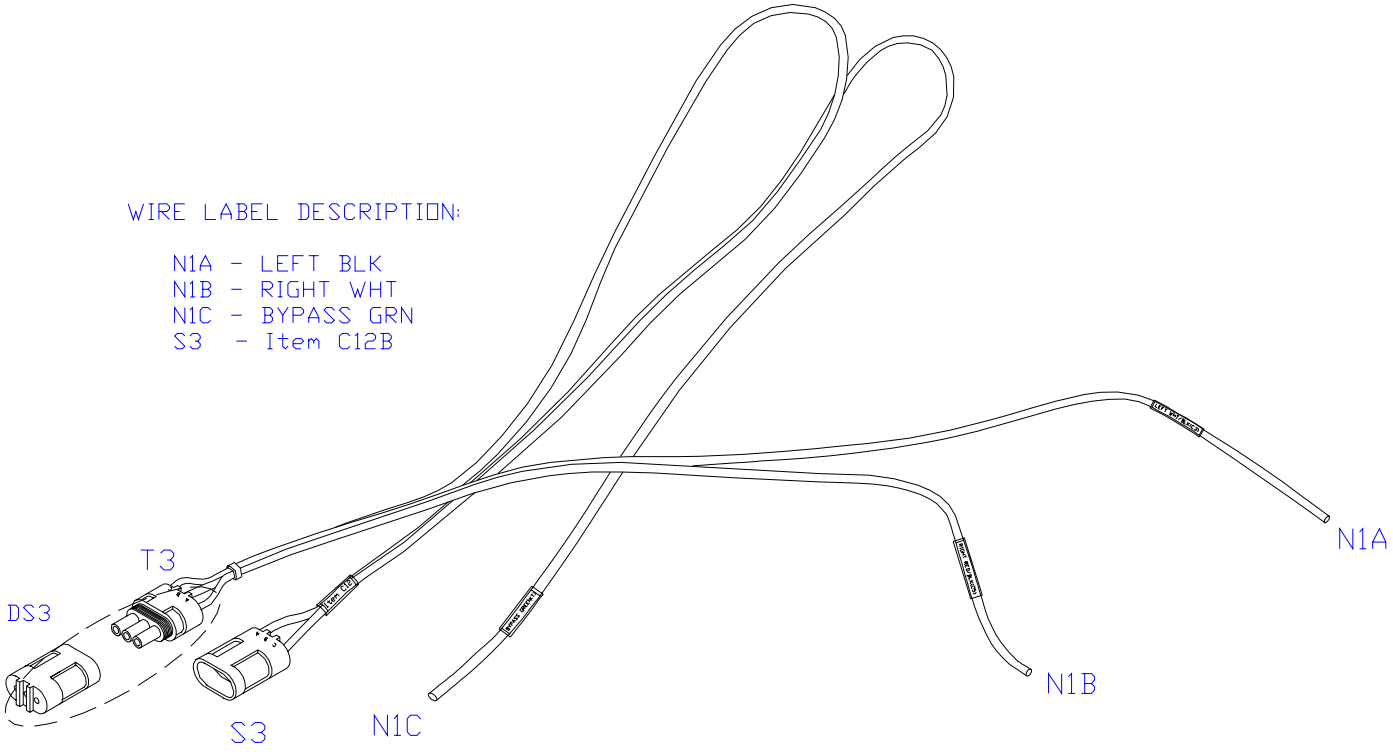


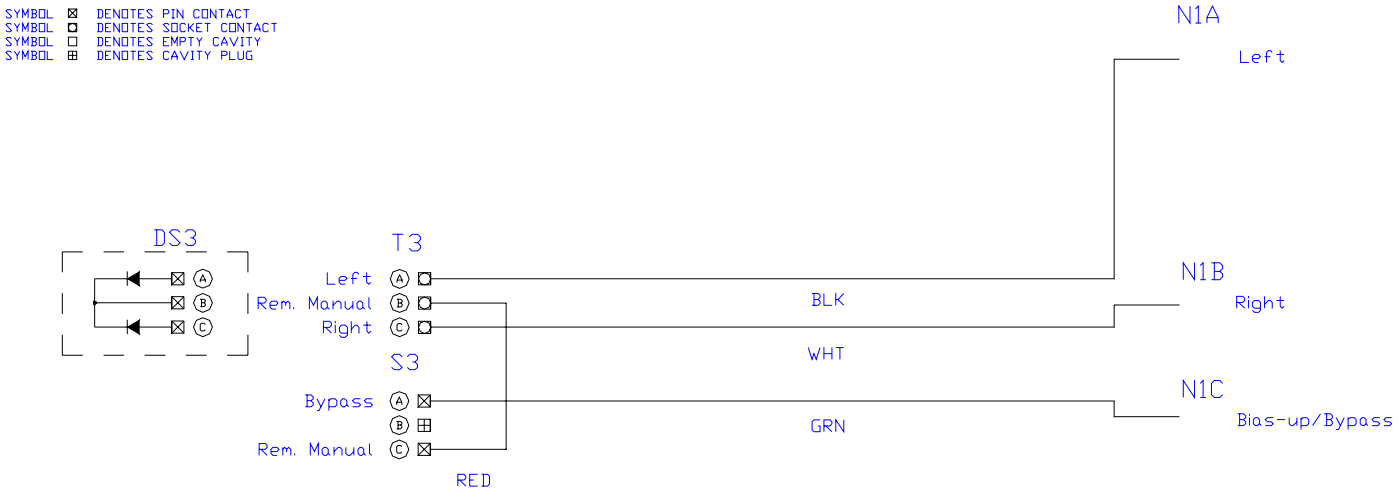
WIRE LABEL DESCRIPTION:

N1A - MAIN UP
N1B - MAIN UP
N1C - MAIN DOWN
N1D - LEFT DOWN
N1E - LEFT UP
N1F - RIGHT UP
N1G - RIGHT DOWN
S6 - C12A

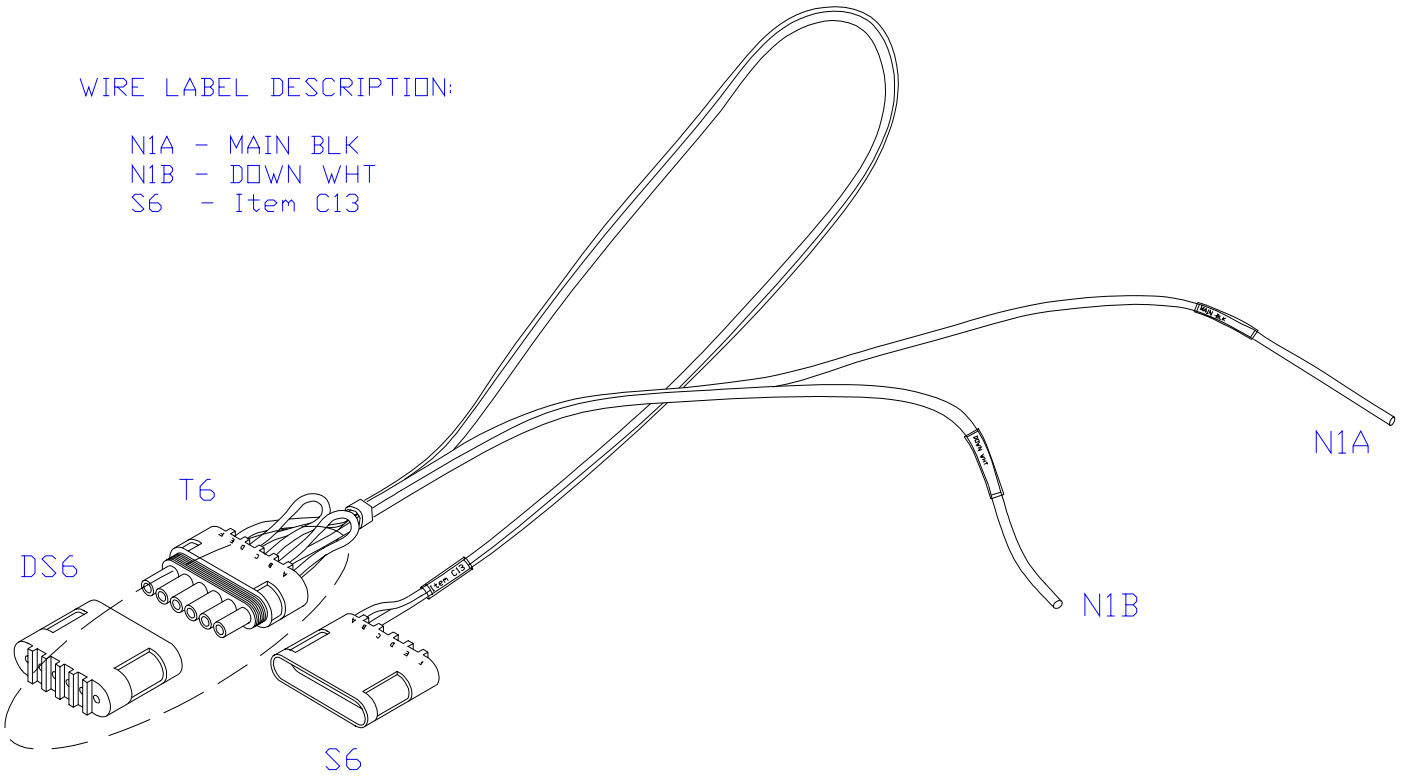


5.8 ITEM C12B: 44658-36 – GENERIC WING INTERFACE CABLE

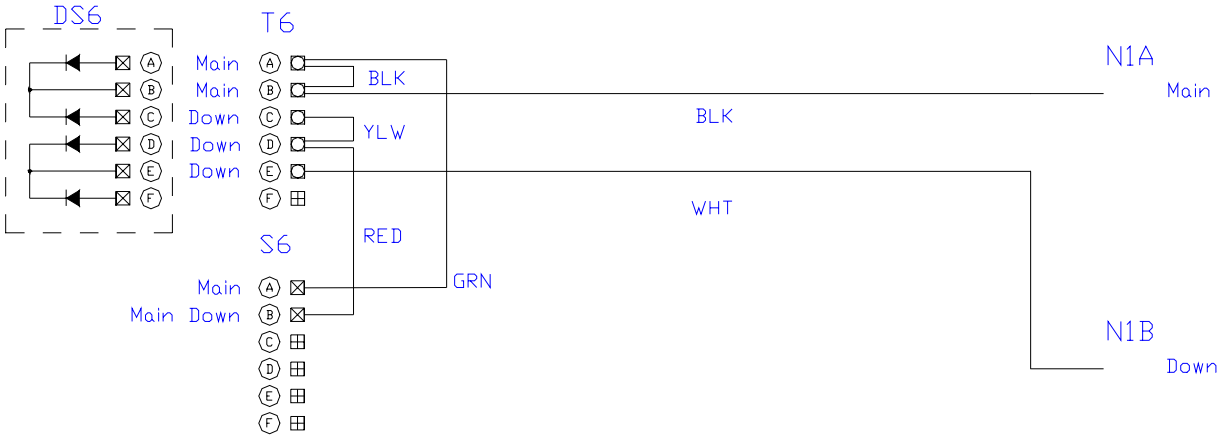




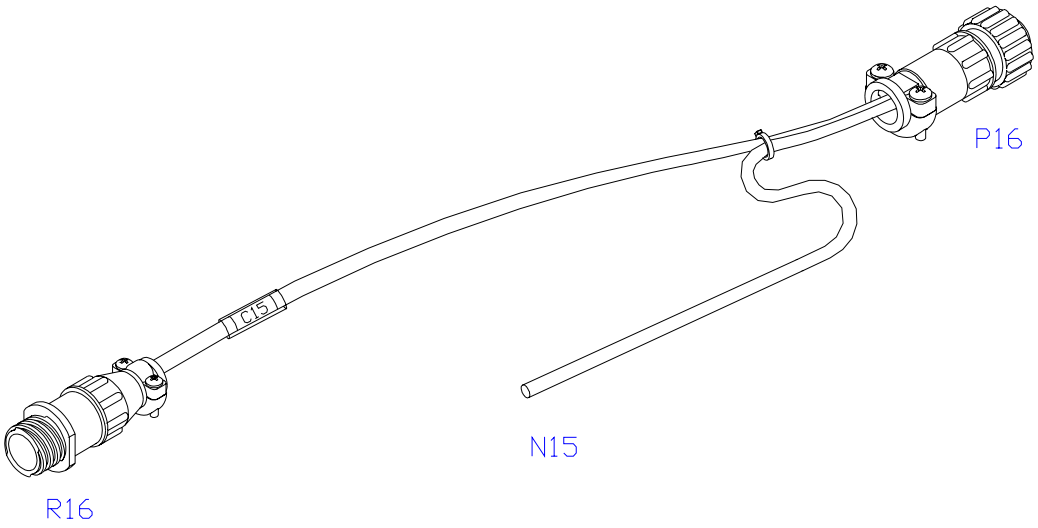
5.9 ITEM C13: 44658-37 – GENERIC MAIN INTERFACE CABLE



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



5.10 ITEM C15: 44658-31 – INTERFACE CABLE HAND CONTROL PIGTAIL



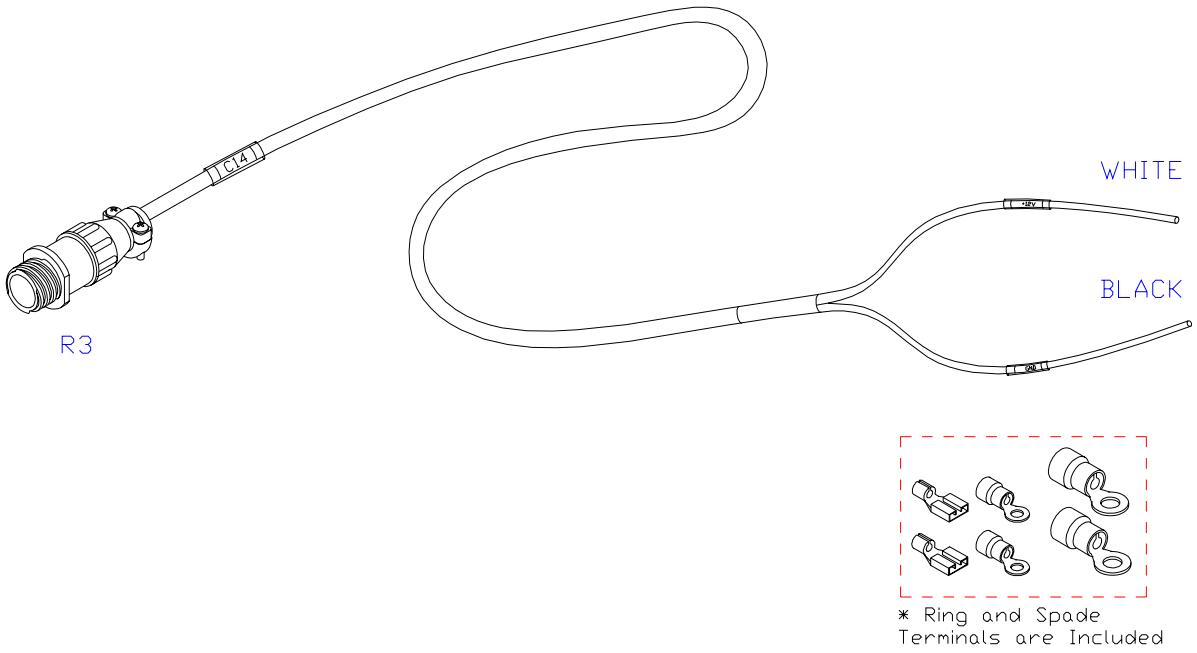
Wire Detail					
Terminal	Cable	Colour	Function	AWG	Terminal
R16B.1 - skt	Item 1	Blue	Rem. Manual	18	P16B.1 - skt
R16B.2 - skt		Green	Left Up	18	P16B.2 - skt
R16B.3 - skt		Orange	Motion Inhibit	18	P16B.3 - skt
R16B.4 - skt		Red/Blk	12 V	18	P16B.4 - skt
R16B.5 - skt		White	Left Down	18	P16B.5 - skt
R16B.6 - skt		Blu/Blk	Rem. Auto	18	P16B.6 - skt
R16B.7 - skt		Blu/Wht	Main Down	18	P16B.7 - skt
R16B.8 - skt		Grn/Blk	Right Up	18	P16B.8 - skt
R16B.9 - skt		Grn/Wht	Main Up	18	P16B.9 - skt
R16B.10 - skt		Black	Bias Up	18	P16B.10 - skt
R16B.11 - skt		Wht/Blk	Right Down	18	P16B.11 - skt
R16B.12 - skt		Red/Wht	Bias Down	18	P16B.12 - skt
R16B.13 - skt		Org/Blk	Bypass	18	P16B.13 - skt
n/c		Red	n/a	18	n/c
n/c		Blk/Wht	n/a	18	n/c
P16B.1 - skt	Item 2	Blue	Rem. Manual	18	n/c
P16B.2 - skt		Green	Left Up	18	n/c
P16B.3 - skt		Orange	Motion Inhibit	18	n/c
P16B.4 - skt		Red/Blk	12 V	18	n/c
P16B.5 - skt		White	Left Down	18	n/c
P16B.6 - skt		Blu/Blk	Rem. Auto	18	n/c
P16B.7 - skt		Blu/Wht	Main Down	18	n/c
P16B.8 - skt		Grn/Blk	Right Up	18	n/c
P16B.9 - skt		Grn/Wht	Main Up	18	n/c
P16B.10 - skt		Black	Bias Up	18	n/c
P16B.11 - skt		Wht/Blk	Right Down	18	n/c
P16B.12 - skt		Red/Wht	Bias Down	18	n/c
P16B.13 - skt		Org/Blk	Bypass	18	n/c
n/c		Red	n/a	18	n/c
n/c		Blk/Wht	n/a	18	n/c

NOTE: N/A means NOT APPLICABLE: Do not use these wires.

A. APPENDIX A – CABLE C14 INFORMATION

The following cable is a typical add-on to allow the NORAC system to be provided with a power connection. For all **C14** Power cables, the WHITE wire is connected to +12V and the BLACK wire is connected to GND. Other power cables may be available upon request. Please contact NORAC for further information.

ITEM C14: 44658-28 – INTERFACE CABLE POWER PIGTAIL



* Ring and Spade Terminals are Included

NOTES:

NOTES: