

# SC1™/TC1 Twin Disc Implement Steer Installation Manual

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## SAFETY

### **NOTICE**

Follow the operation and safety instructions included with the implement and/or controller and read this manual carefully before installing or operating this Raven system.

- Follow all safety information presented within this manual. Review implement operation with your local dealer.
- Contact a local Raven dealer for assistance with any portion of the installation, service, or operation of Raven equipment.
- Follow all safety labels affixed to system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. Contact a local Raven dealer to obtain replacements for safety labels.

Observe the following safety measures when operating the implement after installing this Raven system:

- Do not operate this Raven system or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Be alert and aware of surroundings and remain in the operator seat at all times when operating this Raven system.
  - Do not operate the implement on any public road with this Raven system enabled.
  - Disable this Raven system before exiting the operator seat.
  - Determine and remain a safe working distance from obstacles and bystanders. The operator is responsible for disabling the system when a safe working distance has diminished.
  - Disable this Raven system prior to starting any maintenance work on the implement or components of this Raven system.
- Do not attempt to modify or lengthen any of the system control cables. Extension cables are available from a local Raven dealer.

## DISPLAYS AND CONTROL CONSOLES

- If the display will not be used for an extended period, it is best to remove the display from the machine and store it in a climate controlled environment. This may help to extend the service life of electronic components.
- To prevent theft, secure the display and GPS antenna when leaving the machine unattended.

## **WARNING**

### HYDRAULIC SAFETY

When installing or servicing a hydraulic system or hydraulic components, be aware that hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.

- Always wear appropriate personal protective equipment when installing or servicing hydraulic systems.
- Never attempt to open or work on a hydraulic system with the implement running.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- Care should always be taken when servicing or opening a system that has been pressurized.
- The implement or machine must remain stationary and switched off with booms or implement sections unfolded and supported during installation or maintenance.
- Take precautions to prevent foreign material or contaminants from being introduced into the implement's hydraulic system. Contaminants that are able to bypass the hydraulic filtration system will reduce performance and may damage hydraulic components.
- Stand clear of the implement when starting the system for the first time after installing or servicing hydraulic components in case a hose has not been properly connected or tightened.

To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

## **CAUTION**

### ELECTRICAL SAFETY

- Always verify that power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the Raven system or other components.
- To prevent personal injury or fire, replace defective or blown fuses with only fuses of the same type and amperage.
- Do not connect the power leads to the battery until all system components are mounted and all electrical connections are completed.
- To avoid tripping and entanglement hazards, route cables and harnesses away from walkways, steps, grab bars, and other areas used by the operator or service personnel when operating or servicing the equipment.

### TOUCH SCREEN

- Only touch the touch-screen with your finger or by using a special touch-screen stylus/pen. Operating the touch-screen with sharp objects may cause permanent damage to the screen.
- Only clean the screen using a damp cloth. Never use caustic or other aggressive substances.

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## RECOMMENDATIONS AND BEST PRACTICES

### HOSE ROUTING

The word “hose” is used to describe any flexible, fluid carrying components. Use the following guidelines and recommendations when connecting and routing hoses while installing or maintaining this Raven system:

- Leave protective caps/covers over hose ends until connecting the end into the hydraulic system to help prevent contaminants from entering the system.
- Follow existing hose runs already routed on the implement as much as possible. Proper hose routing should:
  - Secure hoses and prevent hoses from hanging below the implement.
  - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
  - Protect hoses from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).
  - Protect hoses from sharp bends, twisting, or flexing over short distances and normal implement operation.
  - Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp hoses securely to force controlled movement of the hose.
  - Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
  - Avoid areas where the operator or service personnel might step or use as a grab bar.
- Do not connect, affix, or allow hoses to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of hose components.
  - Hoses should be protected or shielded if routing requires the hose to be exposed to conditions beyond hose component specifications.
- Avoid routing hoses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).

### HARNESS ROUTING

The word “harness” is used to describe any electrical cables and leads, both bundled and unbundled. Use the following guidelines and recommendations when connecting and routing harnesses while installing or maintaining this Raven system:

- Leave protective caps/covers over harness connectors until needed to avoid dirt and moisture from contaminating electrical circuits.
- Secure the harness to the frame or solid structural members at least every 30 cm [12 in].
- Follow existing harness runs already routed on the implement as much as possible. Proper harness routing should:
  - Secure harnessing and prevent the harness from hanging below the implement.
  - Provide sufficient clearance from moving components and operational zones around shafts; universal joints and suspension components; pulleys, gears, belts, and chains; moving linkages, cylinders, articulation joints, etc.
  - Protect harnessing from field debris and surrounding hazards (e.g. tree limbs, fence posts, crop stubble, dirt clumps or rocks that may fall or be thrown by the implement).

- Protect harnessing from sharp bends, twisting, or flexing over short distances and normal implement operation.
- Connectors and splices should not be located at bending points or in harness sections that move.
- Ensure sufficient length for free movement of the implement during normal operation and prevent pulling, pinching, catching, or rubbing, especially in articulation and pivot points. Clamp harnessing securely to force controlled movement of the harness.
- Avoid abrasive surfaces and sharp edges such as sheared or flame cut corners, fastener threads or cap screw heads, hose clamp ends, etc.
- Do not connect, affix, or allow harnessing to come into contact with components with high vibration forces, hot surfaces, or components carrying hot fluids beyond the temperature rating of harness components.
  - Harnessing should be protected or shielded if routing requires the hose to be exposed to conditions beyond harnessing component specifications.
- Avoid routing harnesses in areas where damage may occur due to build up of material (e.g. dirt, mud, snow, ice, etc.).
- Avoid routing harnesses in areas where the operator or service personnel might step or use as a grab bar.

**IMPORTANT:** Avoid applying direct spray or pressure washing of electrical components and connections. High pressure streams and sprays can penetrate seals, cause corrosion, or otherwise damage electrical components.  
When performing maintenance:

- Inspect electrical components and connectors for corrosion, damaged pins or housings, etc. Repair or replace components or harnessing as necessary.
- Ensure connectors are kept clean and dry. Apply dielectric grease to the sealing surfaces of all connections exposed to moisture, dirt, debris, and other contaminants. Repair or replace harnessing as necessary.
- Clean electrical components with pressurized air, aerosol electrical cleaning agent, or low pressure rinse.
- Remove visible surface water from electrical components and connections using pressurized air or an aerosol cleaning agent. Allow components to dry thoroughly before reconnecting cables.

The SC1™/TC1 twin disc implement steering system uses one or more disc arms mounted to the implement and is designed to provide accurate steering and positioning of an implement based upon GNSS position information during field operations. Several different disc configurations are possible for steering different implement types.

The following chapters contain important information to install, service, or maintain the disc implement steering system.

**NOTE:** This manual is a general guide and is not intended for any specific implement make or type.

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## PREPARING FOR INSTALLATION

Before installing the Disc Implement Steering system, park the implement where the ground is level, clean, and dry. Leave the implement and any connected equipment turned off for the duration of the installation process.

During the installation process, follow good safety practices. Be sure to carefully read the instructions in this manual as you complete the installation process.

## RECOMMENDATIONS

Raven Industries recommends the following before installing or operating the implement steering system for the first time, at the start of the season, or when moving the implement steering system to another machine:

- Ensure the hydraulic filters have been changed recently and there are no issues with the machine hydraulic system (e.g. pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Operate each of the hydraulic functions (i.e., tilt, raise or lower, or other hydraulic valve functions) three times to ensure the machine hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, etc.

Raven Industries recommends the following when installing the implement steering system.

- Use part numbers to help identify parts.
- Do not remove the plastic wrap from a part until it is necessary for installation.
- Do not remove plastic caps from a part until it is necessary for installation.
- Upon completing installation of the implement steering system, operate the machine manual hydraulic control functions first before operating the implement steer system via the controller/field computer to ensure the hydraulic system has been installed correctly and air is released from the system.

### TOOLS NEEDED

The following tools are recommended for installation of the Disc Implement Steering system:

- Wrenches (Metric or Imperial)
- Sockets (Metric or Imperial)
- Cable ties
- Set of tools

### POINT OF REFERENCE

The instructions in this manual assume that you are standing behind the machine, looking toward the cab.

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### INSTALLATION OVERVIEW

Some components are required for both disc and wheel steering. In the case of disc steering, it is practical to start with the assembly of the disc legs (see *Disc Leg Mounting* section on page 17). Components such as the GPS antenna, SC1 terrain compensation module, Steering Controller, and hydraulic manifold can possibly be added to the construction of the disc leg.

**NOTE:** The installed system produces less than 70 dBA.

For additional information on the component installation, refer to the:

- *Disc Leg Mounting* section on page 17.
- *Mount the Angle Sensor* section on page 20.
- *Mount the Hydraulic Manifold* section on page 24
- *Optional Stone Protection Assembly* section on page 28
- *Mount the Implement Drive Unit (IDU) ECU* section on page 29
- *Mount the SC1 ECU* section on page 30
- *Mount the GPS antenna* section on page 31
- *Connect Harness Leads and Cables* section on page 32

The image below shows approximate installation locations for system components.

FIGURE 1. Example Component Locations

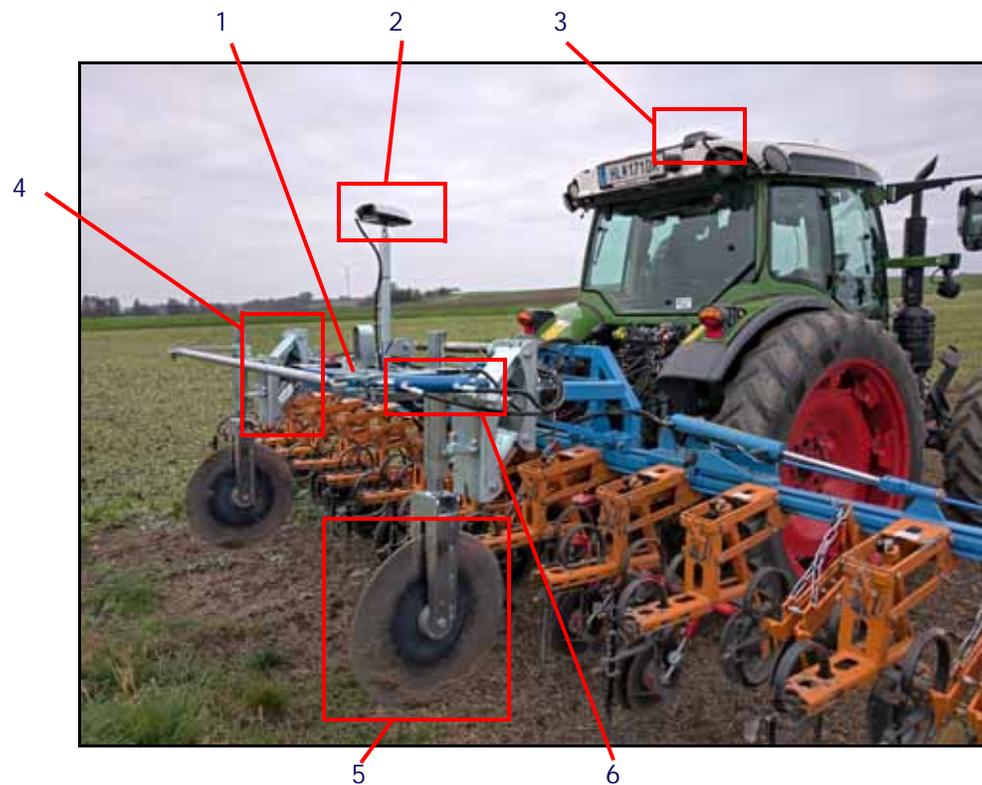


TABLE 1. System Components

Item	Description
1.	SC1 and IDU (Implement Drive Unit)
2.	Raven 700S
3.	Raven RS1
4.	Stone Protection Assembly
5.	Steering Discs
6.	Steering Cylinder

## HYDRAULIC FITTINGS

This manual may reference the following types of hydraulic fittings:

- SAE O-ring fittings
- ORFS (O-Ring Face Seal) fittings

- JIC fittings

SAE O-Ring Fittings



ORFS Fittings



JIC Fitting



## KIT CONTENTS

This section provides an overview of components that may be supplied in the various disc steering sets.

All necessary parts are supplied, including this manual. Verify that all items listed on the packing list are actually present.

## DISC ASSEMBLY

FIGURE 2. 60 cm Disc Assembly Kit (P/N 117-8000-099)

**THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:**

#	QTY	PART #	DESCRIPTION	OEM I
	1	117-8000-344	KIT, MOUNTING, DISC	
	1	117-8000-345	KIT, DISC, BEARING	
	1	107-8000-128	RETAINING SLEEVE, DISC FORK	
	1	116-8000-038	DISC, HEAD TUBE	
	1	116-8000-037	DISC, STEERING ARM	
	1	116-8000-036	DISC, FORK 60CM	
	1	107-8000-127	MOUNTING PLATE, DISC, CYLINDER	
	1	321-8000-035	DISC, 60CM	
	1	107-8000-126	WELD PLATE, DISC, 150X180	

FIGURE 3. Disc Mounting Kit (P/N 117-8000-344)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	311-4050-361K	HEX BOLT, DIN931, CLASS 8.8, M16X70
2	1	311-4050-371K	HEX BOLT, DIN931, CLASS 8.8, M16X120
3	1	311-4050-447K	HEX BOLT, DIN931, CLASS 8.8, M20X70
4	1	311-4050-449K	HEX BOLT, DIN931, CLASS 8.8, M20X80
5	3	311-4055-269K	HEX BOLT, DIN933, CLASS 8.8, M12X40
6	4	311-4055-355K	HEX BOLT, DIN933, CLASS 8.8, M16X40
7	4	311-4055-357K	HEX BOLT, DIN933, CLASS 8.8, M16X50
8	2	311-4060-136K	SCREW, HEXAGON SOCKET CAP, DIN912, 8.8, M6X20
9	2	312-6001-027K	HEX LOCK NUT, NYLON INSERT, DIN985, CLASS 8, M8X1.25
10	3	312-6001-057K	HEX LOCK NUT, NYLON INSERT, DIN985, CLASS 8, M12X1.75
11	6	312-6001-077K	HEX LOCK NUT, NYLON INSERT, DIN985, CLASS 8, M16X2.0
12	2	312-6001-107K	HEX LOCK NUT, NYLON INSERT, DIN985, CLASS 8, M20X2.5
13	2	313-6000-010K	WASHER, ZINK, DIN125A, M6
14	2	313-6000-013K	WASHER, ZINK, DIN125A, M8
15	6	313-6000-019K	WASHER, ZINK, DIN125A, M12
16	12	313-6000-025K	WASHER, ZINK, DIN125A, M16
17	3	313-6000-031K	WASHER, ZINK, DIN125A, M20
18	2	313-6003-022K	WASHER, HEAVY, ZINK, DIN7349, M20
19	2	321-6000-007	SET COLLAR, DIN705, 20X32X14

FIGURE 4. Generic Disc Mounting Kit (P/N 117-8000-490)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	117-8000-307	KIT, WAS LINK, M8 210, RAD-RAD
2	1	107-8000-007	BRACKET, DYNAMIQ, V1
3	1	107-8000-005	BRACKET, WAS, 90 DEGREE
4	1	107-8000-062	BRACKET, MANIFOLD V3, GENERIC
5	1	107-8000-006	BRACKET, STU, MANIFOLD V3
6	1	063-8000-066	WAS ASY, BRCKT, 12V 90°, 35CM
7	1	117-8000-311	KIT, BOLT+NUT, 5/8 UNC SS, ANT
8	1	407-4001-024	BULKHEAD TNC CONNECTOR

FIGURE 5. Disc Bearing Kit (P/N 117-8000-345)

6	4	313-6001-016	Spring Lock Washer DIN127 - Zn - M10
5	2	335-0000-309	RING, RETAINING, EXT, DIN471, 25MM
4	4	311-4062-230	Hexagon Socket Cap Head Screw DIN912 12.9 - M10x60
3	1	107-8000-049	Disk Bearing Hub, Axle
2	1	107-8000-051	Disk Bearing Hub, Right, w/ Bearing
1	1	107-8000-050	Disk Bearing Hub, Left, w/ Bearing
ITM	QTY	PART NUMBER	DESCRIPTION

## SINGLE DISC

FIGURE 6. Load Sense without Stone Protection Kit (P/N 117-8000-480)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	
1	1	334-8000-001	MANIFOLD, IMPLEMENT, LS, 5L	
2	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ	
3	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD	
4	1	115-8000-193	HARNESS, WAS, 1.5M	
5	1	117-8000-099	KIT, DISC ASSEMBLY, 60CM	
6	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1	

FIGURE 7. Load Sense with Stone Protection Kit (P/N 117-8000-481)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	
1	1	334-8000-001	MANIFOLD, IMPLEMENT, LS, 5L	
2	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ	
3	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD	
4	1	115-8000-193	HARNESS, WAS, 1.5M	
5	1	117-8000-099	KIT, DISC ASSEMBLY, 60CM	
6	1	063-8000-039	STONEPROTECTION ASSEMBLY	
7	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER, SINGLE DISC	
8	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1	

FIGURE 8. Open Center without Stone Protection Kit (P/N 117-8000-482)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L	
2	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ	
3	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD	
4	1	115-8000-193	HARNESS, WAS, 1.5M	
5	1	117-8000-099	KIT, DISC ASSEMBLY, 60CM	
6	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1	

FIGURE 9. Open Center with Stone Protection Kit (P/N 117-8000-483)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L
2	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
3	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
4	1	115-8000-193	HARNESS, WAS, 1.5M
5	1	117-8000-099	KIT, DISC ASSEMBLY, 60CM
6	1	063-8000-039	STONEPROTECTION ASSEMBLY
7	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER, SINGLE DISC
8	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

## DUAL DISCS MECHANICAL LINK

FIGURE 10. Load Sense without Stone Protection Kit (P/N 117-8000-484)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	334-8000-001	MANIFOLD, IMPLEMENT, LS, 5L
2	1	063-8000-156	TRACKROD, MECHANICAL LINK, 125-250CM
3	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
4	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
5	1	115-8000-193	HARNESS, WAS, 1.5M
6	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM
7	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

FIGURE 11. Open Center without Stone Protection Kit (P/N 117-8000-485)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L
2	1	063-8000-156	TRACKROD, MECHANICAL LINK, 125-250CM
3	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
4	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
5	1	115-8000-193	HARNESS, WAS, 1.5M
6	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM
7	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

FIGURE 12. Load Sense with Stone Protection Kit (P/N 117-8000-528)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	334-8000-001	MANIFOLD, IMPLEMENT, LS, 5L
2	1	063-8000-156	TRACKROD, MECHANICAL LINK, 125-250CM
3	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
4	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
5	1	115-8000-193	HARNESS, WAS, 1.5M
6	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM
7	2	063-8000-039	STONEPROTECTION ASSEMBLY
8	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER
9	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

FIGURE 13. Open Center with Stone Protection Kit (P/N 117-8000-529)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L
2	1	063-8000-156	TRACKROD, MECHANICAL LINK, 125-250CM
3	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
4	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
5	1	115-8000-193	HARNESS, WAS, 1.5M
6	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM
7	2	063-8000-039	STONEPROTECTION ASSEMBLY
8	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER
9	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

## DUAL DISCS HYDRAULIC LINK

FIGURE 14. 60 cm Disc Assembly Kit (P/N 117-8000-099)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

#	QTY	PART #	DESCRIPTION	OEM I
1	1	117-8000-344	KIT, MOUNTING, DISC	
1	1	117-8000-345	KIT, DISC, BEARING	
1	1	107-8000-128	RETAINING SLEEVE, DISC FORK	
1	1	116-8000-038	DISC, HEAD TUBE	
1	1	116-8000-037	DISC, STEERING ARM	
1	1	116-8000-036	DISC, FORK 60CM	
1	1	107-8000-127	MOUNTING PLATE, DISC, CYLINDER	
1	1	321-8000-035	DISC, 60CM	
1	1	107-8000-126	WELD PLATE, DISC, 150X180	

FIGURE 15. Load Sense with Stone Protection Kit (P/N 117-8000-487)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	(
1	1	334-8000-001	MANIFOLD, IMPLEMENT, LS, 5L	
2	1	334-8001-002	PRESSURE VALVE, 130BAR	
3	1	334-8001-001	PRESSURE VALVE, 140BAR	
4	4	311-4060-141K	SCREW SCKT CAP, 8.8, M6X45	
5	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ	
6	1	334-8004-002	CYLINDER, 40-20-100, ADJ	
7	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD	
8	1	115-8000-193	HARNESS, WAS, 1.5M	
9	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM	
10	2	063-8000-039	STONEPROTECTION ASSEMBLY	
11	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER	
12	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1	

FIGURE 16. Open Center without Stone Protection Kit (P/N 117-8000-488)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	(
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L	
2	1	334-8001-002	PRESSURE VALVE, 130BAR	
3	1	334-8001-001	PRESSURE VALVE, 140BAR	
4	4	311-4060-141K	SCREW SCKT CAP, 8.8, M6X45	
5	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ	
6	1	334-8004-002	CYLINDER, 40-20-100, ADJ	
7	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD	
8	1	115-8000-193	HARNESS, WAS, 1.5M	
9	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM	
10	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1	

FIGURE 17. Open Center with Stone Protection Kit (P/N 117-8000-489)

**THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:**

<b>ITEM #</b>	<b>QTY</b>	<b>PART #</b>	<b>DESCRIPTION</b>
1	1	334-8000-007	MANIFOLD, IMPLEMENT, OC, 5L
2	1	334-8001-002	PRESSURE VALVE, 130BAR
3	1	334-8001-001	PRESSURE VALVE, 140BAR
4	4	311-4060-141K	SCREW SCKT CAP, 8.8, M6X45
5	1	334-8004-001	CYLINDER, 40-20-100, NON-ADJ
6	1	334-8004-002	CYLINDER, 40-20-100, ADJ
7	1	115-8000-385	HRNS, HDU, IMPL. MANIFOLD
8	1	115-8000-193	HARNESS, WAS, 1.5M
9	2	117-8000-099	KIT, DISC ASSEMBLY, 60CM
10	2	063-8000-039	STONEPROTECTION ASSEMBLY
11	1	117-8000-203	KIT, ACCUMULATOR - MANOMETER
12	1	016-8000-150EN	INST. MANUAL RAVEN DISC STEERING, RAVEN SC1/TC1

Parts required for each steering set:

- Single-disc steering set: 1, 2, 3, 4 and 5
- Steering set, dual disc, mechanically connected: 1 (2x), 2, 3 (2x), 4, 5 and 8.
- Steering set, dual disc, hydraulically connected: 1 (2x), 2 (2x), 3 (2x), 4 (2x), 5, 6 and 7 (2x)

## OVERVIEW OF THE OPTIONAL STONE PROTECTION ASSEMBLY

The optional stone protection assembly is designed to prevent damage to the steering discs and disc legs. The assembly consists of one bracket and cylinder for each leg and a hydraulic accumulator.

If a disc contacts a rock, the optional stone protection assembly allows the disc and leg to adjust depth independently from the implement and ride over the rock. This helps prevent damage to the discs and disc legs.

FIGURE 18. Stone Protection Assembly

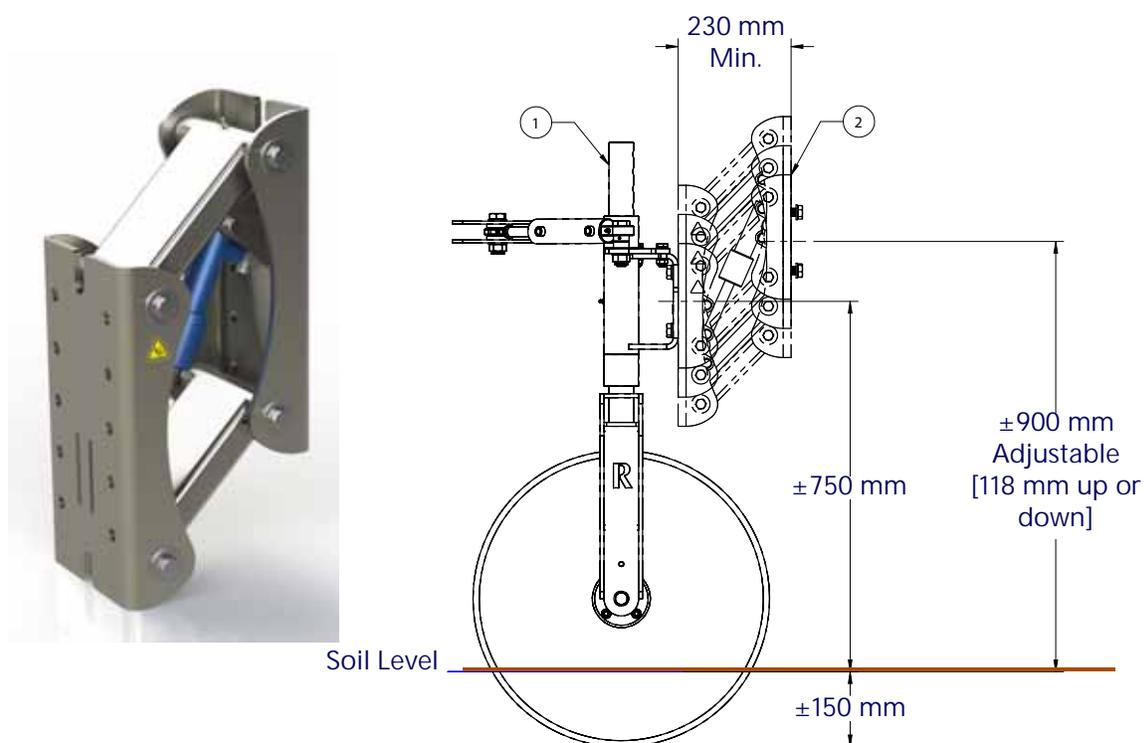


FIGURE 19. Manometer Accumulator Kit (P/N 117-8000-203 Rev. B)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

ITEM #	QTY	PART #	DESCRIPTION	C
1	1	334-8001-018	ACCUMULATOR, 0.35L 210/30BAR	
2	1	103-0159-018	BRACKET, ACCUMULATOR, Ø91-96MM	
3	1	417-0001-033	GAUGE, PRESSURE, 0-250BAR	
4	1	333-0012-452	FITTING, BULKHEAD, 12L, 90DEG	
5	1	333-0012-492	GAUGE FITTING, 12L-R1/4, F-F	
6	1	107-8000-129	BRACKET, MANOMETER	
7	1	107-8000-130	BRACKET, MANOMETER, PROTECTION	
8	4	311-4060-136	SCREW SCKT CAP, 8.8, M6X20	
9	4	312-6001-017	HEX LOCK NUT DIN985 - 8 - M6	
10	8	313-6000-010	WASHER, ZN, DIN125A M6	

## UPDATES

Software and manual updates are available on the Raven Applied Technology website:

<https://ravenprecision.com>

At Raven Industries, we strive to make your experience with our products as rewarding as possible. One way to improve this experience is to provide us with feedback on this manual.

Your feedback will help shape the future of our product documentation and the overall service we provide. We appreciate the opportunity to see ourselves as our customers see us and are eager to gather ideas on how we have been helping or how we can do better.

To serve you best, please send an email with the following information to

[techwriting@ravenind.com](mailto:techwriting@ravenind.com)

- SC1™/TC1 Twin Disc Implement Steer Installation Manual
- 016-8000-150 Rev. A
- Any comments or feedback (include chapter or page numbers if applicable).
- Let us know how long have you been using this or other Raven products.

We will not share your email or any information you provide with anyone else. Your feedback is valued and extremely important to us.

Thank you for your time.

NOTE: This document was originally written and published in English.

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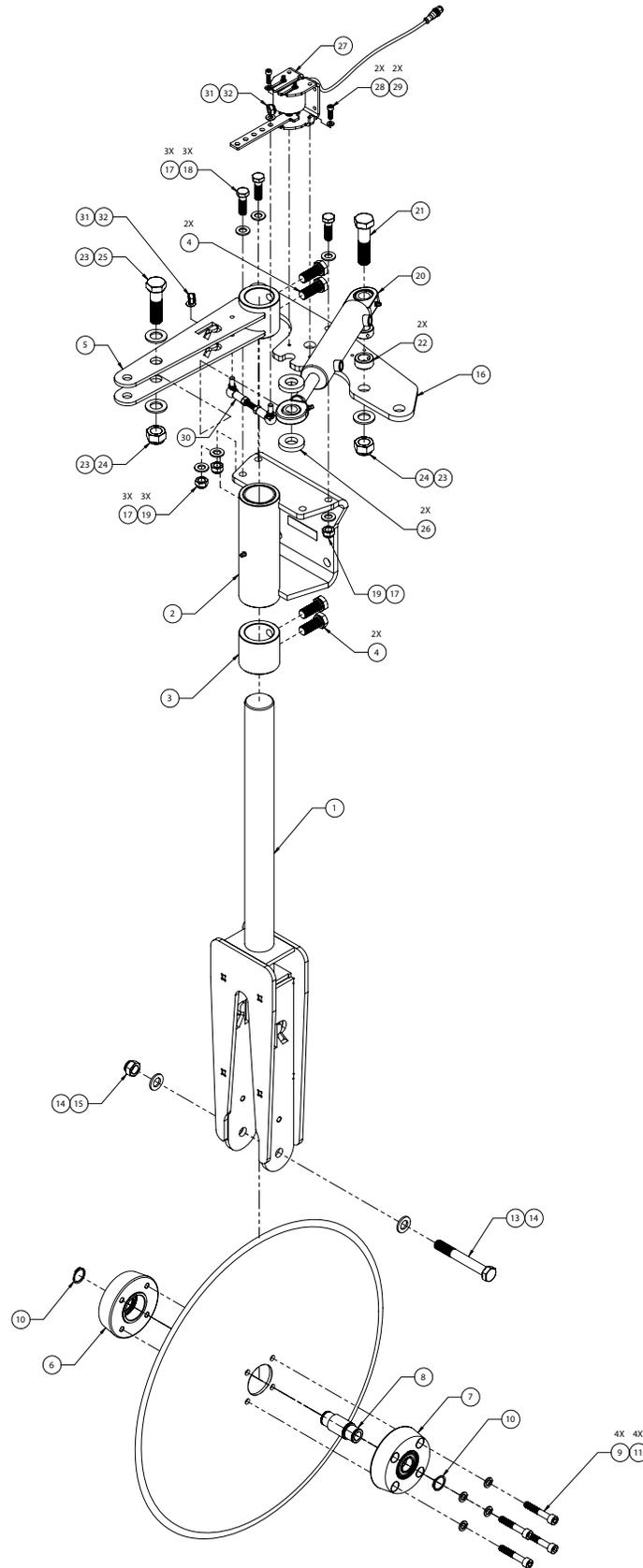
## DISC LEG MOUNTING

Depending upon the implement used, it is advised to mount the disc or discs at the rear of the implement. Discs mounted behind the implement ensure the best results.

### MOUNT THE DISC LEG

Use the set of bolts, nuts and rings/washers supplied. The mounting plate for the cylinder and the angle sensor are provided with several holes. Different holes need to be used, depending upon the steering set used.

FIGURE 1. Disc Leg Exploded View



## DISC LEG CONFIGURATIONS

The following configurations are available for disc steering systems:

- *Single Disc Steering Set*
- *Dual Disc with Mechanical Track Rod*
- *Dual Disc with Hydraulic Track Rod*

**NOTE:** When a dual disc is used, a single hydraulic cylinder with a mechanical track rod is the preferred configuration. A dual cylinder hydraulic track rod configuration should only be used if a mechanical track rod is not possible with the structure of the implement.

**NOTE:** The disc or discs should cut to a depth of about 3-5 cm, depending on the type and humidity of the soil. If the soil has already been ploughed to a depth of 15 cm, this means that the disc should cut to a depth of 20 cm.

**IMPORTANT:** Check the working depth and prevent the disc from cutting too deep into firm soil.

### DUAL DISC WITH MECHANICAL TRACK ROD

FIGURE 2. Dual Disc Steering Set with Mechanical Track Rod



Take account of the working depth of the disc and the position of the disc leg in the attachment. The disc legs are provided with multiple holes in order to finely adjust the required working depth.

**IMPORTANT:** Construct a sturdy frame from thick-walled tubing of at least 70 x 70 x 5 mm.

The track rod must be adjustable, by using a spindle, to be sure that both discs can be properly aligned. When mounted and set the straight forward position, the discs should be parallel. Check whether the distance between the front and rear of the discs is the same. If necessary, make adjustments to the track rod.

On a retractable implement, the frame for the disc legs can be mounted in a central position on the beam of the main frame.

On seeders and inter-row cultivators it is sometimes possible to construct a universal frame that can be transferred from one implement to another. Ensure that the hydraulics, IDU and SC1 are mounted on the universal frame.

### DUAL DISC WITH HYDRAULIC TRACK ROD

When installing a system with a hydraulic track rod (dual cylinders), one cylinder should be non-adjustable and the other should be adjustable.

FIGURE 3. Dual Disc Steering Set with Hydraulic Link

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Take account of the working depth of the disc and the position of the disc leg on the attachment. The disc legs are provided with several holes in order to adjust to the required working depth.

**IMPORTANT:** Construct a sturdy frame from thick-walled tubing of at least 70 x 70 x 5 mm.

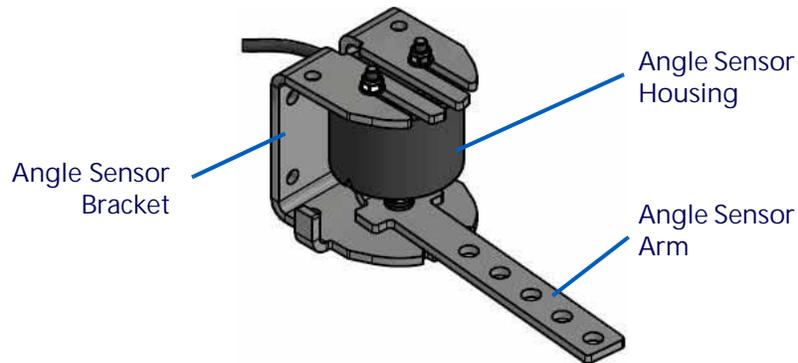
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### MOUNT THE ANGLE SENSOR

The angle sensor measures the position of the disc cylinders during operation. The mounting plate for the disc legs provides holes for mounting the angle sensor bracket.

**NOTE:** The angle sensor and angle sensor bracket are shipped already assembled.

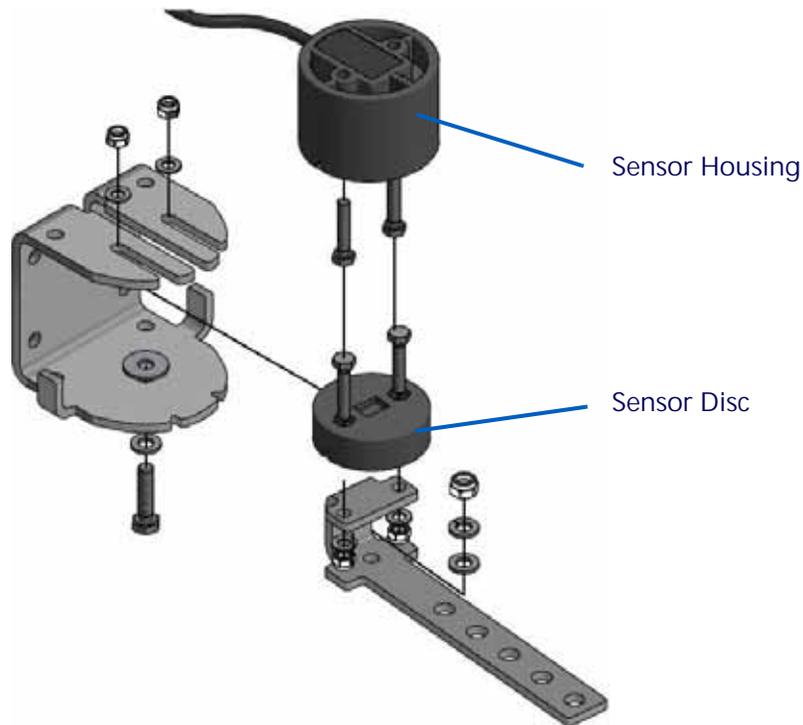
FIGURE 4. Assembled Angle Sensor



### ASSEMBLE THE ANGLE SENSOR

Complete the following steps to assemble the angle sensor and angle sensor mounting bracket:

FIGURE 5. Angle Sensor Exploded View



1. Use the supplied M5 bolts, washers, and lock nuts to attach the sensor disc to the angle sensor arm.
2. Insert M5 bolts in the sensor housing and place housing over the sensor disc.
3. Attach the angle sensor arm to the angle bracket with an M6 bolt, three washers, lock washer, and lock nut (refer to Figure 5 on page 21). The bolts at the top of the sensor housing should slide into the notches at the top of the angle sensor bracket.
4. Tighten the locking nut firmly and then loosen it a 1/4 turn so that the angle sensor is able to turn freely.
5. Secure the sensor housing with the supplied washers and lock nuts.

**NOTE:** Before mounting the angle sensor bracket to the implement, check that the sensor disc can move freely in the sensor housing when turning the sensor arm. The triangular notches carved in the disc and housing should line up when the implement is in the center position.

DISC CONTROL

1. Attach the angle sensor bracket to the mounting plate (see Figure 6 on page 22).
2. Turn the disc leg to the straight forward position and direct the sensor arm straight to the rear.
3. Cut the threaded rod to the required length.
4. Wrap the sensor lead in a protective sleeve to prevent it from becoming constricted or damaged.

FIGURE 6. Angle Sensor on Disc Steering System

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## HYDRAULIC SYSTEM CONNECTIONS

### CHECK THE HYDRAULIC MANIFOLD

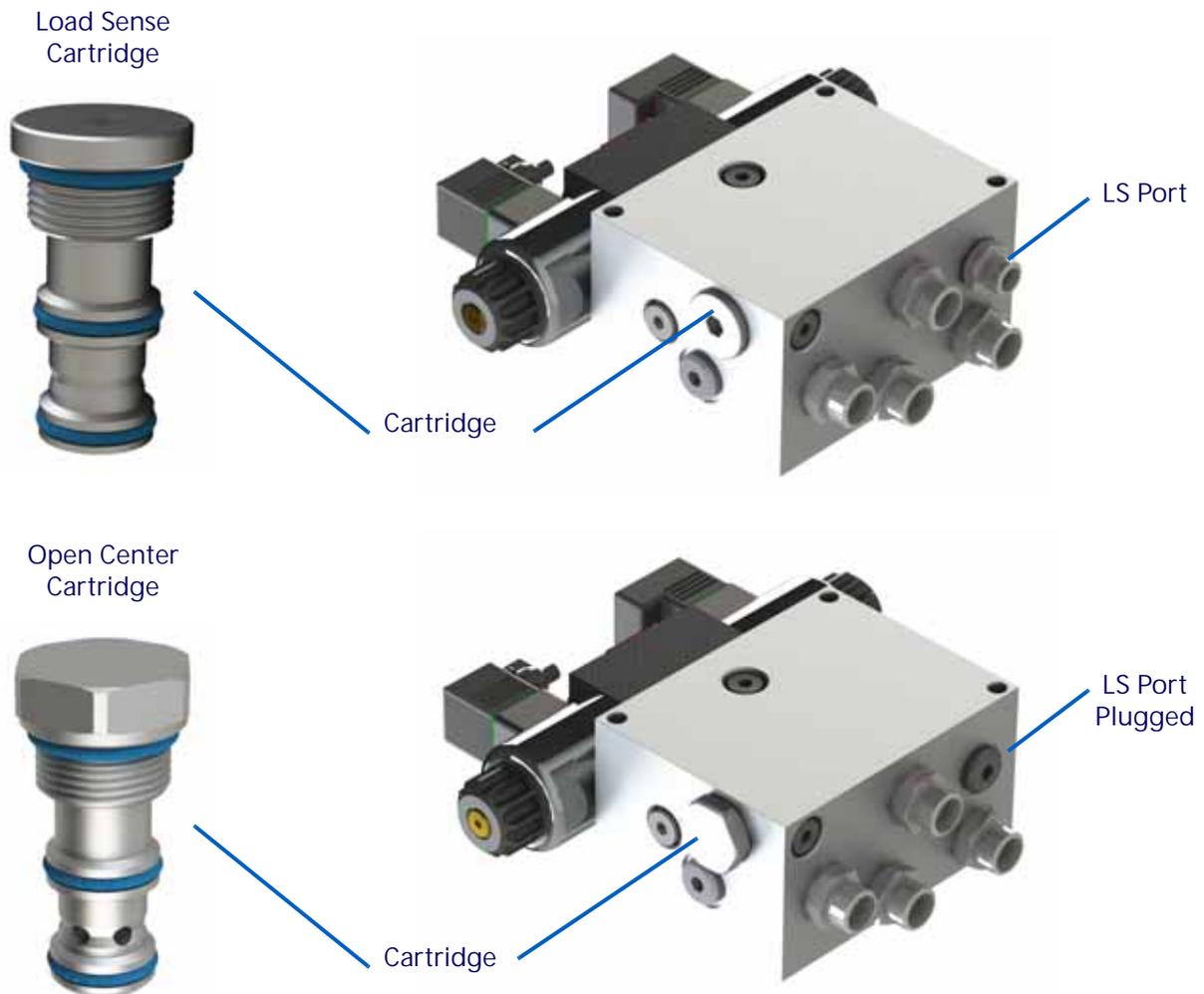
The manifold can be used either in Load Sense (LS) mode or in Open Center (OC) mode. Different selector cartridges are required for Open Center or Load Sense hydraulic systems.

TABLE 1. Manifold Selector Cartridge

System Type	Selector Plug	Part Number
Load Sense (LS)	Cartridge, LS T 30/3 Valve Plug	334-8001-031
Open Center (OC)	Cartridge, OC ELP30	334-8000-002

Check the type of selector plug before mounting the manifold.

FIGURE 7. Selector Cartridge and Cartridge Types



- If the manifold is connected to an external spool valve of the tractor, the manifold must be configured in Open Center mode. The LS port of the manifold must be plugged.
- If the manifold is connected to the power beyond connection at the back of the tractor, the manifold must be configured in LS mode. The LS mode is the preferred mode.

## MOUNT THE HYDRAULIC MANIFOLD

The manifold provides threaded M8 holes for mounting to a bracket or mounting plate. Attach the manifold to the bracket supplied or directly to the frame for the disc legs.

FIGURE 8. Hydraulic Manifold Mounted

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Mount the manifold on the implement in such a way that the hydraulic hoses may be easily routed toward the tractor and control cylinder. Ensure that the connectors on the proportional valve may be connected after mounting the manifold. Connect the control cylinder to the A and B ports of the manifold.

### LOAD SENSE

1. Connect the pressure line to P, the return line to T and the sensor line to LS on the manifold.
2. Use the Power Beyond connections of the tractor.
3. Ensure that the return on the tractor is pressureless.

### OPEN CENTER

1. Connect the pressure line to P and the return line to T on the manifold.
2. Use the external spool valve of the tractor.
3. Be sure that the return on the tractor is pressureless.
4. Be sure to adjust the flow from the spool valve of the tractor to just the right amount of flow for the job.
  - a. Too little flow will result in poor steering performance.
  - b. Too much flow will result in overheating the hydraulic oil.

## DUAL DISC HYDRAULIC SYSTEM

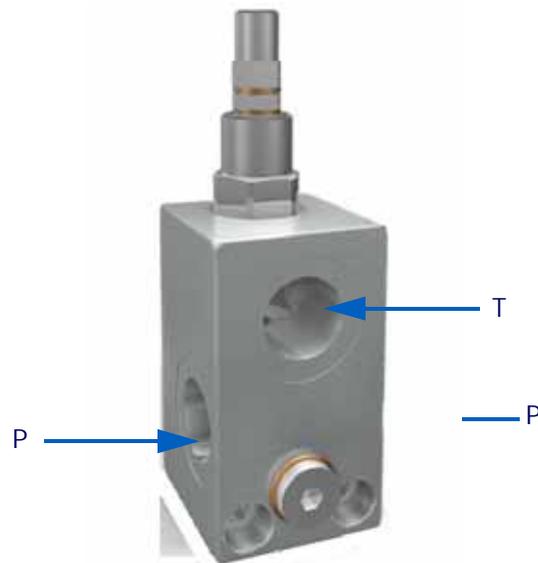
### PRESSURE RELIEF VALVE

The cylinders should be mounted in mirrored positions. The ports on the piston rod side of the cylinders must be connected to each other (Figure 3 on page 20). In addition, two pressure relief valves need to be installed in the correct position in the system. The pressure relief valves are pre-set. Do not change the valve settings.

The mounting sequence of the cylinders is as follows:

1. Mount the fixed cylinder (innermost hole on the mounting plate) on the right side of the implement and then put the disc in the straight forward position.
2. Then mount the adjustable cylinder on the left side (outermost hole on the mounting plate) and also put this disc in the straight forward position.
3. Connect the hydraulic hoses as shown in Figure 12 on page 27. The pressure relief valves have three ports. Two P-ports and one T-port.

FIGURE 9. Ports of the Pressure Relief Valve



4. The angle sensor should be mounted on the right side, with the fixed cylinder.
5. After installing all hydraulics, flush the system by steering left and right several times. Keep on steering, when the cylinders are at the end of their stroke to flush all air out.
6. When all air is out, position the right disc in the mid (straight ahead) position.
7. Check that the distance between the discs at the front and the rear is the same. Adjustments to the adjustable cylinder to achieve that the discs are parallel.

FIGURE 10. Mechanical Link

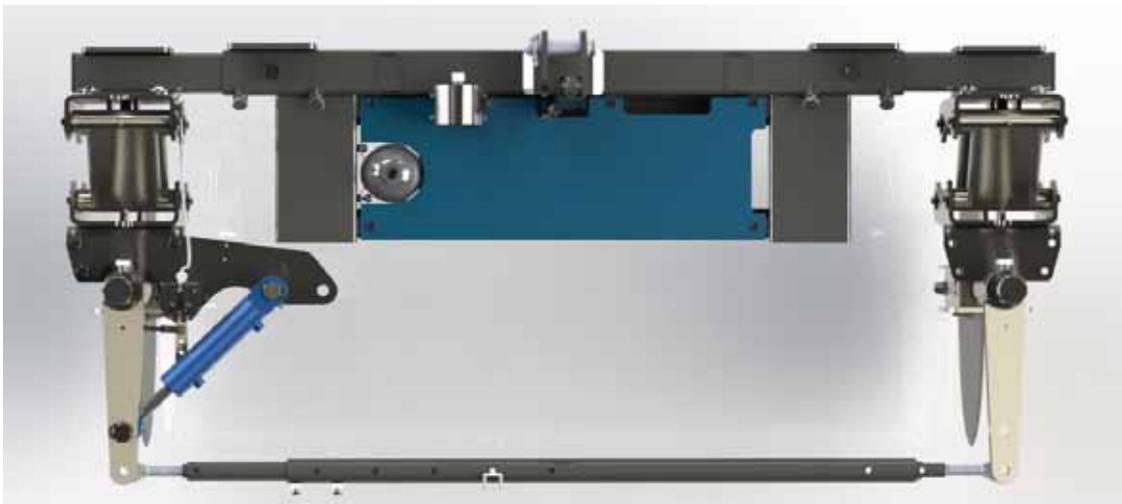


FIGURE 11. Hydraulic Cylinder Link

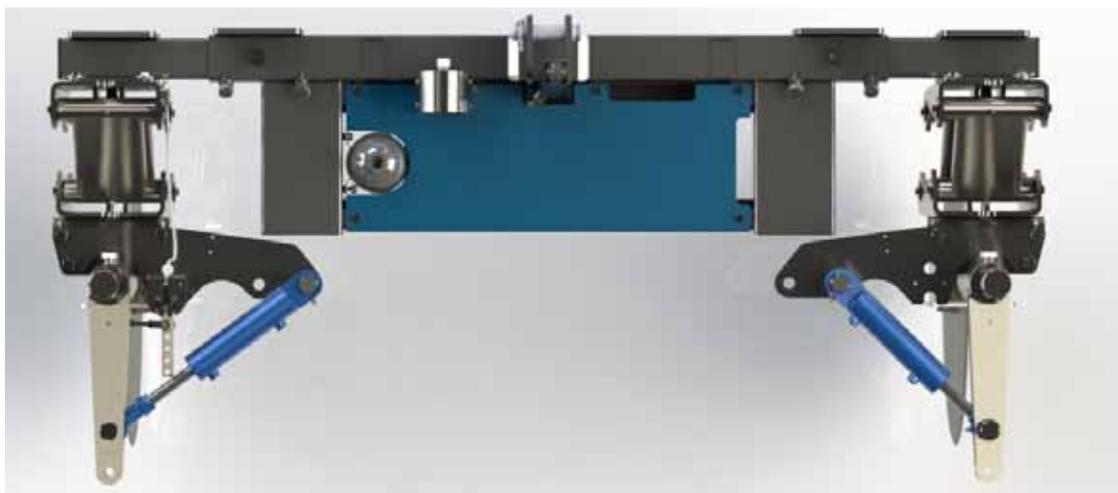
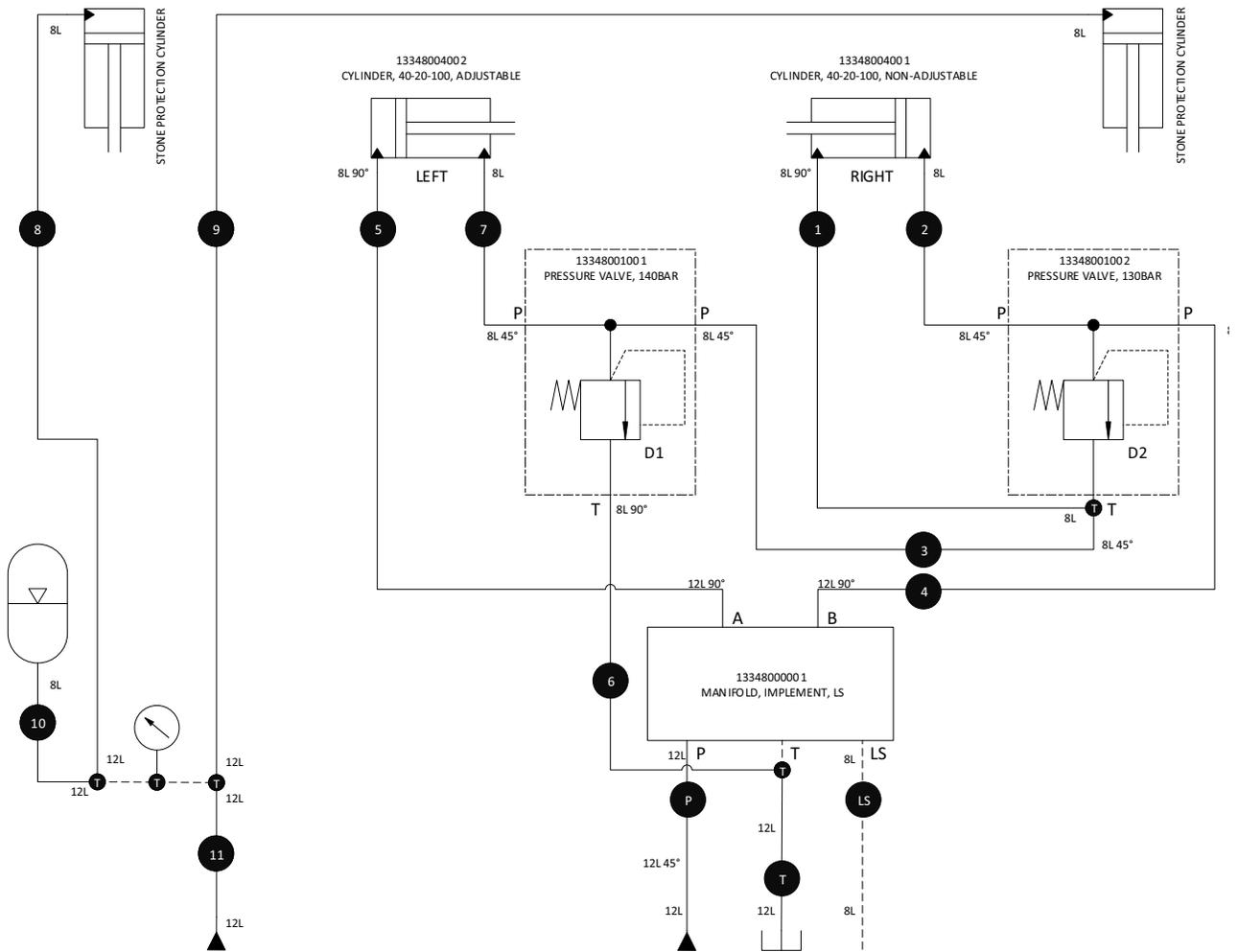


FIGURE 12. Hydraulic Circuit Dual Disc with Hydraulic Track Rod

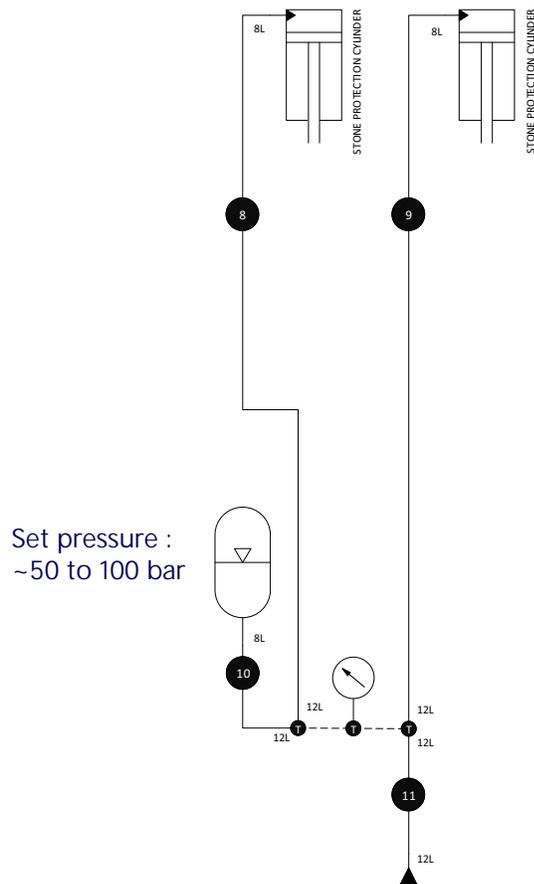


OPTIONAL STONE PROTECTION ASSEMBLY

The optional stone protection bracket and accumulator assembly is be mounted between the implement and the disc leg. The cylinder in the assembly must be connected to an external spool valve of the tractor using hydraulic hoses. An accumulator and pressure gauge should be connected near the cylinder, using tee fittings. Ensure that the pressure gauge is visible from the tractor cab.

Set the pressure (depending on the soil conditions) between 50 and 100 bar. The pressure must be set in such manner, that the discs are protruding into the ground easily and the stone protection is not lifted at this point. However, the stone protection must be lifted when the disc hits a harder surface than the soil itself.

FIGURE 13. Stone Protection Hydraulics



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## ELECTRICAL SYSTEM CONNECTIONS

### MOUNT THE IMPLEMENT DRIVE UNIT (IDU) ECU

The Implement Drive Unit (IDU - Disc steering) can be mounted to the manifold using the IDU bracket or directly to the frame of the implement. Be sure to mount the IDU close enough to the manifold, keeping the length of the IDU harness in mind.

FIGURE 14. Implement Drive Unit and SC1 ECU Mounted



It is recommended to mount the IDU flat or with the connectors pointed downwards to prevent water collecting in the connectors.

## MOUNT THE SC1 ECU

Mount the SC1 terrain compensation ECU on a flat surface free from vibrations and preferably with the connectors pointing to the rear (default configuration). A good place would be on the main frame of the implement.

If the IDU and SC1 are stacked, make sure that the SC1 is mounted nearest to the implement frame.

FIGURE 15. SC1 ECU Mounted

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## MOUNT THE GPS ANTENNA

The best position for the GPS antenna will depend upon the implement being used:

- On front-mounted implements with disc steering, the antenna is mounted as close to the disc leg as possible.
- On rear-mounted planters with wheel steering, mount the antenna close to the planting elements.

FIGURE 16. Examples of Antenna Mounting Positions



It is recommended to attach the GPS antenna as low as possible and at the center of the implement.

Be sure to provide a clear view at an angle of 20 degrees (in relation to the horizon). If the cabin roof is the highest point, the GPS antenna does not need to be mounted as high, depending on how far it is mounted behind the tractor.

In addition, the construction needs to be rigid enough to prevent the GPS antenna from being affected by vibrations.

**NOTE:** Use extendable tubing to mount the GPS antenna as low as possible. If satellite reception is blocked, the tube may be extended to provide a better view of the sky and better satellite reception.

## CONNECT HARNESS LEADS AND CABLES

An Implement-ready wiring harness is required on the tractor for connecting the disc or wheel control unit. The IBBC connector will be used to connect the disc or wheel control to the tractor.

FIGURE 17. IBBC and IBBC Bracket with Antenna Connection

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The implement harness is used to connect the IDU and terrain compensation module to the tractor. The hydraulic harness needs to be connected to the IDU. This hydraulic harness ensures the control of the proportional valve and the readout of the angle sensor.

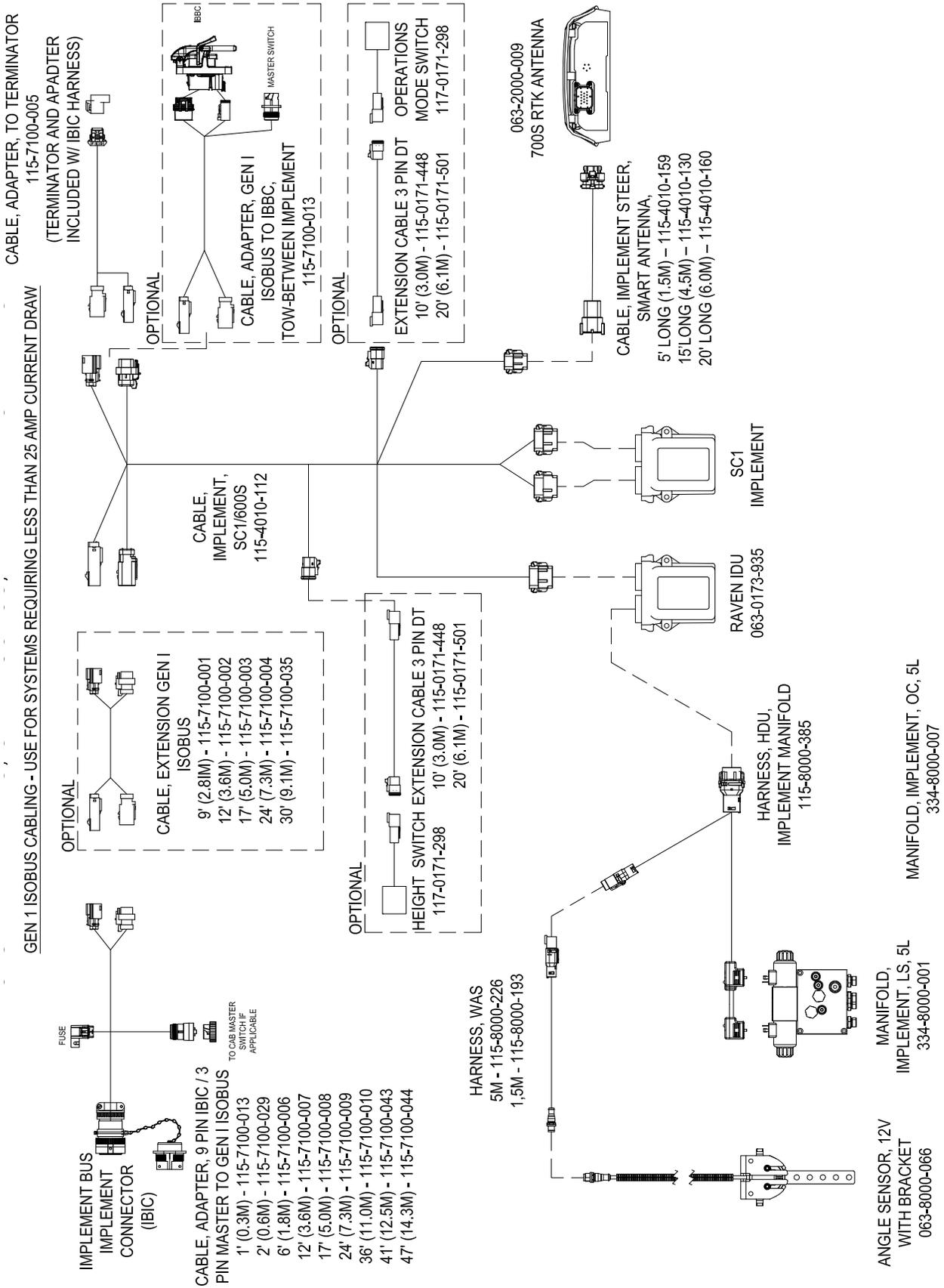
**NOTE:** Tie-wrap the leads to ensure that they are attached free from vibration and friction.

**IMPORTANT:** Mount the CAN implement lead in such a way that the separate conductors coming from the protective sleeve are directed downwards. This will help prevent water from penetrating into the protective sleeve.

**IMPORTANT:** Ensure that the leads do not get damaged during installation.

**IMPORTANT:** Press the connectors firmly into place until they click.

FIGURE 18. CAN Implement Harness Schematic





## A

## IMPLEMENT DRIVE UNIT (IDU)

TABLE 1. IDU A connector (Gray)

Pin	Description
1	HC Power in 1
2	HC Power in 2
3	ECU Power
4	Resume Switch Input
5	CAN2 High
6	CAN1 High
7	CAN1 Low
8	Operator Presence Input
9	Master Switch Input
10	ECU Ground
11	HC Ground IN1
12	HC Ground IN2

TABLE 2. IDU B Connector (Black)

Pin	Description
1	PWM Out Left
2	Ground
3	Lock Valve Output Switched
4	Sensor Power Output (12V)
5	Pressure Sensor Input
6	Sensor Power Output (12V)
7	Angle Sensor Input
8	Input 2
9	Input 5
10	Sensor Power Ground
11	HC Power Ground
12	PWM Ground Out Right

## ANGLE SENSOR

TABLE 3. Angle sensor 12V

<b>Pin</b>	<b>Description</b>	<b>Wire Color</b>
1	5V sensor power	-
2	ECU ground	Blue
3	Sensor signal	Black
4	12V sensor power	Brown

# LIMITED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

## HOW LONG IS THE COVERAGE PERIOD?

Raven Applied Technology products are covered by this warranty for 12 months from the date of retail sale. In no case will the Limited Warranty period exceed 24 months from the date the product was issued by Raven Industries Applied Technology Division. This warranty coverage applies only to the original owner and is non-transferable.

## HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries.

## WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the warranty claim, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

## WHAT IS NOT COVERED BY THIS WARRANTY?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

**Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.**

# EXTENDED WARRANTY

## WHAT DOES THIS WARRANTY COVER?

This warranty covers all defects in workmanship or materials in your Raven Applied Technology Division product under normal use, maintenance, and service when used for intended purpose.

## DO I NEED TO REGISTER MY PRODUCT TO QUALIFY FOR THE EXTENDED WARRANTY?

Yes. Products/systems must be registered within 30 days of retail sale to receive coverage under the Extended Warranty. If the component does not have a serial tag, the kit it came in must be registered instead.

## WHERE CAN I REGISTER MY PRODUCT FOR THE EXTENDED WARRANTY?

To register, go online to [www.ravenhelp.com](http://www.ravenhelp.com) and select Product Registration.

## HOW LONG IS THE EXTENDED WARRANTY COVERAGE PERIOD?

Raven Applied Technology products that have been registered online are covered for an additional 12 months beyond the Limited Warranty for a total coverage period of 24 months from the date of retail sale. In no case will the Extended Warranty period exceed 36 months from the date the product was issued by Raven Industries Applied Technology division. This Extended Warranty coverage applies only to the original owner and is non-transferable.

## HOW CAN I GET SERVICE?

Bring the defective part and proof of purchase to your Raven dealer. If the dealer approves the warranty claim, the dealer will process the claim and send it to Raven Industries for final approval. The freight cost to Raven Industries will be the customer's responsibility. The Return Materials Authorization (RMA) number must appear on the box and all documentation (including proof of purchase) must be included inside the box to be sent to Raven Industries. In addition, the words "Extended Warranty" must appear on the box and all documentation if the failure is between 12 and 24 months from the retail sale.

## WHAT WILL RAVEN INDUSTRIES DO?

Upon confirmation of the product's registration for the Extended Warranty and the claim itself, Raven Industries will (at our discretion) repair or replace the defective product and pay for the standard return freight, regardless of the inbound shipping method. Expedited freight is available at the customer's expense.

## WHAT IS NOT COVERED BY THE EXTENDED WARRANTY?

Raven Industries will not assume any expense or liability for repairs made outside our facilities without written consent. Raven Industries is not responsible for damage to any associated equipment or products and will not be liable for loss of profit, labor, or other damages. Cables, hoses, software enhancements, and remanufactured items are not covered by this Extended Warranty. The obligation of this warranty is in lieu of all other warranties, expressed or implied, and no person or organization is authorized to assume any liability for Raven Industries.

**Damages caused by normal wear and tear, misuse, abuse, neglect, accident, or improper installation and maintenance are not covered by this warranty.**