

TC1/HDU Installation Manual for Kubota M8 Series

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CHAPTER

1

IMPORTANT SAFETY INFORMATION

NOTICE

Read this manual and the operation and safety instructions included with your implement and/or controller carefully before installing the TC1 system.

- Follow all safety information presented within this manual.
- If you require assistance with any portion of the installation or service of your Raven equipment, contact your local Raven dealer for support.
- Follow all safety labels affixed to the TC1 system components. Be sure to keep safety labels in good condition and replace any missing or damaged labels. To obtain replacements for missing or damaged safety labels, contact your local Raven dealer.

When operating the machine after installing TC1, observe the following safety measures:

- Be alert and aware of surroundings.
- Do not operate TC1 or any agricultural equipment while under the influence of alcohol or an illegal substance.
- Remain in the operator's position or a safe working distance away from the booms at all times when TC1 is engaged.
- Disable TC1 when exiting from the operator's seat and machine.
- Do not drive the machine with TC1 enabled on any public road.
- Determine and remain a safe working distance from other individuals. The operator is responsible for disabling TC1 when the safe working distance has diminished.
- Ensure TC1 is disabled prior to starting any maintenance work on TC1 or the machine.

WARNING

- When starting the machine for the first time after installing TC1, be sure that all persons stand clear in case a hose has not been properly tightened.
- The machine must remain stationary and switched off, with the booms unfolded and supported, during installation or maintenance.



HYDRAULIC

GENERAL

- Raven Industries recommends that appropriate protective equipment be worn at all times when working on the hydraulic system.
- Never attempt to open or work on a hydraulic system with the equipment running. Care should always be taken when opening a system that has been previously pressurized.
- When disconnecting the hydraulic hoses or purging is required, be aware that the hydraulic fluid may be extremely hot and under high pressure. Caution must be exercised.
- Any work performed on the hydraulic system must be done in accordance with the machine manufacturer's approved maintenance instructions.
- When installing TC1 hydraulics or performing diagnostics, maintenance, or routine service, ensure that precautions are taken to prevent any foreign material or contaminants from being introduced into the hydraulic system. Objects or materials that are able to bypass the hydraulic filtration system will reduce performance and possibly damage the TC1 hydraulic valve.

INSTRUCTIONS FOR HOSE ROUTING

The word "hose" is used to mean all flexible fluid carrying components. Follow existing hoses as much as possible and use these guidelines:

Hoses should not contact or be attached to:

- Components with high vibration forces
- Components carrying hot fluids beyond component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads
- Ends of adjustable hose clamps

Routing should not allow hoses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of hose components
- Hoses should be protected or shielded if it needs to route near hot temperatures beyond hose component specifications

Hoses should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For hose sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp hoses securely to force controlled movement to occur in the desired hose section
- Avoid sharp twisting or flexing of hoses in short distances

Protect hoses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures
- High pressure wash

ELECTRICAL

GENERAL

- Always verify that the power leads are connected to the correct polarity as marked. Reversing the power leads could cause severe damage to the equipment.
- Ensure that the power cable is the last cable to be connected.
- A minimum of 12 VDC is required for system operation with a maximum of 15 VDC.

INSTRUCTIONS FOR WIRE ROUTING

The word "harness" is used to mean all electrical leads and cables, bundled and unbundled. When installing harness, secure it at least every 30 cm (12in) to the frame. Follow existing harness as much as possible and use these guidelines:

Harness should not contact or be attached to:

- Lines and hoses with high vibration forces or pressure spikes
- Lines and hoses carrying hot fluids beyond harness component specifications

Avoid contact with any sharp edge or abrading surfaces such as, but not limited to:

- Sheared or flame cut edges
- Edges of machined surfaces
- Fastener threads or cap screw heads

- Ends of adjustable hose clamps
- Wire exiting conduit without protection, either ends or side of conduit
- Hose and tube fittings

Routing should not allow harnesses to:

- Hang below the unit
- Have the potential to become damaged due to exposure to the exterior environment. (i.e. tree limbs, debris, attachments)
- Be placed in areas of or in contact with machine components which develop temperatures higher than the temperature rating of harness components
- Wiring should be protected or shielded if it needs to route near hot temperatures beyond harness component specifications

Harnessing should not have sharp bends

Allow sufficient clearance from machine component operational zones such as:

- Drive shafts, universal joints and hitches (i.e. 3-point hitch)
- Pulleys, gears, sprockets
- Deflection and backlash of belts and chains
- Adjustment zones of adjustable brackets
- Changes of position in steering and suspension systems
- Moving linkages, cylinders, articulation joints, attachments
- Ground engaging components

For harness sections that move during machine operation:

- Allow sufficient length for free movement without interference to prevent: pulling, pinching, catching or rubbing, especially in articulation and pivot points
- Clamp harnesses securely to force controlled movement to occur in the desired harness section
- Avoid sharp twisting or flexing of harnesses in short distances
- Connectors and splices should not be located in harness sections that move

Protect harnesses from:

- Foreign objects such as rocks that may fall or be thrown by the unit
- Buildup of dirt, mud, snow, ice, submersion in water and oil
- Tree limbs, brush and debris
- Damage where service personnel or operators might step or use as a grab bar
- Damage when passing through metal structures

IMPORTANT:

- Avoid directly spraying electrical components and connections with high pressure water. High pressure water sprays can penetrate seals and cause electrical components to corrode or otherwise become damaged. When performing maintenance:
- Inspect all electrical components and connections for damage or corrosion. Repair or replace components, connections, or cable as necessary.
- Ensure connections are clean, dry, and not damaged. Repair or replace components, connections, or cable as necessary.
- Clean components or connections using low pressure water, pressurized air, or an aerosol electrical component cleaning agent.

- Remove visible surface water from components, connections, or seals using pressurized air or an aerosol electrical component cleaning agent. allow components to dry completely before reconnecting cables.

INTRODUCTION

Thank you for selecting the Raven TC1/HDU steering system. The TC1 system is designed to provide hands free steering of agricultural equipment using Global Navigation Satellite System (GNSS) position data.

This manual applies to the following machines:

MAKE: Kubota
MODEL: M8
YEAR: 2019 & Newer

PREPARING FOR INSTALLATION

Before installing TC1, park the machine where the ground is level, clean, and dry. Leave the machine 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 best practices before installing or operating the TC1 system for the first time, at the start of the season, or when moving the TC1 system to another machine:

- Ensure the hydraulic filters have been recently changed and there are no issues with the hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).
- Operate each of the hydraulic functions on the machine (i.e., tilt, fold, center rack, tongue extension, turning the steering wheel to the left and right steering locks, or other hydraulic valve functions) three times to ensure the hydraulic valve is using fresh oil and debris is flushed from the hydraulic hoses, valves, and filters.

Raven Industries recommends the following best practices when installing the TC1 system.

- Use part numbers to identify the 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.

TOOLS NEEDED

The following tools are recommended for installation of the TC1 system:

- SAE and metric wrenches and sockets
- 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.

UPDATES

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

<http://www.ravenhelp.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

- TC1/HDU Installation Manual for Kubota M8 Series
- 016-5035-022 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.

KIT CONTENTS

This section contains a list of the components that are included in the TC1 kit. Before beginning the TC1 installation, compare the items in the TC1 kit with the components on this list. If you have questions about the kit, contact your local Raven dealer.

FIGURE 1. TC1/HDU Installation Kit for Kubota M8 (P/N 117-5035-022 Rev. A)

THIS KIT TO CONTAIN THE FOLLOWING ITEMS LISTED BELOW:

#	QTY	PART #	DESCRIPTION	0
	1	053-0159-180	BOX, SHIPPING	
	1	063-0172-470	FOOT SWITCH, ENGAGE	
	1	016-0171-649	SHEET, WARRANY/HELP (016-5031-105)	
	1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING	
	1	063-0173-887	ECU, HYDRAULIC DRIVER UNIT (HDU)	
	1	115-4010-103	CABLE, VALVE, KUBOTA M8	
	1	115-4010-141	CABLE, TC1/HDU, KUBOTA M8	
	1	115-4010-145	CABLE, 500S, KUBOTA M8	
	1	107-0172-650	BRACKET, SC1/HDU KUBOTA M8	
	1	053-0159-015	ENVELOPE, PLASTIC	
	2	311-0050-108	BOLT, HEX HEAD, 1/4"-20 X 1- 3/4" UNC-2A	
	2	312-1001-168	NUT, FLANGED LOCK, 1/4"-20	



CHAPTER

3

CAB COMPONENT INSTALLATION

HDU AND TC1 NODE MOUNTING

FIGURE 1. TC1/HDU Nodes Installed



1. Mount the TC1 node (P/N 063-0174-070) to the node mounting plate (P/N 107-0172-635).
2. Mount the HDU node (P/N 063-0173-887) to the other side of the node mounting plate. Secure the nodes to the plate using the provided 1/4"-20 bolts and nuts.
3. Locate the two bolts at the right side base of the operator seat.

FIGURE 2. Node Mounting Points



4. Remove the two bolts and install the ECU mounting bracket to the seat base using the machine hardware.

CABLE INSTALLATION

1. Remove the panel on the right side of the machine cab.
2. Locate the machine steering connections.

FIGURE 3. Machine Steering Connections

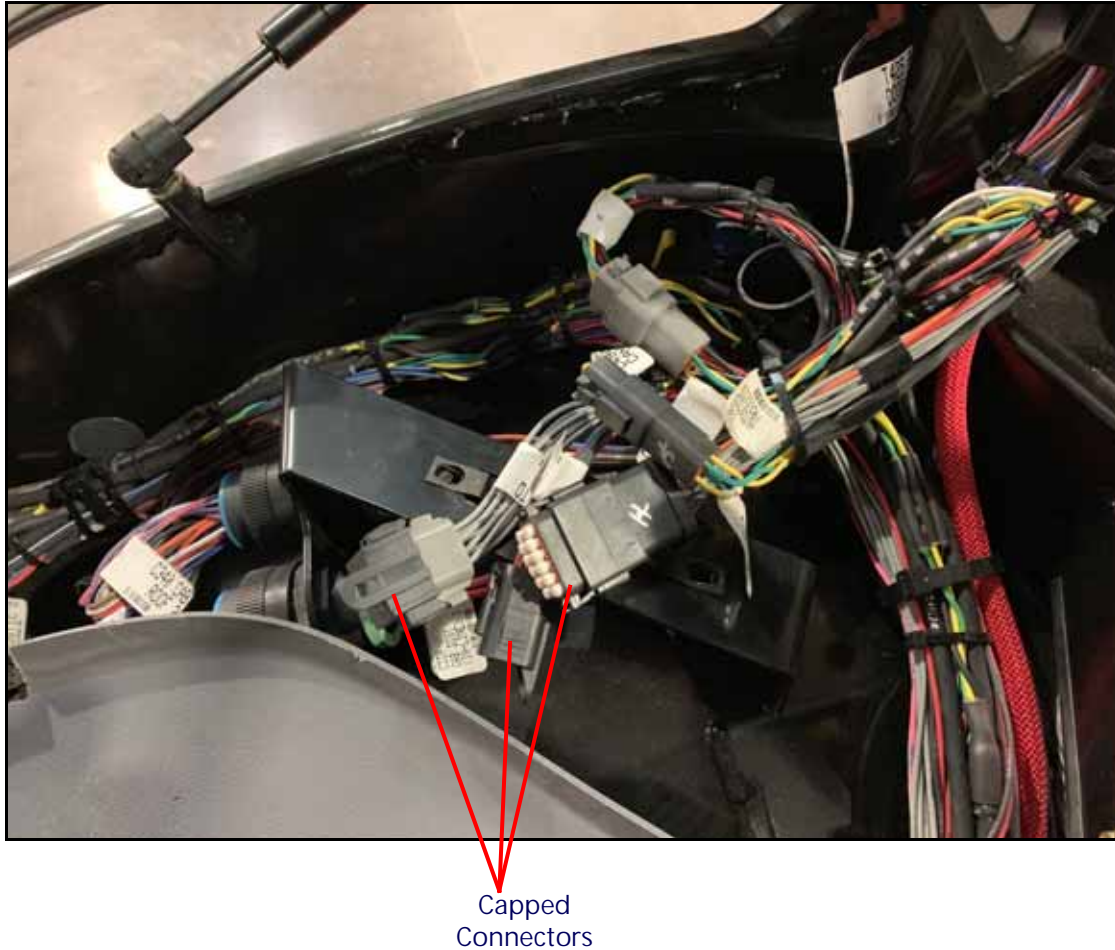


CAN
Connection

3. Disconnect the 4-pin ISO CAN connector (C490) and tee in the ISO CAN connector on the TC1 cable (P/N 115-4010-141).
4. Connect the 8-pin (C430), 12-pin (C901), and 6-pin (C482) connectors on the HDU harness into the mating machine connections.

NOTE: Existing connections are capped.

FIGURE 4. Capped Machine Connections



NOTE: The 3-pin 3D GPS OUT connector may be connected to any ECU that needs serial GPS information.

5. Connect the 2-pin ENGAGE connector into the mating connection on the foot switch (P/N 063-0172-470).
6. Route the HDU and SC1 connectors to the right side of the seat base where the SC1/HDU ECUs are mounted and plug the mating connectors into the ECUs.
7. Locate the Secondary CANbus connection on the rear of the cab behind the operator seat (C434).

NOTE: This connector is either free hanging or connected to the VPAS ECU.

FIGURE 5. Secondary CANbus Connection



8. Connect the 12-pin DTM connector on the SC1/HDU harness into the machine connector (C434).

NOTE: One side of the tee might not be utilized if the machine connector is not plugged into a mating connector.

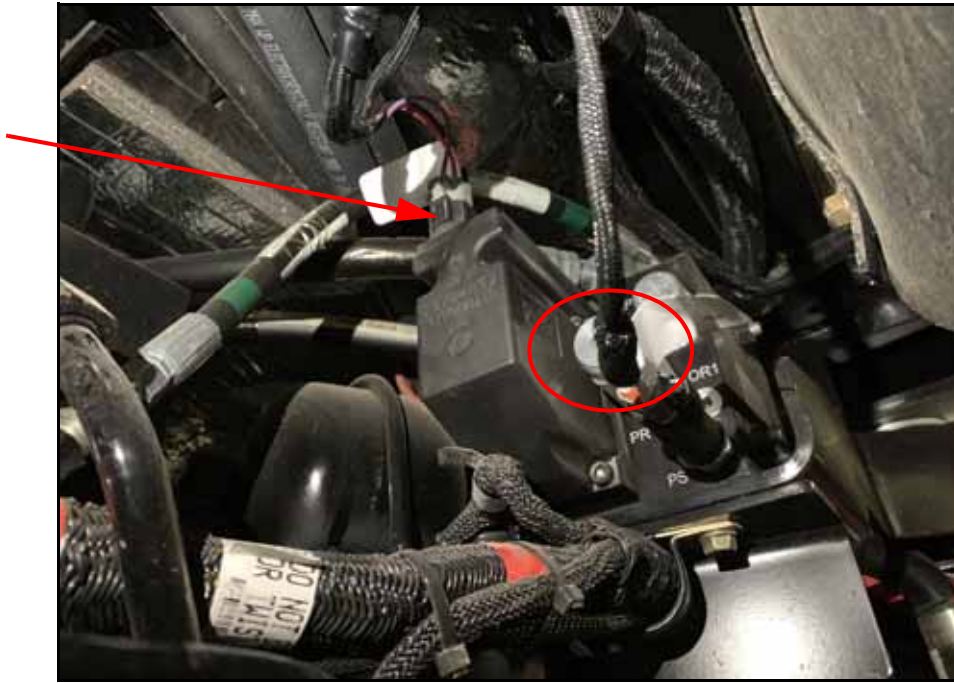
9. Locate the steering valve and wheel angle sensor (WAS) connections underneath the cab near the right, rear axle.
10. Plug the mating 8-pin (C136) and 3-pin (C142) connectors of the valve harness (P/N 115-4010-103) into the machine connections.

FIGURE 6. Valve Harness Connection



11. Connect the 4-pin and 3-pin connectors on the valve harness into the mating ports on the steering valve.

FIGURE 7. Valve Harness Connections



12. Plug the 12-pin connector on the GPS harness (P/N 115-4010-145) into the mating roof bulkhead connection located at the top, rear of the cab.

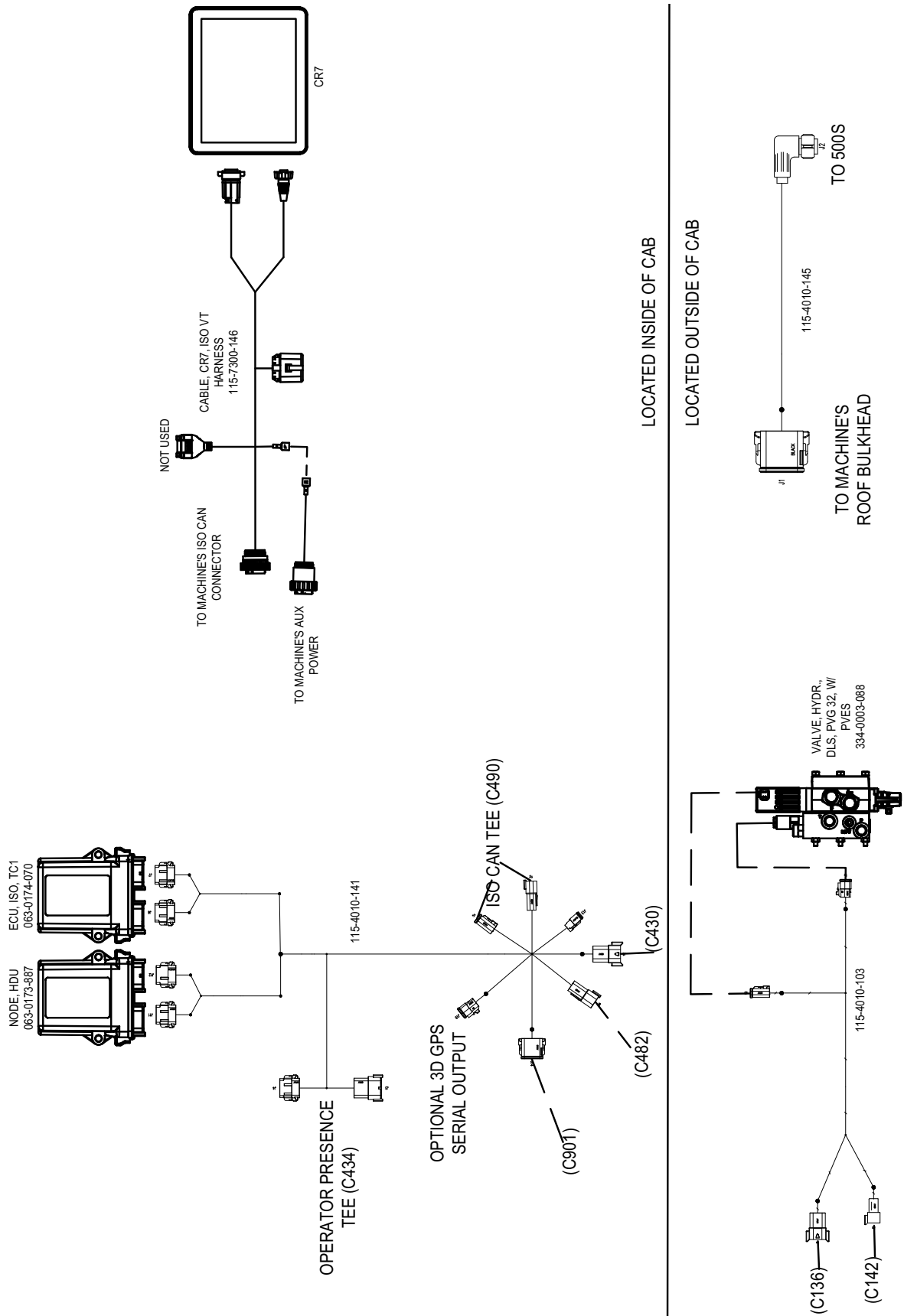
FIGURE 8. Roof Bulkhead Connection




13. Connect the other end of the GPS harness into the 500S smart antenna.

NOTE: A console cable will need to be installed into the 9-pin CAN AUX port on the tractor.


FIGURE 9. TC1/HDU System Diagram for Kubota M8 Series (Steer Ready)





WARNING

When starting the machine for the first time after installing TC1, be sure that all persons stand clear in case a hose has not been properly tightened.



WARNING

Do not use hands to check for leaks. Hydraulic fluid under pressure can penetrate the skin and cause serious injury or death.

VERIFY THE SYSTEM INSTALLATION

1. Turn on the machine.
2. Double-check all fitting and hose connections to ensure that:
 - Hoses are not rubbing on or interfering with moving parts.
 - Hydraulic fluid is not leaking from the system.
3. Turn the wheels fully from side to side repeatedly to remove air from the hydraulic system.

NOTE: During the system installation, whenever the hydraulic system is purged for maintenance, or when fittings are loosened to disconnected, air is introduced into the lines of the hydraulic system. If air pockets are present, the wheels may not move consistently when the steering wheel is turned.

4. Continue turning the wheels until they move steadily and smoothly when the steering wheel is turned.

NOTE: If there are issues with the system, turn off the machine and correct them immediately. For additional assistance, refer to the SC1/TC1 Calibration and Operation Manual (P/N 016-4010-005) or contact your local Raven dealer.

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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 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.