

TC1™ Installation Manual for Kubota M7 Steer Ready

016-5035-080 Rev. A

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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.

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.
- Always start the machine before initializing this Raven system to prevent power surges or peak voltage.
- 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.

RECOMMENDATIONS AND BEST PRACTICES

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 12 in [30 cm].
- 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.

CHAPTER

INTRODUCTION

2

This manual applies to the following machines. For future reference, write your serial number in the space below.


Make. Kubota


Model. M7 Steer Ready

FIGURE 1. Kubota Tractors



INSTALLATION BEST PRACTICES




WARNING

Carefully read and follow all safety requirements and precautions contained in this manual and the machine-specific Installation Manual. Failure to follow safety instructions may lead to equipment damage, personal injury, or death.

RECOMMENDATIONS

Before installing the TC1™ system, park the machine where the ground is level, clean, and dry. Bleed pressure from the hydraulic system and 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.

Raven Industries recommends the following best practices when 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:

- Verify that the machine's hydraulic system is using fresh oil and that the filters have been recently changed
- Ensure there are no issues with the machine's hydraulic system (e.g., pump issues, faulty hydraulic motors, fine metal deposits in the hydraulic hoses, etc.).

POINT OF REFERENCE

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

KIT COMPONENTS

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

FIGURE 2. Kubota M7 CR7 and TC1™ Kit Components (P/N 117-5035-080 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-323	BOX, SHIPPING
1	115-4010-156	CABLE, TC1, KUBOTA M7, STEER READY
1	115-7300-171	CABLE, CR7, ISO, IN-CAB 9P AUXILIARY POWER
1	117-8000-255	KIT, BRACKET, NODE, SEAT MOUNT
1	063-2000-010	ASSEMBLY, 700S, MACHINE BRACKET
1	117-8000-341	KIT, MOUNTING, TRACTOR
1	063-0174-070	ECU, ISO, RC1, LOW SPEED STEERING
1	016-0171-648	WARRANTY/HELP SHEET

FIGURE 3. Kubota M7 CR12 and TC1™ Kit Components (P/N 117-5035-081 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-323	BOX, SHIPPING
1	115-4010-156	CABLE, TC1, KUBOTA M7, STEER READY
1	115-7300-156	CABLE, CR12, ISO, IN-CAB 9P AUXILIARY POWER, INTERNAL G
1	117-8000-255	KIT, BRACKET, NODE, SEAT MOUNT
1	063-2000-010	ASSEMBLY, 700S, MACHINE BRACKET
1	117-8000-341	KIT, MOUNTING, TRACTOR
1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
1	016-0171-648	WARRANTY/HELP SHEET

UPDATES

Updates for Raven manuals as well as software updates for Raven consoles, and product controllers are available at the Applied Technology Division web site:

<https://portal.ravenprecision.com>

Sign up for e-mail alerts to receive notifications when updates for your Raven products are available on the Raven web site.

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™ Installation Manual for Kubota M7 Steer Ready
- 016-5035-080 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.

MOUNT THE HARNESS

1. Remove the pillar panel screws.
2. Loosen the bracket bolts if equipped.

FIGURE 1. Pillar Panel



3. Remove the pillar panel.

FIGURE 2. Pillar Panel Removed



FIGURE 3. Radio and A/C Controls



4. Open the cover where the radio and A/C controls are located and remove the black plastic cover beneath.

5. Locate the Autosteering port on the printed circuit board beneath the radio and A/C panel.

FIGURE 4. Autosteering Port



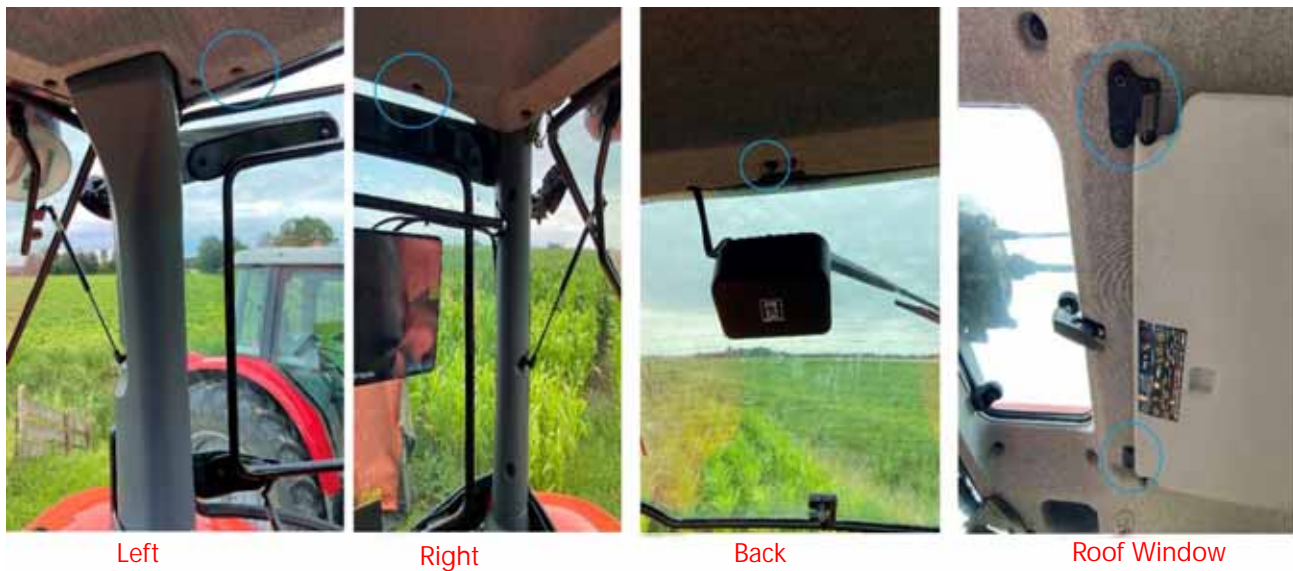
6. Install the Raven Connector labeled "Autosteering port" from cable (P/N 115-4010-156).

FIGURE 5. Cab Roof



7. Remove the four nuts on top of the roof.

FIGURE 6. Inner Cab Roof Bolts



8. Remove the long bolts inside of the cab holding the ceiling.

NOTE: The circled short bolts should stay in place.

9. Once the roof is lifted, there is space at the rear working lights to route the cables through the pillar out of the cab.

10. Route the antenna cable (P/N 115-8000-349) through the opening.

11. If a Slingshot® modem is used route the GPS antenna and Laird cables through the opening.

FIGURE 7. Loop the Cable



12. Place the cable in a small loop just outside of the cab to prevent water from entering into the cab.

NOTE: Due to the construction of the cab, it could be possible that water leaks inside via the cables. It is very important to place a small loop in the cable just outside of the cab.

13. Route the cables behind the panels towards the TC1™.

INSTALL THE TC1™

BEST MOUNTING PRACTICES

Ensure the installer follows all of the following guidelines for best mounting practices:

- Use the standard TC1™ mounting bracket (P/N 117-8000-255).
- Place the TC1™ near the seat, preferably to the right of the seat.
- Mount on the seat bolts. If needed, use two M8 extension nuts to heighten the bracket.
- If the installer is unable to attach the TC1™ to the seat bolts, attach the TC1™ in the cab in a location that is free from vibrations.
- The TC1™ may only be mounted in a horizontal position (with the sticker facing upwards). The connectors may be orientated in four directions: 0, 90, 180, or 270 degrees.
- By default, the orientation of the TC1™ is set to horizontal position with connectors pointing towards the rear. Any other orientation should be set properly in the accompanying software.

FIGURE 8. TC1™ Mounted Next to Seat



INSTALL 500S™ AND 700S™

The TC1™ can be used with the 500S and 700S and internal GPS.

Ensure the installer follows all of the following guidelines for best installation practices:

- Mount the GPS-antenna with the connectors pointing to the backside.
- Mount the GPS-antenna in front of the rear axle.
- Mount the GPS-antenna on the centerline of the cab/tractor.
- When connecting a 500S antenna, use the 115-0172-589 cable.
- When connecting a 700S antenna, use the 115-0172-588 cable.

FIGURE 9. Mounted 500S Antenna



FIGURE 10. 700S Mounting Plate and Antenna



If the antenna is not connected, ensure that the connectors on the roof are covered with a protective cap to prevent dust and water from entering the connector.

FIGURE 11. Protective Cap



INSTALL SLINGSHOT® FIELD HUB

Ensure the installer follows all of the following guidelines for best installation practices:

- The GPRS/UMTS antennas are equipped with a magnetic base and must be placed on top of the cabin.
- The antennas should be mounted in a clear, unobstructed area to ensure clear reception.
- To avoid confusion, label the antenna cables inside the cabin with “Cellular” and “Diversity.” Label the GPS patch antenna cable with “GPS” as seen in Figure 12.
- Mount a gray SMA grip on both antenna cable connections and mount a blue SMA grip on the GPS patch antenna cable, also shown in Figure 12, “Labeled Antenna Cables with SMA Grips,”.

FIGURE 12. Labeled Antenna Cables with SMA Grips



FIGURE 13. Field Hub connected with CRx and Viper 4



If a Slingshot modem is used, in addition to the GPS-antenna, two GPRS/UMTS antennas and a GPS patch should be mounted.

NOTE: Handle the GPS patch with care; the antenna cable is thin and fragile.

The GPRS/UMTS antennas should be mounted as far away from each other as possible. More than 100 cm is recommended.

FIGURE 14. GPS Patch Antenna and Two GPRS/UMTS Antennas



If a standard GPS antenna bracket is mounted, one of the GPRS/UMTS antennas should be mounted on this bracket. The second GPRS/UMTS antenna should be mounted on a metal bracket on the cabin.

FIGURE 15. GPRS/UMTS Mounted



Connect the power cable to the connector with the label "Slingshot PWR." Then connect the RTK IN connector with the GPS OUT connector. Next, connect the Serial RTK IN with the Slingshot. Finally, connect the Ethernet cable between the Slingshot and the CR7.

INSTALL CR7™ OR CR12™

Ensure the installer follows all of the following guidelines for best installation practices.

- Always ensure the terminal is placed in the most appropriate position facing the driver seat for easy access and use.
- Always use a RAM-C ball attachment.
- Mount the terminal with a solid bracket in a place free of vibrations.
- Secure all cables in the cabin so there are no free-hanging cables.
- Ensure the driver has a clear, unobstructed view all around the cabin.

FIGURE 16. CR7 Mounted in Various Positions



FIGURE 17. CR12 Mounted in Various Positions

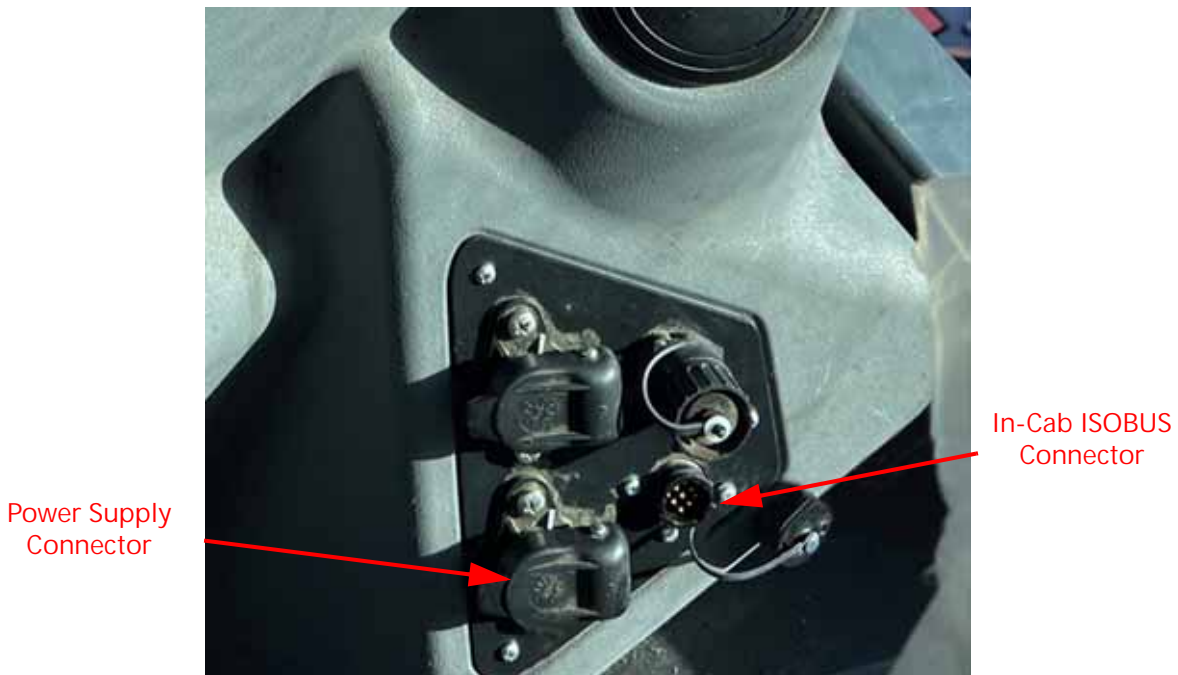


INSTALL FIELD COMPUTER HARNESS

Ensure the installer follows all of the following guidelines for best installation practices.

- Install the field computer harness between the field computer and the standard connectors of the tractor.
- Mount the ISOBUS connector to the panel mount connector in the cab of the tractor.
- Mount the Power Connector.
- Guide the harness to the field computer.

FIGURE 18. ISOBUS and Power Connector



ACTIVATE AUTOMATIC STEERING

NOTE: Before the Autosteering can be installed a Kubota dealer will be required to activate and calibrate the VCU1 and VCU2.

The rocker switch for the PVED will also need to be installed.

1. Change the setting for the VCU1 with the K-OBd service tool.

The screenshot shows the 'Parameters' screen in the K-OBd service tool. The 'xCU' is set to 'VCU1'. The 'Dpkg Ver' is 'V1.00' and the 'xCUSWVer' is 'MT9900856'. The 'Auto-Steering' parameter is set to 1.

Service / Group	Name / Value	Actions
Auto-Steering / System		↓ ↕ ⋮
Existence of pneumatic trailer brake		↓ ↕ ⋮
Engine type Read		↓ ↕ ⋮
Engine horsepower Read		↓ ↕ ⋮
Existence of block heater Read		↓ ↕ ⋮
Ratio of front PTO Read		↓ ↕ ⋮
Existence of front suspension Read		↓ ↕ ⋮
Machine width (cm)_1 Read		↓ ↕ ⋮
Existence of radar sensor Read		↓ ↕ ⋮
Existence of auto steering system F	Existence_of_auto_steeri... 1	↓ ↕ ⋮
Ambient temperature [degC] Read		↓ ↕ ⋮
Hour meter Read		↓ ↕ ⋮
Auto-Steering	DataRecord 1	↓ ↕ ⋮
Language		↓ ↕ ⋮
Radar		↓ ↕ ⋮

2. Existence of auto steering system = 1.
3. Auto-Steering = 1.

4. Change the setting for the VCU2 with the K-OBD service tool.



5. GCOM_IdxVehVrntRead = Premium
6. GCOM_SteerAgRedAvl Read = Installed (Steering angle sensor avail)
7. GCOM_SterCtiAvl Read = Installed (Auto Steer availability)
8. Once these parameters have been successfully set with the K-OBD. The following calibrations need to be done with the K-OBD.
 - Wheel Angle Sensor Calibration - VCU2
 - Wheel Angle Sensor Calibration - SC
 - Spool Calibration - SC
9. To activate the steering valve, flip the steering-wheel switch to the on position.

FIGURE 19. Steering Button



SYSTEM DRAWINGS

FIGURE 20. Kubota M7 CR7 & TC1™ System Drawing (P/N 054-5035-080 Rev. A)

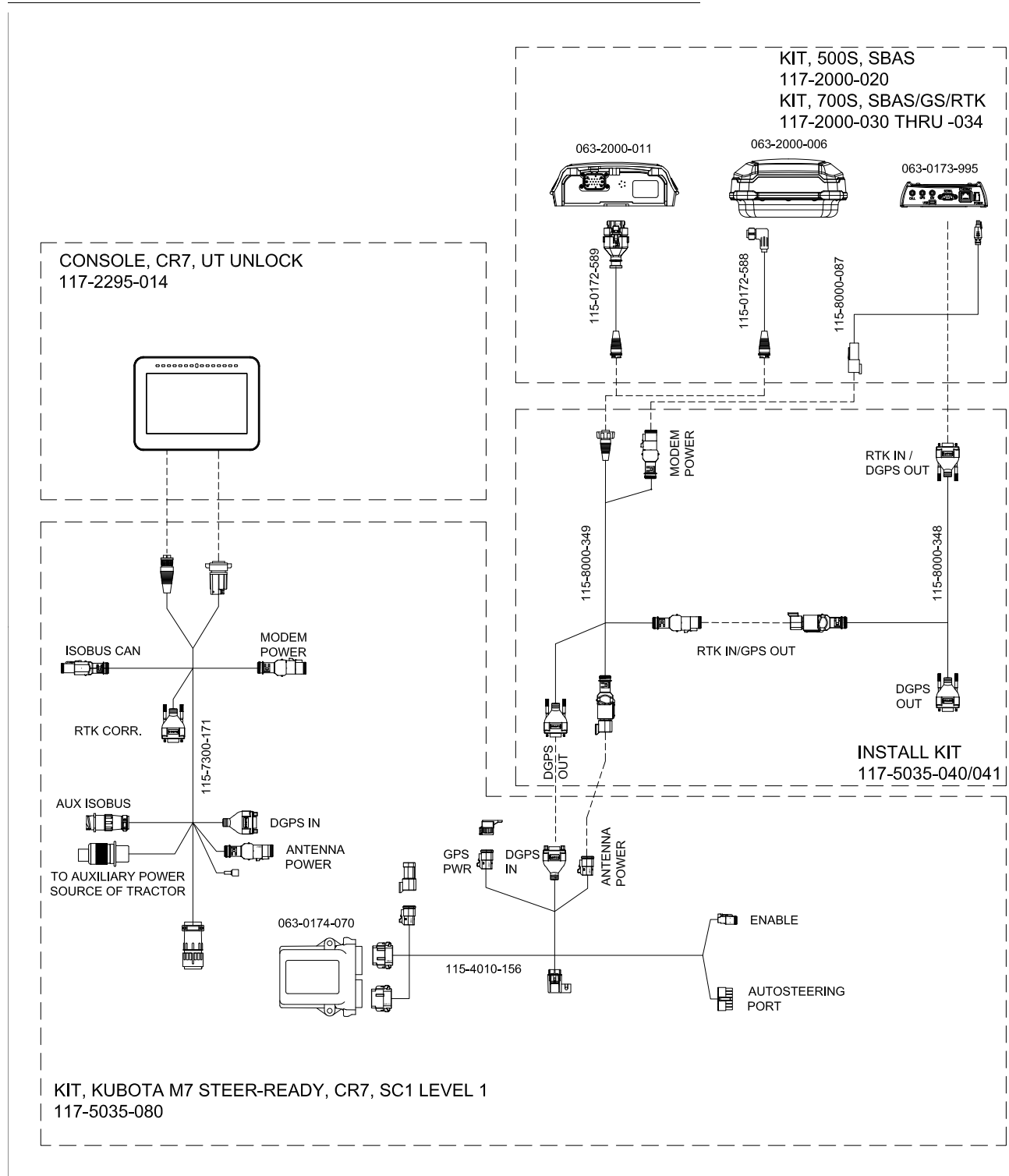
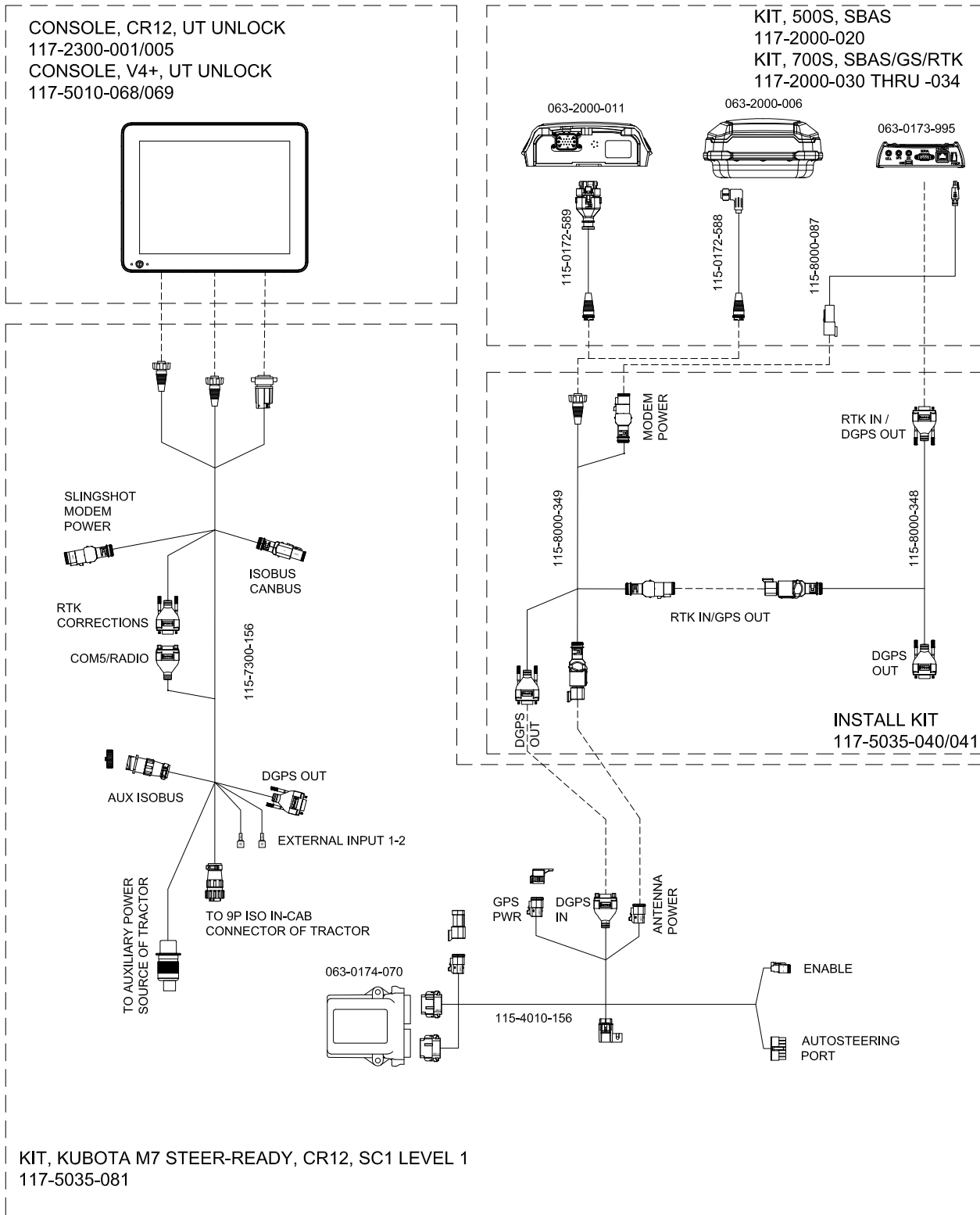


FIGURE 21. Kubota M7 CR12 & TC1™ System Drawing (P/N 054-5035-081 Rev. A)



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.