

TC1™ Installation Manual for Challenger MT7XX & MT8XX C/D/E

016-5033-017 Rev. B

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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

Thank you for choosing Raven Applied Technologies. This system is designed to provide cutting-edge, hands-free steering of the machine via Global Positioning System (GPS) coordinates.

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


Make. Challenger

Model. MT 7XX & 8XX Series AutoGuide and Non-AutoGuide machines

FIGURE 1. Challenger Tractor



INSTALLATION BEST PRACTICES

	<p data-bbox="760 258 1073 310">WARNING</p> <p data-bbox="634 323 1188 483">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.</p>
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RECOMMENDATIONS

Park the machine where the ground is level, clean, and dry before installing the TC1™ system. Bleed pressure from the hydraulic system and leave the machine turned off for the duration of the installation process.

Follow good safety practices during the installation process. Be sure to carefully read the instructions in this manual.

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 the operator is standing behind the machine, looking towards the cab.

KIT COMPONENTS

This section contains a list of the components that are included in the TC1 kit. Compare the items in the kit with the components on this list before beginning the system installation. Contact your Raven dealer with any questions.

FIGURE 2. Challenger AutoGuide CR7 and TC1 Kit Components (P/N 117-5033-019 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-209	BOX, SHIPPING
1	107-8000-173	BRACKET, SC1, SEAT MOUNT
1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
1	115-4010-222	CABLE, SC1 RECEIVER, ROOF BULKHEAD, CHALLENGER MT 700
1	115-4010-221	CABLE, SC1 CAB CHALLENGER, MT 700&800 SERIES
1	115-7300-092	CABLE, CR7 ISO VT ONLY
1	053-0159-074	ENVELOPE, PLASTIC
2	311-0070-059	BOLT, HEX HEAD M6 X 1.0 X 25MM
2	313-6000-010K	WASHER, DIN125A, M6
2	311-4050-223K	HEX BOLT, DIN 931 M10-1.5 X 25MM
2	312-6000-016N	SPING LOCK WASHER DIN127-ZN-M10
2	313-6000-016N	WASHER, DIN125 M10 CLASS V

FIGURE 3. Challenger AutoGuide V4/CR12 and TC1 Kit Components (P/N 117-5033-022 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-209	BOX, SHIPPING
1	107-8000-173	BRACKET, SC1, SEAT MOUNT
1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
1	115-4010-222	CABLE, SC1 RECEIVER, ROOF BULKHEAD, CHALLENGER MT 700
1	115-4010-221	CABLE, SC1 CAB CHALLENGER, MT 700&800 SERIES
1	115-7300-135	CABLE, CONSOLE, VIPER 4 ISO VT
1	053-0159-074	ENVELOPE, PLASTIC
2	311-0070-059	BOLT, HEX HEAD M6 X 1.0 X 25MM
2	313-6000-010K	WASHER, DIN125A, M6
2	311-4050-223K	HEX BOLT, DIN 931 M10-1.5 X 25MM
2	312-6000-016N	SPING LOCK WASHER DIN127-ZN-M10
2	313-6000-016N	WASHER, DIN125 M10 CLASS V

FIGURE 4. Challenger Non-AutoGuide CR7 and TC1 Kit Components (P/N 117-5033-020 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-209	BOX, SHIPPING
1	107-8000-173	BRACKET, SC1, SEAT MOUNT
1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
1	115-4010-220	CABLE, SC1 RECEIVER, CHALLENGER, MT 700&800 SERIES
1	115-4010-221	CABLE, SC1 CAB CHALLENGER, MT 700&800 SERIES
1	115-7300-092	CABLE, CR7 ISO VT ONLY
1	063-2000-010	BRACKET, 700S MACHINE
1	053-0159-074	ENVELOPE, PLASTIC
2	311-0070-059	BOLT, HEX HEAD M6 X 1.0 X 25MM
2	313-6000-010K	WASHER, DIN125A, M6
2	311-4050-223K	HEX BOLT, DIN 931 M10-1.5 X 25MM
2	312-6000-016N	SPING LOCK WASHER DIN127-ZN-M10
2	313-6000-016N	WASHER, DIN125 M10 CLASS V

FIGURE 5. Challenger Non-AutoGuide V4/CR12 and TC1 Kit Components (P/N 117-5033-017 Rev. A)

QTY	PART #	DESCRIPTION
1	053-0159-209	BOX, SHIPPING
1	107-8000-173	BRACKET, SC1, SEAT MOUNT
1	063-0174-070	ECU, ISO, TC1, LOW SPEED STEERING
1	115-4010-220	CABLE, SC1 RECEIVER, CHALLENGER, MT 700&800 SERIES
1	115-4010-221	CABLE, SC1 CAB CHALLENGER, MT 700&800 SERIES
1	115-7300-135	CABLE, CONSOLE, VIPER 4 ISO VT
1	063-2000-010	BRACKET, 700S MACHINE
1	053-0159-074	ENVELOPE, PLASTIC
2	311-0070-059	BOLT, HEX HEAD M6 X 1.0 X 25MM
2	313-6000-010K	WASHER, DIN125A, M6
2	311-4050-223K	HEX BOLT, DIN 931 M10-1.5 X 25MM
2	312-6000-016N	SPING LOCK WASHER DIN127-ZN-M10
2	313-6000-016N	WASHER, DIN125 M10 CLASS V

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 Challenger MT7XX & MT8XX C/D/E
- 016-5033-017 Rev. B
- 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.

INSTALL THE TC1™ CAB CABLE

1. In the cab, remove the right lower panel where the electrical system is located

FIGURE 1. Right Lower Panel



2. Locate the 4-pin Duetsch connector labeled "BUS EXTENSION."

FIGURE 2. BUS EXTENSION Connector



3. Tee in the 4-pin connection on the TC1 cab cable (P/N 115-4010-221).

FIGURE 3. RS232 Connector and Middle Diagnostic Port



4. Locate the 3-pin connector labeled "RS232" and plug in the respective 3-pin connector on the SC1 cable.
5. Plug into a power source.

NOTE: The power source is machine dependent. Some machines will have convenience ports in the rear of the cab, others will have a power rail near the hand rail.

FIGURE 4. Convenience Ports



FIGURE 5. Power Rail



NOTE: The modem power and 3D GPS connections are optional based on the application.

6. Connect the respective field computer cable to the TC1 cab cable.
7. Route optional cables through the rear window if necessary.

NOTE: If RTK or GPS is needed from/to the cab, connect the GPS out/RTK in cable (P/N 115-8000- 348) to the field hub to feed RTK to the receiver or to bring GPS into the cab. Consult the system diagram for more information.

8. Route the cable behind the seat to the back of the cabin, next to the seat, and connect it to 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 117-8000-173).
- Place the TC1 near the seat, preferably to the left of the seat.
- Remove the 2 seat bolts on the left side and install the bracket with TC1 mounted to the rear. Use the provided bolts and washers for proper thread engagement.
- 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 with connectors pointing towards the rear. Any other orientation should be set properly in the accompanying software.

FIGURE 6. TC1 Mounted Next to Seat



1. Connect the two 12-pin connectors to the TC1.

INSTALL 500S™ OR 700S™

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

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 500S adapter cable (P/N 115-0172-588).
- When connecting a 700S antenna, use the smart antenna adapter cable (P/N 115-0172-589).

FIGURE 7. Mounted 500S Antenna



FIGURE 8. 700S Mounting Plate and Antenna



Ensure the connectors on the roof are covered with a protective cap if the antenna is not connected. This prevents dust and water from entering the connector.

FIGURE 9. Protective Cap



INSTALL JOHN DEERE STARFIRE™

The TC1 can be used with the optional John Deere StarFire kit (P/N 117-2000-007).

NOTE: The roof bracket needs to be fully assembled prior to mounting on the roof. Otherwise, a clearance issue will arise.

FIGURE 10. Roof Bracket



1. Attach the roof mount extensions (P/N 107-0172-540) to the roof mount main bar (P/N 107-0172-539) using the shorter M10 bolts and mounting hardware.
2. Attach the StarFire bracket (P/N 107-0172-267) to the roof mount main bar using the M8 bolts, spacers, and mounting hardware.
3. Attach the bracket assembly to the cab roof using the longer M10 bolts, mounting hardware, and spacers.

INSTALL EXTERIOR ANTENNA HARNESS

FOR AUTOGUIDE MACHINES

1. On the roof, connect the 12-pin round bulkhead connector on the cab to the 12-pin round connection on the SC1 receiver cable (P/N 115-4010-222).
2. Connect the other end of the SC1 receiver cable to the respective receiver cable (P/N 115-0172-588 or P/N 115-0172-589 or P/N 115-0172-659).
3. Cap the extra connection if not being used.

FOR NON-AUTOGUIDE MACHINES

1. Remove the bolts on top of the roof and along the perimeter of the bottom lip of the roof to remove the roof cap.
2. Lift the cap from the front left side. Use a block to keep the roof open.
3. Locate the 12-pin connector labeled "TOP DOCK INTERFACE."

FIGURE 11. TOP DOCK INTERFACE Connector



4. Route the gray connector on the SC1 receiver cable (P/N 115-4010-220) through the windshield wiper opening.

FIGURE 12. SC1 Receiver Cable



5. Plug the gray connector on the SC1 receiver cable into the top dock interface connector.

FIGURE 13. Gray Connector Plugged Into Top Dock Interface Connector



6. Reinstall the roof cap.
7. Connect the other end of the SC1 receiver cable to the respective receiver cable (P/N 115-0172-588 or PN 115-0172-589 or P/N 115-0172-659).
8. Cap the extra connection if not being used.

INSTALL CR7™ OR VIPER 4®/CR12™

Ensure the following guidelines are met.

- 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 14. CR7 Mounted in Various Positions



FIGURE 15. Viper 4/CR12 Mounted in Various Positions



INSTALL FIELD COMPUTER HARNESS

Ensure the following guidelines are met.

- Install the field computer harness between the field computer and the connector on the TC1 cable.
- Guide the harness to the field computer.

ACTIVATE AUTOMATIC STEERING

To activate automatic steering for Challenger systems with TC1:

1. Ensure the master switch near the radio is on the field mode and hydraulic lockout is not enabled.

FIGURE 16. Master Switch



2. Use the engage switch to activate automatic steering.

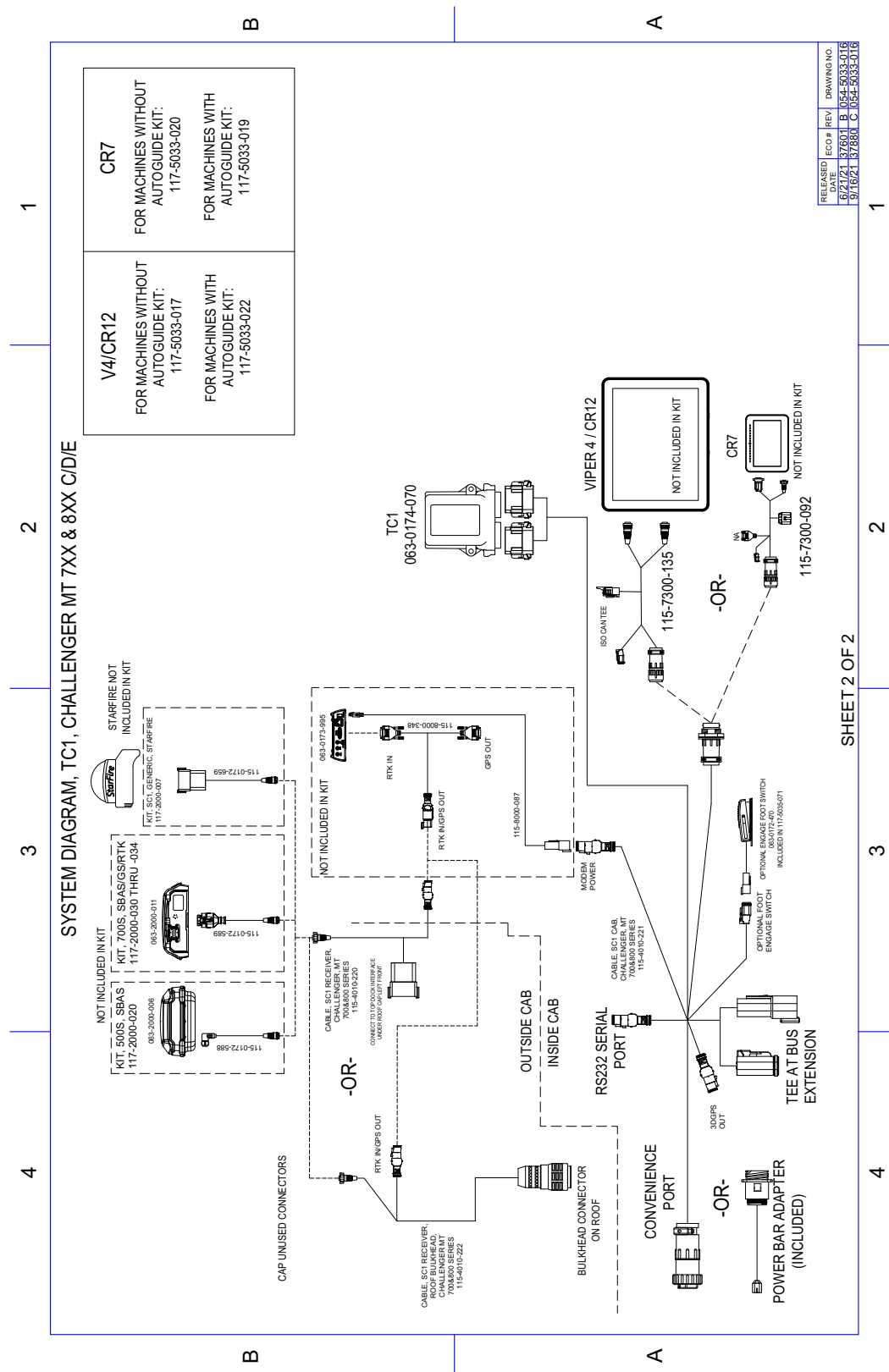
NOTE:

In the event that the engage switch is not present or does not function. First remove the resume switch from the armrest and ensure that the factory harness is connected to the switch.

If the switch still does not function you will need to order the optional foot engage switch kit (P/N 117-5033-071). The foot switch will connect to the Optional Foot Engage Switch connector on the TC1 cab cable (P/N 115-4010-221).

SYSTEM DIAGRAM

FIGURE 17. Challenger MT7XX & MT8XX C/D/E SC1/TC1 System Diagram (P/N 054-5033-016 Rev. B)



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.