M0112075-05 (en-us)
July 2023

Operation and Maintenance Manual

Global Navigation Satellite System (GNSS) Receiver and Devices

ZEB 1-UP (D6T)

Language : Original Instructions

Scan to find and purchase genuine Cat® parts and related service information.

Important Safety Information

Most accidents that involve product operation, maintenance and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards, including human factors that can affect safety. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you verify that you are authorized to perform this work, and have read and understood the operation, lubrication, maintenance and repair information.

Safety precautions and warnings are provided in this manual and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “DANGER”, “WARNING” or “CAUTION”. The Safety Alert “WARNING” label is shown below.

The meaning of this safety alert symbol is as follows:

Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning explains the hazard and can be either written or pictorially presented.

A non-exhaustive list of operations that may cause product damage are identified by “NOTICE” labels on the product and in this publication.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this publication and on the product are, therefore, not all inclusive. You must not use this product in any manner different from that considered by this manual without first satisfying yourself that you have considered all safety rules and precautions applicable to the operation of the product in the location of use, including site-specific rules and precautions applicable to the worksite. If a tool, procedure, work method or operating technique that is not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and for others. You should also ensure that you are authorized to perform this work, and that the product will not be damaged or become unsafe by the operation, lubrication, maintenance or repair procedures that you intend to use.

The information, specifications, and illustrations in this publication are on the basis of information that was available at the time that the publication was written. The specifications, torques, pressures, measurements, adjustments, illustrations, and other items can change at any time. These changes can affect the service that is given to the product. Obtain the complete and most current information before you start any job. Cat dealers have the most current information available.

NOTICE

When replacement parts are required for this product Caterpillar recommends using original Caterpillar® replacement parts.

Other parts may not meet certain original equipment specifications.

When replacement parts are installed, the machine owner/user should ensure that the machine remains in compliance with all applicable requirements.

In the United States, the maintenance, replacement, or repair of the emission control devices and systems may be performed by any repair establishment or individual of the owner's choosing.

Table of Contents

Foreword

Literature Information

This manual should be stored in the operator's compartment in the literature holder or seat back literature storage area.

This manual contains safety information, operation instructions, and maintenance recommendations.

Some photographs or illustrations in this publication show details or attachments that can be different from your product.

Continuing improvement and advancement of product design might have caused changes to your product which are not included in this publication. Read, study and keep this manual with the product.

Whenever a question arises regarding your product, or this publication, please consult your Cat dealer for the latest available information.

Safety

The safety section lists basic safety precautions. In addition, this section identifies the text and locations of warning signs and labels used on the machine.

Operation

The operation section is a reference for the new operator and a refresher for the experienced operator. This section includes a discussion of gauges, switches, product controls, attachment controls, and programming information.

Photographs and illustrations guide the operator through correct procedures of checking, starting, operating and stopping the product.

Operating techniques outlined in this publication are basic. Skill and techniques develop as the operator gains knowledge of the product and its capabilities.

Maintenance

The maintenance section is a guide to equipment care.

Safety Section

i07990093

Safety Messages

SMCS Code: 7405

Important Safety Information

Work safely. Most accidents that involve product operation, maintenance, and repair are caused by failure to observe basic safety rules or precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills, and tools to perform these functions properly.

Safety precautions and warnings are provided in this instruction and on the product. If these hazard warnings are not heeded, bodily injury or death could occur to you or to other persons. Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. Therefore, the warnings in this publication and the warnings that are on the product are not all inclusive.

If a tool, a procedure, a work method, or an operating technique that is not recommended by Caterpillar is used, ensure that the tool, procedure, work method, or operating technique is safe to use. Ensure that the product will not be damaged or the product will not be made unsafe by the operation, lubrication, maintenance, or repair procedures used.

⚠ WARNING

Do not operate or work on this machine unless you have read and understand the instructions and warnings in the Operation and Maintenance Manuals. Failure to follow the instructions or heed the warnings could result in injury or death. Contact your Cat dealer for replacement manuals. Proper care is your responsibility.

⚠ WARNING

Accidental engine starting can cause injury or death to personnel working on the equipment.

To avoid accidental engine starting, disconnect the battery cable from the negative (−) battery terminal. Completely tape all metal surfaces of the disconnected battery cable end in order to prevent contact with other metal surfaces which could activate the engine electrical system.

Place a Do Not Operate tag at the Start/Stop switch location to inform personnel that the equipment is being worked on.

Use steps and handholds whenever you mount the machine. Use steps and handholds whenever you dismount the machine. Before you mount the machine, clean the step and the handholds. Inspect the step and handholds. Make all necessary repairs.

Face the machine whenever you mount the machine and whenever you dismount the machine. Maintain a three-point contact with the step and with handholds.

Note: Three-point contact can be two feet and one hand. Three-point contact can also be one foot and two hands. Refer to Illustration 1 .

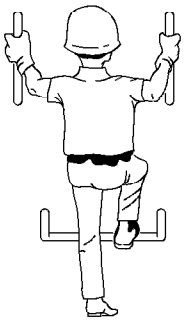

Illustration 1 g00037860

Do not mount a moving machine. Do not dismount a moving machine. Never jump off the machine. Do not try to mount the machine when you carry tools or supplies. Do not try to dismount the machine when you are carrying tools or supplies. Use a hand line to pull equipment onto the platform. Do not use any controls as handholds when you enter the cab or when you exit the cab.

Falling Hazard - Do Not Climb

⚠ WARNING

Falling Hazard. Do not climb onto the drum in order to access the GPS receiver. Climbing on the drum could result in a fall which could cause serious injury or death. Use the raise and lower mechanism to access the GPS receiver for all required maintenance and service. For more information, refer to Operation and Maintenance Manual, “Getting Started”.

Illustration 2 g06500630

WARNING

Do not use this surface as a step or platform. This surface may not support additional weight or may be slippery. Serious injury or death could occur from a fall.

Regulatory Compliance Information

Radio Frequency Components

i08703248

Global Positioning System (GPS)

(Zephyr Model 2 Antenna - If Equipped)

SMCS Code: 7490; 7602

Illustration 3 g06275684

Zephyr Model 2 Rugged

Table 1

Model	Cat Part Number
Zephyr Model 2	386 - 7311

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

i08703249

Global Positioning System (GPS)

(Zephyr III Antenna - If Equipped)

SMCS Code: 7490; 7602

Illustration 4 g06275705

Zephyr III Rugged

Table 2

Model	Cat Part Number
Zephyr III	492 - 7319

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Great Britain

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with the relevant statutory requirements. The full text of the Great Britain Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

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i08703284

Wireless Device
(EC520-W - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

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https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

The following communication device specifications are provided to aid in conducting any related hazard assessment and to ensure compliance with all local regulations:

Table 3

Radio Transmitter Specifications		
Model	**Transmitter Frequency Range**	**Transmitter Power**
EC520-W	2.4 GHz	0.361 W

i08703286

Wireless Device
(MS352 Receiver - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

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https://www.cat.com/radio-compliance

Great Britain

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https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

i08703288

Wireless Device
(TD520 - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

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https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

The following communication device specifications are provided to aid in conducting any related hazard assessment and to ensure compliance with all local regulations:

Table 4

Radio Transmitter Specifications		
Model	**Transmitter Frequency Range**	**Transmitter Power**
TD520	2.4 GHz	22.5 W

i09677435

Wireless Device
(MS995, MS975, MS955 Satellite Receiver - If Equipped)

SMCS Code: 7008; 7600-ZM

Illustration 5 g06275658

MS9X5

(A) MS995
(B) MS975
(C) MS955

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Great Britain

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

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https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

Table 5

Model	Voltage Range	Maximum Current Draw
MS995	9 – 32V	0.4 A
MS975		
MS955		

Certification Notices

Canada Notice to Users

This device complies with Industry Canadas license exempt RSSs. Operation is subject to the following two conditions:

- This device may not cause interference
- This device must accept any interference, including interference that may cause undesired operation of the device.

FCC Notice

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/tv technician for help.

Changes or modifications to this device without the express approval of Caterpillar may void the users authority to use this device.

Certification Markings

Australia/New Zealand – This device is approved for use in Australia & New Zealand.

i09683459

Wireless Device
(MS996, MS976, MS956 Receiver - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Great Britain

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with the relevant statutory requirements. The full text of the Great Britain Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

The following communication device specifications are provided to aid in conducting any related hazard assessment and to ensure compliance with all local regulations:

Table 6

Model	Voltage Range	Maximum Current Draw
MS996	9 -32V	0.4A
MS976		
MS956		

Certification Notices

Canada Notice

This device complies with Industry Canada License-exempt RSS standard(s). Operation is subject to the following two conditions

- This device may not cause interference
- This device must accept any interference, including interference that may cause undesired operation of the device.

FCC Notice

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/tv technician for help

Changes or modifications to this device without the express approval of Caterpillar may void the users authority to use this device.

Certification Markings

Australia/New Zealand – This device is approved for use in Australia and New Zealand.

i09864307

Wireless Device
(G6:M6 GPS Receiver - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Great Britain

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with the relevant statutory requirements. The full text of the Great Britain Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

Table 7

Operating Voltage and Current Draw		
Model	**Voltage Range**	**Maximum Current Draw Range**
G6:M6	9 - 32V	80mA - 30mA

Certification Notices

Canada Notice to Users

This device complies with Industry Canadas license exempt RSSs. Operation is subject to the following two conditions:

- This device may not cause interference
- This device must accept any interference, including interference that may cause undesired operation of the device.

FCC Notice

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/tv technician for help

Changes or modifications to this device without the express approval of Caterpillar may void the users authority to use this device.

Certification Markings

EAEU – (Russia, Belarus, Kazakhstan, Armenia, Kyrgyzstan)

The G6:M6 GPS Receiver product description in the EAEU: Global Navigation Satellite System (GNSS) Receiver Cat ® brand, model G6:M6.

i09866397

Wireless Device
(TD540 - If Equipped)

SMCS Code: 7008; 7600-ZM

sDoC

(Simplified Declaration of Conformity)

European Union

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with directive “2014/53/EU” . The full text of the European Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Great Britain

Caterpillar Inc. 100 NE Adams Peoria, IL 61629 USA

Hereby,Caterpillar Inc. declares this radio equipment is in compliance with the relevant statutory requirements. The full text of the Great Britain Declaration of Conformity is available at the following web address:

https://www.cat.com/radio-compliance

Caterpillar suggests that the Declaration of Conformity is obtained shortly after purchase.

Specifications

The following communication device specifications are provided to aid in conducting any related hazard assessment and to ensure compliance with all local regulations:

Table 8

Model	Voltage Range	Current Draw Range
TD540	9 - 32V	1.4 - 1.8A (12V) 0.6 - 0.8A (24V)
TD540 - W (WiFi)	9 - 32V	1.4 - 1.8A (12V) 0.6 - 0.8A (24V)

Table 9

Radio Transmitter Specifications		
Type	**Frequency Range**	**Transmitter Power**
Wi-Fi Protocols 802.11 a/b/g/n/ac		
2.4GHz ISM	2400 - 2483.5 MHz	802.11 b: +17dBm
5 GHz UNII	5150 - 5250 MHz 5250 - 5350 MHz 5470 - 5725 MHz 5725 - 5850 MHz	802.11 g: +16dBm 802.11 n: +16dBm 802.11 a: +13dBm 802.11 ac: +13dBm
NFC		
	Frequency	**H - Field Strength (dbuA/m at 10m)**
NFC Type A	13.56 MHz	-14.3

(continued)

(Table 9, contd)

Radio Transmitter Specifications		
Type	**Frequency Range**	**Transmitter Power**
NFC Type B	13.56 MHz	-13.95
NFC Type C	13.56 MHz	-12.94

Disclaimer Notice

NOTICE

The transmission of information from this radio frequency device may be subject to various legal requirements depending on the jurisdiction in which the equipment outfitted with the device is located. These legal requirements may include, but are not limited to, radio frequency use authorization. The transmission of information from this device must be limited to those locations where all legal requirements for the use of this device and communication network have been satisfied. Note that if the equipment outfitted with this device is located in or relocated to a location where (i) the transmission of information from the device would not comply with the legal requirements of the local jurisdictional or (ii) the transmission or processing of such information across multiple locations would not be legal, Caterpillar disclaims any liability related to such failure to comply, and Caterpillar may discontinue the transmission of information from that equipment. Consult your Cat dealer with any questions that concern the operation of this system in a specific jurisdiction.

Certification Notice

FCC Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures: l Reorient or relocate the receiving antenna. l Increase the separation between the equipment and receiver. l Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. l Consult the dealer or an experienced radio/TV technician for help. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm (7.8 inch) between the radiator & your body

Canada Notice to Users

This device complies with ISED's license-exempt RSS standard(s). Operation is subject to the following two conditions:

- This device may not cause harmful interference, and
- This device must accept any interference received, including interference that may cause undesired operation.

Radiation Exposure Statement

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20 cm (7.8 inch) between the radiator & your body.

Certification Marking

Australia/New Zealand – This device is approved for use in Australia & New Zealand.

Canada – This device is approved for use in Canada. ISED ID 1756A-TD540 (Contains IC ID: 6100A-CM276NF)

Japan – This device is approved for use in Japan. RF module Certificate No.: 020-200133

United Kingdom – This device is approved for use in United Kingdom.

United States – This device is approved for use in United States. FCC ID: JUP-TD540 (Contains FCC ID: TLZ-CM276NF)

Product Information Section

General Information

i09916399

System Components (G6:M6 Global Navigation Satellite System (GNSS) Receiver Component Information)

SMCS Code: 7220

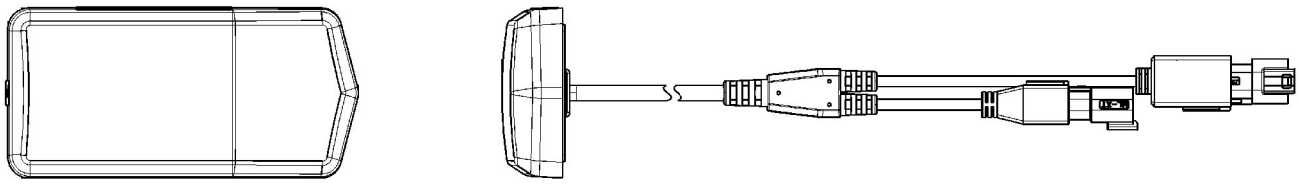

Illustration 6 g06478974

Enclosure and cable/connector

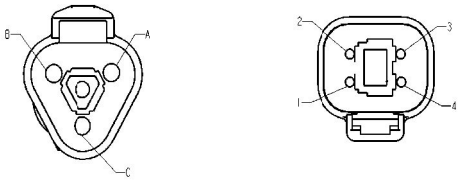

Illustration 7 g06479246

Pin numbering and locations within the connectors

Table 10

Wire Pinout	
Pin Number	**Function**
1	CAN High +
2	CAN Low -
3	1 PPS Output +
4	NC
A	+ Battery
B	- Battery
C	Keyswitch

Specifications

Table 11

Receiver Specifications	
Input Voltage	
Operating Voltage Range	9VDC to 32VDC
Protection	Reverse Polarity
GNSS Receiver	
Satellite Constellations	GPS L1 and GLONASS L1
GPS Center Frequency	1575.42 MHz
GLONASS Center Frequency	1602 MHz
Current Consumption (max)	
Max operational current draw	80 mA
Environment	
Operating Temperature	−40 °C to 85 °C (−40 °F to 185 °F)

(continued)

(Table 11, contd)

Receiver Specifications	
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	9.73 Grms

Zephyr 2 Antenna

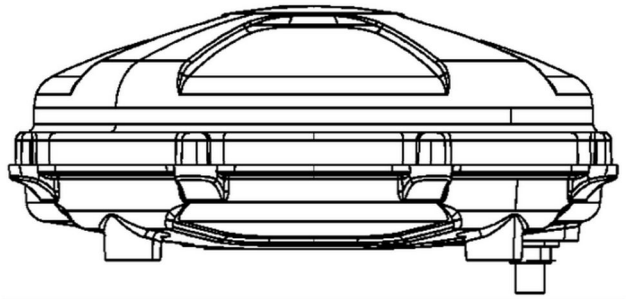

Illustration 8 g07602625

Zephyr 2 antenna

Table 12

Zephyr 2 Antenna Specifications	
Operating Voltage Range	3.5 VDC to 20 VDC
Satellite Constellations	GPS: L1, L2, L5 GLOSNASS: G1, G2, G3 GALILEO: E1, E5, E6 BEIDOU: B1, B2 SBAS: WASS, EGNOS, QZSS, GAGAN, MSAS, INMARSAT (OMNISTAR)
Max Operation Current Draw	150 mA
Operating Temperature	−40 °C to 85 °C (−40 °F to 185 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)

Zephyr 3 Antenna

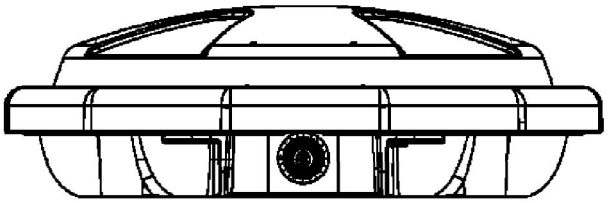

Illustration 9 g07604257

Zephyr 3 antenna

Table 13

Zephyr 3 Antenna Specifications	
Operating Voltage Range	3.5 VDC to 20 VDC
Satellite Constellations	1551–1585 MHz: GPS/QZSS/SBAS: L1, BEIDOU B1 1590–1414 MHz: GLONASS:G1 1217–1257 MHz: GPS/QZSS/SBAS L5, GALILEO E5, BEIDOU B2 1260–1300 MHz: GALILEO E6, QZSS LEX 1525–1559 MHz: MSS (OMNISTAR, RTX, XFILL)
Max Operation Current Draw	125 mA
Operating Temperature	−40 °C to 85 °C (−40 °F to 185 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)

EC520–W

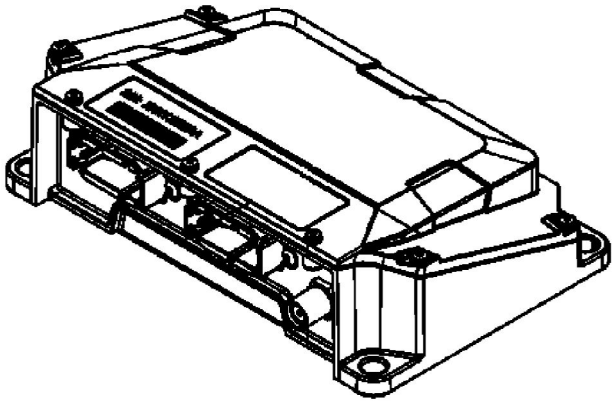

Illustration 10 g07604258
EC520-W

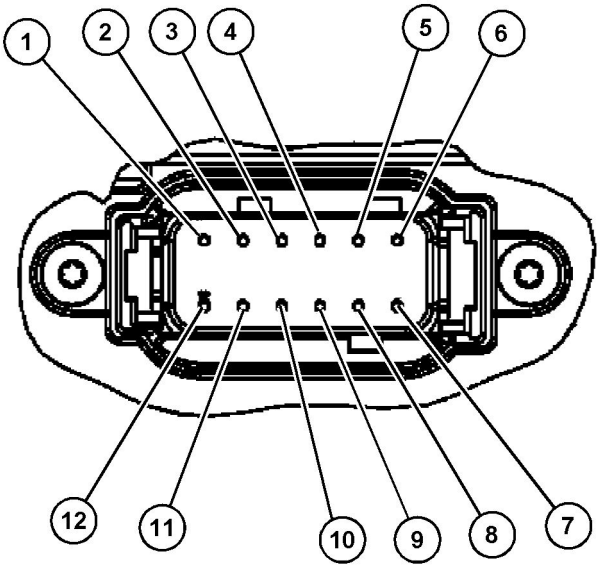

Illustration 11 g07604264
EC520–W main connector

(1) Pin 1
(2) Pin 2
(3) Pin 3
(4) Pin 4
(5) Pin 5
(6) Pin 6
(7) Pin 7
(8) Pin 8
(9) Pin 9
(10) Pin 10
(11) Pin 11
(12) Pin 12

Table 14

EC520–W Main Connector Pinout	
Pin	**Function**
1	Power Supply +
2	Power Ground
3	RS-232 1 TXD
4	RS-232 1 RXD
5	CAN 1 High +
6	CAN 1 Low -
7	CAN 2 Low -
8	CAN 2 high +
9	CAN 3 Low -
10	CAN 3 High +
11	Key Switch Input
12	Switch to Ground Output

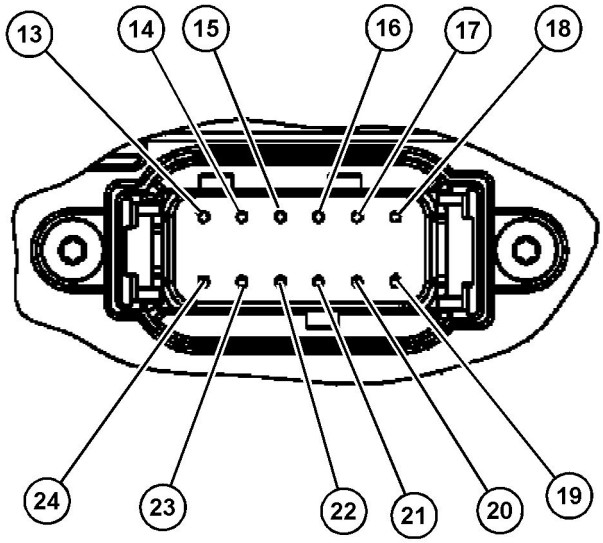

Illustration 12 g07604259

EC520–W ethernet connector

(13) Pin 1
(14) Pin 2
(15) Pin 3
(16) Pin 4
(17) Pin 5
(18) Pin 6
(19) Pin 7
(20) Pin 8
(21) Pin 9
(22) Pin 10
(23) Pin 11
(24) Pin 12

Table 15

EC520-W Ethernet Connector Pinout	
Pin	**Function**
1	Ethernet 1 RX -
2	Ethernet 1 RX +
3	N/A
4	N/A
5	Ethernet 2 TX -
6	Ethernet 2 TX +
7	Ethernet 2 RX +
8	Ethernet 2 RX -
9	N/A
10	N/A
11	Ethernet 1 TX+
12	Ethernet 1 TX-

Table 16

EC520-W Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−40 °C to 85 °C (−40 °F to 185 °F)
Wireless Fidelity (Wi-Fi)	802.11 b/g/n (2.4 GHz)

MS352 Receiver

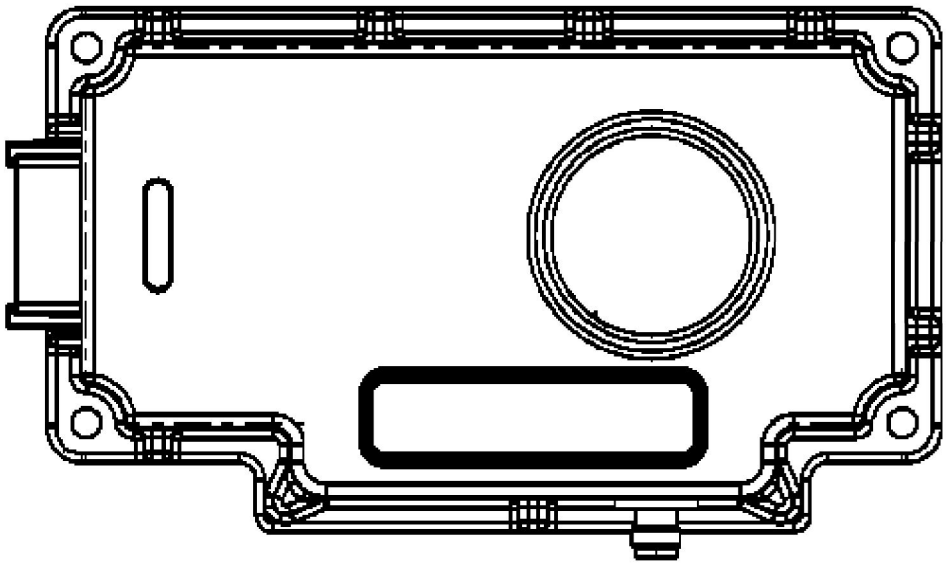

Illustration 13 g07604286
MS352 receiver

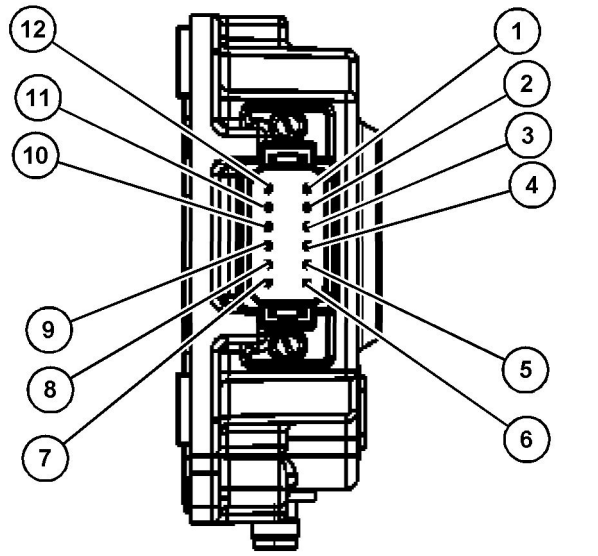

Illustration 14 g07604298

MS352 receiver pin port

(1) Pin 7
(2) Pin 8
(3) Pin 9
(4) Pin 10
(5) Pin 11
(6) Pin 12
(7) Pin 1
(8) Pin 2
(9) Pin 3
(10) Pin 4
(11) Pin 5
(12) Pin 6

Table 17

MS352 Connector Pinout	
Pin	**Function**
1	Power Supply +
2	Power Ground
3	RS-232 1 TXD
4	CAN 1 High +
5	ETH TX +
6	ETH TX -
7	ETH RX +
8	ETH RX -
9	CAN 1 Low -
10	RS-232 1 RXD
11	ID/Function Instance Pin
12	Boot Monitor

Table 18

MS352 Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A SBAS: L1 C/A
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	9.8 G-rms

TD520

Illustration 15 g07604334

TD520 front view

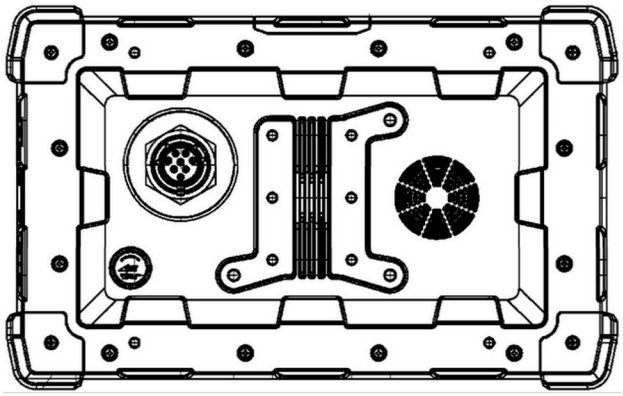

Illustration 16 g07604336

TD520 rear view

Table 19

TD520 Connector Pinout	
Pin	**Function**
A	Ethernet TX -
B	Ethernet RX -
C	N/A
D	Power Ground
E	Power Supply
F	N/A
G	Ethernet RX +
H	Ethernet TX +

Table 20

TD520 Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Operating Temperature	−20 °C to 70 °C (−4 °F to 158 °F)
Storage Temperature	−30 °C to 85 °C (−22 °F to 185 °F)
Wi-Fi	802.11 b/g/n (2.4 GHz)

TD540

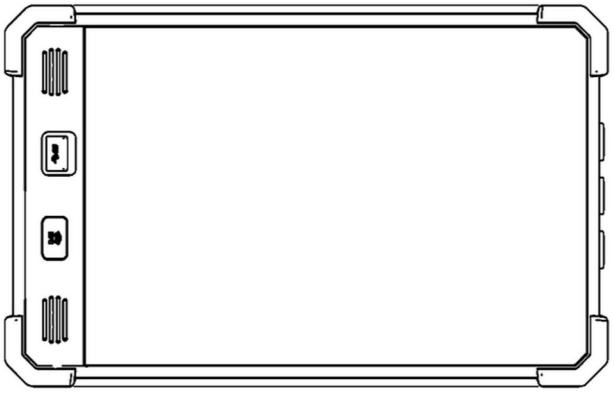

Illustration 17 g07604339
TD540 front view

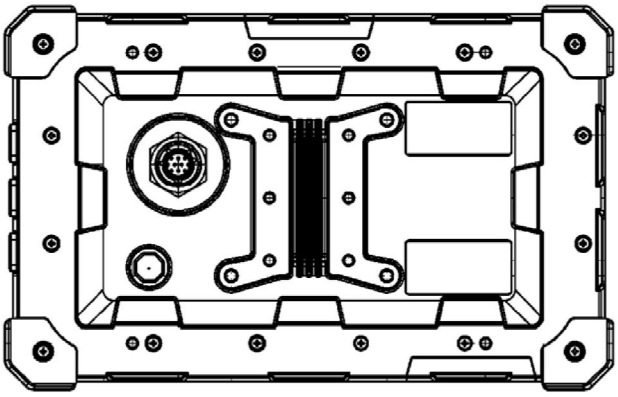

Illustration 18 g07604343
TD540 rear view

Table 21

TD540 Connector Pinout	
Pin	**Function**
A	Ethernet RX -
B	Key Switch Input

(continued)

(Table 21, contd)

TD540 Connector Pinout	
Pin	**Function**
C	Power Supply +
D	Power Ground
E	2 Wire Ethernet (-)
F	N/A
G	2 Wire Ethernet (+)
H	Ethernet TX -
J	Ethernet RX +
K	Ethernet TX +

Table 22

TD540 Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Operating Temperature	−20 °C to 70 °C (−4 °F to 158 °F)
Storage Temperature	−30 °C to 85 °C (−22 °F to 185 °F)
Vibration	4.4 G-rms
Wi-Fi	802.11 b/g/n (2.4 GHz)

MS955, MS975, MS995 Satellite Receiver

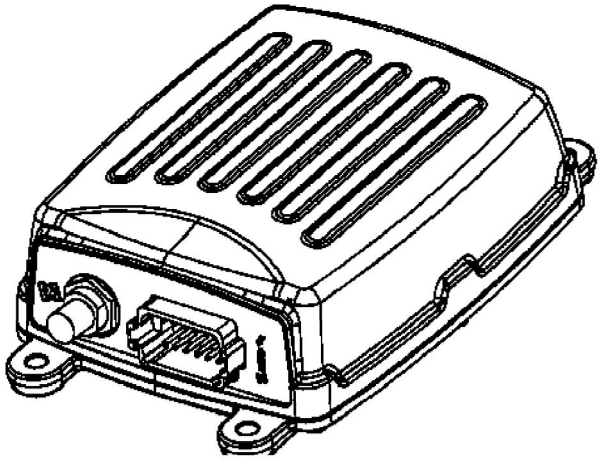

Illustration 19 g07604348
MS955

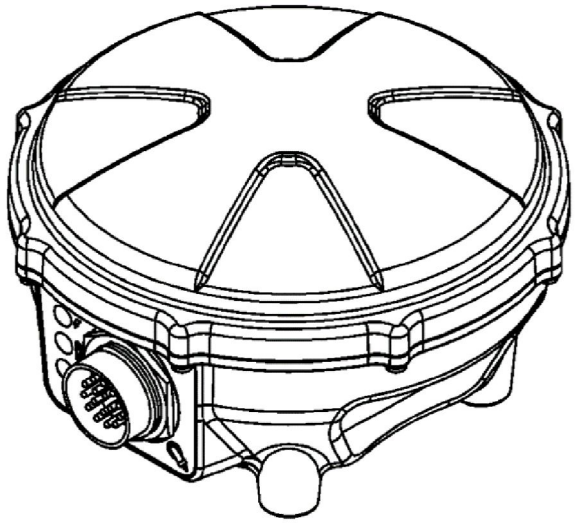

Illustration 20 g07604349
MS975

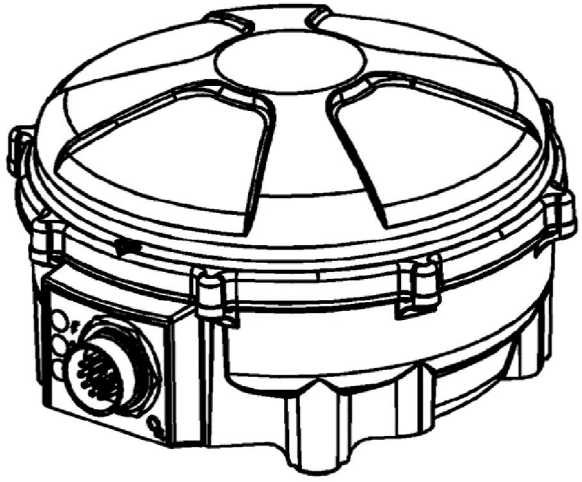

Illustration 21 g07604354
MS995

Table 23

MS995 GNSS Receiver Connector Pinout	
Pin	**Function**
1	Power Supply +
2	Power Ground
3	RS-232 1 TXD
4	CAN 1 High +
5	RS232 2 TXD
6	CAN 2 High +
7	CAN 2 Low -
8	RS-232 2 RXD
9	CAN 1 Low -
10	RS-232 1 RXD
11	ID/Function Instance Pin
12	Boot Monitor

Table 24

M955 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A GALILEO: L1 CBOC, E5A, E5B, E5A1+BOC8 BEIDOU: B1, B2 SBAS (WASS, EGNOS, MSAS, QZSS): L1 C/A, L5
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	9.8 G-rms

Table 25

M975 GNSS Receiver Connector Pinout	
Pin	**Function**
A	RS-232 Ground
B	Power Ground
C	CAN 2 Low
D	CAN 2 Ground/Shield
E	Chassis Ground
F	RS-232 1 TXD
G	Power Supply +
H	Boot Monitor
J	RS-232 1 RXD
K	CAN 1 Ground/Shield

(continued)

(Table 25, contd)

M975 GNSS Receiver Connector Pinout	
Pin	**Function**
L	CAN 1 Low -
M	ID/Function Instance Pin
N	CAN 2 High +
P	CAN 1 High +
R	RS-232 2 RXD
S	RS-232 2 TXD

Table 26

M975 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A GALILEO: L1 CBOC, E5A, E5B, E5A1+BOC8 BEIDOU: B1, B2 SBAS (WASS, EGNOS, MSAS, QZSS): L1 C/A, L5
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	15.3 G-rms

Table 27

MS995 GNSS Receiver Connector Pinout	
Pin	**Function**
A	RS-232 Ground
B	Power Ground
C	CAN 2 Low
D	CAN 2 Ground/Shield
E	Chassis Ground
F	RS-232 1 TXD
G	Power Supply +
H	Boot Monitor
J	RS-232 1 RXD
K	CAN 1 Ground/Shield
L	CAN 1 Low -
M	ID/Function Instance Pin
N	CAN 2 High +
P	CAN 1 High +
R	RS-232 2 RXD
S	RS-232 2 TXD

Table 28

MS995 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A GALILEO: L1 CBOC, E5A, E5B, E5A1+BOC8 BEIDOU: B1, B2 SBAS (WASS, EGNOS, MSAS, QZSS): L1 C/A, L5
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	20.4 G-rms

MS956, MS976, MS996 Satellite Receiver

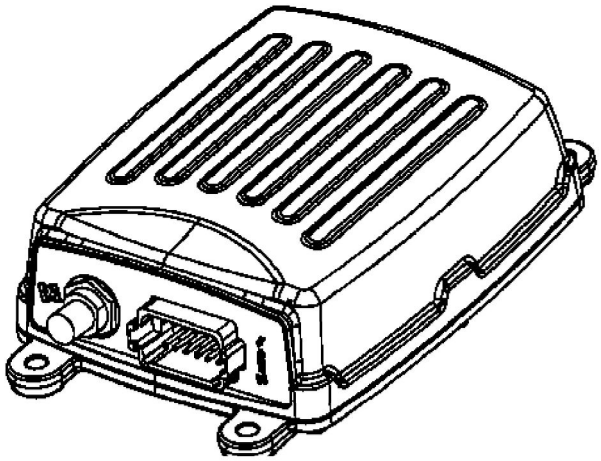

Illustration 22 g07604348
MS956

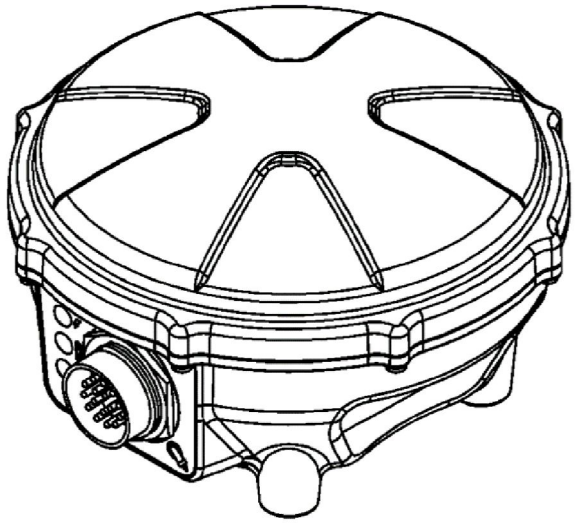

Illustration 23 g07604349
MS976

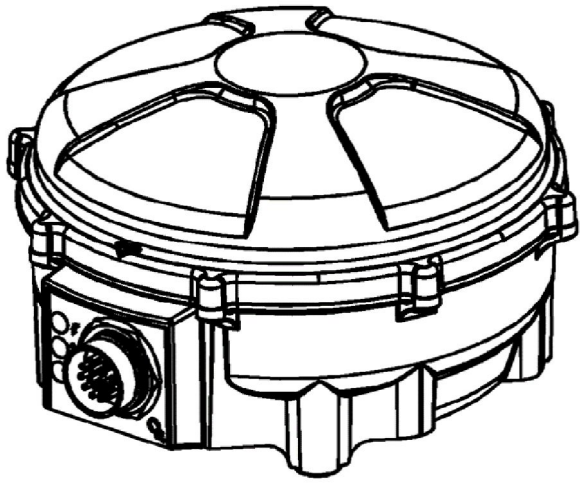

Illustration 24 g07604354

MS996

Table 29

MS956 GNSS Receiver Connector Pinout	
Pin	**Function**
1	Power Supply +
2	Power Ground
3	RS-232 1 TXD or USB D + (Service Mode Only)
4	CAN 1 High +
5	RS232 2 TXD or PPS
6	CAN 2 High +
7	CAN 2 Low -
8	RS-232 2 RXD
9	CAN 1 Low -
10	RS-232 1 RXD or USB D - (Service Mode Only)
11	ID/Function Instance Pin
12	Boot Monitor

Table 30

MS956 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A, L3 GALILEO: E1, E5A, E5B, E5A1+BOC, E6 BEIDOU: B1, B1C, B2, B2A, B2B, B3 QZSS: L1 C/A, L2C, L5, L6 1RNSS: L5 SBAS (WASS, EGNOS, MSAS): L1 C/A, L5
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	9.8 G-rms

Table 31

MS976 GNSS Receiver Connector Pinout	
Pin	**Function**
A	RS-232 Ground
B	Power Ground
C	CAN 2 Low
D	CAN 2 Ground/Shield
E	Chassis Ground
F	RS-232 1 TXD or USB D + (Service Mode Only)
G	Power Supply +
H	Boot Monitor
J	RS-232 1 RXD or USB D - (Service Mode Only)
K	CAN 1 Ground/Shield
L	CAN 1 Low -
M	ID/Function Instance Pin
N	CAN 2 High +
P	CAN 1 High +
R	RS-232 2 RXD
S	RS-232 2 TXD or PPS

Table 32

MS976 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A, L3 GALILEO: E1, E5A, E5B, E5A1+BOC, E6 BEIDOU: B1, B1C, B2, B2A, B2B, B3 QZSS: L1 C/A, L2C, L5, L6 1RNSS: L5 SBAS (WASS, EGNOS, MSAS): L1 C/A, L5

(continued)

(Table 32, contd)

MS976 GNSS Receiver Specifications	
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	15.3 G-rms

Table 33

MS996 GNSS Receiver Connector Pinout	
Pin	**Function**
A	RS-232 Ground
B	Power Ground
C	CAN 2 Low
D	CAN 2 Ground/Shield
E	Chassis Ground
F	RS-232 1 TXD or USB D + (Service Mode Only)
G	Power Supply +
H	Boot Monitor
J	RS-232 1 RXD or USB D - (Service Mode Only)
K	CAN 1 Ground/Shield
L	CAN 1 Low -
M	ID/Function Instance Pin
N	CAN 2 High +
P	CAN 1 High +
R	RS-232 2 RXD
S	RS-232 2 TXD or PPS

Table 34

MS996 GNSS Receiver Specifications	
Operating Voltage Range	9 VDC to 32 VDC
Satellite Constellations	GPS: L1 C/A, L2C, L2E, L5 GLONASS: L1 C/A, L2P, L2 C/A, L3 GALILEO: E1, E5A, E5B, E5A1+BOC, E6 BEIDOU: B1, B1C, B2, B2A, B2B, B3 QZSS: L1 C/A, L2C, L5, L6 1RNSS: L5 SBAS (WASS, EGNOS, MSAS): L1 C/A, L5
Operating Temperature	−40 °C to 70 °C (−40 °F to 158 °F)
Storage Temperature	−50 °C to 85 °C (−58 °F to 185 °F)
Vibration	20.4 G-rms

Identification Information

i09798429

Manufacturing Information

SMCS Code: 7606

Date of Manufacture

Contact an authorized dealer to determine the date of manufacture using the serial number.

Manufacturer Information

Manufacturer:

Caterpillar Inc.,
100 N.E. Adams Street
Peoria, Illinois 61629, USA

Made by the order and specifications of Caterpillar Inc.. See information about the country of origin on the package.

Entity authorized by the manufacturer at the territory of Eurasian Economic Union:

Caterpillar Central Asia LLP
77, Kunaev Str., Almaty,
Medeu district, 050000, Republic of Kazakhstan

Maintenance Section

Maintenance Recommendations

i07934909

General Maintenance Information

SMCS Code: 7220

Conditions for Storage, Transfer, and Disposal

For long-term storage, store in a cool and dry area. Do not exceed the temperature limits of −50° C (−58.0° F) to 85° C (185.0° F).

Never throw away the radio. Dispose of the radio in proper recycling receptacles. Contact the Cat ® dealer to determine the disposal and transfer conditions.

Service Information Section

Configuration

i07918192

Configuration

SMCS Code: 7220

Mounting Requirements

Note: Ensure that power is disconnected from the battery during the steps of the installation.

Ensure that the following guidelines are met when mounting the Receiver:

- Mount the receiver in a horizontal orientation to the horizon
- The receiver must be exposed to a large portion of the sky. Usually the canopy/container roof usually provides an optimal view of the sky with minimal blockages
- The receiver may be mounted under a non-metallic cover, but not a metallic one. A metallic cover will block the utilization of the satellite signals
- Do not mount the receiver in an area that will expose the receiver to extreme conditions of heat
- Locate the receiver so that the connectors are not exposed to high-pressure spray or underwater immersion
- Mount the receiver at least 500 mm (19.6 inch) away from other transmitting antennas

These antennas include, but are not limited to, the following:

- Citizens Band (CB)
- Cellular/satellite
- WiFi/Data Radio
- Commercial communication radios

Bottom Exit Mounting

When using bottom exit configuration, a hole must be drilled through the mounting surface for the pigtail to pass through. The recommended hole diameter is 31.75 mm (1.250 inch).

The radio placement is critical to maintain a seal around the opening.

1. After drilling the hole, deburr the hole.
2. Clean the mounting surface to be free of dirt, debris, or oils.
3. The mounting surface should be dry and at a temperature between 21° C (69.8° F) and 38° C (100.4° F).
4. Remove the red backing paper from the VHB tape. Do not touch the tape or allow the tape to get dirty.
5. Locate the receiver onto the mounting surface and press the top of the device from one end to the other. Apply 103 kPa (15.0 psi) pressure to the top of the device for minimum of 30 seconds. At 21° C (69.8° F), 50 percent of ultimate bond strength will be achieved after 20 minutes, 90 percent after 20 hours, and 100 percent after 72 hours.

Side Exit Mounting

1. When using a side exit configuration, the rubber plug on the bottom of the device must be removed. To do that, first remove the VHB on the perforations. Remove the rubber plug out of the slot in the radio and discard.
2. Press the cable into the slot.
3. Clean the mounting surface to be free of dirt, debris, or oils.
4. The mounting surface should be dry and at a temperature between 21° C (69.8° F) and 38° C (100.4° F).
5. Remove the red backing paper from the VHB tape. Do not touch the tape or allow the tape to get dirty.
6. Locate the receiver onto the mounting surface and press the top of the enclosure from one end to the other. Apply 103 kPa (15.0 psi) pressure to the top of the device for minimum of 30 seconds. At 21° C (69.8° F), 50 percent of ultimate bond strength will be achieved after 20 minutes, 90 percent after 20 hours, and 100 percent after 72 hours.

Troubleshooting

i07918193

Common Problems

SMCS Code: 7220

Troubleshooting Faults and Corrective Actions

Before calling to the Cat ® dealer for repair:

1. Check the integrity of the electric wires.

2. Cycle the battery power to the device.

a. Cycling battery power can be accomplished by:

- Turning the machines master disconnect off and then back on
- Unplugging the harness from the Bluetooth device and then plugging the harness back in
- Disconnecting the negative cable from the negative battery terminal and then reconnect the cable

If these solutions do not help, call the Cat dealer for service.

Index

Product and Dealer Information

Note: For product identification plate locations, see the section “Product Identification Information” in the Operation and Maintenance Manual.

Delivery Date: _____

Product Information

Model: _____

Product Identification Number: _____

Engine Serial Number: _____

Transmission Serial Number: _____

Generator Serial Number: _____

Attachment Serial Numbers: _____

Attachment Information: _____

Customer Equipment Number: _____

Dealer Equipment Number: _____

Dealer Information

Name: _____ Branch: _____

Address: _____

_____

_____

	Dealer Contact	Phone Number	Hours
Sales:	_____	_____	_____
Parts:	_____	_____	_____
Service:	_____	_____	_____