Eaton

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XPD2400

User Manual

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IA9-XPD2400B_User_Manual.docx

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1 1 Introduction

The XPD2400 transceiver module is not sold separately as a standalone device. It is intended to be used as part of a complete Cooper Industries (Electrical) Inc remote control device and in the user manual for any device containing the module will be included the text from the following paragraph.
This manual is for the use of professionals to guide them in the installation, operation and basic system maintenance of the equipment covered.
The XPD2400 radio module has been certified for the FCC and ISED supporting both mobile and portable configurations.

- Portable (SAR compliance required): Antennas with 2.62 dBi and 2.0 dBi gain..
- Mobile (≥20 cm separation): Antennas with 4.4 dBi, 5.0 dBi, and 5.4 dBi gain

The XPD2400 PCB revision 7 radio module has the FCC ID: IA9XPD2400B and the ISED certification number: 1338B-XPD2400B.

2 List of Applicable FCC and ISED Rules

The following FCC rules are applicable to the transmitter: FCC Title 47 CFR Subpart C Part 15.203, Part 15.247, Part 15.205(a), Part 15.209(a) & 15.247(d) and 15.33(a)(1)..

The following ISED rules are applicable to the transmitter: RSS-Gen Issue 5 Section 7.1.2, RSS-247 Issue 2 (5.1) (a), (b) and (c), RSS-Gen Issue 5 (8.9), (8.10).

3 Specific Operational Use Conditions

The radio module may be used only with the antennas that were certified with the module. Using a different antenna is possible only if a Class II Permissible Change is approved.

4 Limited Module Procedure

There aren't limiting conditions on the module that require a host device to remedy. The radio module meets all the eight requirements in FCC Part 15.212(a)(1) for modular approval.

5 FCC and ISED Regulatory Statements

The host products that integrate the radio module will include the following statements in their user manual.

5.1 FCC Part 15 Statement

In accordance with FCC rule 15.21 and requirements 15.19(a)(5), the following statement shall be included in the user manual.

FCC Part 15

This device complies with FCC Rules Part 15 operation is subject to the following two conditions:
1. This device may not cause harmful interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.
Changes or modifications to this device, not expressly approved by Cooper Industries (Electrical) Inc. could void the user's authority to operate the equipment.

5.2 ISED Statement

In accordance with the requirement of RSS-GEN 8.4, the following statement shall be included in the user manual.

This device complies licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:
(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

This device complies with the Canadian ICES-003 Class B specifications. CAN ICES-003(B) / NMB-003 (B).

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempt de licence. L'exploitation est autorisée aux deux conditions suivantes:
(1) l'appareil ne doit pas produire de brouillage;
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

6 RF Exposure Information

READ THIS INFORMATION BEFORE INSTALLING THE XPD2400

This product is intended for mobile and portable installation applications.

The communication protocol used in our radios limits the maximum duty cycle at 53%.

XPD2400 complies with FCC (§1.1310)/ISED (RSS-102 part 5, table 7) RF Exposure requirements for mobile applications, as shown in the RF Exposure Report. The mobile product antenna must be installed in a manner that will provide at least 20 cm clearance between the antenna and any user or member of the public.

XPD2400 was tested with the following antennas:

Item	Description	Manufacturer	Model	Gain
1	2.4-2.5 GHz Dual Closed Coil Whip	Pulse	NMO5E2400B	5 dBi
2	2.4-2.5GHz Edge Inverted L	Cooper	ACAB-2683-07	5.4 dBi (**R260**) 4.4dBi (**R270**)
3	2.4-2.5GHz 1/2λ Dipole	Wellshow	AR010-2.4G	2 dBi
4	2.4-2.5GHz SMD Ceramic	Yageo	ANT7020LL05R2400A	2.62dBi

Table 1. Antennas used for emissions measurement.

The radio module is certified only for these antennas. The module expects a 50-ohm impedance antenna to be connected to the Antenna port and this condition is met for antennas 1, and 3 from Table 1. Antennas 2 and 4 require a matching circuit placed close to the antenna on the host board.

The connection between module's antenna port and the antenna or the antenna matching circuit is made with a coaxial cable having UFL connectors at both ends or a coaxial cable with a UFL connector at one end and a SMA connector at the other end.

The matching circuit must be as close to the soldering point of the antenna as possible and as small in its mechanical area as possible. A good starting point is the ANT7020LL05R2400A data sheet. Cooper Industries (electrical) Inc. offers guidance on how to design the matching circuit. The XPD2400 was evaluated at 20.9 dBm output power conducted, 53% worst case duty cycle.

The RF Exposure Evaluation showed that the maximum power density radiated by the antennas used in mobile applications (antennas 1, and from table) is well under the maximum permissible exposure (MPE) limits as specified in §1.1310 of FCC regulations and RF Field Strength Limits in RSS-102 for general population/uncontrolled exposure at 20cm.

Table 2. RF Exposure Evaluation for Mobile Products

MPE Power Density threshold for General Population/ uncontrolled Exposure FCC 47 §1.1310	RF Field Strength Power Density threshold for General Population/ uncontrolled Exposure RSS-102	Maximum Power Density created at 20 cm distance by the Maximum Gain Antenna (Type2) for a maximum duty cycle of 53%
$1.0\frac{mW}{cm^2}$	$0.547\frac{mW}{cm^2}$	$0.046\frac{mW}{cm^2}$

For portable applications XPD2400 is certified using for Wellshow rubber duck AR010-2.4GHz and Yageo ceramic chip antenna ANT7020LL05R2400A.

In accordance with FCC regulations (KBD 447498 v06) routine SAR testing is excluded if the minimum distances between the person and the antenna satisfy the following conditions:

Table 3. FCC minimum distances for SAR testing exclusion of portable products

Minimum distance between antenna and body for uncontrolled exposure KDB447498	Minimum distance between antenna and extremity for uncontrolled exposure KDB447498
$d_{min} = 34\ mm$	$d_{min} = 13.6\ mm$

Routine SAR testing is excluded in accordance with ISED (RSS-102, issue 6, part 6.3) regulations if the minimum distances between the person and the antenna satisfy the following conditions:

Table 4. ISED minimum distances for SAR testing exclusion of portable products

Antenna type (portable products)	Minimum distance between antenna and body for un-controlled exposure RSS-102	Minimum distance between antenna and extremity for un-controlled exposure RSS-102
AR010-2.4G	$d_{min} = 24.3\ mm$	$d_{min} = 16.5\ mm$
ANT7020LL05R2400A	$d_{min} = 33.8\ mm$	$d_{min} = 23.5mm$

If the minimum distances shown above are not respected in the design of a host product, routine SAR testing is required.

7 RF Exposure for Mobile Host Products

XPD2400 module was certified with antennas 1 and 2 for mobile applications. R260 and R270 mobile hosts are designed to use either an internal antenna (ACAB-2683-07, antenna 2) or an external antenna (NMO5E2400B, antenna 1).

7.1 RF Exposure Statement for Mobile Products

The following text must be included in the host product manual for R260 and R270 with internal or external antenna.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, this equipment should be installed and operated with minimum distance 20 cm (8 inches) between the antenna and your body during normal operation. Users must follow the specific operating instructions for satisfying RF exposure compliance.

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC et ISED CNR-102 établies pour un environnement non contrôlé. Cet émetteur ne doit pas être installé ou utilisé en conjonction avec une autre antenne ou un autre émetteur. Afin d'éviter la possibilité de dépasser les limites d'exposition aux radiofréquences FCC et ISED, cet équipement doit être installé et utilisé avec une distance minimale de 20 cm (8 pouces) entre l'antenne et votre corps pendant le fonctionnement normal. Les utilisateurs doivent suivre les instructions spécifiques d'utilisation pour respecter la conformité à l'exposition aux RF.

To comply with FCC and ISED RF exposure requirements, installation of this transmitter system's antenna must be performed in a manner that will provide the appropriate distance from the antenna to any user or member of the public.

7.2 RSS-Gen Transmit antenna statement for R260 and R270 with removable antennas.

The following text must be included in the host product manual for R260 and R270 with external antenna, the external antenna is removable. Only Pulse antenna NMO5E2400B is certified as an external antenna.

This radio transmitter with certification number IC: 1388B-XPD2400B has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [identifier le dispositif par son numéro de certification d'ISDE IC: 1388B-XPD2400B] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Under Innovation, Science and Economic Development regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Innovation, Sciences et Développement économique Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Innovation, Sciences et Développement économique Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Approved Antenna Types:	Pulse, NMO5E2400B
Maximum gain:	5dBi
Antenna type:	Dual Closed Coil Whip
Radiation pattern:	Omni Directional
Impedance:	50 Ohm
Connector type	SMA

8 RF Exposure for Portables Host Product Manuals

XPD2400 module was certified with antennas 3 and 4 for portable applications.

Antenna 3 (Wellshow, AR010-2.4G) is used in TD3200 and antenna 4 (Yageo, ANT7020LL05R2400A) is used in TD1140, TD2100 and TD3100. In all these products the distance between antenna and body or between antenna and extremities is above the calculated threshold for SAR routine test exclusion.

8.1 RF Exposure Statement (SAR) for TD1140

The following text is included in the host product manual for TD1140.

SAFETY: Limiting Exposure to Electromagnetic Radiation

All actively transmitting radio devices emit some form of electromagnetic radiation. Although prolonged low-level exposure has not been shown to be harmful, the operator must fully understand the risk of using an active device. The maximum radiated output power of this antenna satisfies the specific absorption rate (SAR) limits as specified in §1.1310 of FCC regulations, and RSS-102 issue 6 (section 6.3) of ISED regulations. To minimize exposure, it is advised that the operator avoid being within a 33 mm distance of the radiating area for prolonged durations (hours).

Figure 1 TD1140 handheld operated device.

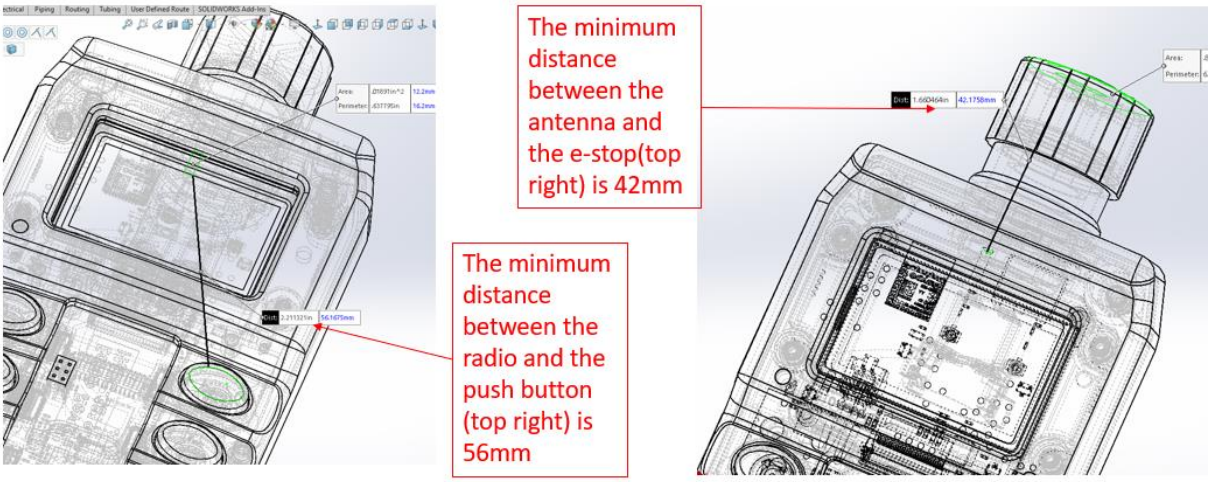


Figure 2 Minimum distances between TD1140's antenna and hand in operation.

As can be seen from above the distance between operator's hand and antenna is larger than 23.5 mm the ISED exclusion threshold or FCC exclusion threshold.

ISED SAR statement

This equipment is compliant with SAR for general population/uncontrolled exposure limits in ISED RSS-102 and has been tested in accordance with the measurement methods and procedures specified in IEEE 1528. Maintain at least 33 mm distance for body-worn condition.

Le présent appareil est le respect de SAR pour la population générale / limites d'exposition incontrôlée de CNR-102 et a été testé en conformité avec les méthodes et procédures de mesure spécifiées dans la norme IEEE 1528. Maintenir au moins 33 mm à distance pour la condition physique-garde.

FCC SAR Statement

This equipment that is intended to be operated close to the human body is tested for body-worn Specific Absorption Rate (SAR) compliance. The SAR limit set by the FCC is 1.6 W/kg when averaged over 1 g of tissue. When carrying the product or using it while worn on your body, maintain a distance of 33 mm from the body to ensure compliance with RF exposure requirements. This equipment complies with ANSI/IEEE C95.1-1999 and are tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

8.2 RF Exposure Statement (SAR) for TD2100

The following text is included in the host product manual for TD2100.

SAFETY: Limiting Exposure to Electromagnetic Radiation

All actively transmitting radio devices emit some form of electromagnetic radiation. Although prolonged low-level exposure has not been shown to be harmful, the operator must fully understand the risk of using an active device. The maximum radiated output power of this antenna satisfies the specific absorption rate (SAR) limits as specified in §1.1310 of FCC regulations, and RSS-102 issue 6 (section 6.3) of ISED regulations. To minimize exposure, it is advised that the operator avoid being within a 33 mm distance of the radiating area for prolonged durations (hours).

Figure 3TD2100 Pistol grip, handheld operated device.

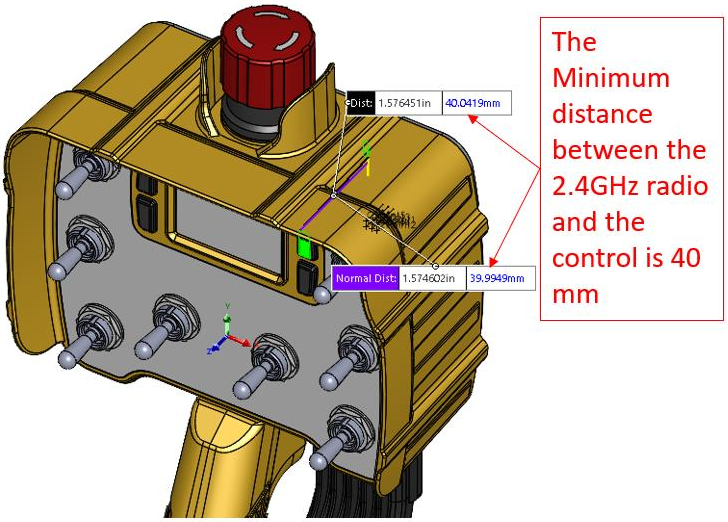


Figure 4 TD2100 minimum distance between antenna and hand is operation.

As can be seen from above the distance between operator's hand and antenna is larger than 23.5 mm the ISED exclusion threshold or FCC exclusion threshold.

ISED SAR statement

This equipment is compliant with SAR for general population/uncontrolled exposure limits in ISED RSS-102 and has been tested in accordance with the measurement methods and procedures specified in IEEE 1528. Maintain at least 33 mm distance for body-worn condition.

Le présent appareil est le respect de SAR pour la population générale / limites d'exposition incontrôlée de CNR-102 et a été testé en conformité avec les méthodes et procédures de mesure spécifiées dans la norme IEEE 1528. Maintenir au moins 33 mm à distance pour la condition physique-garde.

FCC SAR Statement

This equipment that is intended to be operated close to the human body is tested for body-worn Specific Absorption Rate (SAR) compliance. The SAR limit set by the FCC is 1.6 W/kg when averaged over 1 g of tissue. When carrying the product or using it while worn on your body, maintain a distance of 33 mm from the body to ensure compliance with RF exposure requirements. This equipment complies with ANSI/IEEE C95.1-1999 and are tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

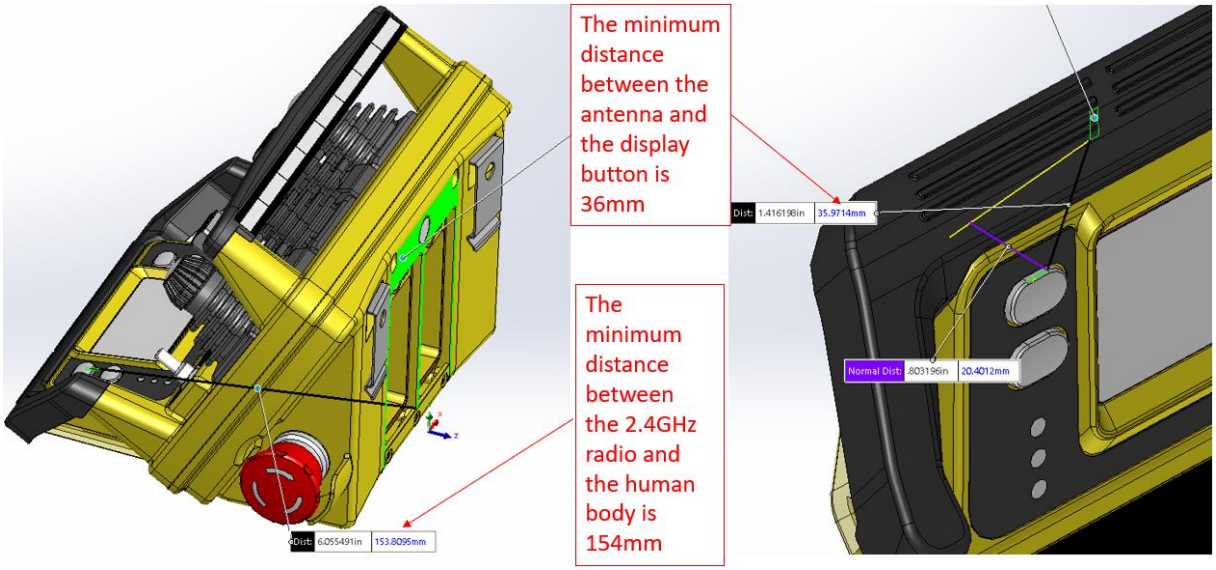
8.3 RF Exposure Statement (SAR) for TD3100

The following text is included in the host product manual for TD3100.

SAFETY: Limiting Exposure to Electromagnetic Radiation

All actively transmitting radio devices emit some form of electromagnetic radiation. Although prolonged low-level exposure has not been shown to be harmful, the operator must fully understand the risk of using an active device. The maximum radiated output power of this antenna satisfies the specific absorption rate (SAR) limits as specified in §1.1310 of FCC regulations, and RSS-102 issue 6 (section 6.3) of ISED regulations. To minimize exposure, it is advised that the operator avoid being within a 33 mm distance of the radiating area for prolonged durations (hours).

Figure 5 TD3100 medium belly packed remote in operation.



ISED SAR statement

This equipment is compliant with SAR for general population/uncontrolled exposure limits in ISED RSS-102 and has been tested in accordance with the measurement methods and procedures specified in IEEE 1528. Maintain at least 33 mm distance for body-worn condition.

Le présent appareil est le respect de SAR pour la population générale / limites d'exposition incontrôlée de CNR-102 et a été testé en conformité avec les méthodes et procédures de mesure spécifiées dans la norme IEEE 1528. Maintenir au moins 33 mm à distance pour la condition physique-garde.

FCC SAR Statement

This equipment that is intended to be operated close to the human body is tested for body-worn Specific Absorption Rate (SAR) compliance. The SAR limit set by the FCC is 1.6 W/kg when averaged over 1 g of tissue. When carrying the product or using it while worn on your body, maintain a distance of 33 mm from the body to ensure compliance with RF exposure requirements. This equipment complies with ANSI/IEEE C95.1-1999 and are tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

8.4 RF Exposure Statement (SAR) for TD3200

The following text is included in the host product manual for TD3200.

SAFETY: Limiting Exposure to Electromagnetic Radiation

All actively transmitting radio devices emit some form of electromagnetic radiation. Although prolonged low-level exposure has not been shown to be harmful, the operator must fully understand the risk of using an active device. The maximum radiated output power of this antenna satisfies the specific absorption rate (SAR) limits as specified in §1.1310 of FCC regulations, and RSS-102 issue 6 (section 6.3) of ISED regulations. To minimize exposure, it is advised that the operator avoid being within a 33 mm distance of the radiating area for prolonged durations (hours).

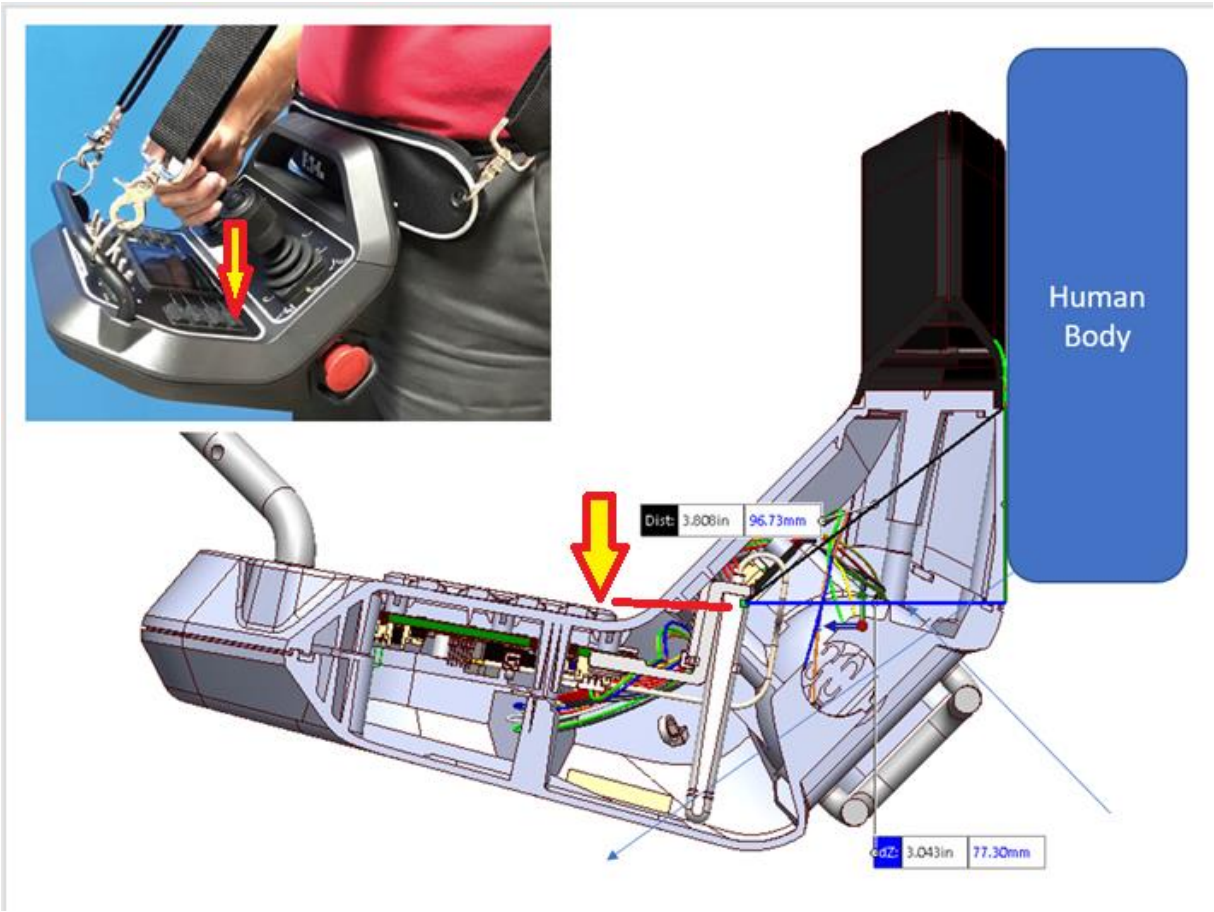


Figure 6 TD3200 medium belly packed remote in operation.

ISED SAR statement

This equipment is compliant with SAR for general population/uncontrolled exposure limits in ISED RSS-102 and has been tested in accordance with the measurement methods and procedures specified in IEEE 1528. Maintain at least 33 mm distance for body-worn condition.

Le présent appareil est le respect de SAR pour la population générale / limites d'exposition incontrôlée de CNR-102 et a été testé en conformité avec les méthodes et procédures de mesure

spécifiées dans la norme IEEE 1528. Maintenir au moins 33 mm à distance pour la condition physique-garde.

FCC SAR Statement

This equipment that is intended to be operated close to the human body is tested for body-worn Specific Absorption Rate (SAR) compliance. The SAR limit set by the FCC is 1.6 W/kg when averaged over 1 g of tissue. When carrying the product or using it while worn on your body, maintain a distance of 33 mm from the body to ensure compliance with RF exposure requirements. This equipment complies with ANSI/IEEE C95.1-1999 and are tested in accordance with the measurement methods and procedures specified in OET Bulletin 65 Supplement C.

9 Label and Compliance Information

When the module's FCC and ISED identification number is not visible when the module is installed inside a host product, then the host product must display a label referring to the enclosed module.

FCC Label

In accordance with 15.212(a)(1)(vi)(A) and KDB 784748 D01 A.6 the host product shall use a physical label stating:

"**Contains Transmitter Module FCC ID: IA9XPD2400B**"
or,
"**Contains FCC ID: IA9XPD2400B**".

ISED Label

In accordance with RSS-GEN 4.3 the host product shall use a physical label stating:

"**Contains IC: 1338B-XPD2400B**"

10 Information on Test Modes and Additional Testing Requirements

The host product must be tested with the radio module. The radio module should be installed in the host product and transmitting RF signal to confirm no emissions exceed the highest limit permitted by the rules.

When testing for unintentional radiator of the host product, the transmitter shall be placed in the receive or idle mode. If that isn't possible the radio should be passive (preferred) and/or active scanning, and thus not turned off. In addition, the host product should be setup to ensure there is activity on the communications BUS of the product (e.g. USB, CAN bus, GPIO) to ensure unintentional radiator circuitry is enabled.

The product may operate in normal mode when the radio needs to be in a transmit mode. When the radio is turned on and attempting to pair it will continue to transmit. This mode may be used for testing that requires the module to be transmitting.

For testing that require the radio to be in receive or idle mode, the device will need to be configured as a slave device. In this mode the radio will be in passive scanning mode. For host products that cannot be configured as slave devices test firmware would need to be used to obtain this operational mode.

11 Additional Testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rules in the grant. The host product must still comply to any other FCC rules not covered by the modular transmitter grant of certification. If the host product is already Part 15 Subpart B compliant without the module, the host product will still require Part 15 Subpart B compliance testing with the modular transmitter installed.

12 Revision History

Revision	Author	Date	Description
D0.1	Radu Oprea	2025-03-06	Create document.
D0.2	Radu Oprea	2025-04-28	Major Revision
D0.3	Radu Oprea	2025-05-19	Minor changes