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XPD2400

User Manual

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IA9-XPD2400A_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 as a portable single-modular transmitter. The XPD2400 PCB revision 5 radio module has the FCC ID: IA9XPD2400A and the ISED certification number: 1338B-XPD2400A.

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 with Industry Canada's license-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts 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.

6 4 RF Exposure Information

READ THIS INFORMATION BEFORE INSTALLING THE XPD2400A

This product is intended for mobile and portable installation applications.

XPD2400 complies with FCC (§1.1310)/ISED (RSS-102 part 4, table 4) 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	2.4-2.5GHz $1/2\lambda$ Dipole	Laird	TRA24003NP	3 dBi
2	2.4-2.5 Dual Closed Coil Whip	Pulse	NMO5E2400B	5 dBi
3	2.4-2.5GHz Edge Inverted L	Cooper	ACAB-2683-07	5.06 dBi
4	2.4-2.5GHz $1/2\lambda$ Dipole	Wellshow	AR010-2.4G	2 dBi
5	2.4-2.5GHz SMD Ceramic	Yageo	ANT7020LL05R2400A	2.62dBi

Table 1. Antennas used for emissions measurement

The XPD2400 was evaluated at 17.6dBm 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, 2 and 3 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. The calculations are done in XPD 2400 RF Exposure Report.

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%
$1.0 \frac{mW}{cm^2}$	$0.547 \frac{mW}{cm^2}$	$0.019 \frac{mW}{cm^2}$

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 (KDB 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
$d_{min} = 16\text{ mm}$	$d_{min} = 6.3\text{ mm}$

Routine SAR testing is excluded in accordance with ISED (RSS-102, issue 5, part 2.5.1) 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 uncontrolled exposure RSS-102	Minimum distance between antenna and extremity for uncontrolled exposure RSS-102	Minimum distance between antenna and body for controlled exposure RSS-102	Minimum distance between antenna and extremity for controlled exposure RSS-102
AR010-2.4G	$d_{min} = 24.3\text{ mm}$	$d_{min} = 16.5\text{ mm}$	$d_{min} = 11.7\text{ mm}$	$d_{min} = 0\text{ mm}$
ANT7020LL05R2400A	$d_{min} = 25.7\text{ mm}$	$d_{min} = 17.5\text{ mm}$	$d_{min} = 12.6\text{ mm}$	$d_{min} = 5.8\text{ mm}$

Occupational exposure limits only apply to “work-related” use conditions. Users must be “fully aware of” and be able to “exercise control over” their exposure to qualify for the higher occupational exposure limits.

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

6.1 RF Exposure Statement for Host Product Manuals

XPD900 module was certified with various antenna listed in the XPD2400 RF Exposure Report. Each host product’s user manual requires a specific statement for the approved antenna used by the host product.

Refer to the XPD900 module’s RF Exposure Test Report for details on the antenna types, SAR calculations, and minimum separation distance to be excluded from routine SAR testing.

Fixed or Mobile Applications

The following test is included in the host product manual.

RF Exposure Statement

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.

The radio module was certified with [insert one of the first 3 antennas from Table 1] for use in a host device used in a mobile application i.e., a device where the distance between any member of the general population and the radiating element is at least 20 cm. The maximum power density radiated by the antennas in these conditions 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.

Portable Applications

The following test is included in the host product manual.

RF Exposure Statement

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 (2.5.1) of ISED regulations. To minimize exposure, it is advised that the operator avoid being within a x mm distance of the radiating area for prolonged durations (hours).

(Insert a drawing of the specific product highlighting the radiating area here.)

7 Antennas

The radio module is only certified for certain antennas. The module expects a 50-ohm impedance antenna to be connected to the Antenna port and this condition is met for antennas 1, 2 and 4 from Table 1 of this document. Antennas 3 and 5 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.

8 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: IA9XPD2400A"

or,

"Contains FCC ID: IA9XPD2400A".

ISED Label

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

"Contains IC: 1338B-XPD2400A"

9 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.

10 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.

11 Revision History

Revision	Author	Date	Description
D0.1	Radu Oprea	2022-10-09	Create document.
D0.2	Radu Oprea	2022-11-09	Revised Document.