

CC3135MODRNMMOBR User's Manual

Revision History

- Rev A – Initial Release

Introduction

The CC3135MODRNMMOBR module allows for 802.11a/b/g/n: 2.4 GHz and 5 GHz communications from the Knox KeyDefender product to connect with the KnoxConnect™ system using a Taoglas FXP840.07.0055B antenna. It is built from a standard networking component acquired from a large semiconductor supplier to ensure a long-lifetime secure supply in support of Knox products.

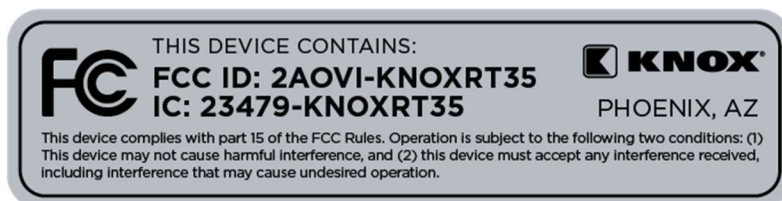
This CC3135MODRNMMOBR module must be labeled with L-2440.



FCC ID: 2A0VI-KNOXRT35
IC: 23479-KNOXRT35

Model:
CC3135MODRNMMOBR

All Devices using the CC3135MODRNMMOBR module will include the label L-2439.



Summary of Operational Use Conditions

The CC3135MODRNMMOBR module operates under the following conditions:

- It is a client-only device and does not support ad-hoc mode.
- The module supports Dynamic Frequency Selection (DFS) capabilities.
- It must be used with approved antennas and within the certified power limits.
- The module is intended for integration into host devices that comply with FCC modular certification guidelines.
- End users must not modify the module or antennas without proper testing and certification.
- The module should be installed in a host system where RF exposure compliance is maintained according to the guidelines defined.

Antenna Trace Designs

The following guidelines are recommended for the implementation of the antenna RF design:

- Ensure an RF path is designed with an impedance of 50Ω.
- Tuning the antenna impedance π matching network after the PCB is manufactured is recommended to account for PCB parasitics.
- π or L matching and tuning between cascaded passive components on the RF path may be required.

NOTE: The CC3135MODRNMMOBR is certified for use with the following antennas and product families. The user is expected to operate it only in this fashion. Changes or modifications not expressly approved by Knox Company voids the user's authority to operate the equipment.

Antenna	Gain dBi	Host Conditions
Taoglas FXP840.07.0055B	3.3	Restricted to KeyDefender product family hosts.

The Taoglas Antenna has the following specifications:

Wi-Fi Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
Wi-Fi - 2GHz	2400-2500	39.8	-4.00	3.35	50 Ω	Linear	Omni	2W
Wi-Fi - 5GHz	5150-5850	28.3	-5.48	3.37				
Wi-Fi - 6GHz	5925-7125	35.4	-4.51	5.31				
Tested on 1mm ABS (Plastic)								

Mechanical	
Dimensions	14 x 5 x 0.1 mm
Material	Polymer
Connector	I-PEX MHF I (U.FL Compatible)
Cable	55mm of $\varnothing$ 0.81mm
Weight	1g

Environmental	
Operation Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Humidity	Non-condensing 65°C 95% RH
RoHS Compliant	Yes
REACH Compliant	Yes

This module complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Concerning EVMs, Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. 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. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie 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 Industrie 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. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

RF Exposure Statement

This product has been evaluated for RF exposure and determined to meet applicable requirements via a low-power exemption. This module may be installed in products with an antenna-to-user distance greater than 20cm. Only the following antennas are approved to be used with this module:

Antenna	Gain dBi	Host Conditions
Taoglas FXP840.07.0055B	3.3	Restricted to KeyDefender product family hosts.

To ensure compliance with FCC RF exposure limits:

This module adheres to the guidelines outlined in FCC KDB 447498 D01.

If the module is used in portable applications (where the user is within 20 cm of the antenna), Specific Absorption Rate (SAR) testing may be required.

For fixed or mobile applications, Maximum Permissible Exposure (MPE) evaluation ensures safe operation distances.

General

The OEM should not provide information to the end user regarding the installation or removal of this RF module or information on how to change RF-related parameters in the user manual of the end product. The OEM integrator is still responsible for testing their end product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

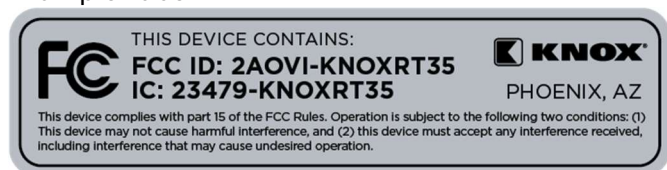
Finished Product Labelling

This Module is labeled with its own US and Canada Certification numbers. If the certification numbers cannot be seen while installed inside the finished product, then the finished product must display the label referring to the module. In that case, the finished product must be permanently labeled on the exterior of the product with wording such as the following*:

“Contains Transmitter Module FCC ID: 2AOVI-KNOXRT35” OR
“Contains FCC ID: 2AOVI-KNOXRT35”. “Contains Transmitter Module IC: 23479-KNOXRT35” OR
“Contains IC: 23479-KNOXRT35”.

* Or similar text which conveys the same meaning.

Example Label:



This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

** If the product is too small to include the above statement, it may be placed in the user's manual.

The following warnings must also be placed in the User Manual of the finished product using this module:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Industry Canada license-exempt RSS standard(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.

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, et (2) l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

For a Class A digital device or peripheral, place the following warning:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For a Class B digital device or peripheral, place the following warning:

Note: 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 to an outlet on a circuit different from that to which the receiver is connected.

If the antenna used in the finished product is detachable or user serviceable, then the following must be included:

This radio transmitter IC: 23479-KNOXRT35 has been approved by Industry Canada to operate with the antenna types listed below, with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio IC: 23479-KNOXRT35 a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

*Antenna: Taoglas FXP840.07.0055B

* Only include the specific antenna(s) used with the particular host integration.

Rules and Regulations

The Knox CC3135MODRNMMOBR module is certified for FCC, IC/ISED, ETSI/CE, and MIC. Moreover, the module is also Wi-Fi certified with the ability to request a certificate transfer for Wi-Fi alliance members. TI customers that build products based on the Knox CC3135MODRNMMOBR can save in testing cost and time per product family.

Regulatory Body	Specification	ID
FCC (USA)	Part 15C + MPE FCC RF Exposure	2AOVI-KNOXRT35
IC/ISED (CANADA)	RSS-102 (MPE) and RSS-247 (Wi-Fi)	23479-KNOXRT35

FCC Certification and Statement

CAUTION

FCC RF 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 a minimum distance of 20 cm between the radiator and your body.

The CC3135MODRNMMOBR modules certified for the FCC as a single-modular transmitter. The modules are FCC-certified radio modules that carries a modular grant.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 of the device.

IC/ISED Certification Statement

CAUTION

IC RF Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

Déclaration d'exposition aux radiations: Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

The CC3135MOD modules are certified for IC as a single-modular transmitter. The TI CC3135MOD modules meet IC modular approval and labeling requirements. The IC follows the same testing and rules as the FCC regarding certified modules in authorized equipment. This device complies with Industry Canada license-exempt RSS standards. 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. 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: • L'appareil ne doit pas produire de brouillage. • L'utilisateur de l'appareil doit accepter tout brouillage

Information on Test Modes and Test Requirements for New Hosts

The module has been tested to meet FCC certification standards. Users must ensure:

- The module is integrated according to its granted FCC modular certification requirements.
- Any modifications (such as firmware changes or antenna replacements) comply with FCC permissive change rules.
- The host device is tested to confirm continued compliance.

Part 15B / ICES-003 Disclaimer

This device complies with Part 15 of the FCC Rules and ICES-003 for Canadian regulations. Operation is subject to the following two conditions:

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

FCC Class B Digital Device Notice

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 to 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.

ICES-003 Compliance (Canada)

This Class B digital apparatus complies with Canadian ICES-003.

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

A disclaimer stating compliance with Part 15B of the FCC rules (or ICES-003 for Canada), typically regarding interference to other devices.

EMI Considerations

Electromagnetic Interference (EMI) can affect the performance of electronic devices, including the WiFi module. To minimize EMI and ensure compliance with regulatory requirements, the following guidelines should be followed:

- **Proper Grounding:** Ensure that the WiFi module is properly grounded to reduce noise and signal interference.
- **PCB Layout Optimization:** Design PCB traces to minimize loop areas and prevent unintended radiation.
- **Shielding:** Use EMI shielding materials such as metal enclosures or shielding cans to reduce interference from external sources.
- **Filtering Components:** Utilize capacitors, ferrite beads, and other filtering components on power and signal lines to suppress EMI.
- **Antenna Placement:** Position antennas away from noise-generating components such as power supplies, clock circuits, and high-speed digital lines.
- **Separation from Other RF Modules:** Maintain adequate spacing between the WiFi module and other RF transmitters to prevent co-channel interference.
- **Regulatory Testing:** Perform pre-compliance and final EMI testing to verify that the device meets FCC and international standards.

By following these best practices, manufacturers can minimize EMI-related issues, enhance signal integrity, and ensure the WiFi module operates reliably within regulatory compliance.

How to Make Changes

Any modifications to the WiFi module must comply with FCC regulations to ensure continued certification and lawful operation. The following guidelines should be followed:

Permissive Changes:

- Minor changes, such as firmware updates or component swaps, may be permitted under FCC Permissive Change Rules.
- The responsible party must document and, if necessary, submit a Class I, II, or III permissive change request to the FCC.

Antenna Modifications:

- The module must use an FCC-approved antenna to maintain compliance.
- If a new antenna type is used, additional RF exposure and emissions testing may be required.

Host Device Integration:

- Any device integrating this module must ensure that the RF exposure conditions remain compliant.
- Testing should be conducted to verify continued compliance with FCC Part 15 and other applicable regulations.

Labeling Requirements:

- If modifications impact the compliance status, updated labeling may be required on the host device.

Retesting and Recertification:

- If changes significantly affect RF performance or emissions, a new FCC certification may be required.
- Testing should be conducted by an FCC-accredited lab to confirm compliance before deployment.

For any substantial modifications, it is recommended to consult with a qualified regulatory expert or test laboratory to ensure continued adherence to FCC rules and regulations.

Instructions for making changes to the module that comply with FCC requirements, including any necessary retesting or notifications.

New Host Test Requirements and Modes

During new host development please refer to FCC's KDB 996369 D04 for guidance.

The following instructions were written for a KeyDefender unit; if the development is for a separate host, then KeyDefender, please contact Knox Engineering to get the latest FW and instructions for your host device.

For new host validation and testing the developer must use the latest FW. At the time of this document's writing the firmware is KEYDEFENDER_DEBUG_CC3135_v3.3.8.2+WIFI_TEST.

For testing purposes, the developer will use Tera Term and can follow the following instructions to test the Wi-Fi module's proper operation.

KEYDEFENDER_FCC_WIFI_TEST_Instructions

This firmware will transmit 1400 bytes (all zeros) continuously when activated.

When powered, The unit will function as a standard KeyDefender in test mode.

Except for the WiFi module, which will be controlled by the 'fcc' command.

Keys can be released (motors run) using PIN '1111' then enter key (bottom right <-|)

The WiFi LED will flash green when transmitting.

1. Load firmware on unit: KEYDEFENDER_Vx.x.x.x_CC31xx_FCC_WIFI_TEST.bin (version and radio may vary)
2. Start Tera Term
3. Plug in USB
4. Open KeyDefender com port in Tera Term - COMx: USB Serial Device (COMx)
5. Reset unit - hold enter key for 10 seconds and release
6. Boot messages and Instruction appear
7. Note: standard debug messages will also be displayed when releasing or returning keys

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FCC TESTING Task Started

* use 'fcc channel rate powerAttn' command *

* channel must be 1-13 or 36-165

* rate must be 1-21

Rate Table:

RATE_1M = 1

RATE_2M = 2

RATE_5_5M = 3

RATE_11M = 4

RATE_6M = 6

RATE_9M = 7

RATE_12M = 8

RATE_18M = 9

RATE_24M = 10

RATE_36M = 11

RATE_48M = 12

RATE_54M = 13

RATE_MCS_0 = 14

RATE_MCS_1 = 15

RATE_MCS_2 = 16

RATE_MCS_3 = 17

RATE_MCS_4 = 18

RATE_MCS_5 = 19

RATE_MCS_6 = 20

RATE_MCS_7 = 21

* power attenuation must be 0-15 (2.4Ghz only)

WARNING! RUNS FOREVER - use 'fcc 0 0 0' command to stop broadcasting

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WiFi FCC TEST socketsStartUp: SPI bitRate 10000000

>>> Boot Log End.

Available commands

?: Display list of commands

clear: Clear the display

getver: Display the Firmware Version

stats: Display status of all I/O

fcc: FCC Testing: fcc <channel> <rate> <powerAttn>

8. Start packet transmission via 'fcc' command

example: channel: 1 rate: RATE_6M attenuation 0 - Note: atten has no effect on 5Ghz channels

> fcc 1 6 0

fcc Testing state ON:

channel: 1 rate: 6 powerAttn: 0

> WARNING! RUNS FOREVER - Be sure to stop it with 'fcc 0 0 0'!

* Wifi LED flashing green

9. stop packet transmission

>fcc 0 0 0

fcc Testing state OFF:

channel: 0 rate: 1 powerAttn: 15

> Packets halted.

* WiFi LED off

10. Any questions, call your Knox contact