FCC ID: 2A95KNINAW15 / IC: 30482-NINAW15

This manual is based on the original manufacturer's manual and has been produced under TWIG brand in accordance with the Change ID process for our FCC and ISED IDs.

1 FCC/IC compliance

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

Any changes or modifications NOT explicitly APPROVED by Twig Com may cause the module to not comply with the FCC rules part 15 thus void the user's authority to operate the equipment.

1.1 FCC compliance

NINA-W15 modules are for OEM integrations only. The end-product will be professionally installed in such manner that only the authorized antennas can be used.

For NINA-W151, an external antenna connector (U.FL. connector) reference design is available and must be followed to comply with the NINA-W15 FCC/IC modular approval.

1.2 FCC statement

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.

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 the 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.

1.3 RF exposure statement

1.3.1 IC compliance

This equipment complies with the requirements of IC RSS-102 issue 5 radiation exposure limits set forth for an uncontrolled environment.
To ensure that the output power remains below the SAR evaluation Exemption limits defined in RSS-102 issue 5, customer applications integrating NINA-W151 must include a separation distance of at least 30 mm between the user (or bystander) and the antenna (or radiating element).

1.3.2 FCC compliance

This device complies with the FCC radiation exposure limits set forth for an uncontrolled environment.

To ensure that the output power remains below the SAR evaluation Exemption limits defined in SAR test exclusion limits in KDB 447498 D01v06, customer applications integrating NINA-W151 must include a separation distance of at least 25 mm between the user (or bystander) and the antenna (or radiating element).

1.4. End-product user manual instructions

1.4.1 IC compliance

User manuals for license-exempt radio apparatus shall contain the following text, or an equivalent notice that shall be displayed in a conspicuous location, either in the user manual or on the device, or both:

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.

Under Industry Canada regulations, this radio transmitter can 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 chosen in such a way that the equivalent isotopically radiated power (e.i.r.p.) is not more than that is necessary for successful communication.
Le manuel d'utilisation des appareils radio exempts de licence doit contenir l'énoncé qui suit, ou l'équivalent, à un endroit bien en vue dans le manuel d'utilisation ou sur l'appareil, ou encore aux deux endroits.
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.

Conformément aux réglementations d'Industry Canada, cet émetteur radio ne peut fonctionner qu'à l'aide d'une antenne dont le type et le gain maximal (ou minimal) ont été approuvés pour cet émetteur par Industry Canada. Pour réduire le risque d'interférences avec d'autres utilisateurs, il faut choisir le type d'antenne et son gain de telle sorte que la puissance isotrope rayonnée équivalente (p.i.r.e) ne soit pas supérieure à celle requise pour obtenir une communication satisfaisante.

1.4.2 End-product labeling requirements

1.4.2.1 IC compliance

The host product shall be properly labelled to identify the modules within the host product.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word "Contains" or similar wording expressing the same meaning, as shown in Figure 1 Example of an end product label.

Le produit hôte devra être correctement étiqueté, de façon à permettre l'identification des modules qui s'y trouvent.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit:

Figure 1 Example of an end product label

1.4.2.2 FCC compliance

For an end product that uses the NINA-W151 there must be a label containing, at least, the information shown in Figure 1:

The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in compliance with the modular approval guidelines developed by the FCC.

In accordance with 47 CFR § 15.19, the end-product shall bear the following statement in a conspicuous location on the device:

"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."

When the device is so small or for such use that it is not practicable to place the statement above on it, the information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

In case, where the final product will be installed in locations where the end user is unable to see the FCC ID and/or this statement, the FCC ID and the statement shall also be included in the end product manual.

Model	FCC ID	IC Certification Number
NINA-W151	2A95KNINAW15	30482-NINAW15

Table 1: FCC and IC IDs for the NINA-W15 series module

1.4.3 End product compliance

1.4.3.1 General requirements

- Any changes to hardware, hosts or co-location configuration may require new radiated emission and SAR evaluation and/or testing.
- The regulatory compliance of NINA-W151 does not exempt the end product from being evaluated against applicable regulatory demands; for example, FCC Part 15B criteria for unintentional radiators.
- Only authorized antenna(s) may be used.
- Any notification to the end user about how to install or remove the integrated radio module is NOT allowed.

1.4.3.2 Co-location (simultaneous transmission)

If the module is to be co-located with another transmitter, additional measurement for simultaneous transmission is required.

2 Antennas

This chapter gives an overview of the different external antennas that can be used together with the module.

This radio transmitter IC: 30482-NINAW15 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.

Cet émetteur radio IC: 30482-NINAW15 été approuvé par Industry Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximum autorisé et l'impédance nécessaire pour chaque type d'antenne indiqué. Les types d'antenne ne figurant pas dans cette liste et ayant un gain supérieur au gain maximum indiqué pour ce type-là sont strictement interdits d'utilisation avec cet appareil.

For each antenna, the "Approvals" field defines in which test reports the antenna is included. Definitions of the «Approvals» field are:

- FCC - The antenna is included in the FCC test reports and thus approved for use in countries that accept the FCC radio approvals, primarily US.
- IC - The antenna is included in the IC (Industrie Canada) test reports and thus approved for use in countries that accept the IC radio approvals, primarily Canada.
- RED - The antenna is included in the ETSI test reports and thus approved for use in countries that accept the Radio Equipment Directive, primarily the European countries.
- UKCA – The antenna is included in the UKCA test reports and thus approved for use in Great Britain.
- MIC - The antenna is included in the Japanese government affiliated MIC test reports and thus approved for use in the Japanese market.
- NCC - The antenna is included in the Taiwan NCC test reports and thus approved for use in Taiwan.
- KCC - The antenna is included in the Korea KCC test reports and thus approved for use in Korea.
- ANATEL – The antenna is included in the Brazil Anatel test reports and thus approved for use in Brazil.
- ACMA – The antenna is included in the Australia and New Zeeland test reports and thus approved for use in Australia and New Zeeland.
- ICASA – The antenna is included in the South Africa ICASA test reports and thus approved for use in South Africa.

In general, antennas with SMD connection, Reverse Polarity SMA connector or U.FL connector are included in FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA and ICASA radio tests. The antennas with SMA connector are included in RED, MIC, NCC, KCC, ANATEL, ACMA and ICASA radio tests but not in the FCC or IC due to FCC/IC regulations.

The external antennas are connected to the board through U.FL connectors. Some antennas are connected directly to the U.FL connector of the board while some are connected using an SMA or reversed polarity SMA connector through a short U.FL to SMA or reversed polarity SMA adapter cable.

This radio transmitter IC: 30482-NINAW15 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 in this device.

2.1 Approved antennas

2.1.1 Single band antennas

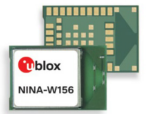
NINA-W152

Manufacturer Abracon

Gain +3 dBi
Impedance 50 Ω
Size (HxWxL) 3.0 x 3.8 x 9.9 mm
Type PIFA
Comment SMD PIFA antenna on NINA-W152. The antenna should not be mounted inside a metal enclosure. See also Internal antenna.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

NINA-W156

Manufacturer Abracon



Gain +3 dBi
Impedance N/A
Size (HxWxL) 1.1 x 3.4 x 10 mm
Type PCB trace
Comment PCB antenna on NINA-W156. The antenna should not be mounted inside a metal enclosure. See also Internal antenna.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL and ACMA

2.4 GHz miniature screw-mount monopole antenna, GW.26.0111

Manufacturer Taoglas

Polarization Vertical
Gain +2.0 dBi
Impedance 50 Ω
Size Ø 7.9 x 30.0 mm
Type Monopole
Connector SMA (M) .
Comment To be mounted with a U.FL to SMA adapter cable.
Approval RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

2.45 GHz Reduced-height helical whip antenna, ANT-2.4-CW-RH-RPS
Manufacturer Linx

Polarization Vertical
Gain -1.0 dBi
Impedance 50 Ω
Size Ø 7.4 x 27.0 mm
Type Monopole
Connector Reverse Polarity SMA plug (inner thread and pin receptacle).
Comment To be mounted with a U.FL to SMA adapter cable.
An SMA version antenna is also available but not recommended for use (ANT-2.4-CW-RH-SMA).
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

Wi-Fi external antenna, PN PRO-EX-348
Manufacturer Abracon

Polarization Vertical
Gain +3.0 dBi
Impedance 50 Ω
Size Ø 12.0 x 28.0 mm
Type Monopole
Connector Reverse Polarity SMA plug (inner thread and pin receptacle).
Comment The antenna adapter cable UF.L part must be mounted on a metal ground
plane for best performance.
To be mounted with a U.FL to SMA adapter cable.
An SMA version antenna is also available but not recommended for use(PN PRO-EX-347.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA
Original part number at certification: Ex-IT 2400 RP-SMA 28-001)

Wi-Fi/Bluetooth external antenna, PN PRO-EX-296
Manufacturer Abracon

Polarization Vertical
Gain +2.0 dBi
Impedance 50 Ω
Size Ø 12.0 x 28.0 mm
Type Monopole
Cable length 100 mm
Connector U.FL. connector
Comment For best performance, the UF.L part of the antenna adapter cable must be mounted on a metal ground plane.
To be mounted with a U.FL connector.
For information about integration the U.FL. connector, see also the NINA-W1 series system integration manual [1].
It is necessary to follow this reference design to comply with the NINA -W15 FCC/IC modular approvals.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, ICASA
Original part number at certification: Ex-IT 2400 MHF 28)

Wi-Fi/Bluetooth/Bluetooth LE external whip antenna, PN PRO-EX-333
Manufacturer Abracon

Polarization Vertical
Gain +3.0 dBi
Impedance 50 Ω
Size Ø 10 x 83 mm
Type Monopole
Connector Reverse Polarity SMA plug (inner thread and pin receptacle)
Comment To be mounted with a U.FL to SMA adapter cable.
An SMA version antenna is also available but is not recommended for use (PN
PRO-EX 332).
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA
Original part number at certification: Ex-IT 2400 RP-SMA 70-002)

Wi-Fi/Bluetooth external whip antenna, PN PRO-EX-327
Manufacturer Abracon

Polarization Vertical
Gain +3.0 dBi
Impedance 50 Ω
Size Ø 9.4 x 70.5 mm
Type Monopole
Cable length 100 mm
Connector U.FL. connector
Comment To be mounted with a U.FL connector.
For information about integration the U.FL connector, see also the NINA-W1 series system integration manual [1].
It is necessary to follow this reference design to comply with the NINA-W1 FCC/IC modular approvals.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA
Original part number at certification: Ex-IT 2400 MHF 70-001)

Wi-Fi/Bluetooth/Bluetooth LE board antenna, PN PRO-IS-237
Manufacturer Abracon

Gain +3.0 dBi
Impedance 50 Ω
Size 27 x 12 mm (triangular)
Type Patch
Cable length 100 mm
Connector U.FL. connector
Comment Should be attached to a plastic enclosure or part for best performance.
To be mounted with a U.FL connector.
For information about integration the U.FL connector, see also the NINA-W1 series system integration manual [1]. It is necessary to follow this reference design to comply with the
NINA-W15 FCC/IC modular approvals.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

2.2.2 Dual-band antennas

Wi-Fi/Bluetooth/Bluetooth LE board antenna, PN PRO-IS-299
Manufacturer Abracon

Gain +3.0 dBi
Impedance 50 Ω
Size 27 x 12 mm (triangular)
Type Patch
Cable length 100 mm
Connector U.FL. connector
Comment Should be attached to a plastic enclosure or part for best performance. Dual-band (2.4 GHz / 5 GHz) antenna to be mounted with a U.FL connector.
For information about integration the U.FL connector, see also the NINA-W1 series system integration manual [1]. It is necessary to follow this reference design to comply with the
NINA-W15 FCC/IC modular approvals.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

Wi-Fi/Bluetooth/Bluetooth LE board antenna, PN PRO-IS-432

Manufacturer Abracon

Gain +3.0 dBi
Impedance 50 Ω
Size 24x22x1 mm with mounting hole
Type Patch
Cable length 100 mm
Connector U.FL. connector
Comment Should be attached to a plastic enclosure or part for best performance. Dual-band (2.4 GHz / 5 GHz) antenna to be mounted with a U.FL connector.
For information about integration the U.FL connector, see also the NINA-W1 series system integration manual [1]. It is necessary to follow this reference design to comply with the NINA-W15 FCC/IC modular approvals.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, and ICASA

Wi-Fi/Bluetooth external whip antenna, PN PRO-EX-286

Manufacturer Abracon

Type ½ wave dipole dual-band antenna
Polarization Vertical
Gain +3 dBi
Impedance 50 Ω
Size 107 mm (Straight)
Type Monopole
Connector Reverse Polarity SMA plug (inner thread and pin receptacle)
Comment To be mounted with a U.FL to SMA adapter cable.
Approval FCC, IC, RED, UKCA, MIC, NCC, KCC, ANATEL, ACMA, ICASA
Original part number at certification: Ex-IT WLAN RPSMA)