7705 SAR-Hm and 7705 SAR-Hmc | RELEASE 21.7

SAR-Hm and SAR-Hmc Chassis Installation Guide

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Nokia is committed to diversity and inclusion. We are continuously reviewing our customer documentation and consulting with standards bodies to ensure that terminology is inclusive and aligned with the industry. Our future customer documentation will be updated accordingly.

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1 Preface

1.1 About This Guide

This guide provides an overview of the 7705 SAR-Hm and 7705 SAR-Hmc chassis, recommendations for preparing the site, procedures for installing, grounding, and powering the chassis, and prerequisites and instructions for initializing and commissioning the system.

After the hardware installation process is completed, refer to the List of Technical Publications for information about how to configure and manage the 7705 SAR-Hm and 7705 SAR-Hmc.

1.1.1 List of Technical Publications

For information about the 7705 SAR-Hm and 7705 SAR-Hmc software features, refer to the following software guides:

- 7705 SAR-Hm and 7705 SAR-Hmc Main Configuration Guide
- 7705 SAR-Hm and 7705 SAR-Hmc Interface Configuration Guide

1.1.2 Warnings and Notes

Observe the warnings and notes in this guide to avoid injury or equipment damage during installation and maintenance. Follow standard safety procedures and guidelines when working with and near electrical equipment. Warning statements and notes are provided in each chapter.

1.1.3 Audience

This guide is intended for network installers and system administrators who are responsible for installing, configuring, or maintaining networks. This guide assumes you are familiar with electronic and networking equipment.

1.1.4 Information Symbols

Table 1 describes symbols contained in this guide.

Table 1 **Information Symbols**

Symbol	Meaning	Description
	Danger	This symbol warns that improper handling and installation could result in bodily injury. An electric shock hazard could exist. Before you begin work on this equipment, be aware of hazards involving electrical circuitry, be familiar with networking environments, and perform accident prevention procedures.
	Warning	This symbol warns that improper handling and installation could result in equipment damage or loss of data.
	Caution	This symbol warns that improper handling may reduce your component or system performance.
	Note	This symbol provides additional operational information.

1.1.5 Technical Support

If you purchased a service agreement for your router and related products from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance. If you purchased a Nokia service agreement, follow this link to contact a Nokia support representative and to access product manuals and documentation updates:

Product Support Portal

1.1.6 Nokia Canada Address

Nokia Canada Inc.
600 March Road
K2K 2T6
Ottawa, Canada

2 Mandatory Regulations

2.1 In This Chapter

The following sections describe the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc:

2.2 List of Terms

Table 2 lists the mandatory regulations terms used in this guide.

Table 2 **List of Terms**

Term	Expansion
ACMA	Australian Communications and Media Authority
ACTA	Administrative Council for Terminal Attachments
ANSI	American National Standards Institute
AS/NZ	Australian/New Zealand standard
ATEX	ATmosphères EXplosives
CBN	Common Bonding Network
CE	Conformité Européene
CFR	Code of Federal Regulations
CSA International	Canadian Standards Association International
DC-C	Common DC Return
DC-I	Isolated DC Return
EEC	European Economic Community
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EN	European Standards
ES1	Class 1 energy source
ES2	Class 2 energy source
ES3	Class 3 energy source
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission
IBN	Isolated Bonding Network
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
IET	Institution of Engineering and Technology (UK)

Table 2 **List of Terms (Continued)**

Term	Expansion
LVD	Low Voltage Directive
NRTL	Nationally Recognized Testing Laboratory
OSHA (USA)	Occupational Safety and Health Administration (USA)
PCS	Personal Communications Service
PTCRB	PCS Type Certification Review Board
RoHS	Restriction of the use of certain Hazardous Substances
SELV	Safety Extra Low Voltage
TNV-1	Telecommunications Network Voltage, class 1
TNV-2	Telecommunications Network Voltage, class 2
TNV-3	Telecommunications Network Voltage, class 3
UL	Underwriters Laboratories
WEEE	Waste Electrical and Electronic Equipment

2.3 Safety Warnings / Avertissements de Sécurité

Ensure that you read and observe all of the dangers and warnings described in this section.

Veuillez lire la description des risques et les avertissements mentionnés dans le présent chapitre.

Installation sections throughout the document have links to this section as applicable.

Les chapitres relatifs à l'installation de tout le document comportent des liens vers le présent chapitre, le cas échéant.

- Installation and servicing of the system must be done only by trained service personnel familiar with potential electrical, mechanical, and LASER radiation hazards.

  Seul un personnel formé qui connaît les risques électriques ou mécaniques ainsi que les dangers des rayons laser doit effectuer l'installation et l'entretien du système.
- Ensure that nearby equipment, including breaker panel bus bars and power connectors, is made safe. Either shut off the power, if possible, or install safety guards or mats over exposed power points and cables.

  Vérifiez que les équipements à proximité, comme les barres omnibus, le panneau à disjoncteurs et les connecteurs électriques, sont sécurisés. Coupez l'alimentation si possible ou installez des protections ou des tapis de sécurité sur les points d'alimentation et les câbles exposés.
- Do not power up equipment before verifying that all common equipment (chassis, power, cooling, and grounding) is connected correctly.

  Ne mettez pas l'équipement sous tension avant d'avoir vérifié que tous les équipements communs (châssis, alimentation, refroidissement et mise à la terre) sont correctement raccordés.
- The equipment must be provided with a readily accessible disconnect device as part of site preparation.

  L'équipement doit être équipé d'un dispositif de déconnexion facilement accessible dans le cadre de la préparation du site.

- For DC (nominal 12, 24 VDC or 48 VDC) powered systems, the unit should be connected to a DC branch circuit with a 10 A (maximum for the 7705 SAR-Hm) or 5 A (maximum for the 7705 SAR-Hm) DC-rated circuit breaker or fuse that meets the requirements for branch circuit protection. A suitable disconnect device must be provided in the DC branch, either a circuit breaker, fuse, or switch that can be used to disconnect power to the system during servicing. For high-voltage DC applications, the circuit breaker or fuse must be approved for the applicable DC voltage.

  Pour les systèmes alimentés en courant continu (tension nominale de 12 VDC, 24 VDC ou de 48 VDC), l'unité doit être connectée à un circuit de dérivation DC avec un disjoncteur de 10 A au maximum (7705 SAR-Hm) ou 5A maximum (7705 SAR-Hmc) qui répond aux exigences de protection du circuit de dérivation. Un dispositif de déconnexion approprié, un disjoncteur ou un interrupteur capable de déconnecter l'alimentation du système pendant l'entretien, doit être prévu dans le circuit de dérivation DC. Pour les applications en courant continu haute tension, le disjoncteur ou le fusible doit être approuvé pour la tension en courant continue applicable.

- Disconnect all power feeds before installation and servicing.

  Débrancher toutes les AC ou les sources DC d'alimentation avant l'entretien.

- Systems equipped with DC power connections should be installed in restricted access areas, such as a dedicated equipment room or an equipment closet, in accordance with Articles 110-16, 110-17, and 110-18 of the National Electric Code ANSI/NFPA 70, and in accordance with local rules, statutes and electrical codes.

  Les systèmes équipés de connexions d’alimentation en courant continu doivent être installés dans des zones à accès restreint, comme un local spécial ou une armoire, conformément aux articles 110-16, 110-17 et 110-18 de la norme NEC (National Electric Code ou Code national de l’électricité) ANSI/NFPA 70 ainsi qu’aux réglementations, statuts et codes de l’électricité locaux.

- All AC power cords, DC power cords, and ground cables for equipment must meet local rules, statutes, and electrical codes.

  Tous les câbles d’alimentation AC ou DC ainsi que les câbles de mise à la terre de l’équipement doivent être conformes aux réglementations, statuts et codes de l’électricité locaux.

- Never make equipment connections in wet locations.

  Ne branchez jamais l’équipement dans des endroits humides.

2.3.1 Ground Connections / Raccordement à la Terre

- The chassis must be correctly connected to earth ground.

  Le châssis doit être correctement raccordé à la terre.
- Ground connection on the chassis is mandatory. The gauge of the chassis ground wire must match or exceed the gauge of the supply conductors.

  La mise à la terre du châssis est obligatoire. La section du câble de terre du châssis doit être au moins égale à celle des conducteurs d’alimentation.
- When wiring the unit, the ground connection must always be made first and disconnected last.

  Lors du câblage de l’unité, le câble de terre doit toujours être raccordé en premier et déconnecté en dernier.

2.3.2 LASER Transceiver / Émetteur-récepteur LASER

- Class 1 LASER product

  Appareil à LASER de classe 1
- Pluggable optic modules are very hot while in use. Touch only the extraction lever or handle when removing the module. Allow the module to cool before further handling.

  Les modules optiques enfichables sont très chauds lorsqu’ils fonctionnent. Touchez uniquement le levier ou la poignée d’extraction lorsque vous retirez le module. Laissez-le refroidir avant de poursuivre la manipulation.

2.3.3 Lightning / Foudre

- Lightning strikes are possible during stormy weather and could result in death or severe injury. Do not work on antenna installation or on power supply lines or antenna feeds during stormy weather.

  La foudre est possible par temps orageux et peut entraîner la mort ou des blessures graves. Ne travaillez pas sur l’installation de l’antenne, sur les lignes d’alimentation électrique ou les alimentations de l’antenne en cas d’orage.
- With AC power ports, an external surge protection device is intended to be used at the AC input of the router.

  Avec les ports d’alimentation AC, un dispositif externe de protection contre les surtensions est destiné à être utilisé à l’entrée AC du routeur.

2.3.4 Physical Safety / Sécurité Physique

- Always keep your fingers away from rotating fan blades. Do not put your fingers or any tool near a fan if the fans are still spinning. Allow the fans to spin down and fully stop before servicing.

  Tenez toujours vos doigts éloignés des pales du ventilateur en rotation. Ne placez pas vos doigts ou tout autre outil à proximité d'un ventilateur s'il tourne encore. Laissez les ventilateurs s'arrêter complètement avant l'entretien.
- Before working on equipment that is connected to power, remove jewelry, such as rings, necklaces, and watches. When metal objects are in contact with power and ground, serious burns can occur or the objects can become welded to the terminals.

  Avant de travailler sur un équipement connecté à l'alimentation, retirez vos bijoux, tels que les bagues, les colliers et les montres. Lorsque des objets métalliques entrent en contact avec l'alimentation et la terre, de graves brûlures peuvent survenir ou les objets peuvent se souder aux bornes.

2.3.5 Electrical Safety / Sécurité Électrique

- Only connect like circuits: SELV to SELV (ES1 to ES1), TNV-2 to TNV-2 (ES2 to ES2), and Primary to Primary (ES3 to ES3), as defined in IEC 60950-1 and 62368-1.

  Ne connectez que les circuits identiques: SELV à SELV (ES1 à ES1), TNV-2 à TNV-2 (ES2 à ES2) et primaire à primaire (ES3 à ES3), conformément à la définition des normes CEI 60950-1 et 62368-1.
- The intrabuilding ports of the equipment must use shielded intrabuilding cabling/wiring that is grounded at both ends.

  Les ports de l'équipement se trouvant à l'intérieur d'un bâtiment doivent utiliser un câblage intérieur blindé mis à la terre aux deux extrémités.

2.4 General Requirements

The sections that follow outline the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc. The information in this section also describes instructions and information related to overall conformance with the mandatory regulations. You must adhere to these instructions so that your system meets regulatory requirements.

Danger: Before working on equipment that is connected to power, remove jewelry, such as rings, necklaces, and watches. When metal objects are in contact with power and ground, serious burns can occur or the objects can become welded to the terminals.

Warning: The compliance and long-term reliability of the 7705 SAR-Hm and 7705 SAR-Hmc are wholly dependent on using the product within the environmental limits and restrictions described in the Site Preparation chapter.

2.4.1 Anti-static Measures

Figure 1 shows the ESD awareness label used on Nokia products to alert personnel to the presence of ESD-sensitive devices in the product. The necessary ESD precautions must be taken whenever this symbol is present on the product.

Figure 1 **ESD Awareness Label**

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This guide uses the following icon and associated text to provide special information relating to ESD-sensitive activities or situations.

Warning:

- ESD damage can occur if components are mishandled. The 7705 SAR-Hm and 7705 SAR-Hmc chassis must be properly grounded. The grounding point is located at the bottom of the chassis faceplate.
- Always wear an ESD-preventive wrist or ankle strap connected to a nearby ground point that is connected to the site grounding point when working on the 7705 SAR-Hm, 7705 SAR-Hmc, or the 35W High Voltage Power Supply.

The risk of damage to an ESD-sensitive device is reduced considerably after assembly in a circuit designed to protect sensitive components; however, the following basic precautions should be taken to reduce ESD to harmless levels.

- Handle all units as if they contained ESD-sensitive devices unless they are known not to contain ESD-sensitive parts.
- Wear an anti-static ESD strap on your wrist or heel prior to and while touching or handling units containing ESD-sensitive devices.
- For surfaces with resistance to ground in excess of 100 MΩ, such as ordinary tile, either cover them with properly grounded static dissipative runners or wax them with a static dissipative wax.
- Store (even temporarily), pack, and ship units in anti-static bags or containers.
- Do not handle units and components unnecessarily.
- Do not use synthetic bristled brushes or acid brushes to clean units.
- Handle failed units with the same precautions as working units.

2.4.1.1 ESD Grounding

When a 7705 SAR-Hm or 7705 SAR-Hmc chassis is properly installed in a grounded equipment rack, the rack provides ESD grounding for the chassis. Before a 7705 SAR-Hm or 7705 SAR-Hmc chassis is installed, connect the ESD wrist strap to a grounded rack or other ground point. After the chassis is installed in a grounded rack or cabinet, connect the anti-static wrist strap to the ground point on the front of the chassis, as shown in Figure 2 and Figure 3.

Figure 2 **Wrist Strap Label at the Front of the 7705 SAR-Hm Chassis**

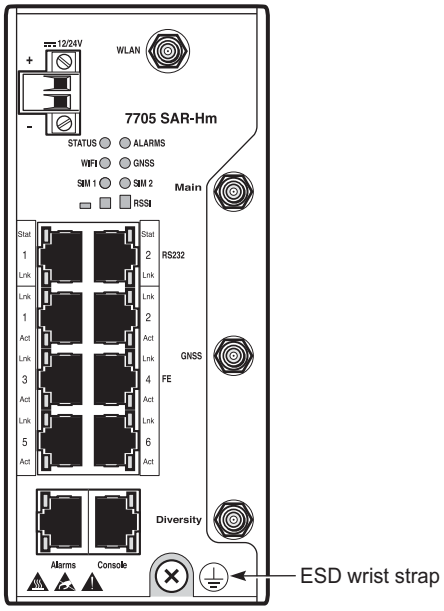
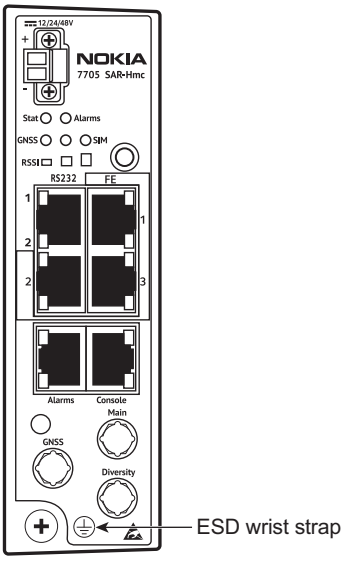


Figure 3 **Wrist Strap Label at the Front of the 7705 SAR-Hmc Chassis**



2.4.2 Unit Repair

Return a damaged unit to an authorized Nokia repair center for service or repair.

2.4.3 Equipment Interconnection Points

Warning: Only connect like circuits: SELV to SELV or TNV-2 to TNV-2, as defined in IEC 60950-1, and ES1 to ES1 or ES2 to ES2, as defined in IEC 62368-1.

2.4.3.1 SELV and ES1

The following interconnection points on all 7705 SAR-Hm and 7705 SAR-Hmc chassis are SELV or ES1 connections:

- Ethernet (10/100Base-T) ports
- Alarm port
- Console port
- RS-232 ports
- DC power input terminal block

2.4.3.2 Primary and ES3

The following interconnection points on all HV-PS35 external power are Primary or ES3 connections:

- AC
- HV DC (high voltage DC; from 88 VDC up to 300 VDC)

2.4.4 Prevention of Access

The 7705 SAR-Hm and 7705 SAR-Hmc must be accessible only to authorized, trained service personnel. Install this apparatus in a restricted access location or similar environment to prevent unauthorized access.

2.4.5 Environmental Requirements for Installation

For information about the environmental requirements for installing the 7705 SAR-Hm and 7705 SAR-Hmc, see Installation Locations.

2.4.6 Protective Safety Ground (Earth)

The cable used for safety ground must be at minimum 12 AWG (3.3 sq mm; 2.0 mm diameter) in size, green and yellow in color, and of sufficient length to connect the building earth point to the chassis ground connection. This 12 AWG ground wire exceeds the minimum safety requirement, to also address compliance with the EMC surge requirements. See Grounding the Chassis for instructions on connecting the chassis ground.

2.4.7 EMC Compliance

EMC compliance requires the use of shielded cables and may require other special accessories. Where required, these special accessories must be installed as per the instructions.

To maintain EMC compliance, cables that are shielded and grounded at both ends must be used on the following interfaces and ports:

- Console port
- RJ-45 Alarm port
- Ethernet interfaces
  - Fast Ethernet (CAT5 minimum)
- RS-232 interfaces

2.4.8 Regulatory Symbols

The 7705 SAR-Hm and 7705 SAR-Hmc use various regulatory symbols, which may be used on product markings such as approvals labels. These symbols are described in IEC 60417 and shown in Table 3.

Table 3 **Regulatory Symbols**

Symbol	Meaning	Description
	Protective earth (ground)	This symbol indicates that you must connect to earth ground before you make any other connections to the equipment.
	Protective bond	This symbol indicates that you must provide a protective bond connection on the equipment; that is, any accessible metal parts that could become energized must be properly bonded to the earthed chassis.
	Hot surface	This symbol indicates that the equipment surface is hot to the touch when it is powered on or during maintenance when a subassembly is removed.
	Direct current	This symbol indicates that the equipment is suitable for direct current only.
	Alternating current	This symbol indicates that the equipment is suitable for alternating current only.
	Caution	This symbol indicates that caution should be taken when handling the equipment.
	Read operator’s manual	This symbol indicates that the operator’s manual or card instructions should be read before continuing with an operation.

2.5 Safety Approvals

This product is approved by an NRTL and also the IECEE CB Scheme. It is compliant with IEC 60950-1 and IEC 62368-1, with all country deviations.

2.6 Safety Approval for External DC Sources That Power This Equipment

2.6.1 Low-Voltage DC Sources, Nominal 12/24/48 VDC

The low-voltage DC source, from which this equipment derives power, must be safety approved (as per local requirements) and meet the requirements of a SELV source as defined in IEC/UL/CSA/EN 60950-1, or an ES2 source as defined in IEC/UL/CSA/EN 62368-1.

2.6.2 High-Voltage DC Sources, 88 to 300 VDC

The high voltage DC source, from which the HV-PS35 external Power Supply derives power, must be safety approved (as per local requirements) and meet the requirements of a Hazardous Voltage Secondary source as defined in IEC/UL/CSA/EN 60950-1, or an ES3 source as defined in IEC/UL/CSA/EN 62368-1.

The external DC source must have double or reinforced levels of insulation, isolating the DC output from the AC mains. (AC mains are sources up to and including 300 Vrms, including 230/400 V and 277/480 V sources).

Note: Only the low-voltage DC option is approved for hazardous locations.

2.7 Canada Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc in Canada.

2.7.1 Industry Canada Regulations

ICES-003: Interference-Causing Equipment Standard - Information Technology Equipment (ITE) - Limits and methods of measurement

Note: Changes or modifications not expressly approved by Nokia could void the user's authority, granted by Nokia's certification by Industry Canada, to operate the equipment.

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.

2.7.2 General Requirements for Compliance of Radio Apparatus (RSS-GEN)

The 7705 SAR-Hm contains licensed and license-exempted transmitter modules. The 7705 SAR-Hmc only contains a licensed transmitter module.

The 7705 SAR-Hm licensed transmitter module is approved under the certification number IC:2417C-MC7455.

The 7705 SAR-Hmc (3HE12472AA) licensed transmitter module is approved under the certification number IC:24872-MG401.

The 7705 SAR-Hmc (3HE12473AA) licensed transmitter module is approved under the certification number IC:2417C-MC74B.

This device contains license-exempt transmitter/receiver that comply with Innovation, Science and Economic Development Canada's license-exempt RSS-247.

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.

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 exempts de licence. L’exploitation est autorisée aux deux conditions suivantes.

- L’appareil ne doit pas produire de brouillage.
- L’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

This radio transmitter [IC: 8407A-RS9113DB] 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 [IC: 8407A-RS9113DB] 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.

The maximum antenna gain must not exceed the limits listed in Table 4 and Table 5.

Note: WiFi (WLAN) is not supported on the 7705 SAR-Hmc.

Table 4 **WiFi Antenna Gain Limits**

WLAN Frequency (MHz)	Max Omni-directional Antenna Gain (dBi)	EIRP Limit (dBm)
2412- 2484	18	36
5150-5250	5	23
5250-5350	18	30
5470-5600	18	30

Table 4 **WiFi Antenna Gain Limits (Continued)**

WLAN Frequency (MHz)	Max Omni-directional Antenna Gain (dBi)	EIRP Limit (dBm)
5650-5725	18	30
5725-5850	18	30

Notes:

1. The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems (devices installed in vehicles are permitted).
2. For devices with detachable antennas, the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the Maximum Effective Isotropic Radiated Power (EIRP) limit.
3. For devices with detachable antennas, the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the EIRP limits, as appropriate.
4. Where applicable, antenna types, antenna models, and worst-case tilt angles necessary to remain compliant with the EIRP. elevation mask requirement set forth in RSS-247 section 6.2.2.3 shall be clearly indicated.

Table 5 **LTE Antenna Gain Limits**

Band	LTE Frequency (MHz)	EIRP Limit (dBm)
2	1850 to 1910	30
4	1710 to 1755	30
5	824 to 849	30
7	2500 to 2570	33
12	699 to 716	30
13	777 to 787	30
17	704 to 716	30
25	1850 to 1915	30
26	814 to 849	30
30 [1]	2305 to 2315	See Note 1
41	2496 to 2690	33
66	1710 to 1780	30

Note:

1. The EIRP limit in Band 30 for mobile stations must not have an antenna gain exceeding 1 dBi in Band 30. Additionally, the IC prohibits the use of external vehicle-mounted antennas for mobile stations in this band. Fixed subscriber stations in Canada may have an antenna gain of up to 10 dBi in Band 30; however, the use of outdoor antennas or outdoor station installations are prohibited, except if installed professionally in locations that are at least 20 meters from roadways or in locations where it can be shown that the ground power level of -44 dBm per 5 MHz in the bands 2305–2315 MHz and 2350–2360 MHz or -55 dBm per 5 MHz in the bands 2315–2320 MHz and 2345–2350 MHz will not be exceeded at the nearest roadway.

2.7.3 EMC Compliance

EMC compliance requires the use of shielded cables or other special accessories. These special accessories must be installed as per the instructions. See section EMC Compliance for additional information.

2.7.4 RF Exposure

The 7705 SAR-Hm and 7705 SAR-Hmc comply with the RSS-102 RF Exposure limits when operating with the allowed maximum gain antennas defined by Nokia. At least 7.9 in. (20 cm) separation distance between the operator or bystander and the 7705 SAR-Hm or 7705 SAR-Hmc antenna must be maintained at all times.

2.8 United States Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc in the United States.

2.8.1 Federal Communications Commission

2.8.1.1 EMC Regulations

FCC Part 15

Note: Changes or modifications not expressly approved by Nokia could void the user's authority, granted by Nokia's certification by the FCC, to operate the equipment.

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.

2.8.1.2 RF Regulations

The 7705 SAR-Hm is a mobile device and operates in the cellular bands. It contains licensed and license-exempted transmitter modules.

The 7705 SAR-Hm contains the licensed transmitter module that is approved under the certification number FCC ID: N7NMC7455.

The 7705 SAR-Hm contains the WLAN module that is certified under the FCC ID: XF6-RS9113DB.

The 7705 SAR-Hmc systems are mobile devices and operate in the cellular bands. The systems only contain a licensed transmitter module. WLAN is not supported on the 7705 SAR-Hmc systems.

The 7705 SAR-Hmc (3HE12472AA) contains the licensed transmitter module that is approved under the certification number FCC ID: 2AU8H-MG401.

The 7705 SAR-Hmc (3HE12472AA) system can also be configured as a CBSD Category A or B, and is approved under the certification number FCC ID: AS57705SARHMC-1.

The 7705 SAR-Hmc (3HE12473AA) contains the licensed transmitter module that is approved under the certification number FCC ID: N7MMC74B.

The 7705 SAR-Hmc (3HE12473AA) system can also be configured as a CBSD Category A or B, and is approved under the certification number FCC ID: AS57705SARHMC-2.

2.8.2 FCC RF-Exposure Regulations

These safety requirements require additional care to ensure that normal accessible areas near the antenna do not exceed the Uncontrolled Exposure limit, as specified in the FCC RF-Exposure Regulations.

FCC provides two exposure limits depending on the situation: 1) “Controlled” or occupational exposure, 2) “Uncontrolled”, which defines the exposure limit to the general public. A detailed discussion of the guidelines and adopted limits are included in FCC technical bulletin, OET Bulletin 65.

The 7705 SAR-Hm and 7705 SAR-Hmc comply with the Bulletin OET 65 RF Exposure limits when operating with the allowed maximum gain antennas defined by Nokia. At least 7.9 in. (20 cm) separation distance between the operator or bystanders and the 7705 SAR-Hm or 7705 SAR-Hmc antenna must be maintained at all times, as defined in the FCC 2.1091.

As a mobile deployment, the LTE and WLAN ports can transmit simultaneously on a 7705 SAR-Hm. The colocated configuration must not exceed the limits listed in Table 6 and Table 7.

Table 6 **Indoor WLAN Antenna Gain Limits**

WLAN Frequency (MHz)	Max Omni-directional Antenna Gain (dBi)	EIRP Limit (dBm)
2412- 2484	7	25
5150-5825	15	27

Note:

1. When selecting antennas, the maximum power spectral density limits as per FCC Part 15 Subpart E Section 15.407 shall not be exceeded for the 5GHz range. For the 2.4GHz range, the FCC Part 15 Subpart C Section 15.247 requirements shall not be exceeded.

Table 7 LTE Antenna Gain Limits

Band	LTE Frequency (MHz)	EIRP Limit (dBm)
2	1850 to 1910	30
4	1710 to 1755	30
5	824 to 849	30
12	699 to 716	30
13	777 to 787	30
17	704 to 716	30
25	1850 to 1915	30
26	814 to 849	30
30 [1]	2305 to 2315	See Note 1
41	2496 to 2690	33
48	3550 to 3700	EUD > 23 Category A > 30 Category B > 47
66	1710 to 1780	30

Note:

1. EIRP limit in Band 30 for mobile stations must not have antenna gain exceeding 1 dBi in Band 30. Additionally, the FCC prohibit the use of external vehicle-mounted antennas for mobile stations in this band. Fixed customer premises equipment (CPE) stations in the United States may have an antenna gain up to 10 dBi in Band 30; however, the use of outdoor antennas or outdoor station installations are prohibited except if professionally installed in locations that are at least 20 meters from roadways or in locations where it can be shown that the ground power level of -44 dBm per 5 MHz in the bands 2305 to 2315 MHz and 2350 to 2360 MHz or -55 dBm per 5 MHz in the bands 2315 to 2320 MHz and 2345 to 2350 MHz will not be exceeded at the nearest roadway.
2. This device is certified for mobile and fixed applications. Under no conditions may an antenna gain be used that exceed the EIRP power limit as specified in Part 22/24/27/90/96.

2.9 European Union Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc in the European Union.

2.9.1 Declaration of Conformity

Hereby, Nokia declares that the equipment documented in this publication is in compliance with the essential requirements and other relevant provisions of Directive 2014/35/EU, Directive 2014/30/EU, and Directive 2011/65/EU (including Commission Delegated Directive (EU) 2015/863). Where radio devices are used, Directive 2014/53/EU applies.

The technical documentation as required by the Conformity Assessment procedure is kept at the Nokia location that is responsible for this product. For more information, please contact your local Nokia Customer Service Organization.

2.9.2 EU Compliance Statement

This product has been CE marked in accordance with the requirements of European Directives 2014/35/EU Low Voltage (LVD) Directive, 2014/30/EU Electromagnetic Compatibility (EMC), 2011/65/EU Restriction of Hazardous Substances (Recast) Directive, including Commission Delegated Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU of the European Parliament and of the Council as regards the list of restricted substances, and for radio devices, 2014/53/EU Radio Equipment Directive (RED).

2.9.3 EMC/EMI Compliance

The equipment complies with the following EMC and EMI specification: EN 301 489-1 Class A.

2.9.4 Radio Compliance

The equipment complies with the applicable requirements in ETSI EN 301 908-2 and EN 301 908-13.

The equipment complies with the applicable WLAN requirements in ETSI EN 300 328 (2.4GHz) and EN 301 893 (5GHz). In the frequency band 5 150-5 350 MHz, the band is restricted to indoor use with a maximum mean EIRP of 200 mW (23dB).

2.9.5 RF Exposure

The 7705 SAR-Hm and 7705 SAR-Hmc comply with the EN62311 RF Exposure limits when operating with the allowed maximum gain antennas defined by Nokia. At least 7.9 in. (20 cm) separation distance between the operator or bystander and the 7705 SAR-Hm or 7705 SAR-Hmc antenna must be maintained at all times.

The EIRP levels are maintained when operating with the antennas provided by Nokia.

2.9.6 Protective Earth

Protective earth is referred to as chassis ground in this document. A green and yellow colored earth wire must be connected from the site equivalent of the mains earth connection to all shelves in accordance with IET Wiring Regulations (use the most recent edition available). This connection is made via the chassis ground connection (see Grounding the Chassis for specific instructions on connecting the protective earth).

2.9.7 Eco-Environmental

Packaging Collection and Recovery Requirements

Countries, states, localities, or other jurisdictions may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

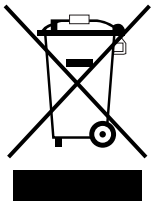
For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, please contact the appropriate environmental health and safety organization.

Recycling / Take-back / Disposal of Product

Electronic products bearing or referencing the symbol shown in Figure 4, when put on the market within the European Union, shall be collected and treated at the end of their useful life in compliance with applicable European Union and local legislation. They shall not be disposed of as part of unsorted municipal waste. Due to materials that may be contained in the product, such as heavy metals or batteries, the environment and human health may be negatively impacted as a result of inappropriate disposal.

Note: In the European Union, the WEEE symbol (a wheeled trash bin that has been crossed out and is positioned above a solid bar) indicates that the product was put on the market after 13 August 2005. This product is compliant with the WEEE marking requirements of Directive 2012/19/EU Waste Electrical and Electronic Equipment (WEEE).

Figure 4 **WEEE Symbol for post-August 13, 2005 Product**



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Moreover, in compliance with legal requirements and contractual agreements, where applicable, Nokia will offer to provide for the collection and treatment of Nokia products bearing the logo at the end of their useful life, or products displaced by Nokia equipment offers. For information regarding take-back of equipment by Nokia, or for more information regarding the requirements for recycling/disposal of product, please contact your Nokia Account Manager or Nokia Takeback Support.

2.9.8 Material Content Compliance

European Union (EU) Directive 2011/65/EU, “Restriction of the use of certain hazardous substances in electrical and electronic equipment” (recast), and Commission Delegated Directive (EU) 2015/863 restrict the use of lead, mercury, cadmium, hexavalent chromium, phthalate, and certain flame retardants in electrical and electronic equipment. The Directive 2011/65 EU applies to electrical and electronic products placed on the EU market after 2 January 2013, and the (EU) 2015/863 amendment after 22 July 2019. Nokia products shipped to the EU comply with the EU RoHS 2 Directive and latest amendments. Nokia ensures that equipment is assessed in accordance with the Harmonised Standard EN IEC 63000:2018 (CENELEC) on “Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances”.

2.10 United Kingdom Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc in the United Kingdom.

2.10.1 Declaration of Conformity

Hereby, Nokia declares that the equipment documented in this publication is in compliance with the essential requirements and other relevant provisions of:

- Electromagnetic Compatibility Regulations 2016
- Electrical Equipment (Safety) Regulations 2016
- Radio Equipment Regulations 2017
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The technical documentation as required by the Conformity Assessment procedure is kept at the Nokia location that is responsible for this product. For more information, please contact your local Nokia Customer Service Organization.

This product has been UKCA marked in accordance with the requirements of the Regulations.

2.10.1.1 EMC/EMI Compliance

The equipment complies with the following EMC and EMI specifications:

EN 300 386 Class A and EN 301 489-1 Class A

2.10.1.2 Laser Interface

The system uses laser devices that are rated in accordance with IEC 60825-1 as Class 1 devices.

2.10.1.3 Protective Earth

Protective earth is referred to as chassis ground in this document. A green, or green and yellow, colored earth wire must be connected from the site equivalent of the mains earth connection to all shelves in accordance with IET Wiring Regulations (use the most recent edition available). This connection is made via the chassis ground connection (see Grounding the Chassis for specific instructions for connecting the protective earth).

This equipment must be permanently grounded.

2.10.1.4 Material Content Compliance

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 restricts the use of lead, mercury, cadmium, hexavalent chromium, phthalate, and certain flame retardants in electrical and electronic equipment.

Nokia ensures that equipment is assessed in accordance with the Standard EN IEC 63000:2018 (CENELEC) on “Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances”.

2.11 Australia/New Zealand Regulations

This section describes the mandatory regulations that govern the installation and operation of the 7705 SAR-Hm and 7705 SAR-Hmc in Australia and New Zealand.

2.11.1 ACMA Regulations

The 7705 SAR-Hm and 7705 SAR-Hmc chassis comply with the ACMA requirements, and the product is marked with the RCM logo under the Supplier Code E762.

EMC

This Class A digital apparatus complies with AS/NZS CISPR 32.

Safety

All products supplied in Australia comply with an applicable Australian Standard electrical safety standard.

The 7705 SAR-Hm and 7705 SAR-Hmc chassis comply with the AS/Telecommunications requirements.

2.12 China Regulations

The statements that follow are the product conformance statements that apply to the 7705 SAR-Hm and 7705 SAR-Hmc when deployed in China.

2.12.1 Packaging Collection and Recovery Requirements

Jurisdictions in the People's Republic of China may require that systems be established for the return and/or collection of packaging waste from the consumer, or other end user, or from the waste stream. Additionally, reuse, recovery, and/or recycling targets for the return and/or collection of the packaging waste may be established.

For more information regarding collection and recovery of packaging and packaging waste within specific jurisdictions, please contact the appropriate environmental health and safety organization.

2.12.2 Material Content Compliance

The People's Republic of China Ministry of Information Industry has published a regulation (Order #39) and associated standards regarding restrictions on hazardous substances (China RoHS). The legislation requires all Electronic and Information Products (EIP) to comply with certain labeling and documentation requirements. Nokia products manufactured on or after 1 March 2007, that are intended for sale to customers in the China market, comply with these requirements.

In accordance with the People's Republic of China Electronic Industry Standard "Marking for the Control of Pollution Caused by Electronic Information Products" (SJ/T11364-2006), customers may access the Nokia Hazardous Substances Table, in Chinese, from the following location:

https://www.nokia.com/sites/default/files/2018-11/nokia_china_rohs-2_hst-4_0.pdf

2.12.3 Altitude Limit

Nokia products use the symbol shown in Figure 5 on the approvals label to indicate that the product is only to be used at altitudes equal to or less than 2000 m (6562 ft) above sea level.

Figure 5 **Altitude Limit Symbol**

23467

仅适用于海拔2000m 以下地区安全使用" 或类似的警告语句

“Only used at altitudes no higher than 2000 m above sea level”

2.13 South Korea Regulations

The following EMC statement applies to the 7705 SAR-Hm and 7705 SAR-Hmc when deployed in South Korea.

EMC

Class A Equipment (Broadcasting and Communication Equipment for Office Work)

A급 기기 (업무용 방송통신기자재)

The seller and user will be notified that this equipment is suitable for electromagnetic equipment for office work (Class A) and it can be used outside the home.

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다

South Korea's “Electrical Communication Basic Law” requires EMC testing and certification. Certified equipment will be labeled with the KC mark and certification number shown below:

Certification number: R-R-NOK-7705SAR-Hm

2.14 Japan Regulations

The statements that follow are the product conformance statements that apply to the 7705 SAR-Hm and 7705 SAR-Hmc when deployed in Japan.

2.14.1 Safety

The equipment complies with the Product Safety specifications of IEC 60950-1 and/or IEC 62368-1.

Note:

- AC PSUs and AC cords sold by Nokia with a 3HExxxxxxx part number are dedicated for use with Nokia IP routers only.
- Based on the requirements from METI (Ministry of Economy, Trade and Industry), these AC PSUs and AC cords do not require PSE certification if used solely with Nokia IP routers.

2.14.2 EMC

This equipment is a VCCI Class A compliant product and is marked with the VCCI logo shown below.

Class A Equipment

この装置は、クラスA機器です。この装置を住宅環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This equipment is a Class A device. Operation of this equipment in a residential environment could cause radio interference. In such a case, the user may be required to take corrective actions. VCCI-A

2.15 Hazardous Locations

2.15.1 Chassis Labels

The 7705 SAR-Hm and 7705 SAR-Hmc chassis display the following labels:

2.15.2 Conditions of Use

- The equipment shall be installed in an enclosure that provides a degree of protection not less than IP 54 in accordance with EN 60079-0 and EN 60079-7. Any field wiring connections or cable entries used for this outer enclosure shall also be suitably certified against the enclosure requirements of EN 60079-0 and EN 60079-7. The installer shall ensure that the maximum ambient temperature of the module when installed is not exceeded.
- The equipment shall only be used in an area of at least pollution degree 2, as defined in IEC 60664-1.
- The chassis shall be grounded as described in the in this manual before use.
- The SIM card shall be connected or disconnected only in a non-hazardous area or when the device is not energized.
- The end-use enclosure shall provide a Warning label “Do not open while energized”.

Note: See 7705 Outdoor Enclosure Requirements for Hazardous Locations for hazardous locations requirements pertaining to the 7705 Outdoor Enclosure.

3 7705 SAR-Hm and 7705 SAR-Hmc Overview

3.1 In This Chapter

This chapter provides an introduction to the 7705 SAR-Hm and 7705 SAR-Hmc. The topics include:

3.2 Overview of the 7705 SAR-Hm and 7705 SAR-Hmc

The 7705 SAR-Hm and 7705 SAR-Hmc are small form factor IP/MPLS routers. They are temperature and EMC-hardened and are passively cooled. The 7705 SAR-Hm supports cellular, GPS/GLONASS, and WLAN radio interfaces. The 7705 SAR-Hmc supports cellular and GPS/GLONASS radio interfaces. Figure 6 shows the 7705 SAR-Hm chassis. Figure 7 shows the 7705 SAR-Hmc chassis.

Figure 6 **7705 SAR-Hm Chassis**

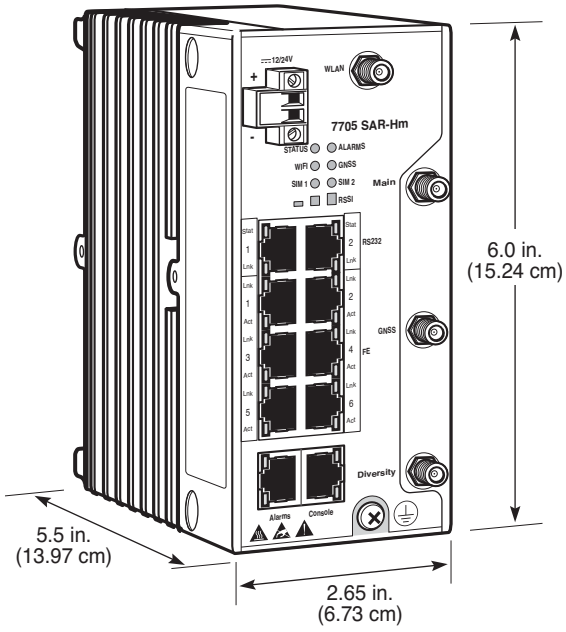

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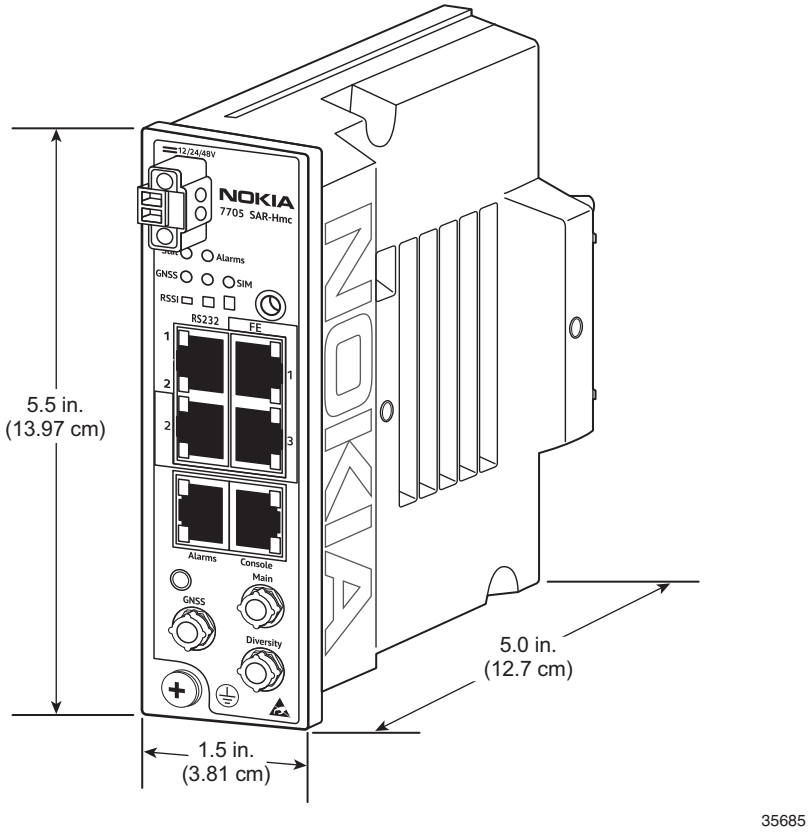
Figure 7 **7705 SAR-Hmc Chassis**



The 7705 SAR-Hm chassis is available in the following variants, each of which is distinguished by its factory-installed carrier wireless module. The modules are designed to support the radio protocols and bands used in the geographic regions specified in Table 8.

Table 8 **7705 SAR-Hm Chassis Variants by Carrier Wireless Module**

7705 SAR-Hm Chassis Part Number	Variant Description
3HE11600AA	7705 SAR-Hm 3G/LTE North America and EMEA
3HE11602AA	7705 SAR-Hm 3G/LTE APAC and ROW

The 7705 SAR-Hmc chassis is available in the following variants. The modules are designed to support the radio protocols and bands used in the geographic regions specified in Table 9.

Table 9 **7705 SAR-Hmc Chassis Variants**

7705 SAR-Hmc Chassis Part Number	Variant Description
3HE12472AA	7705 SAR-Hmc NA
3HE12473AA	7705 SAR-Hmc NA Variant 2
3HE12474AA	7705 SAR-Hmc B31 (EMEA/CALA)
3HE12475AA	7705 SAR-Hmc B87 (EMEA/CALA)
3HE12477AA	7705 SAR-Hmc EMEA/APAC

All variants of the 7705 SAR-Hm and 7705 SAR-Hmc chassis have the same physical features and run the same operating system software. The terms 7705 SAR-Hm and 7705 SAR-Hmc are used in this document as a generic reference to all variants of the chassis. When referring to a specific chassis variant, the variant and part number are specified.

The 7705 SAR-Hm and 7705 SAR-Hmc chassis are designed for DIN-rail or flat-surface mounting and can be installed indoors or outdoors in enclosures (such as the 7705 Outdoor Enclosure), cabinets, or huts that provide weather and environmental protection in an extended temperature-controlled environment.

The 7705 SAR-Hm and 7705 SAR-Hmc support a low DC voltage input feed. The 7705 SAR-Hm supports a nominal rating of ± 12/24 VDC and the 7705 SAR-Hmc supports a nominal rating of ± 12/24/48 VDC. A separately orderable 35W High Voltage Power Supply Unit (HV-PS35) with an operating range of 88 VDC to 300 VDC or 90 VAC to 264 VAC is available for high-voltage applications.

The 7705 SAR-Hm chassis is equipped with six Fast Ethernet data ports and two RS-232 RJ-45 ports, WLAN, 3G/LTE, and GPS antenna connectors, console and alarm connectors, and indicator LEDs. All physical cabling connections are made at the front of the chassis, including the chassis ground connection and DC power input. All status and alarm LEDs are visible on the front of the chassis.

The 7705 SAR-Hmc chassis is equipped with three Fast Ethernet data ports and two RS-232 ports in a single RJ-45 connector, an LTE and GPS antenna connector, console and alarm connectors, and indicator LEDs. All physical cabling connections are made at the front of the chassis, including the chassis ground connection and DC power input. All status and alarm LEDs are visible on the front of the chassis.

The 7705 SAR-Hm and 7705 SAR-Hmc TiMOS software is factory-installed. Configuration files and executable software are stored locally in the on-board flash memory. The system boots up when power is applied to the chassis.

The NSP Network Functions Manager - Packet (NSP NFM-P) can be used to discover, configure, and manage the 7705 SAR-Hm nodes and domains. When the 7705 SAR-Hm or 7705 SAR-Hmc is powered on for the first time, Auto-Discovery Protocol (ADP-Hm) is instantiated by a factory-installed default boot option that automates and simplifies the initial commissioning of 7705 SAR-Hm or 7705 SAR-Hmc. See ADP-Hm Prerequisites and Pre-staging Considerations for more information.

3.2.1 7705 SAR-Hm and 7705 SAR-Hmc Components

3.2.1.1 Chassis Features

Figure 8 and Figure 9 show the physical features on the front and back of the 7705 SAR-Hm and 7705 SAR-Hmc chassis. The back views shows the chassis with the rear cover removed.

Figure 8 **7705 SAR-Hm Chassis Front and Back Features**

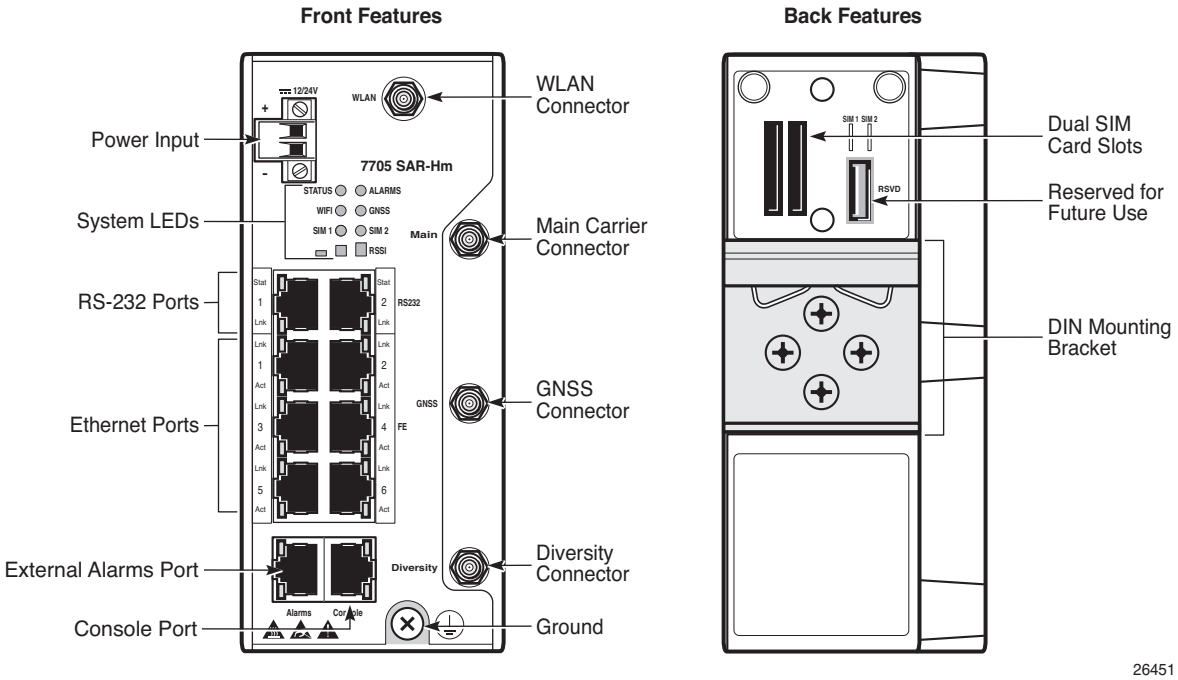
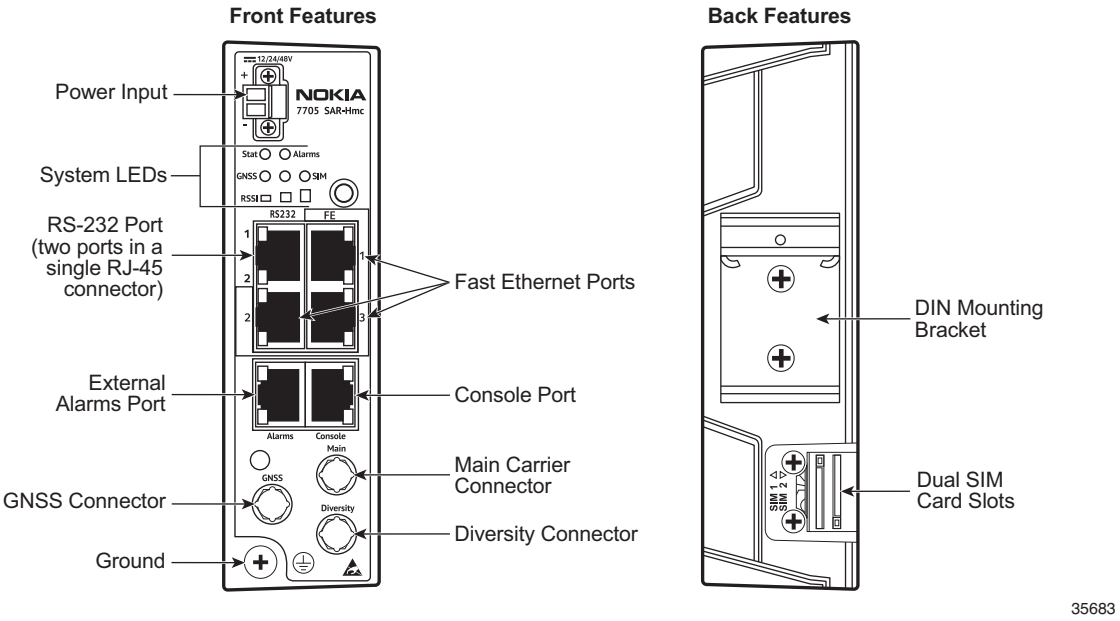


Figure 9 **7705 SAR-Hmc Chassis Front and Back Features**



3.2.1.2 Ethernet Ports

The 7705 SAR-Hm chassis has six 10/100Base-T RJ-45 Fast Ethernet (FE) ports and the 7705 SAR-Hmc has three 10/100Base-T RJ-45 FE ports. When making a connection to an FE port, a shielded CAT5 (minimum) Ethernet cable grounded at both ends must be used to maintain EMC compliance.

See Ethernet Ports Pinout Assignments for pinout assignments.

3.2.1.3 RSVD Port

The reserved (RSVD) port on the back of the chassis is for Nokia use only.

3.2.1.4 RS-232 Ports

The 7705 SAR-Hm has two asynchronous RS-232 serial ports that use RJ-45 connectors. The 7705 SAR-Hmc supports two RS-232 ports in a single RJ-45 connector.

When making a connection to an RS-232 port, a shielded cable grounded at both sides must be used to maintain EMC compliance (an 8-conductor cable is required on the 7705 SAR-Hm and a 4-conductor cable is required on the 7705 SAR-Hmc). If a connection to both RS-232 ports on the RJ-45 connector is required on the 7705 SAR-Hmc, a 7705 SAR-Hmc RS-232 Y-Cable (3HE12554AA) is required.

See RS-232 Ports Pinout Assignments for pinout assignments. Refer to the 7705 SAR-Hm and 7705 SAR-Hmc Main Configuration Guide for more information about how to configure and use these ports.

3.2.1.5 Console Port

The 7705 SAR-Hm and 7705 SAR-Hmc have a serial Console port that uses an RJ-45 connector to provide access to an RS-232 CLI craft terminal interface. The craft terminal is used during initial startup procedures, as described in Powering Up and Initializing. The Console port is not a permanent connection and must be used only for installation and maintenance routines.

A shielded cable grounded at least at one end must be used.

See Console Port Pinout Assignments for pinout assignments.

3.2.1.6 Alarms Port

The 7705 SAR-Hm and 7705 SAR-Hmc have an Alarms port that uses an RJ-45 connector to monitor and report external alarms. In a remote or outdoor deployment, alarm inputs typically allow an operator to detect conditions such as whether a door is open or closed or an air conditioner fault has occurred.

The Alarms port on the 7705 SAR-Hm supports three input and two output pins. The Alarms port on the 7705 SAR-Hmc supports three input pins. Pins can be configured to indicate the severity level of an event and the normally open/normally closed state. When an input pin changes state, the router can generate log events and raise facility alarms. For more information about input and output alarms and the Alarms port pinout assignments, see Alarms Port Pinout Assignments.

A shielded cable grounded at both ends must be used. For connections within the 7705 Outdoor Enclosure (a connection to the door alarm switch, for example), the shielded cable can be grounded at the 7705 SAR-Hmc Alarms port only.

Note: Both the 7705 SAR-Hm and 7705 SAR-Hmc Alarms port inputs have 100k Ohm pull-up resistors to 3.3V.

3.2.1.7 Main and Diversity Antenna Connectors

The 7705 SAR-Hm and 7705 SAR-Hmc have two subminiature version A (SMA) (female) connectors on the front of the chassis that are designed for external Main and Diversity antennas. See Cellular Components for more information. See also Direct-mounting the Indoor LTE Omni-directional Antenna and Installing and Grounding Outdoor Cellular Antennas.

3.2.1.8 GPS Antenna Connector

The 7705 SAR-Hm and 7705 SAR-Hmc have an integrated Global Navigation Satellite System (GNSS) SMA (female) connector that is used for an external GNSS/GPS antenna.

See GNSS Components for more information.

3.2.1.9 WLAN Connector

The 7705 SAR-Hm has a reverse polarity RP-SMA (female) WLAN connector that is used for a WiFi antenna that supports a 2.4 GHz/5 GHz, IEEE 802.11b/g/n WLAN interface.

See WLAN Components for more information. Installation of the WiFi antenna is described in Direct Mounting an Indoor WiFi Antenna and Installing and Grounding WLAN Outdoor Antennas.

3.2.1.10 Chassis Grounding

The 7705 SAR-Hm and 7705 SAR-Hmc have one designated grounding point on the front of the chassis. See Grounding the Chassis for more information.

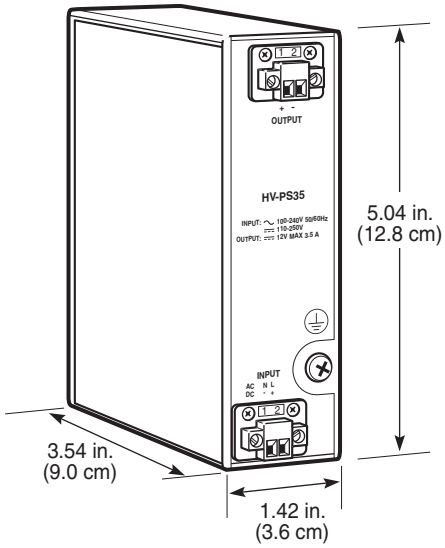
3.2.1.11 Power Supply Input

The 7705 SAR-Hm and 7705 SAR-Hmc have a single pluggable terminal connector on the front of the chassis. The terminals are the DC power feed points for a low-voltage ± 12/24 VDC power source on the 7705 SAR-Hm and a ± 12/24/48 VDC power source on the 7705 SAR-Hmc. See Preparing the DC Power Connections for requirements and information about how to prepare DC power cables.

3.2.1.12 High Voltage Power Supply Unit

The Nokia 35W High Voltage Power Supply (HV-PS35) (3HE11298AA) is an optional and separately orderable component that can be used for high-voltage DC or AC applications. The HV-PS35 has a small form factor and is designed to be installed adjacent to the 7705 SAR-Hm or 7705 SAR-Hmc. The HV-PS35 is factory-equipped with a DIN rail mounting racket. Figure 10 shows the HV-PS35.

Figure 10 **35W High Voltage Power Supply**



The power input is a pluggable terminal block that supports power feeds of 90 to 264 VAC (50/60 Hz) or 88 to 300 VDC. The HV-PS35 power output is a pluggable terminal block that delivers a floating 24 VDC.

See HV-PS35 Specifications for technical data and High Voltage Power Supply Unit for installation instructions.

3.2.1.13 Chassis Temperature Control

The 7705 SAR-Hm and 7705 SAR-Hmc chassis are passively cooled using fins for heat dissipation. Clearance requirements must be followed to ensure proper airflow around the chassis (see Chassis Clearance and Thermal Requirements).

System temperature is monitored. An Overheat alarm is raised if the system ambient operating temperature range is exceeded. The Overheat alarm is cleared when the system temperature falls within the specified operating range.

Warning: If an Overheat alarm occurs, take immediate action to cool the operating environment. If the system internal temperature continues to increase, system functions will be affected and can shut down, which may result in equipment damage.

3.2.1.14 Chassis Mounting Options

The 7705 SAR-Hm and 7705 SAR-Hmc chassis are designed to support indoor and outdoor mounting options. Outdoor installation requires the use of a cabinet or enclosure that provides weather protection in an extended temperature-controlled environment. The following mounting options are available.

Note: An Uninterruptable Power Supply (UPS) is available for powering the 7705 SAR-Hm and 7705 SAR-Hmc outdoors. Refer to the UPS vendor manual for information on how to connect the UPS unit.

- 7705 SAR-Hm and 7705 SAR-Hmc DIN rail mount

  The chassis is factory-equipped with a rear-mount DIN rail clip so that the chassis can be mounted on a horizontal 35 mm top-hat rail, as outlined in the EN 50022 standard. See DIN Rail-mounting the Chassis for more information.

  The HV-PS35 also comes factory-equipped with a DIN rail clip so that the PSU can be DIN rail-mounted adjacent to the chassis. See DIN Rail-mounting the HV-PS35 for mounting options and instructions.

- 7705 SAR-Hm and 7705 SAR-Hmc flat-surface mount

  The chassis can be installed on a flat surface, such as a table or desktop. 7705 SAR-Hm includes four rubber feet that are shipped with the chassis in a bag. The feet are self-adhesive and must be applied to the bottom of the chassis if this mounting option is used. Restrictions apply. See Mounting the Chassis on a Flat Surface.

- 7705 SAR-Hm and 7705 SAR-Hmc rack mount

  The chassis can be rack-mounted using a DIN rail-to-rack mount adapter kit. These kits are available from third-party vendors.
- 7705 SAR-Hmc direct mount

  The 7705 SAR-Hmc can be mounted directly on any surface using the two screw holes on the front of the chassis. See 7705 SAR-Hmc Direct Mounting.
- 7705 Outdoor Enclosure

  See 7705 Outdoor Enclosure for more information.

3.3 Cellular Components

This section describes the components that support cellular network connectivity for the 7705 SAR-Hm and 7705 SAR-Hmc, including the wireless module options for the 7705 SAR-Hm, and the Subscriber Identity Modules (SIMs) and antenna options.

3.3.1 Carrier Wireless Module Variants

The 7705 SAR-Hm and 7705 SAR-Hmc chassis variants are determined by the factory-installed carrier wireless module. Table 10 and Table 11 list the supported modules and their respective bands. See Cellular Radio Specifications for more information.

Table 10 **7705 SAR-Hm Carrier Wireless Module Variants**

Nokia Part Number	Description	Bands
3HE11600AA	7705 SAR-Hm 3G/LTE North America and Europe, the Middle East and Africa (EMEA)	**LTE** — B1-B5, B7, B12, B13, B20, B25, B26, B29, B30, B41 **WCDMA** — B1, B2, B3, B4, B5, B8
3HE11602AA	7705 SAR-Hm 3G/LTE Asia-Pacific (APAC) and the rest of the world (ROW)	**LTE** — B1, B3, B5, B7, B8, B18, B19, B21, B28, B38-B41 **WCDMA** — B1, B5, B6, B8, B9, B19

Table 11 **7705 SAR-Hmc Carrier Wireless Module Variants**

Nokia Part Number	Description	Bands
3HE12472AA	7705 SAR-Hmc NA	**FDD-LTE** — B2, B4, B5, B8, B12 (with MFBI), B13, B14, B25, B26, B66 **TDD-LTE** — B41, B42, B43, B48
3HE12473AA	7705 SAR-Hmc NA Variant 2	**FDD-LTE** — B2 (with UMTS), B4 (with UMTS), B5 (with UMTS), B7, B12, B13, B14, B25, B26, B66, B71 **TDD-LTE** — B41, B42, B43, B48
3HE12474AA	7705 SAR-Hmc B31 (EMEA/CALA)	**FDD-LTE** — B3, B4, B7, B20, B28, B31, B72 **TDD-LTE** — B38, B42, B43
3HE12475AA	7705 SAR-Hmc B87 (EMEA/CALA)	**FDD-LTE** — B3, B4, B7, B20, B28, B87 **TDD-LTE** — B38, B42, B43
3HE12477AA	7705 SAR-Hmc EMEA/APAC	**FDD-LTE** — B1 (with UMTS), B3, B5 (with UMTS), B7, B8 (with UMTS), B20, B28, B32 **TDD-LTE** — B38, B40, B41, B42, B43

The 7705 SAR-Hm and 7705 SAR-Hmc have a GNSS receiver that provides location data to operators of the 7705 SAR-Hm or 7705 SAR-Hmc. See GNSS Components for more information.

3.3.2 SIMs

The 7705 SAR-Hm and 7705 SAR-Hmc have two SIM slots to support carrier wireless network connectivity. The system uses the 2FF Industrial Mini SIM format. The SIMs are installed behind a tamper-resistant screw-down panel at the rear of the chassis, facing the DIN rail. This location reduces the likelihood of tampering.

The following are the SIM requirements.

- Only one SIM in slot 1 is required to operate the cellular interface; Slot 2 is used for dual SIM operation.
- A valid SIM must be procured from a service provider before operating the cellular interface.
- To run the ADP process on the 7705 SAR-Hm and 7705 SAR-Hmc, the SIM must be inserted in slot 1 or the ADP process will not function.

See Installing the SIM for installation instructions. Refer to the 7705 SAR-Hm Interface Configuration Guide for more information about SIMs and the configuration of the cellular interface.

3.3.3 Commercial Cellular Antennas

Table 12 lists the commercial cellular antennas that are available from and approved by Nokia for use with the 7705 SAR-Hm and 7705 SAR-Hmc.

Table 12 **Carrier Wireless Commercial Antenna Options**

Nokia Part Number	Description	Comments
3HE12343AA	Outdoor 2G/3G/4G omni-directional Antenna	Omni-directional antenna with mounting bracket kit. See Outdoor 2G/3G/4G Omni-directional Antenna.
3HE12344AA	Outdoor 2G/3G/4G directional Antenna	Directional antenna with mounting bracket kit. See Outdoor 2G/3G/4G Directional Antenna.
3HE12371AA	Indoor LTE omni-directional Antenna	See Indoor LTE Omni-directional Antenna.

3.3.3.1 Outdoor 2G/3G/4G Omni-directional Antenna

The Outdoor 2G/3G/4G omni-directional Antenna (3HE12343AA) is a MIMO omni-directional LTE antenna that operates at two frequency ranges, 695 to 960 MHz and 1700 to 2700 MHz with gain of 2 dBi and 3dBi respectively. Impedance is 50 Ω. The antenna is equipped with two N-Type (female) connectors.

Installation instructions, a mounting bracket, U-bolts, and fastening hardware for mounting the antenna on a mast up to 2.5 in. (63.5 mm) O.D. are shipped with the antenna. See Outdoor 2G/3G/LTE Omni-directional Antenna Specifications and Outdoor 2G/3G/4G Omni-directional Antenna Installation Overview for more information.

3.3.3.2 Outdoor 2G/3G/4G Directional Antenna

The Outdoor 2G/3G/4G directional Antenna (3HE12344AA) features a frequency range of 698 to 960 MHz and 1710 to 2700 MHz and nominal gain of 6 dBi at 698 to 960 MHz and 8 dBi at 1710 to 2700 MHz. The impedance is 50 Ω. See Outdoor 2G/3G/LTE Directional Antenna Specifications and Outdoor 2G/3G/4G Directional Antenna Installation Overview for more information.

On the back of the antenna are two N-Type (female) connectors. The antenna is waterproof, vented, and rated at IP67 for indoor or outdoor use.

The antenna is shipped with a heavy-duty articulating mounting bracket that supports horizontal polarization, vertical polarization, or a 45˚ diagonal slant. The bracket can be fixed to a mast measuring 1.63 to 2.3 in. (41.4 to 58.4 mm) O.D. using pipe clamps. Pipe clamps and installation instructions are included with the antenna.

3.3.3.3 Indoor LTE Omni-directional Antenna

The indoor LTE omni-directional Antenna (3HE12371AA) is a dipole terminal antenna with a hinged SMA (male) connector suitable for direct mount on the 7705 SAR-Hm in an indoor facility.

The antenna operates in a dual frequency of 698 to 960 MHz and 1710 to 2690 MHz, a nominal impedance of 50 Ω. See Indoor LTE Omni-directional Antenna Specifications and Direct-mounting the Indoor LTE Omni-directional Antenna for more information.

3.3.3.4 LTE Surge Protectors

The LTE surge protectors are designed to offer sufficient protection against lightning surges and are highly recommended when installing outdoor antennas.

Nokia offers three variants, which are N-Type (female to female) for indoor to outdoor applications, and N-Type (female to male) or 4.3-10 (male to female) for 7705 Outdoor Enclosure applications. The frequency range is from 698 MHz to 2700 MHz.

Note: Nokia does not offer LTE surge protectors for the following frequency bands at this time:

- Band 31/72/87 (410 to 470 MHz)
- Band 42/43/48 (3400 to 3800 MHz)

3.4 GNSS Components

All 7705 SAR-Hm and 7705 SAR-Hmc variants have a GNSS receiver. Table 13 lists the chassis models and the supported GNSS systems and frequencies.

Refer to the GNSS Installation Guide, located in the Nokia Documentation Center, for more information on antenna offerings, cable installation kits, and installation.

Table 13 **Carrier Wireless Module Variants and Supported GNSS Systems and Frequencies**

Nokia Part Number	Carrier Wireless Module Variant	Supported GNSS System and Frequency
3HE11600AA	7705 SAR-Hm 3G/LTE North America and EMEA	• GPS (1575.42 MHz) • GLONASS (1602 MHz)
3HE11602AA	7705 SAR-Hm 3G/LTE APAC and ROW	
3HE12472AA	7705 SAR-Hmc NA	
3HE12473AA	7705 SAR-Hmc NA Variant 2	
3HE12474AA	7705 SAR-Hmc B31 (EMEA/CALA)	
3HE12475AA	7705 SAR-Hmc B87 (EMEA/CALA)	
3HE12477AA	7705 SAR-Hmc EMEA/APAC	

3.5 WLAN Components

The following antennas can be connected to the WLAN port on the 7705 SAR-Hm.

Note: Nokia does not offer WLAN surge protectors at this time.

3.5.1 Outdoor WiFi Antennas

Nokia supports WiFi omni-directional antennas, WiFi directional antennas, and vehicle mount LTE/WiFi/GNSS outdoor antennas. For more information about these antennas, see Installing and Grounding WLAN Outdoor Antennas.

3.5.2 Indoor WiFi Antenna

The Indoor WiFi omni-directional Antenna (3HE12345AA) is a dipole antenna with an RP-SMA (male) connector that can be mounted directly on the 7705 SAR-Hm chassis. The antenna is rated at IP65 and is suitable for indoor use.

The antenna supports frequency ranges of 2.4 to 2.5 GHz and 5.1 to 5.85 GHz, with a peak gain at 2.37 dBi and 2.93 dBi respectively. The antenna has a nominal impedance of 50 Ω. See Indoor WiFi Omni-directional Antenna Specifications and Direct Mounting an Indoor WiFi Antenna for more information.

3.6 Citizens Broadband Radio Service

The cellular interface on the 7705 SAR-Hmc NA (3HE12472AA) and the 7705 SAR-Hmc NA variant 2 (3HE12473AA) supports the Citizens Broadband Radio Service (CBRS) B48 spectrum.

When operating in the CBRS spectrum, the 7705 SAR-Hmc is classified as either an end-user device (EUD) or a Citizens Broadband Service Radio Device (CBSD) Category A or B, depending on the maximum effective isotropic radiated power (EIRP).

Refer to 7705 SAR Interface Configuration Guide for information about the settings and functionality.

3.7 ADP-Hm Prerequisites and Pre-staging Considerations

In order for ADP-Hm to function, a number of prerequisites must be completed in advance of initial power-up of a 7705 SAR-Hm and 7705 SAR-Hmc. Refer to the 7705 SAR-Hm Main Configuration Guide for a list of prerequisites for ADP-Hm.

Consideration must be given to when and where initial power-up of the node occurs. ADP-Hm supports two installation options that can be configured on the NSP NFM-P before the initial boot-up of the 7705 SAR-Hm or 7705 SAR-Hmc. The options are:

a. The 7705 SAR-Hm or 7705 SAR-Hmc can be booted for the first time at a pre-staging facility, where it is initialized, secured, partially configured, and then shut down. The router is then shipped to the installation site, installed, and booted again, at which time the configuration process is completed.
b. The 7705 SAR-Hm or 7705 SAR-Hmc can be installed on site, where it is booted for the first time, initialized, and configured.

3.8 Chassis Installation Process

3.8.1 Preparation

Step 1. Review all regulations. See Mandatory Regulations.

Step 2. Assess and prepare the site and observe all safety warnings. See Site Preparation.

3.8.2 Pre-staging

This section applies only if you are using ADP-Hm to initialize and commission the 7705 SAR-Hm or 7705 SAR-Hmc in a pre-staging facility.

Note: The instructions in this guide assume that the prerequisites for the instantiation of ADP-Hm have been completed. Refer to the 7705 SAR-Hm and 7705 SAR-Hmc Main Configuration Guide for more information.

To pre-stage the 7705 SAR-Hm or 7705 SAR-Hmc chassis, perform the following steps in order:

Step 1. Unpack the chassis at the pre-staging facility. See Unpacking the Chassis.

Step 2. Install the SIM. See Installing the SIM.

Step 3. Install the chassis on a table top. See Mounting the Chassis on a Flat Surface.

Step 4. Ground the chassis. See Grounding the Chassis.

Step 5. Connect the antenna and network cables to the chassis. See Making Indoor Antenna Connections to the 7705 SAR-Hm and Making Connections to the RJ-45 Ports.

Step 6. Prepare the DC input power cables and connections to the DC power feed. See Preparing the DC Power Connections. If the HV-PS35 is used, see High Voltage Power Supply Unit.

Step 7. Power up the system and monitor ADP-Hm. See Powering Up and Initializing.

Step 8. Shut down all power to the router.

Step 9. Remove the power cables from the router.

Step 10. Remove the antennas and cabling from the router. Do not remove the SIM.

Step 11. Repackage the router and ship it to the installation site.

Step 12. Perform On-site Installation.

3.8.3 On-site Installation

This section applies in any the following installation scenarios:

- you are using ADP-Hm and have performed the pre-staging steps
- you are using ADP-Hm and are not pre-staging the router
- you are not using ADP-Hm

To install the 7705 SAR-Hm or 7705 SAR-Hmc chassis on site, perform the following steps in order:

Step 1. Assess and prepare the site. See Site Preparation.

Step 2. Unpack the chassis. See Unpacking the Chassis.

Step 3. Install the SIM. This step is not required if the router has been pre-staged. See Pre-staging in this chapter. See also Installing the SIM.

Step 4. Install the chassis according to one of the methods described in Installing and Grounding the Chassis.

Step 5. Ground the chassis. See Grounding the Chassis.

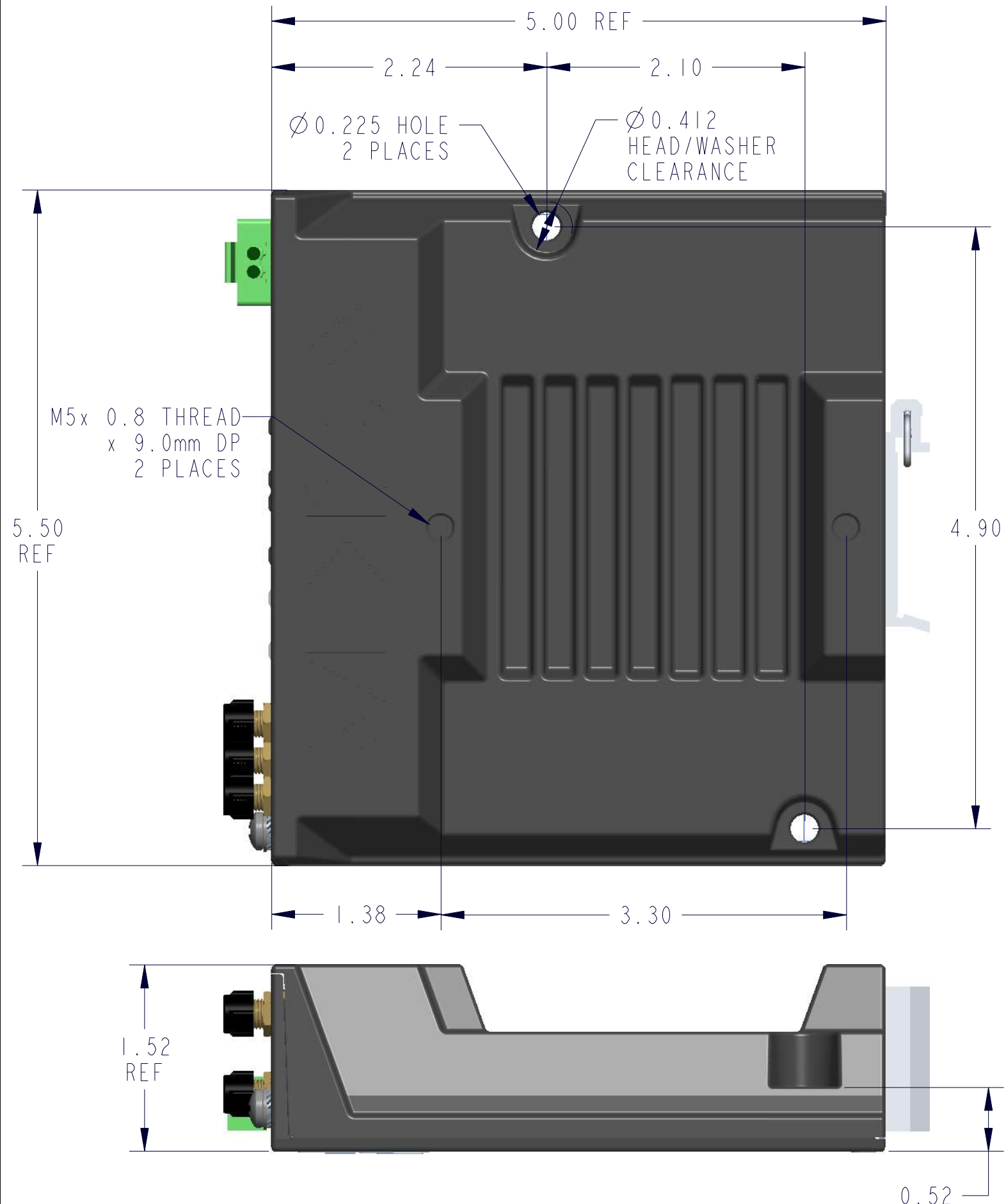
Step 6. Install the Main, Diversity, WiFi, and GPS antennas. See Overview or Installing and Grounding Outdoor Antennas.

Step 7. Connect the coaxial antenna cables and the network cables to the chassis. See Making Outdoor Antenna and Cable Connections and Making Connections to the RJ-45 Ports.

Step 8. Prepare the DC input power cables and connections to the DC power feed. See Preparing the DC Power Connections. If the HV-PS35 is used, see High Voltage Power Supply Unit.

Step 9. Power up the system. See Powering Up and Initializing.

7705 SAR-Hmc Direct Mount Template



SCALE 1:1
RECOMMENDED SCREW/BOLT SIZE: #10-32 (M5)

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