

Hughes 9450 Mobile Satellite Terminal

Installation Guide

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Understanding safety alert messages

Safety alert messages call attention to potential safety hazards and tell you how to avoid them. These messages are identified by the signal words **WARNING** or **CAUTION**, as illustrated below. To avoid possible property damage, personal injury, or in some cases possible death, read and comply with all safety alert messages.

Messages concerning personal injury

The signal words **WARNING** and **CAUTION** indicate hazards that could result in personal injury or in some cases death, as explained below. Each of these signal words indicates the severity of the potential hazard.




WARNING indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation, which if not avoided, could result in minor or moderate injury.

Safety symbols

The generic safety alert symbol  calls attention to a potential personal injury hazard. It appears next to the WARNING and CAUTION signal words as part of the signal word label. Other symbols may appear next to WARNING or CAUTION to indicate a specific type of hazard (for example, fire or electric shock).

Chapter 1

Introduction

The purpose of this guide is to provide assistance to personnel installing the Hughes 9450 mobile satellite terminal into a vehicle.

WARNING

This product must be installed by Authorized Service Personnel.



Note: Damages resulting in the failure to conform to the instructions found herein, as well as standard installation practices, will be the responsibility of the installer.

Hughes 9450 mobile satellite terminals

The mobile satellite terminals are composed of four core component parts: the transceiver or Indoor Unit (IDU), the antenna or Outdoor Unit (ODU), the power connector/cable, and an 8 meter RF cable.



Figure 1. Common IDU (left) Class 10 ODU (middle), and Class 11 (right)

The Hughes IDU has multiple interfaces that various Terminal Equipment (TE) devices such as laptops, PDA's, phones, etc., can connect to: four PoE/Ethernet (RJ-45), ISDN, two POTS (RJ-11) and Wireless Local Area Network (WLAN).

Indoor Unit (IDU)

The IDU provides all of the TE interfaces, plus the interface for the antenna (ODU) and manages the communications over the Inmarsat BGAN network. Communication to the ODU is provided by the RF cable from the IDU.

Physical dimensions

IDU: Size: 46 mm x 281 mm x 233 mm
 Weight: 2.2 kg

RF cable: 8 meter coaxial RG400 or equivalent (<10 dB loss),
 TNC connector



Figure 2. Indoor Unit (IDU)

Power port

The power port is the connection from the power supply (vehicle battery or some other 12 or 24 Vdc power source) to the IDU. The power cable has a +V power line, an ignition sense line, and a -V power line.

Table 1. Power port pin out

Line type	Pin number
+V power line	1
Ignition Sense	2
-V power line	3

4X RJ-45 Ethernet with Power over Ethernet (PoE) ports

There are four RJ-45 ports with Power over Ethernet (PoE) on the IDU. The ports supply standard PoE according to the

IEEE 802.3af standard (48 Vdc up to 15.4 W) and 10/100BaseT Ethernet. The pinout of the ports supports a direct straight-through connection to a PC with a standard Ethernet cable. Table 2, shows the pinout of the Ethernet connector.

Table 2. RJ-45 Ethernet port pinout

Pin	
1	RX+
2	RX-
3	TX+
4	NC
5	NC
6	TX-
7	NC
8	NC



Note: The +48 V and -48 V are supplied over the TX, RX pairs. They are only active when an 802.3af compliant device is plugged in. The other pairs (4, 5, 7, and 8) are unused.

The total power supplied by the PoE is limited to 30.8 W maximum for 12 V installations and 61.6 W maximum for 24 V installations. The IDU automatically detects the class of the device plugged in and will apply power such that the total cannot exceed these limits. If the user attempts to connect a combination of devices that require more than this, the IDU will not power any devices that would cause the limit to be exceeded.



Note: Class 4 (802.3at) PD devices are not supported.

ISDN port

There is one ISDN port on the IDU. It provides 4 kbps voice, 3.1 kHz audio, and 64 kbps data communication. The following table lists the pinout of the ISDN connector.

Table 3. ISDN port pin out

Pin	
1	NC
2	NC
3	ISDN RX+(+40 V)
4	ISDN TX+(-40 V)
5	ISDN TX-(-40 V)
6	ISDN RX-(+40 V)
7	NC
8	NC

RJ-11 ports

There are two RJ-11 ports on the IDU: FAX is for 3.1 kbps fax calls and TEL for 4 kbps speech calls. The following table lists the pinout of the RJ-11 connectors.

Table 4. RJ-11 port pinout

Pin	
1	NC
2	NC
3	Ring (-V)
4	Tip (+V)
5	NC
6	NC

Antenna port

Both Class 10 and Class 11 antennas connect to the same 50 Ohm female TNC connector antenna port. This line carries the L-band RF, ASK signaling, and DC power (42 Vdc) for the antenna.



The antenna cable carries DC power; do not connect or disconnect the antenna cable while the unit is powered on.

WLAN port

The WLAN port on the IDU is a reverse polarity SMA jack. The supplied antenna is a 2.4 GHz 3 dBi “Rubber Duck” antenna with RP-SMA plug connector, part number HG2403RD-RSF.

To prevent blocking or attenuation of the WLAN signal, the IDU should be installed such that there is no metal blocking the radio path to the user’s device.

SIM card

The IDU requires an Inmarsat SIM to be installed. Insert the SIM (supplied by the dealer) into the SIM card holder with the metal contacts facing down. Insert the SIM card as shown in Figure 3.

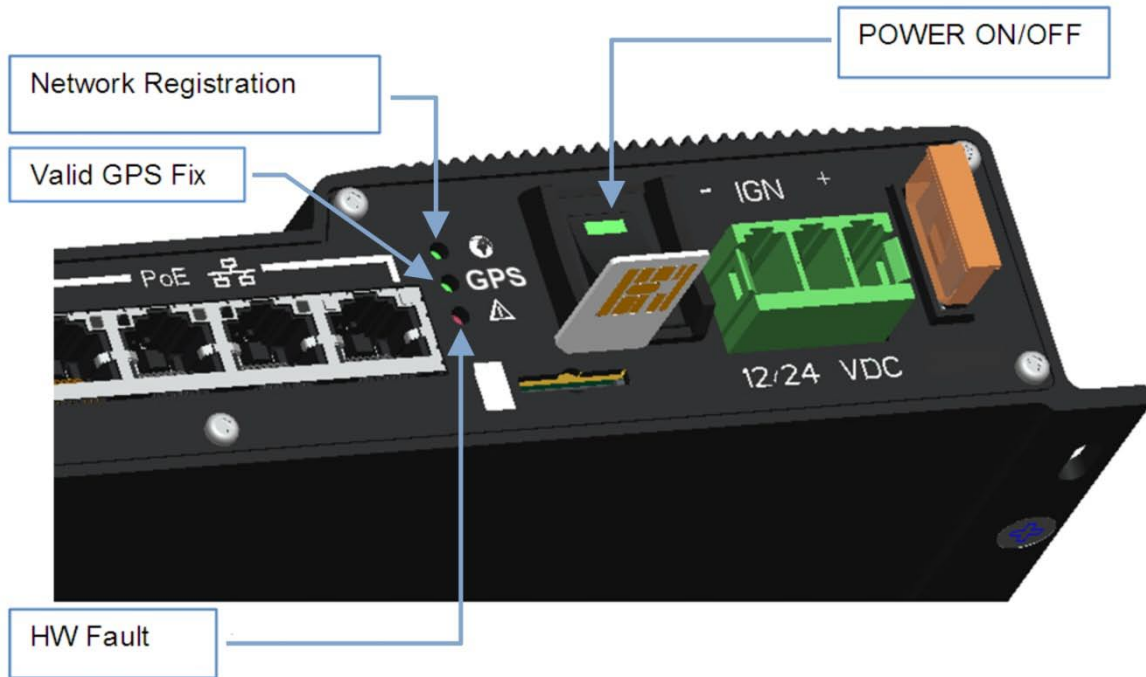


Figure 3. Inserting SIM card in the SIM card holder

Chapter 2

System power requirements

There is one power connection on the IDU. This must be connected to a 12 or 24 Vdc power supply.

Power requirements and consumption are as follows:

Table 5. System power requirements

Voltage Input Minimum	10 V
Voltage Input Maximum	32 V
Total Current for ODU, and IDU (Max.)	12 A
Required Fuse	15 A

Fuse

The fuse is a 15 Amp, fast blow, ATO blade fuse. The installed part is from Littelfuse, part number 0257015. To replace the fuse, pull fuse out of fuse holder (pliers may be needed to grip fuse) and press new fuse into fuse holder.

Power cable

The power cable uses a Phoenix contact #1718384 PC5/3 STCL-7, 62 connector, and the pinout is shown in Table 6.

Table 6. Power cable pinout

Color	Function
red	DC +
white	Ignition Sense
black	DC -

The optional accessory car adapter power cable, Hughes' part number 3500472-0002, includes a car adapter plug with a 20 Amp, 250 V fuse, and the ignition sense wire is connected to the positive power wire in the plug.

Chapter 3

Standard cable connections

In addition to the DC power connection, an ignition sense connection must be made. This is done using the three-wire power cable. In the case of a vehicle installation, the power source is typically the vehicle battery. Cables should be routed appropriately, and cable ties and clamps should be used as required to ensure that vibration and/or rubbing of the cables does not occur.

Ignition sense (white wire)

Route and connect the white wire (ignition sense) to a switched 12 or 24 Vdc source, such as accessory line or fuse block. Extended use of ignition sense in the accessory position (ACC) by the end user may lead to a discharged car battery.



Note: Ensure that the connection is a switched source: OFF when ignition is off or in start and ON only when ignition switch is in the ACCESSORIES or RUN position.

If using the car adapter plug, the ignition sense wire is already connected to the positive power wire in the plug.

Chassis grounding

The unit includes an isolating power supply. The IDU must be grounded by connecting a grounding wire from the chassis ground point to the vehicle chassis. See Figure 4. The ground wire should be clamped between the two nuts ensuring both are securely tightened.

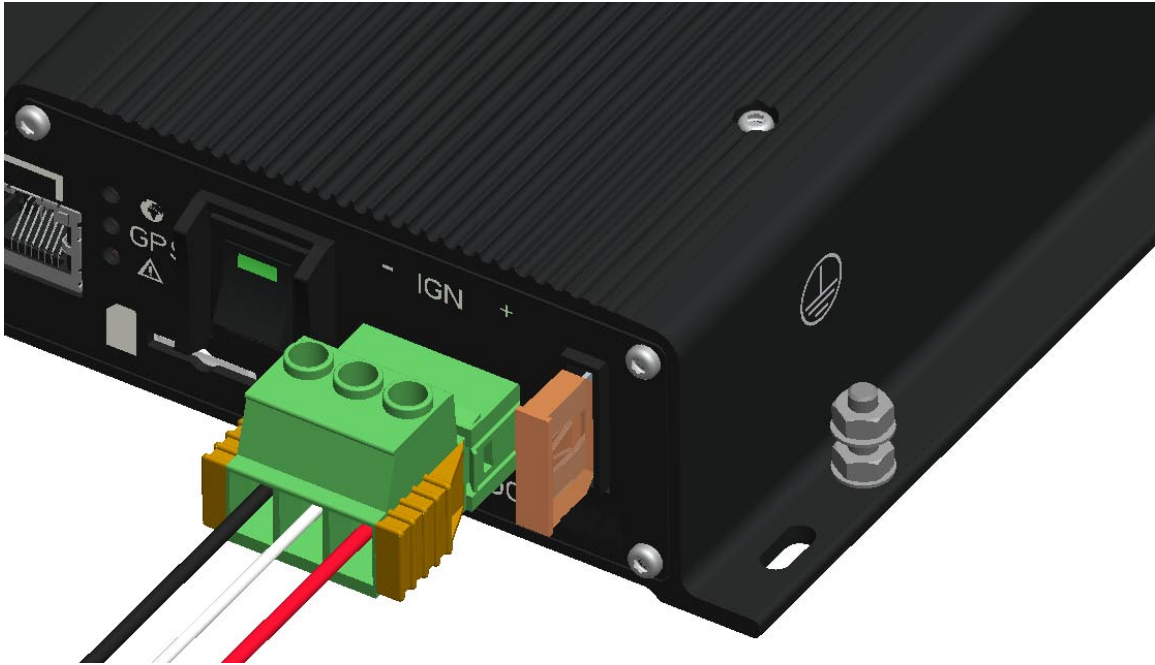


Figure 4. Chassis ground

Chapter 4 Package materials

The 9450 kit is an over-pack box with the following contents based on model:

Table 7. Package materials

Model	Hughes part number	Description
9450-11 kit 3500497-0001	3500462-0001	Radio, 9450
	<ul style="list-style-type: none"> • 9506197-0001 • 3500472-0001 • 3004129 	<ul style="list-style-type: none"> • WLAN antenna (2.4 GHz, 3 dB) • Power cable with 3-pin connector • Install Manual
	1502819-0001	C11 antenna with magnetic mount
	3500479-0001	RG400 coax cable TNC-TNC (8 meter)
9450-10 kit 3500497-0002	3500462-0001	Radio, 9450
	<ul style="list-style-type: none"> • 9506197-0001 • 3500472-0001 • 3004129 	<ul style="list-style-type: none"> • WLAN antenna (2.4 GHz, 3 dB) • Power cable with 3-pin connector • Install Manual
	1502740-0001	C10 antenna with magnetic mount
	3500479-0001	RG400 coax cable TNC-TNC (8 meter)

Chapter 5

Vehicular installation

Basic installation procedure

The basic installation procedure is as follows:

1. Decide where you are going to install the antenna and IDU.
2. Ensure that the IDU is located inside the vehicle and attached to something structurally solid. Loose mounts that vibrate will degrade performance.
3. Determine the cable length required for the power installation.
4. Perform the installation of the antenna and IDU.
5. Connect the antenna via the three magnetic mounts to the vehicle's roof or permanently mount using screws/bolts.
6. Connect the RF cable to both the IDU and antenna TNC connectors
7. Connect the power to the IDU.
8. Properly ground the IDU
9. Power up the IDU/antenna

Installation notes

1. Whenever routing cable through holes drilled in metal or through bulkheads, use grommets and RTV sealant to weatherproof all holes drilled on the outside of the vehicle.
2. Use cable ties every 300 – 450 mm (12"-18").
3. The IDU can be mounted in either the horizontal or vertical position.
4. The main power line must be connected to a fused 12 or 24 Vdc power source. The unit is fused, but a 15 A or greater fuse is required in the source to protect against shorts in the cabling. If connecting to a circuit in the fuse box that is already in use, ensure that the circuit can supply the extra 12 A at 12 V or 7.5 A at 24 V for the unit. If using the car adapter cable, it already includes the fuse in the adapter.
5. Route and connect the white ignition sense wire to a switched 12 or 24 Vdc source.
6. Ground the IDU to the vehicle via a wire connected to the IDU chassis ground. See Figure 4.

7. Install the IDU in a protected but ventilated area. Allow at least a 1-inch space around all surfaces, except for the bottom surface attached to the vehicle, to provide adequate cooling. Ensure that the location is accessible for servicing.
8. The IDU is not waterproof.
9. Always provision the wiring into the IDU with a drip loop.
10. With the exception of the IDU-to-antenna RF cable, do not route the power cable outside the vehicle.

Common IDU mounting information



Note: Use care when drilling through the body of the vehicle to avoid puncturing critical items.

Instructions for the installer:

1. Mount the terminal onto a flat surface using at least four screws (not supplied). Use screws with a diameter between 3.5 to 4 mm. Vibration-resistant screws or lock washers should be used.
2. There are two mounting holes/slots on either side of the terminal base.

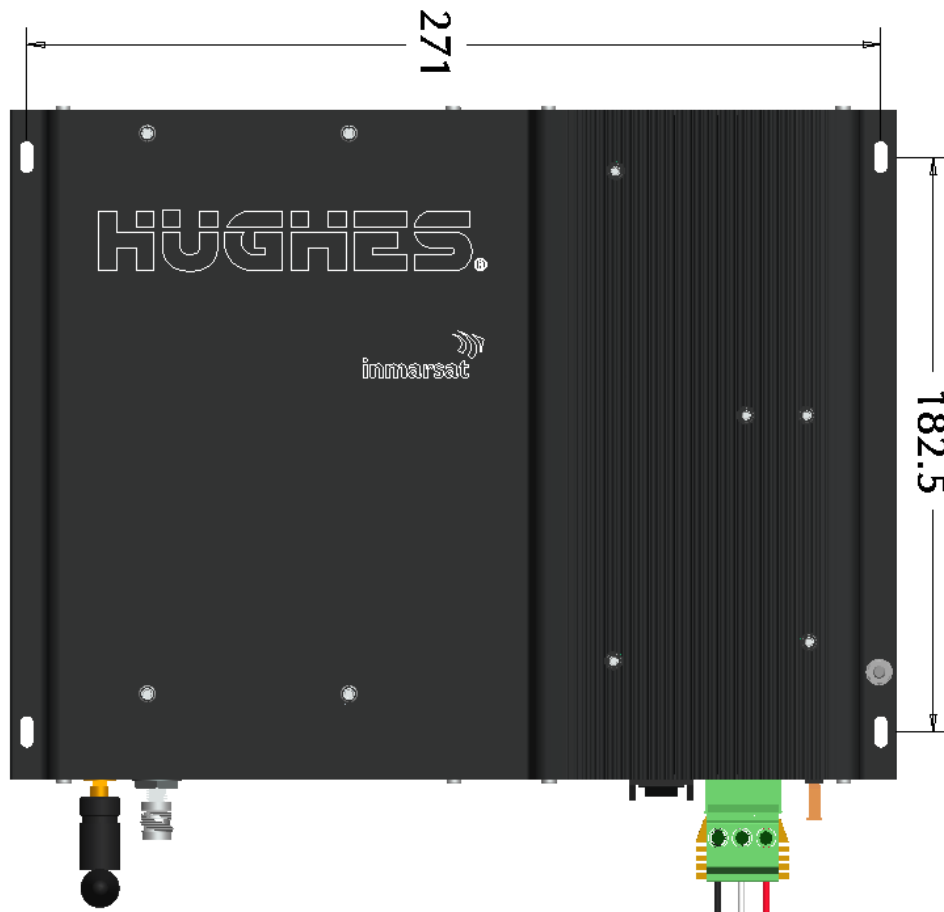


Figure 5. Common Indoor Unit mounting dimensions

Final dimensions after mounting: 46 mm x 233 mm x 281 mm
without accessories

Land mobile antenna

This section addresses the C10 antenna. Procedures are the same for the C11 antenna.

Magnetic mounting (optional)

Three magnetic mounts are optional for the antenna installation. These mounts will withstand 100 mph wind force.

If the antenna cannot be mounted using the magnetic feet, the magnetic feet can be removed, and the mounting holes can be used to bolt the antenna onto a roof bracket system.

Installation

The magnet mount consists of three individual high-intensity magnets with rubber coating. Each magnet has a stainless steel center bolt.

First attach the magnets to the antenna. There are three “legs” on the antenna where the magnets are placed. Note the position of the two rubber washers just below and above each antenna “leg,” the stainless steel washer above the upper rubber washer, and the protective nut on top.



Figure 6. C10 antenna with magnetic mount component parts

Now place the antenna with magnets on the roof of the car. When installing the antenna cable, it's important to protect against moisture, using self-amalgamating tape, or similar, wrapped around the coaxial connector. Also be careful with the cable run from the antenna and secure it at short intervals. An unsupported length of cable will vibrate when driving and could negatively affect the connection over time.

Dismounting magnetically mounted antenna

Use your hand to pry underneath the antenna near one of the magnets and lift. When one magnet is loose, the other two are easy to “break off.”

Permanent mount installation

If the antenna cannot be mounted using the magnetic feet option, the three mounting holes on the outside diameter of the antenna can be used to bolt the antenna onto a roof bracket system.

Please ensure that you utilize the proper bolt size to withstand the wind loading and vibration that the antenna will undergo for your particular application.

Chapter 6

The antenna Outdoor Unit (ODU)

The antenna unit is composed of the antenna element, high-power and low-noise amplifier systems, and a mechanical tracking system housed in the radome.

Both the Class 10 and Class 11 ODUs are 2-axis antennas intended for land-mobile use.

Connection to the ODU is made by a TNC connector. The single coaxial cable carries L-band RX and TX, power, and tracking information.

Physical dimensions

- ODU: **Size:** Class 10: 477 mm x 153 mm
Weight: 6 kg
Size: Class 11: 252 mm x 119 mm
Weight: 2 kg



Only use the C10 antenna supplied with the 9450 terminal. Do not use the similar looking C10EE antenna from a Hughes 9250.



Figure 7. Class 10 antenna Outdoor Unit (ODU) 477 mm X 153 mm height



Figure 8. C11 antenna ODU 252 mm x 119 mm height

Antenna cable lengths and types

The Hughes IDU has an automatic cable calibration feature that determines the dB loss of the cable. The RF cable that comes standard in the terminal kit is 8 meters long. If a longer cable is required for the installation, the end-to-end RF loss needs to be <10 dB at 1.6 GHz and the cable must be 50 Ohm impedance.



Note: The installer is responsible for choosing the proper type of cable for the length required in order to meet the <10 dB requirement.

Installing the antenna

WARNING

Avoid exposure to microwave radiation. Keep a minimum safe distance of 1 meter (39 inches) to the side and above the antenna.

WARNING

The antenna cable carries DC power. Always power the IDU down prior to connecting or disconnecting the antenna cable from either the antenna or the IDU.

The antenna port is a 50 Ohm female TNC. This line carries RF, signaling, and DC power for the antenna.

Keep a clear line-of-sight to the satellite. Preferably, avoid all obstructions within 3 meters of the antenna. Obstructions less than 150 mm (6 inches) in diameter can be ignored beyond this distance.

It is important to ensure that there is a clear line-of-site to the satellite.

Do not locate the antenna close to interfering signal sources or receivers. It is recommended that no other antennas be located within 3 meters of the 9450 antennas. If there is other equipment installed near the Hughes 9450 mobile satellite terminal, it is recommended to operate all equipment simultaneously and verify there is no co-interference.