

**SIMRAD**

# MX521B GPS/DGPS Smart Antenna Installation Manual

ENGLISH





# Preface

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## Disclaimer

As Navico is continuously improving this product, we retain the right to make changes to the product at any time which may not be reflected in this version of the manual. Please contact your nearest distributor if you require any further assistance.

It is the owner's sole responsibility to install and use the equipment in a manner that will not cause accidents, personal injury or property damage. The user of this product is solely responsible for observing safe boating practices.

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## Compliance

Navico declares under our sole responsibility that the MX521B GPS/DGPS smart antenna conforms with the requirements of the European Council Directive 2014/90/EU on Marine Equipment modified by Commission Implementing Regulation MED (EU) 2018/773 - Wheelmark.

All compliance documents are available on the product's section on the following website: [www.navico.com/commercial](http://www.navico.com/commercial)

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## Warranty

The warranty card is supplied as a separate document.

In case of any queries, refer to our website:


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## About this manual

This manual describes the operation and installation of the MX521B antenna sensor. The latest available manual version can be downloaded from our web sites.

Important text that requires special attention from the reader is emphasized as follows:

- **Note:** Used to draw the reader's attention to a comment or some important information.

 **Warning:** Used when it is necessary to warn personnel that they should proceed carefully to prevent risk of injury and/or damage to equipment/personnel.

## Important notice

- **Note:** The MX521B GPS/DGPS sensor is an aid to navigation only. Its accuracy can be affected by many factors such as equipment defects, environmental conditions, or improper operation. The user is responsible for safe navigation of the vessel. This includes exercising common prudence and navigational judgement at all times.

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# 1

## General

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The MX521B smart antenna is available in two versions, with or without beacon differential receiver, and is designed to work with compatible Control and Display Units (CDU) or as a stand-alone positioning device for other applications.

The MX521B smart DGPS antennas can achieve better than 2-meter DGPS accuracy in areas with good beacon differential coverage and autonomous GPS accuracy better than 5 meters.

When connected to a compatible CDU the antenna can be controlled to function in several modes:

- GPS and GPS + GLONASS
- Differential correction search mode in Auto, Database or Manual
- WAAS\* (Wide Area Augmentation System-US system)
- EGNOS\* (European Geostationary Navigation Overlay System)
- RAIM (Receiver Autonomous Integrity Monitoring)

\*Not yet recognized by IMO as official differential correction system.

Before installing the MX521B smart antenna, please read this manual carefully to ensure proper installation and operation of the unit.

## Supplied equipment

Description	Part Number
MX521B GPS smart antenna with GLONASS	000-11641-001
or,	
MX521B DGPS smart antenna with GLONASS and beacon differential receiver	000-11640-001

The antenna cable assembly is not included and must be ordered separately. Please specify the cable length required. Below are available cable lengths:

20 meters	3508 102 70170
40 meters	3508 102 70180
60 meters	3508 102 70640
80 meters	3508 102 70185

The MX521B GPS and DGPS are combined GPS/DGPS/GLONASS smart antenna sensors. They are fully automatic and do not require initialization or user intervention. They will automatically search for available satellites and make a position fix shortly after power is applied.

The internal 2-channel beacon receiver, in the DGPS version, initiates an Automatic Beacon Search (ABS) at power on. The primary channel will lock-on to the nearest beacon station, while the second channel searches for other available beacon signals. Should it find a superior signal, it will automatically switch the primary channel to the new station.

The beacon receiver can be controlled by a compatible Control and Display Unit (CDU) to operate in Automatic Beacon Search, Manual Tune or Database modes. The Database mode allows the beacon receiver to store the almanac of 10 stations that are closest to its present position. This feature complies with the IEC 61108-4 specifications. The combined performance of the high-precision GPS and GPS/GLONASS receivers and 2-channel smart beacon receiver provides a more accurate position fix, usually within 1 meter or less.

## List of abbreviations

CDU	Control and Display Unit
DGPS	Differential Global Positioning System
FDMA	Frequency Deviation Multiple Access
GLONASS	Global Orbiting Navigation Satellite System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HDOP	Horizontal Dilution of Precision
IMO	International Maritime Organization
NMEA	National Marine Electronic Association
PDOP	Positional Dilution of Precision
RAIM	Receiver Autonomous Integrity Monitoring
RTCM	Radio Technical Commission for Maritime Services
SBAS	Satellite Based Augmentation System
VDOP	Vertical Dilution of Precision

# 2

## Installation

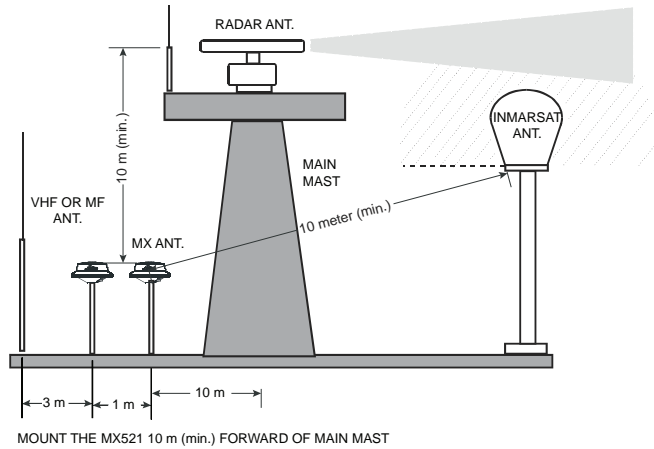
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### Antenna mounting guidelines

The MX521B antenna housing is weather-resistant and must be located outside where it will have a good view of the sky around it. Use a standard 1"-14 TPI bracket or tube for mounting.

- Install the antenna where it has a clear view of the sky around it.
  - Locate the antenna for easy access and maintenance.
  - Stay away from high-power energy sources such as radar, SSB, INMARSAT and other transmitting radio antennas by 5 meters or more.
  - Locate the antenna at least 10 meters away from, and out of the transmitting beam of radar, INMARSAT and other high-power transmitters.
  - Mount the antenna low to avoid excessive position and speed errors while underway.
  - Mount the antenna as far away as possible from large metal structures.
  - Mount the antenna at least 1 meter away from the compass and other GPS antennas.
- **Note:** If you are not sure if the chosen location is appropriate, you can mount the antenna temporarily and check signal reception from your CDU. Monitor the operation of the antenna while you turn on other on-board electronic equipment. Move the antenna around until the antenna operates satisfactorily then mount it permanently.
- **Note:** Powerful Xenon-Arc search lights emit electromagnetic radiation, which may interfere with communication and navigation systems on board. The preferred location for the GPS antenna is at least 3 meters above the light.





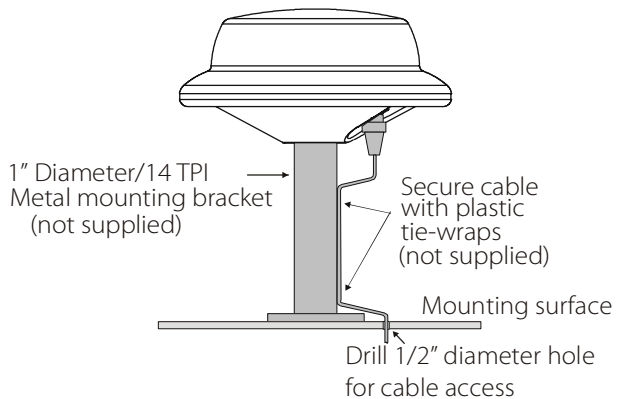
## Antenna mounting

### Bracket mount

The MX521B mounting thread is an industry standard fitting for VHF antenna mounting (1 inch, 14 TPI). This enables the antenna to be mounted on a wide range of mounting brackets, including swivel joints, commonly used for angled surface. Refer to the figure below for bracket mounting illustration.

→ **Note:** Hand-tighten the antenna onto the bracket until snug. Do not overtighten.

A 10-pin (male) plastic connector is located at the underside of the antenna for power and data connection.

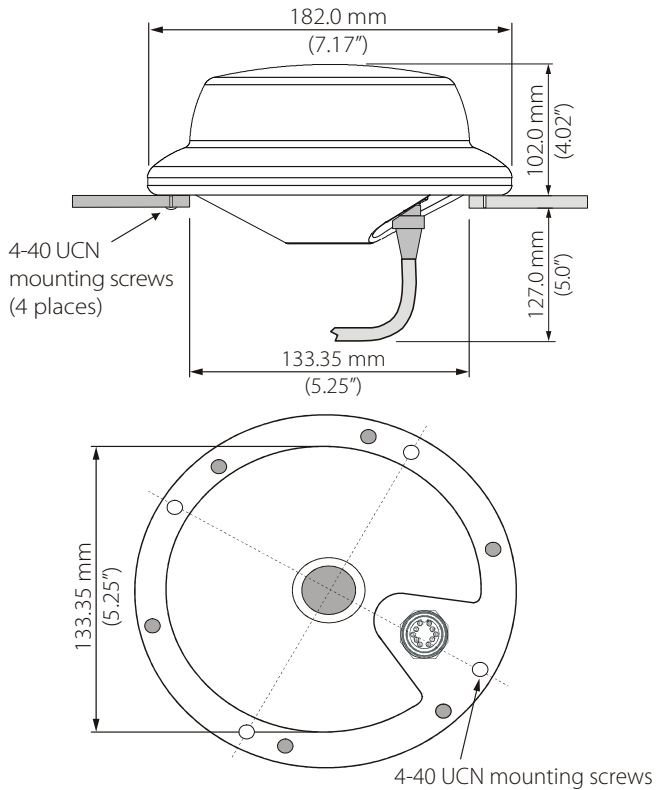


## Surface mount

The antenna can also be surface-mounted. Make sure there is at least 5-inch clearance underneath the mounting surface to accommodate the lower section of the antenna housing, connector and cable. Refer to the figure below for surface mounting considerations. Cut a 133.35 mm (5 1/4 inch) diameter hole on a horizontal mounting surface and drill the four mounting screw holes as shown.

Fasten the antenna by using 4-40 UCN size stainless steel screws (4 places). Use a marine grade caulking compound to seal between the mounting surface and the bottom of the antenna housing.

Choose a location for the antenna that has a clear view of the sky. Make sure there are no major obstructions or metal fixtures in the immediate proximity to the antenna. The GPS antenna relies on direct 'line-of-sight' signal reception. If you are unsure if the chosen location is suitable, it is advisable to mount the antenna in a temporary manner to verify correct operation.



## Antenna cable selection

The antenna cable assembly for the MX521B antenna is not included in the kit and must be ordered separately. Several cable lengths are available in stock. To assist you in ordering the correct cable length, please refer to the antenna cable list below for cable description and part number.

Antenna cable with one 10-Pin Connector

20 meters	3508 102 70170
40 meters	3508 102 70180
60 meters	3508 102 70640
80 meters	3508 102 70185

## Wiring

### Power requirement

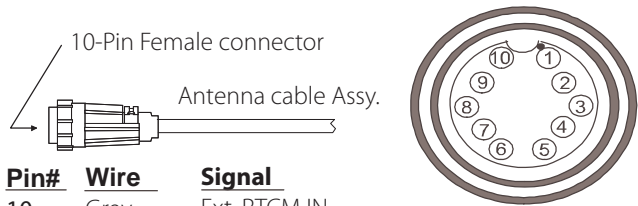
External power supplied to the MX521B must be within 10.5-32 V DC. Negative grounding is required. The MX521B draws less than 300 mA at 12 V DC. An in-line fuse or circuit breaker rated at 2 A is recommended for overload protection.

The red wire connects to the (+) DC power, while the black wire is the negative return. Although the antenna has a reverse polarity protection, it is prudent to make sure that proper polarity is observed before making the connection.

→ **Note:** Reverse polarity connection may damage the unit.

## Antenna cable assembly

Below is a diagram showing the pins and wire color-coding of the antenna cable assembly.



<b>Pin#</b>	<b>Wire</b>	<b>Signal</b>
10	Grey	Ext. RTCM IN -
9	Purple	Ext. RTCM IN +
8	White	Beacon Status Out +, Secondary output
7	Yellow	Beacon Status Out -, Secondary output
6	Green	GPS Out +, Primary output
5	Orange	GPS Out -, Primary output
4	Brown	MPM In +, Control input
3	Blue	MPM In -, Control input
2	Red	10.5 to 32 V DC
1	Black	Negative GND

Pins 1 & 2: Power input.

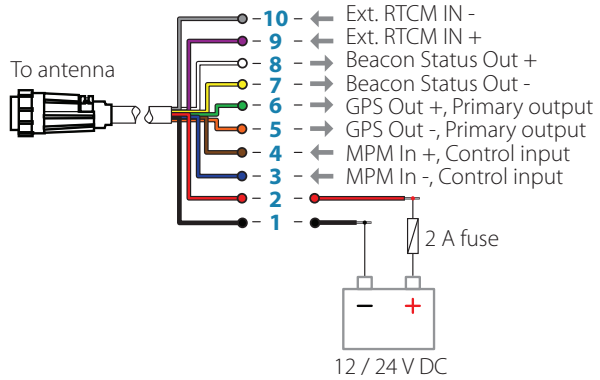
Pins 3 & 4: MX proprietary message (MPM) input port.

Pins 5 & 6: GPS output to NMEA 0183 compatible devices.

Pins 7 & 8: Beacon monitoring signal output. Sends the SNR, Signal and Frequency to the CDU.

Pins 9 & 10: External RTCM Correction (Input).

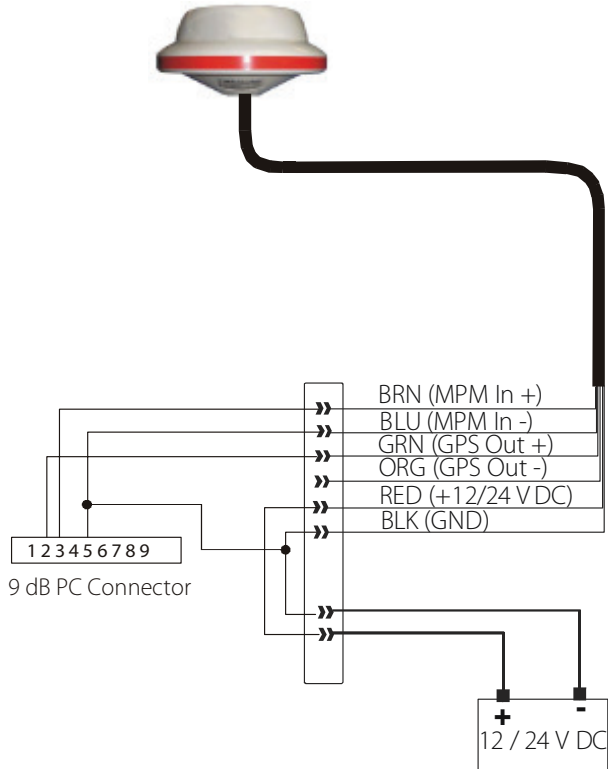
## Wiring example



Pin	Wire color	DGPS Antenna	GPS Antenna
1	BLK	Negative Ground	
2	RED	10.5 to 32 V DC	
3	BLU	MX Proprietary Message (MPM In (-)) Control input	
4	BRN	MX Proprietary Message (MPM In (+)) Control input	
5	ORG	GPS Out (-) Primary output	
6	GRN	GPS Out (+) Primary output	
7	YEL	Beacon Status Out (-) Secondary output	
8	WHT	Beacon Status Out (+) Secondary output	
9	PRPL	Ext. RTCM IN (+)	
10	GRY	Ext. RTCM IN (-)	

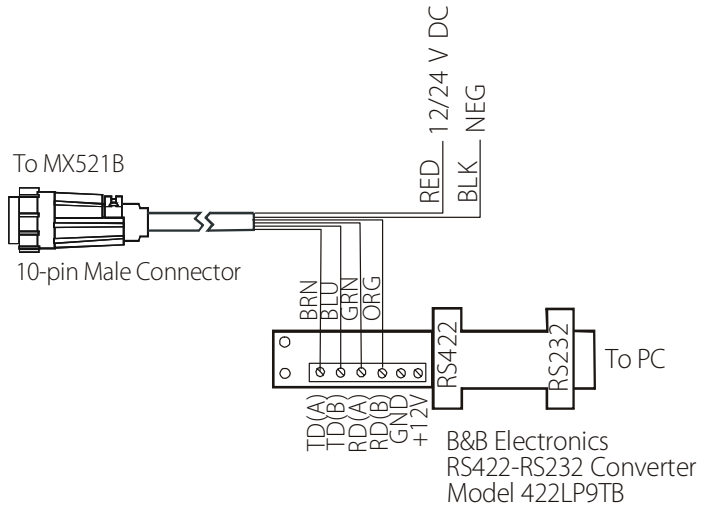
## Data interface to PC or other navigation systems

The figure below shows the power and data output connections to the serial port of a PC or other navigation systems using a dB9 connector and a terminal strip (user supplied items).



## MX521B Programming cable

The programming cable is used for upgrading the software of the GPS and Beacon PCBs inside the MX521B smart antenna. The figure below shows the programming cable diagram and equipment setup. Please note that external 12/24 volt DC is required to power up the antenna. The RS422-RS232 converter may be powered from the PC serial port or from an external 12 volt power supply.



# 3

## Technical specifications

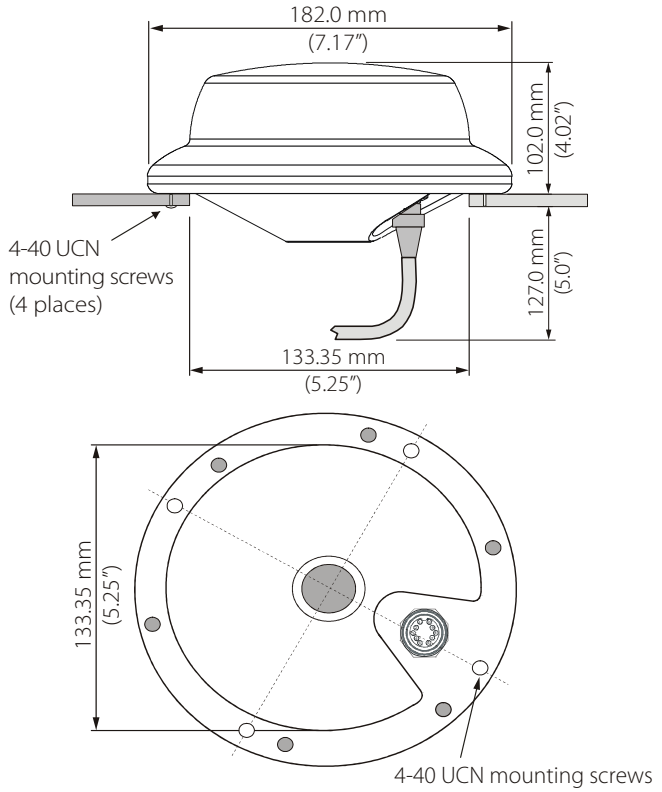
<b>GNSS receiver</b>	
<b>Type</b>	L1, C/A Code (SPS) with carrier phase smoothing
<b>Frequency</b>	1575.42 MHz
<b>Channels</b>	12 Channels, parallel tracking (10 channels when tracking SBAS)
<b>Update rate</b>	1 Hz
<b>Signals received</b>	GPS and GLONASS
<b>Fix calculation</b>	GPS or GPS + GLONASS
<b>SBAS tracking</b>	2 channel parallel tracking
<b>RTCM Input</b>	RTCM SC-104 format
<b>Antenna type</b>	Ceramic patch
<b>Dynamic range</b>	90 dB
<b>Time to first fix</b>	
<b>Cold start (no almanac or RTCM)</b>	60 second (typical)
Reacquisition	< 10 second (typical)
<b>Position accuracy</b>	
With differential corrections from Beacon stations	< 1 m (2D-RMS) typical depending on distance from differential base station
Without differential corrections	< 3 m (2D-RMS) (with S/A off)
<b>Serial ports</b>	2 duplex NMEA 0183 ports
<b>Baud rates</b>	4800 (default), 9600, 19200
<b>Data I/O Protocol</b>	NMEA 0183 V3.0
<b>Correction I/O Protocol</b>	RTCM SC-104
<b>Datum</b>	WGS84
<b>NMEA messages</b>	GGA, GRS, GSA, GSV, GST, RMC, VTG, ZDA & PMVXG,GBS (MX Marine proprietary)



<b>Beacon receiver (DGPS model only)</b>	
<b>Frequency</b>	283.5 to 325.0 kHz. 2-channel Auto or Manual selection (500 Hz steps)
<b>Sensitivity</b>	2.5 uV/m for 6 dB SNR @ 200 bps
<b>Operating modes</b>	Automatic, Manual or Database
<b>Dynamic Range</b>	100 dB
<b>Adjacent Channel Rejection</b>	61 dB @ f + 400 Hz
<b>Channel spacing</b>	500 Hz
<b>Frequency offset tolerance</b>	+ 5 Hz
<b>Antenna type</b>	H-Field
<b>MSK rates</b>	50, 100 and 200 bps
<b>Environmental</b>	
<b>Operating temperature</b>	-30 to +70 °C
<b>Storage Temperature</b>	-40 to +85 °C
<b>Humidity</b>	"Exposed Category" (IEC 60945)
<b>Electrical</b>	
<b>Operating voltage range</b>	10.5 to 32 V DC
<b>Operating current</b>	< 230 mA at 12.0 VDC
<b>Power consumption</b>	< 3 Watts
<b>Mechanical</b>	
<b>Height</b>	102 mm (4.0")
<b>Diameter</b>	182 mm (7.2")
<b>Weight (MX521B DGPS)</b>	820 g
<b>Weight (MX521B GPS)</b>	600 g
<b>Mounting</b>	1"14 pole mount or surface mounting

# 4

## Dimensional drawings







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