User Manual

iNAT-Rx/-Fx/-Hx, iNAT-M200 and iNAT-CFM

(also for iSULONA, iCOMBANA, iPRENA, iATTHEMO-B/C)

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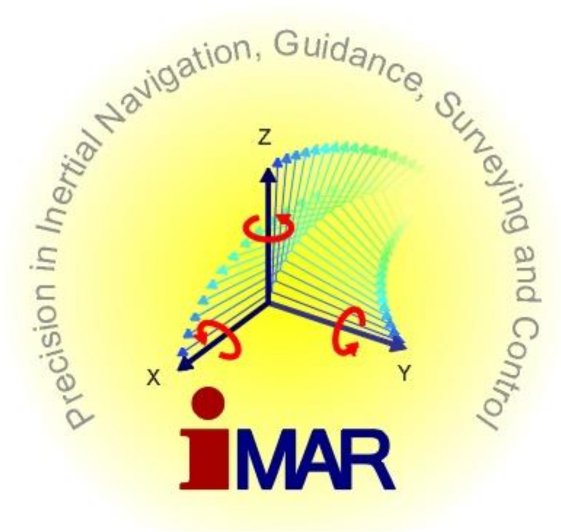
Commercial-in-Confidence ☑



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DOCUMENT CHECK & APPROVAL REQUIREMENTS

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Acronyms of Functions

<u>Industrial/MIL Projects / Industrie- & MIL-Projekte</u>

CEO	Chief Executive Officer (Geschäftsführer)
CUST	Customer (Kunde)
DE	Design Engineer / Development Engineer (Entwicklungsingenieur)
HD	Head of Development (Entwicklungsleiter)
PJM	Project Manager (Projektleiter)
PM	Production Manager (Fertigungsleiter)
QA	Quality Assurance (Qualitätssicherung)
QM	Quality Manager (Qualitätsmanagement-beauftragter)

<u>Aviation & Space Projects / Luft- und Raumfahrtprojekte</u>

AM	Accountable Manager
CUST	Customer (Kunde)
DE	Design Engineer / Development Engineer (Entwicklungsingenieur)
HD	Head of Design (Entwicklungsleiter)
HoA	Head of Office of Airworthiness (Leiter Musterprüfleitstelle)
HoD	Head of Design Organisation
PJM	Project Manager (Projektleiter)
PM	Production Manager (Fertigungsleiter)
CVE	Compliance Verification Engineer (Musterprüfingenieur)
QA	Quality Assurance (Qualitätssicherung)
QM	Quality Manager (Qualitätsmanagementbeauftragter)

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How to use this manual:

- Read this manual carefully before using the iNAT system.
- Recommendations for a proper operation are marked with this sign: !
- Warnings and Dangers are marked with this sign: !

See chapter 15 for any support by iMAR application engineers.

RELATED DOCUMENTS

This manual references to the following documents regarding the hardware and software of the iNAT-systems:

	Title	DocNo.	Comments
[1]	ICD_iNAT-RxFxHx_IEP-I000288	DOC141203029	Hardware ICD of iNAT-Rx/Fx family (drawings, connector pinout, GND concept)
[2]	ICD_iXCOM Protocol Specification	DOC141126064	Communication description of iNAT systems and list of all commands / data
[3]	ICD_ARINC825_iNAT	DOC141106133	ARINC825 CAN Implementation
[4]	iNAT-Rx/-Fx/-Hx/-M200 data sheets	several	Technical product specifications
[5]	Application Note iNAT Firmware Update	DOC141016031	How to install a new firmware on an iNAT hardware with 335xl kernel
[6]	MAN_iXCOM-CMD	DOC151112010	Manual of iXCOM-CMD GUI Software
[7]	MAN_UserManual_iNAT-RxFxHx_IEP-I000288	DOC151228001	User Manual for iNAT-Fx/-Rx/-Hx systems
[8]	CFG_Factory-Config-Table_iNAT-RxFxHx_IEP-I000288	LYT150803134	Template for factory settings for iNAT systems
[9]	ICD_iNAT-M200_IEP-I000245	DOC140301006	Hardware ICD of iNAT-M200 family (drawings, connector pinout, GND concept)
[10]	MAN_Introduction-into-Inertial-Measuring-Technology	DOC151228003	General description of coordinate systems etc.

Table 1: Related Documents

1 INTRODUCTION

This document shows how to operate the navigation systems of the iNAT system family, i.e. family iNAT-Rx/-Fx/-Hx (i.e. iNAT-RQT, iNAT-RQH, iNAT-FSSG), iNAT-M200, iNAT-M200-FLAT, iNAT-CFM as well as the military versions iSULONA, iCOMBANA and iPRENA.

The iNAT family is a class of inertial measurement systems with integrated high performance GNSS engine, which is made for a wide range of operation in navigation, timing, surveying, guidance and control. Depending on the applied firmware, the systems can be used as full INS / IMS solution (standard usage) or as an specific IMU with an interface for time synchronized calibrated raw data of inertial sensors, GNSS data and time stamp acquired aiding data (e.g. for very customer specific tasks):

Figure 1: System of iNAT-Rx/-Fx/-Hx Family

a. **Navigation & Control**

   Systems for **Na**vigation and **T**iming (**iNAT**), Guidance and Control, Surveying or Attitude Heading Reference System (AHRS) with advanced and qualified sensor and processing hardware for - but not limited to - land, sea, subsea and airborne applications.

   Advanced strapdown navigation algorithms as well as the sophisticated 27+ states extended Kalman filter based INS/GNSS/ODO data fusion are processed on the powerful integrated processor with ARM architecture. Additionally the data fusion can process further external information like air data, magnetometer data or Doppler velocity aiding etc. (depending on application and sensor technology).

b. Extended Inertial Measurement Unit

   Usage of the system explained under item a) above only as Extended Inertial Measurement Unit (EIMU), providing calibrated inertial data (angular rates / accelerations, timestamp, BIT), GNSS raw data (single or dual antenna; GPS, GLONASS, GALILEO, Beidou, TerraStar corrections) or GNSS processed data (position, velocity, standard deviations etc.), odometer / airdata / magnetometer / Doppler log data (all time-stamped according to IMU data (e.g. for dead reckoning solutions). In this case (operation only as EIMU) the system does not contain the Kalman filter based data fusion.

Figure 2: System of iNAT-M200 Family

   All mentioned time stamped calibrated raw data are also always available for the user if the system is operated as “Navigation & Control” unit according to item a).

2 SYSTEM SPECIFIC SETTINGS

! Each delivered system can have factory specific features, depending on the purchase order and SOW. They are summarized in document [8] (see Table 1), which is provided for each delivered system individually. It contains the system type, the part number, the serial number and the configuration of the communication interfaces (UART, CAN, Ethernet, SYNC, USB, HDLC, ARINC429 etc.) at the time of delivery.

It is mandatory to have this configuration sheet on hand before you contact the iMAR support engineers for any reason.

3 TECHNICAL SPECIFICATION

The technical specification of performance of the iNAT systems is described in separate documents [4].

4 ELECTRICAL INTERFACE AND DATA INTERFACE

The hardware interface (mechanics, connectors and pinout, electrical signals, power supply, GND and earthing design etc.) is described in the system ICD.

The relation between the hardware interfaces on each connector and the software ports is also given in the system ICD.

5 COMMUNICATION INTERFACE AND COMMANDS

The communication interface (data structures, commands etc.) is described in a separate document [2] (see Table 1). There is also described how to build up a communication to the system via UART or Ethernet. A short excerpt about the internal logical channel structure can be also found in the iXCOM-CMD manual [6].

In [5] an application note is provided which describes how a firmware update can be installed on the controller of the iNAT system. Such update must not be applied without the agreement of an iMAR support engineer.

If the system is delivered including lab cables (these cables are called “lab cables” because they are not intended to be used in an aircraft or under harsh environmental conditions – if you need such cables, please contact iMAR for assistance if needed), this cable has a MIL connector at the one side and several TNC / SUB-D / RJ45 connectors at the other side, depending on application. The setup of the lab cable is described in the system ICD.

The pin out of the SUB-D15 female connector for the RS422 / UART ports is as follows:

```
Pin 2: RxD+
Pin 3: RxD-
Pin 6: TxD+
Pin 7: TxD-
Pin 9: GND
```

The pin out of the SUB-D9 male connector for the CAN lines is as follows:

```
Pin 2: CAN-LO
Pin 3: GND
Pin 7: CAN-HI
```

The pin out of the RJ45 LAN connector (socket) is as follows:

```
Pin 1: TX-P
```

```
Pin 2: TX-N
Pin 3: RX-P
Pin 6: RX-N
```

The pin out of the SUB-D9 male connector for the ODOMETER lines is as follows (if any):

```
Pin 1: ODO-B-LO
Pin 3: ODO-B-HI
Pin 5: GND
Pin 6: ODO-A-HI
Pin 7: ODO-A-LO
```

! The proper interface termination (120 OHM at UART RS422 and CAN) must be considered when building up the communication. Hints are given in [1].

6 INSTALLATION (HARDWARE AND COMMUNICATION)

6.1 Hardware Installation

! In general, the INS can be installed inside the application / vehicle / aircraft / ship in any arbitrary orientation. The lever arm to the GNSS antenna as well as the lever arm to the wheel sensor / odometer (if any) shall be as short as possible and has to be coordinated in the INS enclosure coordinate system. Details are described in [10] and [2] (see Table 1).

! The installation shall be made at a location with reasonable low impact of vibration, shock and temperature gradients as the iNAT is a high precision measurement instrument.

! Any shock impact due to installation handling must be avoided. A small bump between tw metal surfaces may induce a shock of several hundreds or even thousands of g. Falling down only a few millimeters on a metal surface may induce a several thousands g shock (even if the duration is quite short) and degrade or damage the system.

6.2 Communication Installation

In the following chapters some basics are described, the detailed description and additional parameters are given in [2].

In [2] the chapter “How to install an iXCOM communication channel” gives a good introduction how to establish a communication to the iNAT system, to configure it and to read measurement data and status information. The usage of the XCOM command and the LOG command are explained in detail as well as the meaning of commands, messages, responses and parameters regarding to the iXCOM protocol definition.

In chapter 7 a Quick Start information is provided as an example how to build up a communication following the required actions step by step.

In chapter 18 (appendix) instructions are given on how to connect from a local computer to the iNAT INS (Appendix: USB Driver INSTALLATION ON HOST PC).

6.3 Lever Arms and Misalignment Angles

The center point of the inertial sensors, especially the intersection point of the three accelerometers, is located somewhere inside of the inertial measurement system (IMS). This point is given in the mechanical drawings of the system (note: carefully distinguish between the sensor intersection point and the center of gravity of the measurement system).

The position of the GNSS antenna, of the odometer or the virtual measurement point (VMP) has to be given in respect to this sensor intersection point to the internal strapdown algorithms to perform best lever arm compensation.

Typically, the lever arm to these devices (GNSS antenna, odometer) or to the virtual measurement point is surveyed with a theodolite or with a laser tracker inside of the application once the IMS is installed. An alternative method will be to acquire the lever arm coordinates from the mechanical drawings of the setup.

The following drawings show the sensor intersection point.

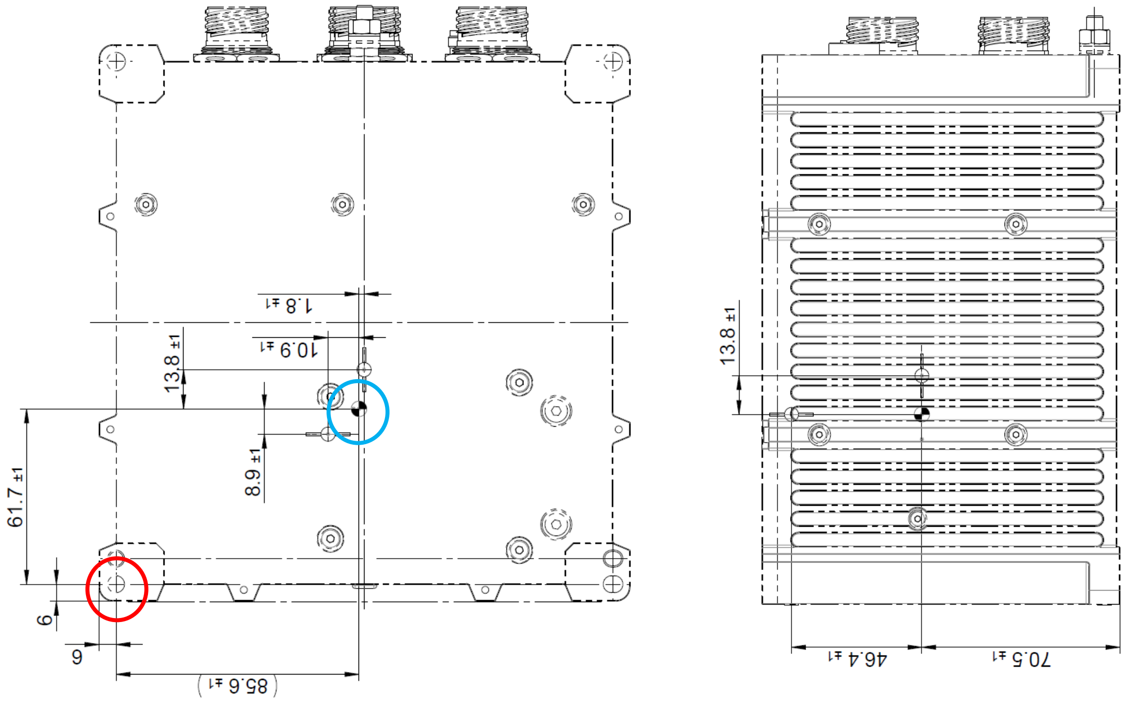


Figure 3: Sensor Intersection Point (Accelerometers) inside the Drawing

The red circle shows the relevant through hole fitting (note: the drawing is given by bottom view here!), the blue circle shows the sensor intersection point, which is relevant for the internal algorithmic compensation.

To make the acquisition of the lever arm measures more easy for the operator / surveyor, in all iNAT systems (i.e. using the iXCOM protocol or/and iXCOM-CMD software) the reference point for surveying any lever arm is the circular fitting / mounting through hole at the bottom plate of the IMS, and there specifically the mid of this hole[1]. The embedded software inside the IMS automatically performs the right transformation into the sensor's intersection point (for each enclosure the mechanical relations between the circular fitting hole and the sensor intersection point are stored inside the factory setup).

The following picture shows this in detail (top view).

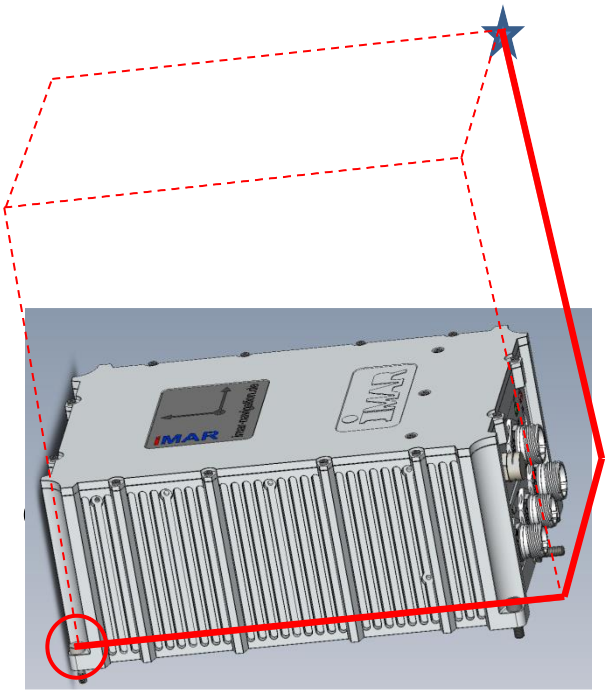


Figure 4: Lever Arm Definition

In the above example it can bee seen, that the lever arm has to be entered by the user, is measured from the red circled fitting hole to the blue marked star (location of GNSS antenna, odometer etc.). It is measured in body frame axes.

Lever-arm_x = - 364 mm
lever.arm_y = + 232 mm
lever-arm_z = - 312 mm

Take care, whether the body z axis is directed down or up (both is possible, depending on system calibration and application).

If you use RTK based GNSS aiding data (i.e. centimeter level accuracy) during the operation, it is of course mandatory to determine the GNSS lever arm with an accuracy which is at least not worse than the GNSS accuracy (i.e. in the millimeter area).

The misalignment angles (e.g. if the IMS is installed being rotated by 90 deg around the body z xis) are always given by Eulerian angles around the body axes. To determine the rotation angles, install the IMS in the desired orientation and then rotate it (virtually) first around the body z axis, then around the rotated body y axis and finally around the again rotated x axis and insert the three rotation angles.

[1] Note: there are several fittings available. Make sure that you use the through hole circular fitting.

6.4.1 GNSS Antenna Lever Arm

To achieve best results in position and orientation determination, the system shall know the lever arm between the INS and the GNSS antenna (or both GNSS antennas in case of a dual-antenna solution) as accurate as possible, but at least double as accurate as the expected GNSS standard deviation. For example standard GNSS accuracy is 1…2 m, therefore the lever arm shall be surveyed at least within 0.5 m accuracy. If the INS/GNSS system is used in RTK mode (2 cm position accuracy), the lever arm shall be surveyed with an accuracy of < 1 cm.

The GNSS lever arm can be defined using the parameter ***PARGNSS_ANTOFFSET***.

It is recommended that the user mounts the INS as close as possible to the primary GNSS antenna, particularly in the horizontal plane. The uncertainty of the lever arm has to be provided together with the lever arm itself and should overbound the expected error.

The x, y and z values of the parameter represent the vector from the INS' center of navigation to the antenna phase center, measured in the INS enclosure frame.

In some applications the applied Kalman filter, which is used for INS/GNSS data fusion, supports an online antenna lever arm estimation.

6.4.2 Magnetometer Misalignment Setup

If the INS is aided by a magnetometer (not supported by all versions), the relative orientation of the magnetometer to the INS has to be entered. If the magnetometer axes do not coincide with the INS enclosure axes, the parameter ***PARMAG_MISALIGN*** shall be used to rotate the magnetometer output data in a way that it fits to the INS coordinate frame.

6.4.3 Odometer Integration Setup

Beside of navigation aiding the odometer can be used for zero velocity detection to perform ZUPTs (zero velocity updates). The lever arm from the INS to the odometer is to be set with the parameter ***PARODO_LEVERARM.*** It shall be accurate within the centimeter range.

If the INS is aided by an odometer / wheel sensor (not supported by all versions), an initial value of the scale factor of the odometer must be set. The parameter for this action is ***PARODO_SCF***. It shall be at least accurate within +/-10 % for correct initialization of the internal Kalman filter, if GNSS aiding is at least initially available. The Kalman filter improves the accuracy of the scale factor over time as long as a reasonable GNSS aiding is available.

If a mission is executed without any GNSS aiding, the user has to set the scale factor as good as possible because finally the accuracy of the scale factor of the odometer limits the overall navigation performance (so-called dead-reckoning mode).

The odometer should not be mounted on a driven or braked wheel to avoid non-linear slippage effects, which increase the uncertainty of the navigation solution.

The internal Kalman filter estimates the odometer boresight angles, if aiding with holonomic constraints is selected via *PARODO_CONSTRAINT*.

6.4.4 Relative orientation of IMU and vehicle (mounting misalignment)

In order to indicate the roll, pitch and yaw angles as expected (pitch angle positive for nose up, roll positive for right wing down, yaw 0° pointing to north and 90° pointing to the east), the INS has to be mounted with its x-axis forward, y-axis to the right and z-axis down.

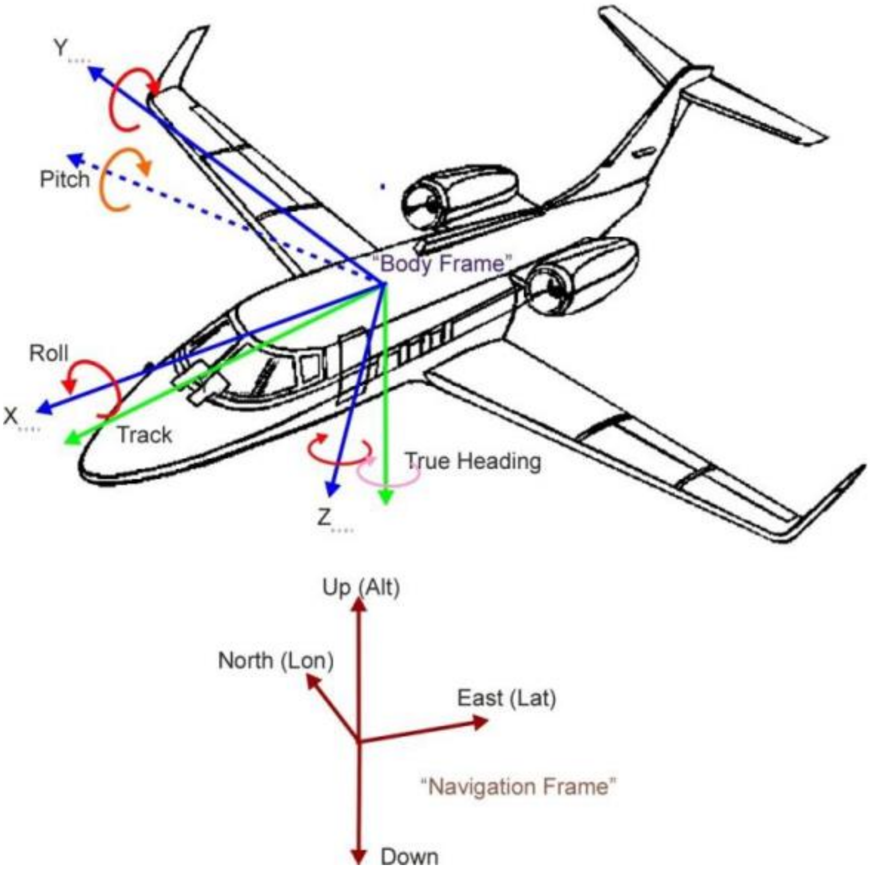
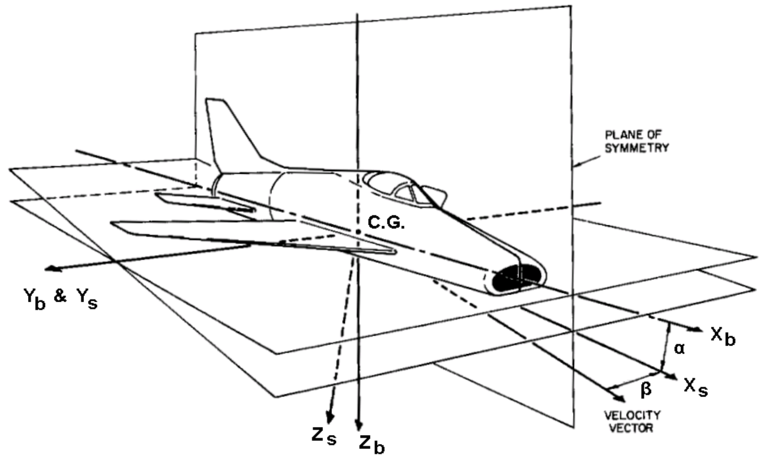


Figure 5: Navigation Frame (red) and body frame (blue)



Definition of Body and Stability Axes

Figure 6: Side slip angle (beta) and angle of attack (alpha)

Since it is not always possible to align the INS axes exactly to the vehicle main axes, the vehicle to body rotation may be entered using three rotation angles (Eulerian angles; rot_x / rot_y / rot_z). The related parameter is ***PARIMU_MISALIGN***. The definition of the rotation (including the correct sequence) is given in [2]. All information in output logs formerly expressed in body coordinates is subsequently expressed in vehicle coordinates (i.e. for example INSVELBODY, INSRPY, INSDCM or INSQUAT as well as the corresponding components of INSSOL)Internally the INS is navigating in ECEF (geodetic reference frame) to allow a seamless navigation also during flights over the north or south pole.

6.5 Alignment

The system supports several alignment modes to determine attitude and heading prior to a mission or during a mission (in-flight alignment). The alignment mode is defined using the parameter ***PAREKF_ALIGNMODE.***

6.6 Startup Mode

After power down, the INS can power up with a defined initial data setup. In general we distinguish the following initialization capabilities for heading and position:

- Use heading from gyro compassing or dual-antenna GNSS setup
- Use stored heading
- Use forced heading

- Use position from GNSS measurements
- Use stored position
- Use forced position

The stored data are used from the information stored during last power down. If no stored information is found, the system uses pre-defined default values, which can also be set by parameter command.

6.7 Special Navigation Modes

Special navigation modes can be made available to handle certain issues in aiding sources availability.

If no further valid GNSS updates (or air data updates) are available longer than a defined duration, the system can automatically activate a pre-defined aiding mode:

- Use air data speed
- Use baro altitude
- Output frozen speed
- Output frozen height

If no further valid air data and no further valid GNSS updates are available longer than a defined duration, the system can automatically output pre-defined values:

- Output frozen height
- Output frozen speed

Details are described in [2].

6.8 iXCOM Messages (Excerpt)

This chapter gives a brief overview of the most relevant data logs being used to receive navigation output data from the INS. For details please see [2].

6.8.1 INSSOL

The `INSSOL` message includes the navigation data as a result of the internal data fusion (INS integrated solution). It also contains the system status and the alignment status. The `INSSOL` message is available with a rate up tothe rate of the inertial sensors.

6.8.2 GNSSSOL

The `GNSSSOL` message contains the GNSS receiver solution. The GNSS solution includes the WGS84 position, the undulation (ellipsoid/geoid height difference), the GNSS based NED velocity, the standard deviations, status and the number of tracked/used satellites. The maximum `GNSSSOL` message rate depends on the GNSS receiver hardware being integrated in the INS.

6.8.3 GNSSTIME

The `GNSSTIME` message contains the UTC time-stamp. This message is needed to convert the GPS time to UTC time.

6.8.4 SYS_STAT

The `SYS_STAT` message contains the more detailed system status. The content of this message is variable and can be configured via the iXCOM parameter `PARDAT_SYSSTAT`. It is recommended to enable this message with the event based trigger. This means that the `SYS_STAT` message will only be sent if the content has been changed.

7 QUICK START

This section describes the first steps with the iNAT system for configuration and operation. Many other commands and logs are available and can be found in document [2] (see Table 1) for more sophisticated operation.

It s recommended (at least for new users) to use the iXCOM-CMD tool (Table 1: Related Documents, item [6]) for system configuration and operation. If you intend to program your own communication interface to the iNAT system, we recommend to use our software development kit (SDK) which is available for MS Windows and Linux.

The following steps provide an informative basis for the first usage of the system.

1. Mount the antenna and connect the antenna cable to the correct connector (see system ICD, typically TNC or SMA connector).
2. Connect the lab cables with the system connectors of the iNAT.
3. Connect the RS422 UART port (typically COM3 for iNAT-Rx/-Fx-Hx) with the host PC. Take care for RxD / TxD logic as well as for polarity (RxD+ of the iNAT shall lead to TxD+ of the destination etc.).
4. ! Plug in the power connector of the iNAT (10-35 V DC or 16-35 V DC, depending on version; confirm regarding type plate!).
5. Switch power on
6. Open your serial port on your host computer and send the iXCOM command `XCOM` with the `OPEN` parameter (command ID 0x0005) to the iNAT (create a channel number etc. as described in [2]). This command is mandatory required to enable a specific iXCOM communication channel.[2]
7. Configuration of the data messages (`INSSOL`, `GNSSSOL`, `GNSSTIME` and `SYS_STAT`) with the desired rates (inside of the given constraints of baud rate).
8. Configuration of the INS misalignment via the iXCOM parameter `PARIMU_MISALIGN`.
9. Configuration of the GNSS antenna lever-arm via the iXCOM parameter `PARGNSS_ANTOFFSET`.
10. Configuration of the alignment time via the iXCOM parameters `PAREKF_ALIGNTIME` and `PAREKF_COARSETIME`.
11. Configuration of the alignment mode via the iXCOM parameter `PAREKF_ALIGNMODE`.
12. Configuration of the Kalman filter start-up behaviour via the iXCOM parameter `PAREKF_STARTUP`.
13. Saving the configuration into the internal non-volatile memory via the iXCOM command `CONF` (command ID 0x0003).
14. Start a re-alignment via the iXCOM command EKF (command ID 0x0004).
15. After the mission is completed, the iXCOM communication channel shall be closed via the iXCOM command `XCOM` with the `CLOSE` parameter.

[2] Per default by factory set the „channel number“ 0 (zero) is existing with a pre-defined log list (output of certain data logs). It is best practise to clear all logs at the beginning by the application and to command the logs being required by the specific application.

8 BUILD-IN-TEST

8.1 BIT Function Description

The INS contains the resources to perform a Built-In-Test (BIT) function. The BIT is designed to inform the user whether the outputs are valid, whether the internal hardware is operating correctly (internal voltages, temperatures and test signals) and whether the inertial sensors are providing correct data (within the range of testability).

8.2 Power-up BIT (PBIT)

During power-up, the INS auto-executes the PBIT function. Power-up to normal operation, including the PBIT, will take less than 15 seconds. Shorter durations TBD. The PBIT comprises sensor and electronics health and temperature monitoring.

8.3 Continuous BIT (CBIT)

During normal operation a CBIT is running as a permanent background process to monitor the health of the INS. The CBIT comprises sensor and electronics health and temperature monitoring.

8.4 LED Status Indicators

One or two LEDs signalize the status of the system. The description can be found in the system ICD.

9 HARDWARE ARCHITECTURE

The hardware architecture of the INS is given in the dedicated system ICD.

10 SPECIAL FEATURES

The system supports a lot of useful additional features. Not all of these features are available in every system configuration and not on each hardware type. In the following a few of these features are listed.

10.1 REC Parameter / Post Processing

The recording module (REC) records the sensor data and the INS/GNSS solution to the internal storage device. The REC module can be configured to record specific modules at a specific data rate. The secondary sensors with a low data rate such as GNSS, MAG or MADC will be recorded with their respective processing rate. This ensures that all aiding data are available for post-processing. The configurable recording rate refers to the IMU and the data fusion modules.

The REC feature can be configured by the iXCOM-CMD software or via dedicated commands sent by the user.

11 GROUND SUPPORT EQUIPMENT

The INS provides several data interfaces (Ethernet, RS422 UART) which can be used for operational as well as for diagnostics purposes. As GSE (ground support equipment) a standard PC can be used if it supports Ethernet (100 Mbit/s) and/or RS422 UART (baud rate adjustable up to 921.6 kBd). For standard notebooks commercial adapters (USB to RS422 UART or Ethernet to RS422 UART, e.g. from MOXA) are available on the market.

For the UART interface in general a standard terminal program is sufficient. For Ethernet, UART and USB interfacees iMAR provides a support and command software iXCOM-CMD. An iMAR internal FAT and BIT analyzing support software is available for customers, having a larger number of iNAT systems under operation (please contact iMAR support engineers for detailed information and conditions).

For operation in the lab a standard power supply is required (28 V DC / 1.5 A or 8…36 V DC, 50 W). Furthermore one or two L1L2 GPS + GLONASS + L-Band antennas (depending on standard setup or dual-antenna setup) is required as well as a set of system lab cables.

12 PACKAGING & STORAGE

The INS is a highly accurate measurement tool, which requires a careful handling. Nevertheless of the ruggedized and the shock resistant design, mounting and transportation shocks shall be avoided where possible.

Also high ESD impacts shall be avoided as usual.

Therefore a proper packaging is mandatory before transportation or storage. This can be achieved by a double hull packaging within ESD protected foam.

The transportation and storage shall be executed within the specified environmental conditions (see datasheet).

As valid for every technical device, avoiding strong temperature gradients during operation or storage may increase the lifetime of the goods.

13 ROHS & REACH

In standard configuration the INS electronics does not contain environmental or health hazardous materials.

If the system is manufactured with Nickel plated connectors (standard configuration), they do not contain environmental or health hazardous materials.

The inertial sensor assembly (integrated optics, ring laser setup) may contain certain listed materials in small volume (< 0.1 % by weight). This is required for a reliable operation and cannot be substituted.

14 HARDWARE & SOFTWARE DESIGN STANDARDS

Hardware and software of the iNAT-Rx/-Fx/-Hx as well as iNAT-M200 and iNAT-CFM (and accordingly the versions iSULONA, iCOMBANA and iPRENA for military applications) are developed under full configuration control according to iMAR standards. The equipment is designed to be used for advanced navigation, surveying and control applications. Certain equipment (see dedicated ICD of the product) is certified regarding environmental conditions and regarding EMI/EMC protection to be used in military and commercial aircraft (MIL-STD-810F/G, MIL-STD-461E, MIL-STD-704D, DO160E). The design standards of DO254 and DO178C are not applicable for the current releases.

For navigation applications in military aircraft the usage of an independent navigation backup system (ESI) is recommended.

15 SUPPORT

15.1 Asking for Support

For our support management system, we need to know the project number (Proj.No.) or alternatively P/N and S/N of the system you are speaking about.

These numbers are for example provided on the type plate (example shown in the Fig. on the right side).

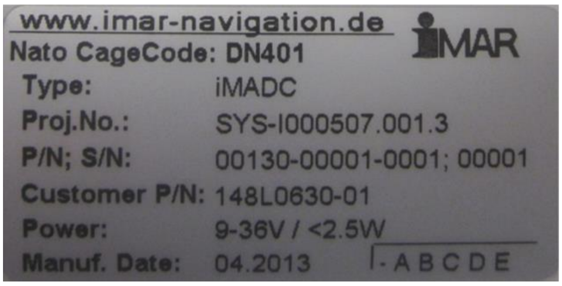


Figure 7: Example of iMAR type plate

15.2 Contact

You can find general information about our products, used technologies, and about inertial navigation, and GNSS based navigation at www.imar-navigation.de.

You can reach iMAR Customer Support as follows:

support@imar-navigation.de

+49-6894-9657-0

iMAR Navigation GmbH
Customer Support
Im Reihersbruch 3
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Germany

16 ABBREVIATIONS

Expression	Description
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
FTP	File Transfer Protocol
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
NAT	Navigation And Timing
OS	Operating System
PPS	Pulse Per Second
RNDIS	Remote Network Driver Interface Specification
USB	Universal Serial Bus

17 APPENDIX: iXCOM-CMD CDU SOFTWARE

A software is available, which allows a quick access to the major data of the INS and to perform certain parameter settings.

The iXCOM CDU software can be operated on a standard PC, on a tablet or on specific handheld devices like GETAC^{TM} terminals.

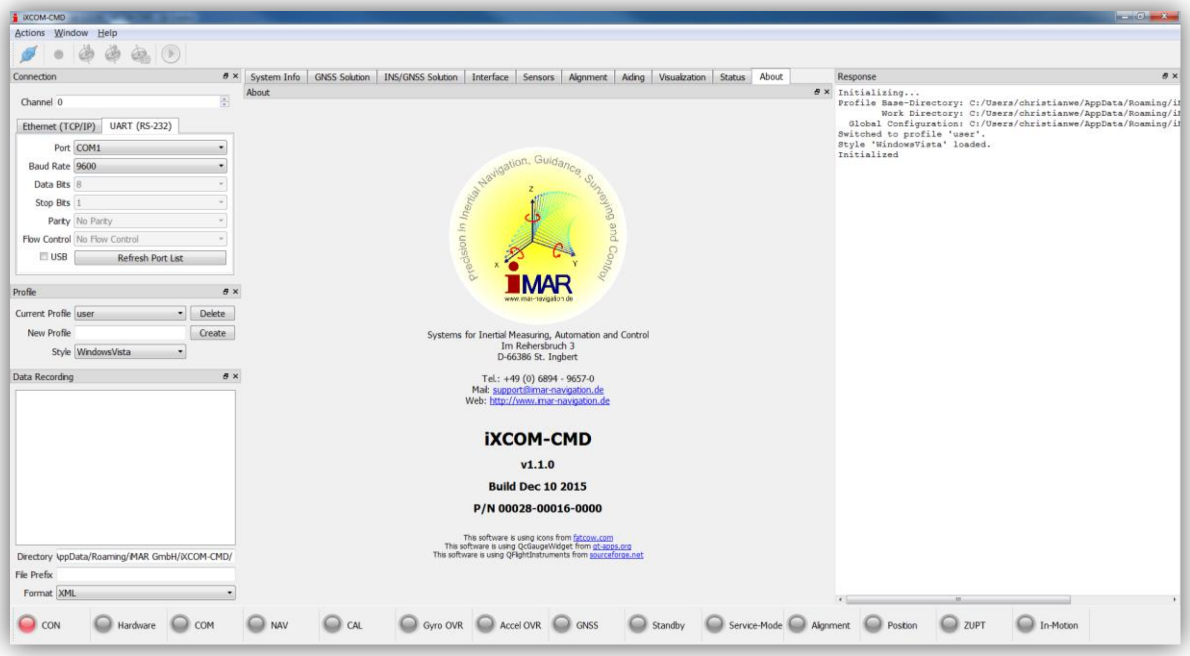


Figure 8: iXCOM-CMD Software Main Screen

Please refer to the document MAN_iXCOM-CMD.pdf (DOC151112010) for a detailed description of the software. Also a training course document is available to support a quick start for new users.

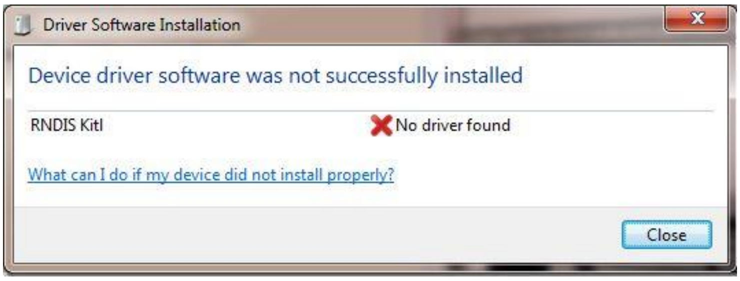
18 APPENDIX: USB DRIVER INSTALLATION ON HOST PC

To configure the system via a host PC, the user can connect to the INS direct via Ethernet, via RS422 (UART) or via USB. By logic the USB port is mapped in the PC like an Ethernet network port.

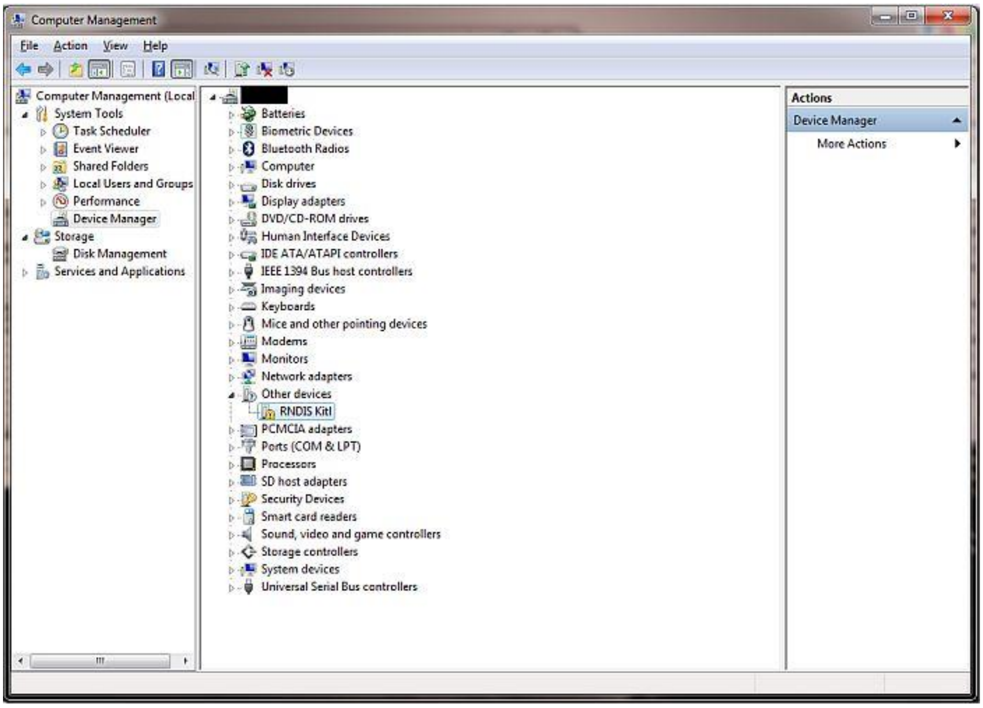
The USB peripheral will enumerate to the host as an Ethernet device, using the “usbnet” driver with Linux hosts or Microsoft's RNDIS driver with Windows hosts. The user has to set it up like any other two-host Ethernet link.

RNDIS driver is a part of the Windows 7 operating system, but the OS fails to detect it automatically. The following steps will help the user to install the RNDIS driver.

1. After the device is connected to the PC, the Windows OS will automatically search for the RNDIS driver. After it fails to find the driver, the following message will be shown.

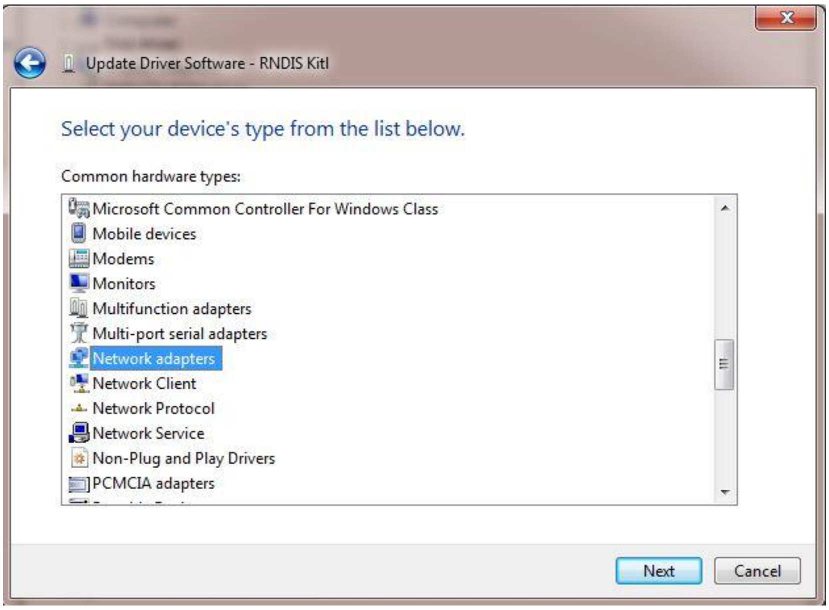


2. Right click on Computer and select Manage. From System Tools, select Device Manager. It will show a list of devices currently connected with the development PC. In the list, RNDIS can be seen with an exclamation mark implying that driver has not been installed.

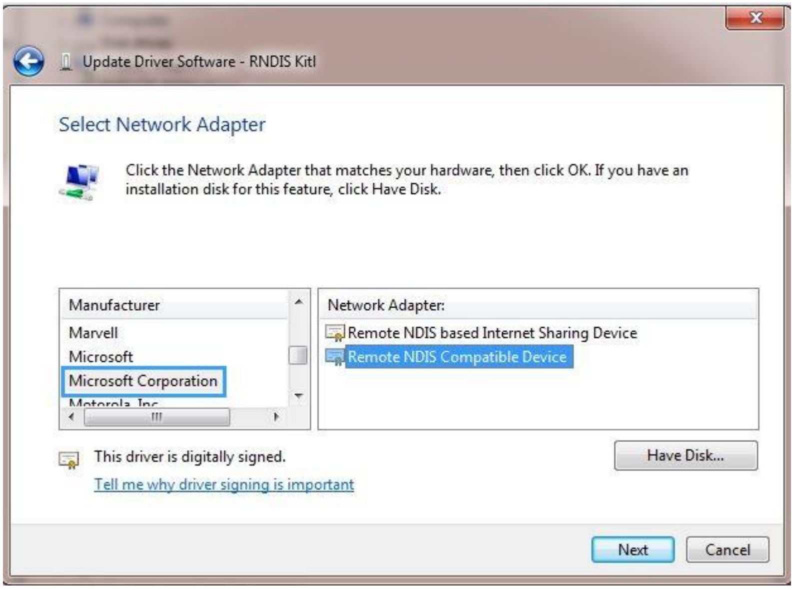


3. Right click on it and select Update Driver Software... When prompted to choose how to search for device driver software, choose Browse my computer for driver software.

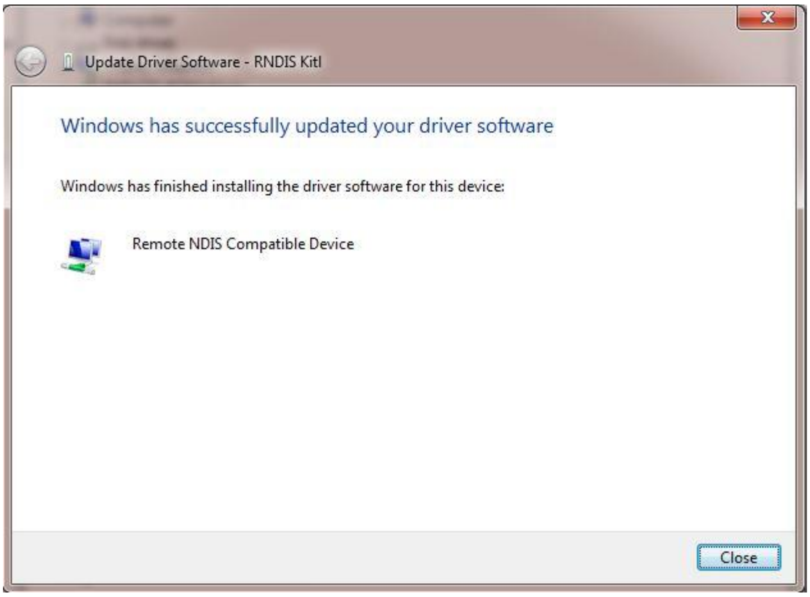
4. Browse for driver software on your computer will come up. Select Let me pick from a list of device drivers on my computer.
5. A window will come up asking to select the device type. Select Network adapters, as RNDIS emulates a network connection.



6. In the Select Network Adapter window, select Microsoft Corporation from the Manufacturer list. Under the list of Network Adapter, select Remote NDIS compatible device.



7. The RNDIS device is now installed and ready for use.



After the driver is installed successfully, a further network adapter is available. It is required to use a static IP address for this network. The iNAT's IP address is **192.168.5.147**. Therefore, the new network adapter has to be in the same sub-network (e.g. 192.168.5.**2**).

19 APPENDIX: FTP ACCESS TO THE INS

The iNAT provides a user interface via FTP. We strongly recommend using a FTP-Client such as Win-SCP[3] or FileZilla[4]. The following example uses Win-SCP as FTP-Client.

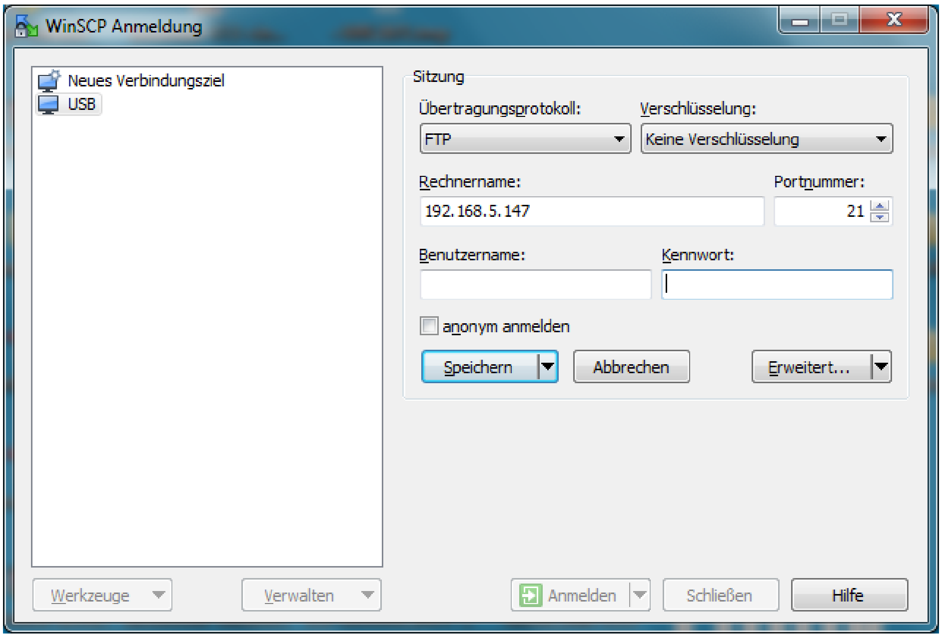


Figure 9: Win-SCP Connection Parameters

The connection parameters are:

- IP-Addresse: **192.168.5.147**
- Port: **21**
- Username: *not required*
- Password: *nor required*

Note: For systems being delivered until May 2016 a download of measurement data from the INS shall be performed via USB. If FTP is used, please use a switch of type NetGear FS108 (and not of type "ProSafe" like NetGear GS108).

The iXCOM-CMD software supports file transfer with an integrated FTP client.

[3] Download: http://winscp.net/eng/download.php
[4] Download: https://filezilla-project.org/download.php?type=client