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i N A V

Systems for Inertial Measurement, Navigation and Control

Connecting the IMS to a Network
Setup of Software Updates via NavCommand
DUMP File Download via NavCommand
(for 32Bit-Systems)

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1 INS Ethernet Connection – General Introduction

The Inertial Navigation Systems and Inertial Measurement Systems (in the following the abbreviation IMS is used) using an internal Pentium based computation unit, have typically at least two interfaces: Ethernet (TCP/IP) and RS232. These interfaces can be used for standard communication in the system application (e.g. output of navigation results, command of parameters etc) and they can also be used for service, software update and system configuration purposes.

An Ethernet TCP/IP connection to the IMS requires an IP address of the IMS which must be known by the computer (in the following we will name it “notebook”) being connected to the INS. As an alternative the notebook or the network server where the INS is connected has to provide a DHCP server, which will make a translation between the IP address and the logical name of the INS.

The INS can be connected via Ethernet (10/100BaseT) directly to the notebook (using a cross-over cable) or via a network server (using typically a 1:1 cable from the INS to the server and a 1:1 cable from the server to the notebook.

Standard settings of the INS:

- Monitor Interface: COM1 or COM2, Baud rate 115.200 kBd; 8, N, 1
- IP address: 192.168.1.199, TCP/IP
- Ethernet Port: 50052 (for navigators iNAV, iDIS)
  50055 (for iDRPOS)
- logical network name: xxxx_yyy , if the name S/N of the INS is SYSxxxx-yyy
  (leading zero if necessary; SYS0166-001 ==> 0166_001)

1.1 Network Preparation of your Notebook

We have to distinguish between

a) operation of the INS in a network where a DHCP server is available

b) operation in a point-to-point configuration, where the notebook and the INS is connected directly with a (cross-over) Ethernet cable

Case a):

The IP address of the INS will be automatically fitted by the DHCP server into the sub-net of the customer. The INS is always addressed by its logical name.

Case b):

The network environment settings of the notebook have to be set to a fixed address. Go into

"Network Environment" ==> Properties ==> TCP/IP ==> Properties

and don't select "receive IP address automatically". Select "Use following IP address" and use an address which is conform with your local network (if any) and which is conform with the IP address of the INS (may be you have to change the IP address of the INS ==> see chapter 4). Make sure, that your "Subnet Mask" fits the IP address of the INS.

Example:

The INS IP address is	192.168.1.199
The notebook IP address is	192.168.1.10
The Subnet Mask is	255.255.255.0
The Gateway address is	192.168.1.001
The DNS server address is	192.168.1.208
The alternative DNS server is	192.169.1.001

Subnet Mask 255.255.255.0 means: the first three entries of the IP address between INS and notebook have to be identically (255), the last entry may take every value. So it is made sure that your notebook will not search "all over the world" but only in your subnet for the INS.

1.2 Connecting to Ethernet / FTP

The INS has username and password as well as an IP address as well as a logical name to be rooted via a DHCP server. The default user name is ***Guest*** and no password is required.

The username/password can be individually chosen by the user by connecting via COM1 or COM2 (depends on application) to the INS with the iMAR Monitor program "iMonTerm.exe" (start the iMonTerm software before power-on of the INS so the INS can automatically switch into the monitor mode!), but it is recommended to use the standard settings to prevent from "wrong" actions.

Only for advanced users:

The following procedure shal only be done after correspondence with iMAR. All standrad operations of the IMS can be done with the default user "guest"!

Only for advanced users: Use the command "user" to define a new user with a new password. E.g. to create the user, start the iMonTerm.exe on your laptop (connected with COM1 of the IMS) and then (not before!) start the IMS (power on). Now, after the system has booted, type

user <account_name> <password> <password>

to create the user <account_name> with the password <password>. Now send "exit 1" to store the new user data on the INS flash.

The IP address of the INS typically is 192.168.1.199, if no DHCP server is available in your network. Otherwise your DHCP server will give a specific IP address to the INS (can be different from session to session).

To start the application from the monitor, type "Start". Then the RS232 will be disconnected internally from the monitor functionality.

For factory purposes iMAR may have a user installed.

(account_name = imar, password = imar)

If no RS232 interface can be accessed, it is also possible to use the XIO4WINDOWS.exe software to setup a user account. For this use type

imon "user <account_name> <password> <password>"

in the command line.

If the account is set up, then the monitor interface can also be accessed by the UDP based software iMonLog. Connect with <account_name> and <password> and use RC5 encryption for 32 bit systems and MD5 for 16 bit systems. With CTRL E the monitor command line appears.

If you (customer / user) build up access via a network access to the INS, it is recommended to use the

user = guest

password = (blank)

because under this account some features are not activated which could be used to modify the INS in a way that it will not operate any more in the specified manner. Please also note that new files (updates) are only allowed to be copied into the UPD folder (the INS checks the data plausibility with next power on).

Using the DHCP features of the INS (requires DHCP support from your network / notebook) you can connect easily to the INS file system (e.g. for backup or updates) if you select on your notebook (Windows operating system assumed) "Network environment". Then open the window "Search for a computer" and type the logical name of the INS (xxxx_yyy i.e. for instance 0144 for SYS144-1 or 0144_002 for SYS144-2) or the IP address. Then the access to the file system of the INS will appear and you see the INS like this:

RTSMB Server (0144_002)

If you double-click on this device you will see the logical drives of the INS.

If you know the current IP address of your INS (see chapter 1.2), you can also search with the IP address for the INS in your network

With the Windows Internet Explorer or an FTP communication software also a connection to the INS file system can also be established typing

Kommentar [vH1]: Verborgen: iMAR Factory Set User

ftp://192.168.1.199

user: guest

password: <none>

if no DHCP server is active and if the factory settings of the INS are not changed so far (otherwise please use the IP address actually set on the INS). Then you have also access to the INS file system for backup or update purposes.

But it is deeply recommended to open a network connection via the "Windows Network Configuration" which typically is found on your desktop (press right mouse key and select "Search Computer").

1.3 What is the current IP address in the network?

With the iMAR UDP Monitor program iMonLog.exe a connection can also built up via UDP (Ethernet). You can also check the IP address of the INS with this program (all INS currently being available on the network are shown). For this use the selection box "List all Servers".

The logical name of an INS is typically the serial number:

SYS0135-001 has the DHCP name 0135_001), the system SYS0148-002 has the name 0148_002, the system SYS0148-003 has the name 0148_003 etc.

1.4 Where I have to copy my update files to?

New files (updates) are only allowed to be copied into the UPD folder (the INS checks the data plausibility with next power on). It is not allowed to copy them into the C drive. If you want to download all system files, please make a backup from the c drive.

Files to be copied into the UPD folder shall fulfill the following attribute requirements:

- no srite protection set
- archive flag set
- system flag not set

If the attributes are set wrong, you can delete the file and copying it again or you can login with the iMonLog software and change the file attributes (see manual of iMonLog).

2.1 Implementation of new software via Ethernet / FTP

The execution file on the INS has the extension *.RTB (real-time binary file).

First connect with the iMAR software iMonLog.exe via Ethernet and start the system with power on. use the manual for iMonLog to build up the connection.

To implement a new *.RTB file on the INS, copy the new file with the Explorer (see above) on the UPD disk of the INS, wait at least 20 seconds and perform a power-off / power-on. [1]

Internally the operating system of the INS creates a so-called *.RTA file from the *.RTB file and from this the final *.RT0 file is created (the *.RT0 is the "executable" where the *.RTA is not used further more and can be deleted). The INS automatically renames the old *.RT0 to *.RT1, the old *.RT1 to *.RT2..., so always the last versions are available on the disk as an backup.

In short words:

a) rename the executable you want to install from *.RTx (x = 0...4) into *.RTB
b) copy the *.RTB file on the c:\upd folder of the INS
c) wait for at least 20 seconds until all files are closed
d) reboot the system

Now the software is installed as *.RT0 and the old software has been shifted to *.RT1

If you have to implement a file directly in the root directory of the IMS, then copy this file first to the UPD directory and then start the monitor (iMonLog, Ctrl-e) and send a "copy2 command to copy the file from UPD to the root folder.

2.1.1 If you have two different applications on your IMS...

... you will find two RT0 files on the flash drive c: of your system, e.g. iNAV.RT0 and iRLG.RT0. Build up a connection with the Monitor interface using iMonLog.exe via TCP/IP or iMonTerm.exe via RS232 and send the command

copy c:*.RT0 c:*.RTB (e.g. * = iNAV)

BOOTCODE <*.RTB>

to the system, where <*.RTB> is the file you want to be the new executable. Afterwards send an

reboot

or perform a power-off / power-on (not before 30 seconds have been left after the bootcode command has been send). Now the system is starting the selected application automatically after power-on.

[1] Only for elder systems (typically < 10/2002 without newer update):
Copy the RTB file on disk C of the INS and then execute the command
BootCode C:\xxx.RTB (xxx is the name of the file)
Then send the REBOOT command via RS232 (iMonTerm).

2.2 Implementation of new software via RS232

The upload of new software to the INS is most comfortable using the Ethernet link. But if the Ethernet link is not available for any reason, also an upload via RS232 is possible.

Assume you have received a ZIP file containing some software update. The archive may include the following items:

iMonterm.exe:	This is the program needed to update the software on the measurement system via RS232 (see also description above).
zzz.RTB :	e.g. is the new software for the measurement system.
www.PAR :	e.g. a configuration file for the measurement system.

The following are the instructions to install the software on the measurement system via RS232. It is assumed that your notebook is connected to those RS232 interface of the INS which supports the Monitor features (this is defined in the file iNAV.PAR on the INS file system).

First connect your notebook with the INS via a cross-over cable (pinning of the cable is 2=>3, 3=>2, 5=>5). Start the iMonTerm.Exe program on your notebook. It will ask you on which COM port of your notebook the measurement system is connected. After pressing OK and choosing 115.2 kBd transmitting rate, you will see a terminal window. Now start the measurement system (it is important to start the system after you have connected the iMonTerm program). After some time you will see a welcome message and then a command prompt (>) in the iMonterm window. Now press

Ctrl + D

on your keyboard (control key and than the D key). You will get a menu from which you choose 'Upload'. This will lead you to a file selection dialog box, where you should select the zzz.RTB (or whatever is the name in your specific application). After pressing the “open” button, the file will be transmitted to the measurement system. This will take some time; you will see a progress bar during the transmission.

After the transmission is finished, repeat the procedure for the other files (press Ctrl + D and select the file in the dialog box, where you have to change the file filter from *.RTB to *.* to see all files).

After this is finished, go to the iMonTerm window and enter the following command at the command prompt (you have to press the RETURN key after the command)

dir a:*

You should now see all files being transferred to the INS with the corresponding file size (first number), e.g.:

388110 byte for zzz.RTB and 631 bytes for www.PAR.

Compare these file sizes with the file size on your notebook to be sure that the full file has been transmitted successfully.

Now you have to copy all files to drive C: of the INS with the following commands:

copy a:www.PAR C:\upd\www.PAR

copy a:zzz.RTB C:\upd\zzz.RTB

After this is done, verify that the files are successfully copied with the following command:

dir c:\upd*

You should see the files with the correct sizes.

Now close the iMonTerm program and restart the INS.

The execution file on the INS has the extension *.RTB (real-time binary file) which will be converted b ythe INS into the file *.RT0 which is finally executed.

3 Changing the Static IP Address of the INS via RS232

Download the file iMON.PAR from the INS file system using the Ethernet interface (see above description).

Change the line

```
StaticIpAddr = 192.168.1.199
```

in a way that it will fit your network requirements (i.e. on a free address in your subnet).

Connect your notebook via RS232 with the INS and start the iMonTerm software before switching on the INS (see the detailed description above).

Now type the command

```
ipaddr xxx.xxx.xxx.xxx 1.1.1.1
```

so the INS knows the new IP address (where `xxx.xxx.xxx.xxx` is the address you have inserted in the file iMON.PAR).

Now create a user account on the INS:

```
user imar imar imar
```

and send the command

```
exit 0
```

afterwards. The INS will reboot automatically.

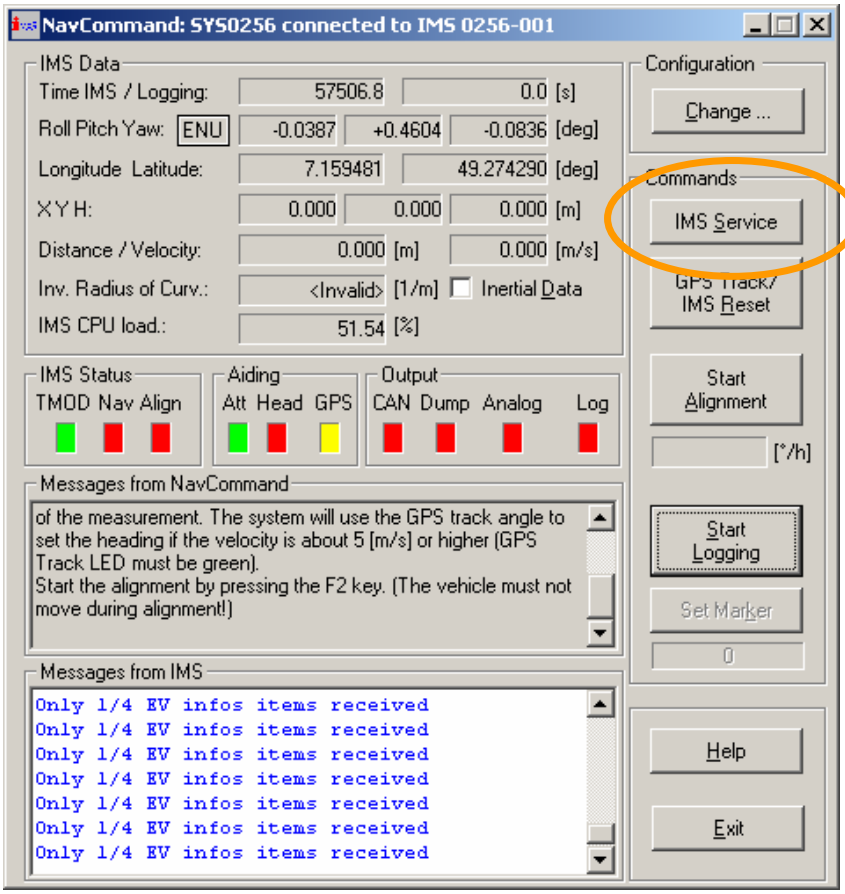
Now close the iMonTerm program and build up a connection via Ethernet (see chapter 1.2). For this use your new IP address `xxx.xxx.xxx.xxx` and the user “imar” and password “imar”. Copy the modified file iMON.PAR into the UPD folder of the INS, wait at least 20 seconds and perform a power down / power on of the INS.

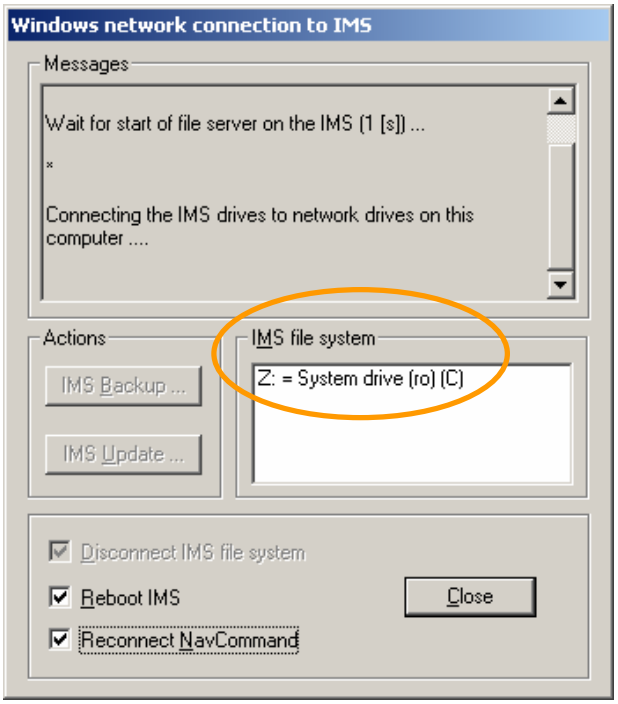
Now the INS is ready to communicate with the new IP address as its default IP address.

4 How to Download a DUMP File from the INS Flash Drive

If the creation of a DUMP file is initialised on the INS, the defined raw data are stored on the internal data flash drive. The DUMP file can be downloaded from the DMP folder on the INS. To download the file, an FTP access has to be made from the user's local Notebook to the INS (username: GUEST, password: <none>).

As an alternative the INS can be connected to the NavCommand software. Then open press the button "IMS Service" and make a double click on the DMP folder which is shown in the window:



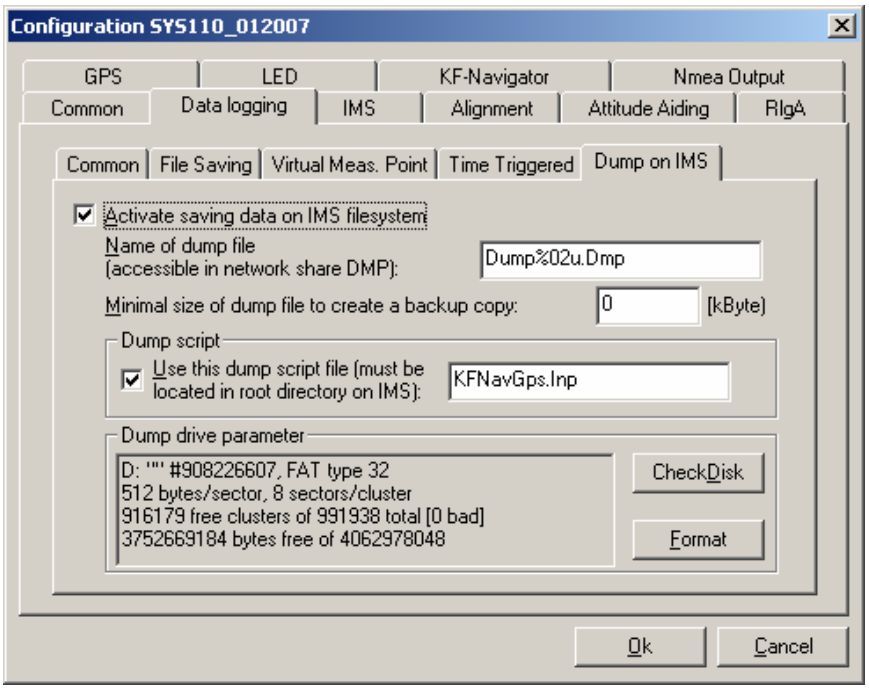


After the download the DUMP file has to be deleted. Don't switch the power off during any file operation.

Aftter those operation the file system shall be checked using the function provided by NavCommand. Go to:

"Configuration Change", "Edit", "Data Logging", "Dump on IMS" and select "CheckDisk".

If the flash disk had been corrupted (e.g. due to power loss during storage operation), use the "Format" button. In this case all data (not the system program) stored on the flash drive are lost.



5 Gloabl Parameter File Settings

iMON.PAR:

```
;
; C:\iMon.Par (example omly!!)
;

; Ethernet settings
UseDHCP          = true
UseTelnetSrv     = true
UseFTPServer     = true

StaticIPAddr     = 192.168.1.199
StaticGateway    = 192.168.1.1
StaticSubnetMask = 255.255.255.0


; COM settings
ComIrq  = 0, 0, 10, 11, 12
ComBase = 0, 0, 0x3E8, 0x2E8, 0x3A8


; iMAR Monitor settings
Verbose      = false
MonPort      = COM2 3 0x2F8       ; Port, IRQ and Address
TerminateCom = false              ; don't terminate monitor port
                                  ; COM2 when application is running


TcpIpNumPackets0 = 64             ; special settings for packet definition
TcpIpNumPackets1 = 64
TcpIpNumPackets2 = 64
TcpIpNumPackets3 = 64


; Application settings (if any)
EnablePegasus = true
```

iNAV.PAR:

```
;
; C:\iNav.Par  (example only !!)
;

EnaMonCommand = true
XIOBaud=115200                  ; Bd
```

```
AddPwrOnDelay = 1500            ; in ms (20...3000)
XioPort = COM1                  ; COM1, COM2 or NONE
startBIT = false                ; no initiated BIT (IBIT) of FMU
Rmm1612ExtTrigger = true        ; D/A card initialisation
Rmm1612BaseAddr = 0x200

;
; ============================
; Special settings for UDP and re-installation of closed ports:
; Spezialeinstellungen SYS200-001 BEWAG

XioNoNagleAlg = true
XioNoDelAckn = true


; Number of attempts, to send XIO packets via a TCP-Socket
; allowed values : integer between 3 and 1000
; Default = 20
MaxTcpIpSendRetry = 50

; Timeout [ms] until a Tcp-Socket accepts data to be sent (select on
FD_WRITE)
; allowed values : integer between 2 and 200
;Default = 50
TcpIpSocketSelectTO = 50

; both values given above define the time until a XIO channel will be
closed via TCP if it is not ready to send


; Timeout [ms] until a UPD-Socket accepts data to be sent
; allowed values : integer between 2 and 500
; Default = 100
TcpIpSocketSelectTO = 100


; number of packet buffers being available in the global XIO Pool
; allowed values : integer between 128 and 1024 * 64   (shall be 2^x)
; Default = 4 * 1024

MaxXioPoolNum = 65536
```

GARMIN.INP:

```
$PGRMO,,2
$PGRMC,3,,100,,,,,A,5,0,2,4,1
$PGRMO,GPGGA,1
$PGRMO,GPVTG,1
$PGRMO,PGRME,1
$PGRMV,1
$PGRMI,,,,,,,R
```

DATA.PIO:

```
; demo for PIO - Output
TMOD format %+08.3lf float      ; output of UTC time (requires GPS)
NRPY format %+08.3lf float      ; output of roll/pitch/yaw
OMGS format %+08.3lf float      ; output of angular rate
ACCS format %+08.3lf float      ; output of acceleration (gravity
                                  compensated)
```

AutoCommand File:

(automatic script file execution)

Example 1:

```
; XIO command script for ground alignment

; disable iNav32 navigation algorithm
CalcMd 0 0
CalcMd 1 0
CalcMd 2 0
CalcMd 3 1

; disable automatic log activation
LgAct 0 0 0.0

; query sample freq for postprocessing
*Delay 20000
GetPar FA

; set time in external values and signals to TINTRPL for synchronisation of IMU and GPS
XTime TINTRPL
STime TINTRPL

; start logging of external values
*Delay 50000
; AutoX 0 1    ; GPS position
; AutoX 1 1    ; GPS velocity
; AutoX 5 1    ; Utc seconds of day

; to set the start value of the iNav32 navigator, enable the KF for a short time
KfNE 20
*Delay 10000
KfNE 0

; static alignment to determine roll and pitch
Alignm 120

; wait for end of static alignment
*Delay 125000

; save result of static alignment
; GetDat NRPY
; GetDat NLLH
; GetDat NVEL
; *Delay 1000

; start logging of inertial data
; Log 0 2000 TINTRPL TIME IACC IOMG
; Log 0 10 TINTRPL NRPY NLLH NVEL

; start logging of the KF state and state deviation
; Log 0 10 TINTRPL KFZ KFS
; Log 0 10 TINTRPL KFRPY KFLLH KFVEL KFABIAS KFGBIAS
; *Trigger

; start KF with ZUPT (ZUPT will be terminated by the 169 module of the IMS software)
KfNE 3         ; start ZUPT
```

```
KfNE 26         ; disable LLH aiding
KfNE 28         ; disable GPSVel aiding
KfNE 36         ; disable position update in KF during alignment
KfNE 40
KfNE 17         ; disable iNav32 Error compensation
KfNE 20

*Delay 905000
KfNE 4          ; stop ZUPT
KfNE 25         ; enable LLH aiding
KfNE 27         ; enable GPSVel aiding
KfNE 35         ; enable position update in KF during alignment
KfNE 16         ; enable iNav32 Error compensation

; enable iNav32 navigation algorithm
CalcMd 0 1
CalcMd 1 1
CalcMd 2 1
```