GMS-xx
GSR-IAx
User Manual

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19.02.2008 V0i	Updated after new firmware
20.10.2008 V0k	Updated after new firmware
27.10.2008 V1	Updated for latest firmware and hardware
11.03.2009 V2	Change of Address
06.08.2009 V3	Update to V3
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08.11.2010 V7	Minor corrections
17.01.2011 V8	Corrections related to the new features of the FW version 0.71

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Table of Contents

List of Figures

Applicability of This Manual

GMS Instruments are constantly being improved. Although the manual you receive along with your instrument corresponds to the actual software versions, you are advised to check the GeoSIG web page periodically for the most recent version of this document, and especially after performing any software upgrades. This manual is based on the following software and firmware versions:

Component	Description	Required version or higher
GeoDAS	Data Acquisition and Analysis Software on the computer	2.21
Newdas	Data Acquisition software of the instrument	20.00.71
RTC	Real time clock	80.00.19
DSP	Signal processor	50.01.03
Bootloader	Bootloader	1.19
uCLinux	Operating System	0.26

Warnings and Safety

STATIC ELECTRICITY
The instrument and if available, its sensor unit contains CMOS devices and when serviced, care must be taken to prevent damage due to static electricity. This is very important to ensure long-term reliability of the unit. Such risk exists when both the instrument cover and the front panel are removed.

INSIDE THE INSTRUMENT (MAINTENANCE)
When it is desired to fully restrict the access to the unit so that even its cover cannot be removed, lockers can be mounted in the middle of the handles, on the side of the instrument.
Under normal circumstances, there is no need to remove the front panel of the instrument.
In any case, only trained person should remove the front panel. Moreover untrained access may lead to serious damage to the instrument, as well as may void the warranty.
Before removing the front panel:

1. ***Turn the unit off***
2. ***Disconnect all cables connected to the unit***
3. ***Disconnect the battery***
4. ***Make sure that all LED indicators are OFF***

BATTERY LIFE
The instrument is shipped with an internal battery. Do not forget to connect the battery when you install the unit; the battery is provided with a polarised connector to avoid any wrong connections.
In order to prevent data loss, you should be aware of the replacement policy of the battery before its expected lifetime expires. Battery expected life times under normal conditions is:

Main battery	***Fiamm-FG29722, 12V 7.2Ah or similar type of battery***	***3 years***

The lifetime of the main battery can drastically change depending on operating conditions. Strong discharge of the main battery must be avoided. During normal operation, power comes from the external charger and charges the battery.

The housing provides no protection against explosive atmosphere. It must not be directly operated in area where explosive gases could be present.

Symbols and Abbreviations

ADC	Analog to Digital Converter
CF	Compact Flash, memory card using Flash memory
Bootloader	First program executed when unit starts
Compact Flash	See CF
ColdFire	Main processor
DSP	Digital Signal Processor in charge of controlling the ADCs
Flash	Program storage memory device. It contains the Linux file system in Read Only mode and some block areas under direct control of main program or bootloader.
GPS	Global Positioning System
LAN	Local Area Network, a simple branch of private network using private IP address. It could have or not have access to Internet (WAN).
NTP	Network Time Protocol
PPS	Pulse Per Second
RAM	Random Access Memory
RTC	Real Time Clock
SPS	Samples Per Second
SSH	Secure Shell
SSID	Service Set IDentifier, This is the identifier name of a wireless network.
STP	Shielded Twisted Pair
UTP	Unshielded Twisted Pair
VPN	Virtual Private Network
WAN	Wide Area Network, it is a network connection established between 2 LAN or a LAN and a server over the internet (usual case) or through a rented link.
WPA	WiFi Protected Access. It is a secure specification that allows users to access information instantly via wireless link. It is a more modern and secure link than the WEP type.
WEP	Wired Equivalent Privacy

1. Introduction

Dear Valued GeoSIG Customer, thank you for purchasing this product.

These Instruments have been optimised to meet the requirements of the majority of customers out of the box and may have even been delivered tailored to your needs. In any case, to be able to get the most out of our product, please carefully study this manual, its appendices and referenced manuals, as well as any other documents delivered with it.
This is a reliable and easy to use device, and at the same time a sophisticated product, which requires care, attention and know-how in configuring, installing, operating and maintenance.

GeoSIG continuously improves and enhances capabilities of all products. There may be several other connectivity, hardware or software options for the instrument, which are not covered in this manual. Refer to separate documentation from GeoSIG about available options or ask GeoSIG directly.

This document is made for use in direct connection with the instrument during installation, start-up and servicing of the unit.

2. Incoming Inspection

All instruments are carefully inspected both electrically and mechanically before they leave the factory. Please check if all received items correspond with the packing list and your order confirmation. In case of discrepancy please contact GeoSIG or your local representative immediately.

2.1. Damage during shipment

If requested at the time of order, all instruments can be insured prior to shipment. If you receive a damaged shipment and shipping insurance was previously arranged you should:

- Report the damage to your shipper immediately
- Inform GeoSIG or your local representative immediately
- Keep all packaging and shipping documents

☞ ***Insurance claims may be void if the above procedure is not followed.***

2.2. Warranty

GeoSIG Ltd (hereafter GeoSIG) warrants hardware and software products against defects in materials, workmanship and design for the defined period in the relevant contract or offer, starting from date of shipment and 5 years parts and maintenance support commitment. If GeoSIG receives notice of such defects during the warranty period, GeoSIG shall at its option either repair (at factory) or replace free of charge hardware and software products that prove to be defective. If GeoSIG is unable, within a reasonable time to repair or replace any cabinet to a condition as warranted, buyer shall be entitled to a refund of the purchase price upon return of the cabinet to GeoSIG. 50% of freight charges on shipments of warranty repairs or replacements will be borne by GeoSIG (normally one way freight).

2.2.1. Limitation of Warranty

The foregoing guarantee shall not apply to defects resulting from:

- Improper or inadequate maintenance by buyer
- Buyer supplied software or interfacing
- Unauthorised modification or misuse
- Operation and storage outside of the environmental specifications of the instrument
- Related to consumables or batteries
- Improper preparation and installation at site.

2.3. Storage (Instrument Shelf Life)

In case the instrument is stored, the batteries have to be maintained according to the storage duration.

Period of time	External power supply	Instrument is operating	Main battery	Real Time Clock backup battery
< 1 month	ON	YES	Connected	Connected
	ON	NO	Connected	Connected
	OFF	NO	Connected	Connected
1 – 3 months	ON	YES	Connected	Connected
	ON	NO	Connected	Connected
	OFF	NO	**Disconnected**	Connected
3 – 6 months	ON	YES	Connected	Connected
	ON	NO	Connected	**Disconnected**
	OFF	NO	**Disconnected**	**Disconnected**

More than 6 months	ON	YES	Connected	Connected
	ON	NO	Connected	**Disconnected**
	OFF	NO	**Disconnected, must be recharged every 6 months for at least 24 hours.**	**Disconnected**

Table 1, Storage instruction

Removing or replacing the backup battery must be done by a trained person only. Therefore if the instrument is stored for more than 3 month, always have it connected to power and let it running.

2.3.1. Main battery

If the instrument is connected to AC power through its power supply module, the main battery can remain in the unit; it will remain charged and ready for use.

Current leakage on main battery when unit is off, without external supply is about 40 µA.

2.3.2. Backup battery

Autonomy of Real Time Clock on its backup battery is 3 years typical at ambient temperature. The jumper JMP401 on the main board has to be put in position 2-3 to disconnect this backup battery. This must be done by a trained person only.

3. Description

3.1. Housing

The instrument is a housing mounted with a base plate. The base plate is fixed on ground and levelled one time during installation, then the instrument can be replaced with no need for levelling.

Figure 1, Instrument housing[1]

3.1.1. Base plate

A base plate is supplied with the instrument for fixation and levelling of instrument on site. 3 levelling feet are provided to adjust horizontally the base plate. The fixation is done as a single point in the middle of the plate.

To insure correct orientation when an instrument is installed on the plate, 2 pins are provided with the plate. They can be mounted in different position, according to the orientation required and will fit in the 2 holes existing in the base of the instrument.

A connection point for earthing is also provided with the plate as a M6 thread.

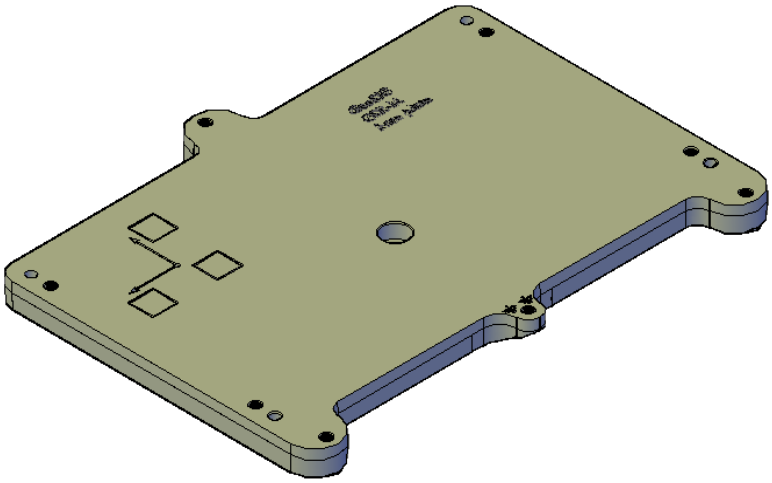


Figure 2, Instrument base plate

[1] Connectors may vary depending on ordered configuration

3.2. Connectors

The instrument has up to nine connectors and two antenna plugs:

Figure 3. Instrument with all connectors. Antennas are not mounted[2]

3.2.1. Standard External Connectors

These connectors well be always assembled:

POWER	Connection to the power supply module of the instrument or to an external battery.
LAN	Connection with Ethernet cable to a LAN. The cable connection is dominant other the Wifi link. As soon as the cable connector is plugged in the instrument LAN socket, the Wifi module will be turned off, even if the RJ45 connector at the end of the cable is not plugged into any socket.
SERIAL	Connection to the console or for the serial data stream output, depending on the cable type. Optionally also the GPRS modem can be connected to this port.
GPS	For connection to a GPS receiver.

3.2.2. Optional External Connectors

These connectors depend on the ordered options:

SENSOR1	Connection to an external sensor.
SENSOR2	Connection to a second external sensor in case of a six channel instrument with two external sensors.

[2] Connectors may vary depending on ordered configuration

INTERCON	Connection to the interconnection network allowing common time and common triggering.
MODEM	Connection to T+T line for the internal analog modem.
ALARM	Contacts of the internal alarm relays
Wifi	Antenna connector for the wireless Internet
WiSync	Antenna connector for 433 MHz synchronisation, allowing time synchronisation of several instruments wirelessly.

3.2.3. Connectivity Options

A large variety of options can be connected to the instrument. The following figure should give an overview of the main possibilities. Ask GeoSIG for details about any specific connectivity options.

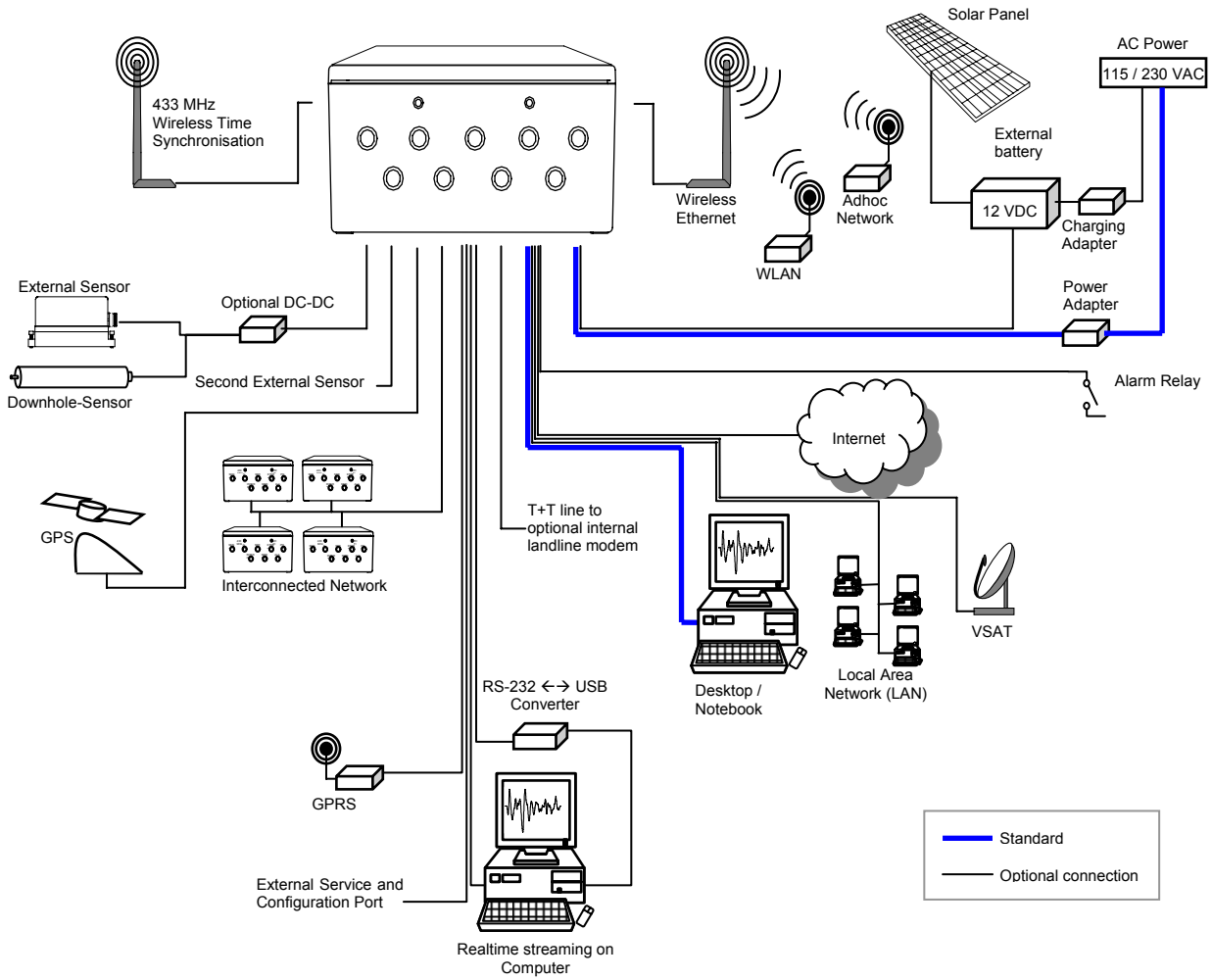


Figure 4. Connectivity Options

3.2.4. Internal Connector

The instrument is equipped with an internal RS-232 connector giving access to the console. A standard RS-232 extension cable (straight, female-male) can be used to connect to a computer

Figure 5. Internal RS-232 connector for the console

3.3. Visual Indicators

Several visual indicators (LED's) show the status of the instrument.

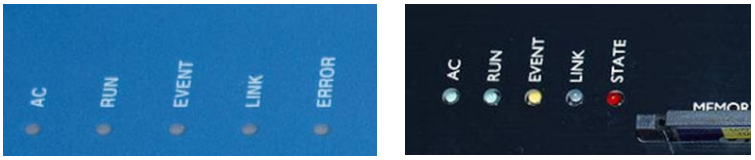


Figure 6. Visual indicators on the cover (left) and inside the instrument (right)

Indicators for left to right:

Color	Indication	States
GREEN	**AC** indicator	When ON, the external power supply is present
GREEN	**RUN** indicator	**OFF**: the unit is off **Blinking 20% ON, 80% OFF at 2 sec period**: The instrument is starting up or the newdas has been stopped, data acquisition is not running **Blinking 20% ON, 80% OFF at 1 sec period**: Normal operation of the instrument, data acquisition is running **Blinking 80% ON, 20% OFF at 2 sec period**: Instrument is shutting down, data acquisition is not running and the instrument will be powered down soon
YELLOW	**EVENT** indicator	**OFF**: Unit is not recording and no events are on the CF card **Blinking**: Indicates the amount of memory used on the CF card (<25%, >25%, >50%, >75%) **ON**: The unit is recording
BLUE	**LINK** indicator	**OFF:** Link with the data server is established, no communication ongoing **Blinking at 1 sec period**: Problem with the link to the data server **ON**: Link with the data server is established, communication or data transfer ongoing
RED	**ERROR / STATE** indicator	**OFF**: No problem or warning **Blinking at 2 sec period**: Warning is present **Blinking 1 sec period**: Error is present **ON**: Data acquisition is not running, e.g. during start up

Table 2, Indicators Description

3.3.1. Detail Description

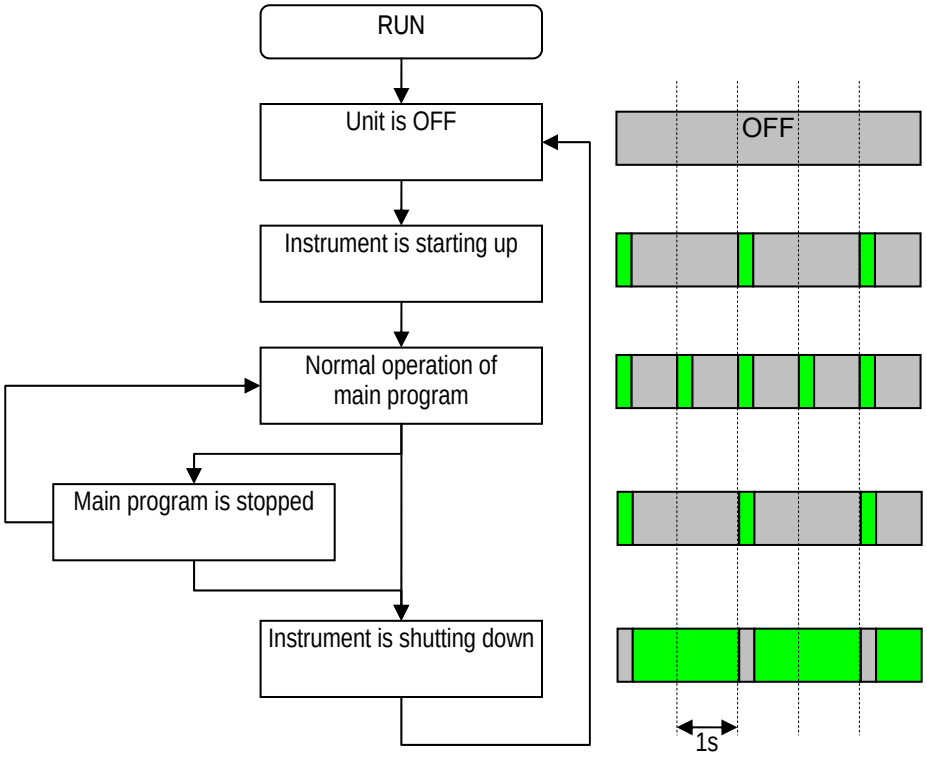


Figure 7, RUN indicator

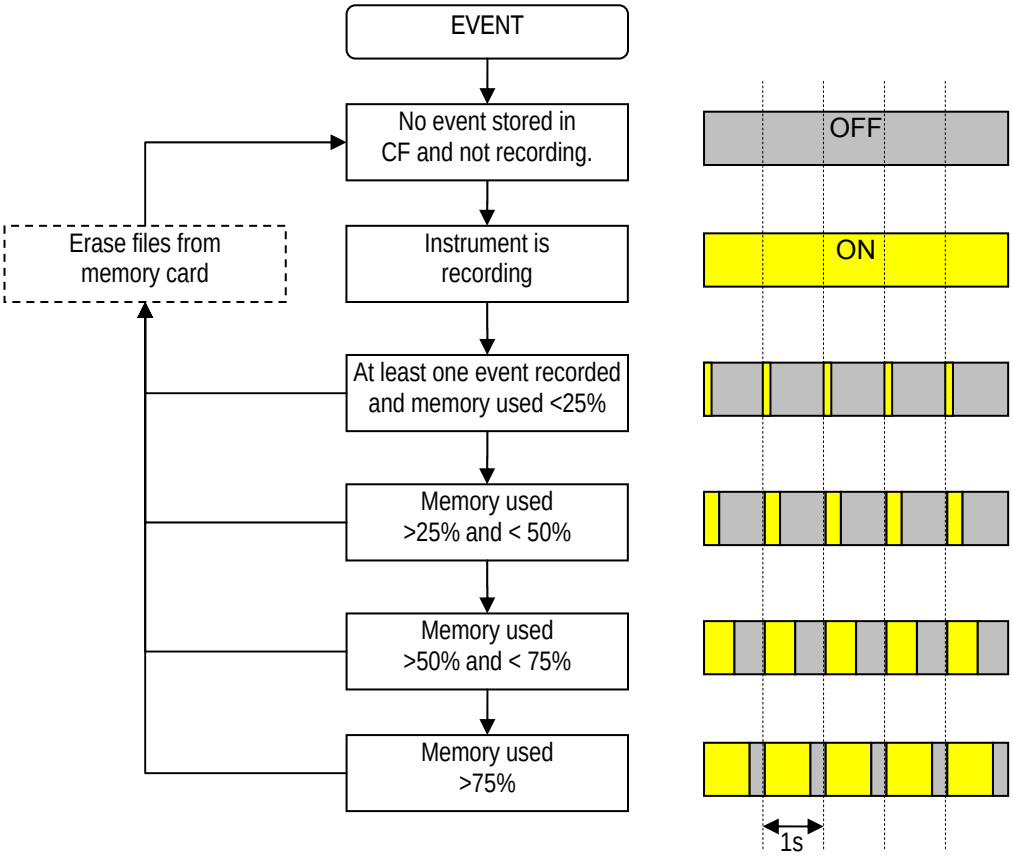


Figure 8, EVENT indicator

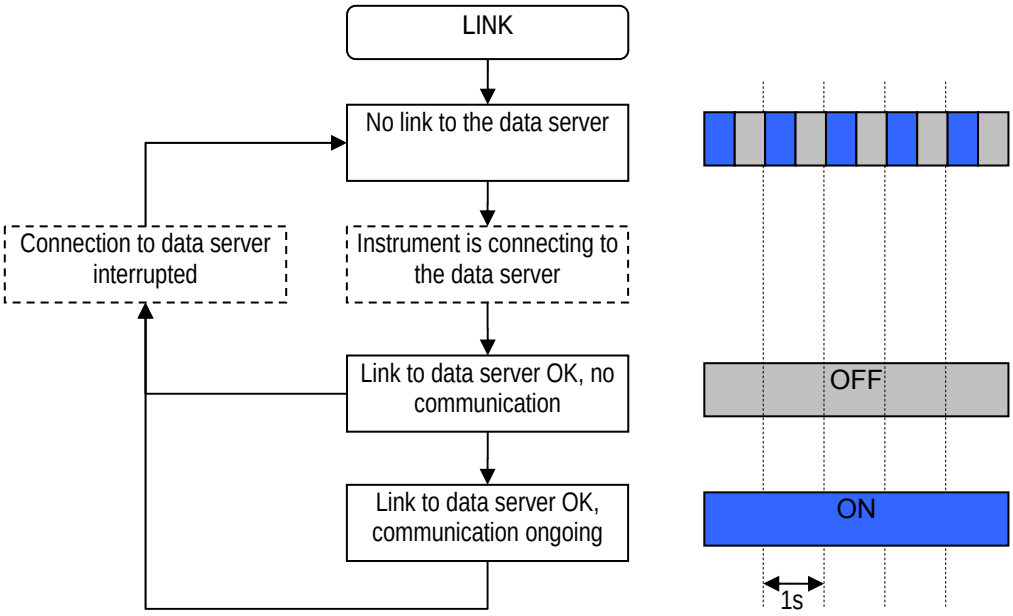


Figure 9, LINK indicator

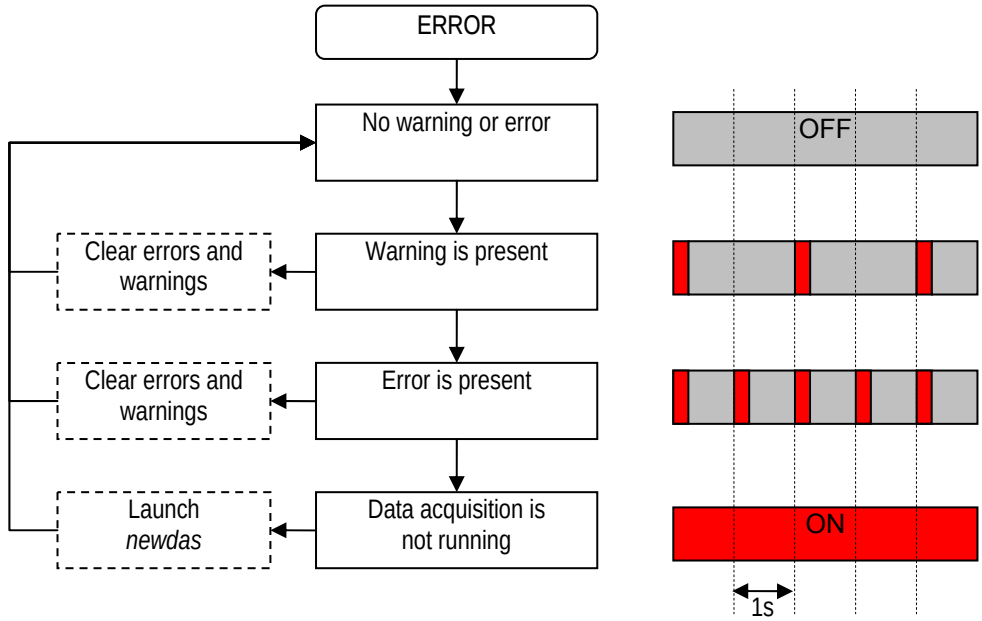
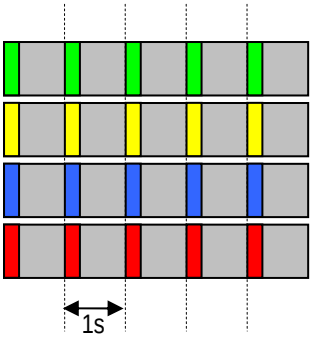


Figure 10, ERROR indicator

File Checkup



At startup, three LEDs (yellow, blue and red) may flash synchronously for some while, which indicates that firmware is performing the full check of all files stored on the compact flash card. The process may take long if there are many files collected.

Figure 11, File Checkup

3.4. Internal Batteries

3.4.1. Main Battery

The battery is used in the instrument to power it in case of external power loss. If the external power is not restored when the battery reach a low level, the unit will switch off by itself to avoid deep discharge of the battery. This protects the battery against capacity reduction or destruction occurring usually in case of deep discharge for such battery type. It has the following specifications:

Description	Specification
Nominal Voltage	12 V
Capacity	7 Ah
Length	153 mm
Width	66 mm
Height	96 mm
Overall height	102 mm
Weight	2.65 kg
Connection	Faston 6.3

Table 3, Main battery specification

The following models have been checked to be compatible with the instrument:

Supplier	Model
Yuasa	NP7-12D
FIAM	FG29722
Panasonic	VRLA_LC-R127R2P

Table 4, Main battery models

3.4.2. Backup battery

The backup battery is used to maintain time in the instrument when it is powered off. It requires the following specifications:

Description	Specification
Nominal Voltage	3 V
Capacity	285 mAh
Cell diameter	24.5 mm
Cell height	3 mm
Weight	4.1 g

Table 5. Main battery specification

The following models have been checked to be compatible with the instrument:

Supplier	Model
RENATA	CR2430 MFR
DURACELL	CR2430

Table 6. Backup battery models

3.5. Power supply

- The main power is provided to the instrument from an AC/DC power module providing 15 VDC at 1 A. The AC entry is compatible with 110 / 60 Hz or 230 / 50 Hz network without any adjustment. The block has a C13 connector and can use any standard power cord with such connector. The power module and the power cord supplied as are both UL approved. The power module must be connected to mains with a 3-wire power cable providing *Phase*, *Neutral* and *Protection Earth*.

Optionally the instrument can be build to have a 9 to 36 VDC power input range. This option must be specified at order time.

3.6. Supplied and Optional Accessories

3.6.1. Standard Supplied Accessories

The following parts will be included in a shipment additional to the instrument:

- External **power supply** module, 100 to 230 VAC / 50-60 Hz, UL approved.
- **AC Power cable**, depending on the shipping address with European, US or Swiss power plug
- **Fixation base** with levelling feet
- **Ethernet cable**, category 5 cable for 10/100 MBit network with a suitable connector for the instrument, 5 meters of cable and a standard RJ45 connector. Other cables lengths are available by request.
- **Console cable** for use on the internal RS-232 connector

3.6.2. Optional Accessories

The following parts can be ordered additionally and will be added if specified at order time:

- **GPS** time code receiver with 20 meters cable, other cable length on request. GPS is an option as the time can also be synchronised through the network using NTP.
- **Console cable** for use on the external SERIAL connector.
- **Data stream cable** for use on the external SERIAL connector.
- **CF to PC-CARD** (PCMCIA) adapter for reading the memory card on a laptop.
- **CF card reader for USB** for reading the memory card on a computer or laptop.
- Any **spare connectors**
- Any **spare antennas**
- Spare **battery**

4. Installation

This section lists the procedures involved in installation of the Instrument. The procedures will be outlined as steps to be performed in the field or in house prior to deploying the instrument in the field.

4.1. Site Selection

4.1.1. Environmental Considerations

The choice of an installation site for a seismic event recorder is similar in most respects to that of a regular continuous recording seismic station.

Although the instrument is housed in a solid, weatherproof case, it should be installed in a place free from direct sunlight, precipitation, the danger of falling materials in the event of a severe earthquake and the risk of tampering or vandalism if the unit is to be left unattended.

There are also special considerations for event recorder installations. It is important to select the site and set the trigger level to avoid unwanted data recording, such as vibration from machinery, highway traffic, aircraft, waves, etc. It is wise to check the instrument frequently during the first several days of operation after each set-up, to see if there are previously unsuspected sources of noise which are triggering the instrument and using up the memory.

In addition, the user should select a site with a provision for 115 / 230 VAC power if the unit will be left in place for a long period of time (more than 26 hours). Although this is not necessary for the operation of the device, it does preclude concerns about battery charging.

You should make note at this point of any cultural or environmental sources of noise and vibration around the selected site, which may cause false triggers of the recording mechanism. These will have to be considered when setting the trigger parameters.

4.1.2. Power Supply Considerations

The Instrument may be powered from a 115 / 230 VAC supply through the external AC/DC converter, from the internal battery, or optionally from a 12 VDC external supply such as an automotive battery or solar panels. It can also be powered from an external DC power supply from 9 to 36 VDC (this is optional and must be specified at order time).

- If the supply in the field will be from a 115 / 230 VAC supply, you need to connect the VAC cable from the external AC/DC to the power source only. The Instrument operates continuously, providing a trickle charge to the internal battery. The VAC supply must consist of Phase, Neutral and Protection Earth.
- If the supply in the field will be from a 9 to 36 VDC supply (optional), you need to connect the power cable from Instrument to the power source only. The Instrument operates continuously, providing a trickle charge to the internal battery.
- If the instrument is running from an external battery (optional), you need to connect the delivered battery cable from Instrument to the power source only. In this case there should be no internal battery installed. The external battery must be charged with an external battery charger.
- If the supply will be exclusively from the Instrument's internal battery, it is necessary to charge the battery sufficiently beforehand. Make sure to have at least 24 hours of uninterrupted charging prior to leaving the Instrument in the field. The configuration of the instrument, of course, may be performed while the charger is connected to the Instrument. The external AC/DC converter has to be plugged to 115 / 230 VAC for charging the internal battery.

The best approach to the deployment of the Instrument is to use the internal battery along with the VAC/VDC power at the remote site. It is highly recommended, to check and configure the Instrument for the correct time, trigger and other relevant settings in the lab, prior to the installation (see chapter 5). It may then be carried to the remote site (it should be switched *OFF* to conserve the internal battery) and then connected to the VAC power through the external AC/DC converter or directly to the VDC power supply. After turning the Instrument *ON* (see chapter 8.2), the instrument runs with the pre-configured parameters. This reduces the amount of time needed to configure in the field; an important consideration in the case of an adverse condition.

4.1.3. Communication Considerations

An Ethernet connection or Wifi signal must be present to have a sufficient data communication. If the Instrument uses an *NTP Server* as time source, please make sure that an internet connection is available and the network settings are properly set in the instrument. Optionally an external GPRS modem can be used for the connection to the internet. Use of NTP is not recommended when using a GPRS modem; a GPS should be used instead if possible.

If the Instrument is used as a standalone recording station, a notebook with an Ethernet connector can be used for downloading the data on a regularly basis. In a network the stations will upload the data to the configured server.

4.2. Installation

Many times the locations of seismic equipment are highly exposed to electrical disturbances caused by lightning or by the industrial environment. Although the instrument contains over voltage protection, it may sometimes be necessary to use additional surge protectors for the equipment. Contact GeoSIG or your local representative for more information.

4.2.1. Requirements for the Instrument Foundation

Minimum surface area requirements

- with internal sensor: 30 x 26 cm
- with external sensor (excluding area of sensor itself): 30 x 30 cm

Foundation has to be very well anchored or adhered preferably to a rock or concrete base. In case of a need for a foundation on soil, a concrete cubicle of 1 m^3 has to be cast in the ground to serve as a base.

4.2.2. Mounting the Instrument

The unit must be fixed rigidly on the building foundation, it has a base plate that must be first fixed on the ground and then the instrument mounted on it. For that purpose, the base plate has a central fixation hole (suitable for 8 mm screws) and three levelling screws. Prepare the base plate (see also Figure 12):

- Mount the 3 levelling screws ***(D)***.
- Check that the 4 M6 threads for the instrument fixation are free from dust.
- Mount the 2 polarization pins on the base plate on the side where the connectors will be ***(E/F)***.

Place the base plate at the selected location. Verify that the surface is sufficient flat and horizontal so that the three feet can level the plate. Be sure to leave enough space at the front of the Instrument for the connectors and for opening the cover. The sides of the instrument should typically not be closer than 100 mm (4“) from a wall. Mark on the ground the location of the central hole in the plate. Remove the base plate.

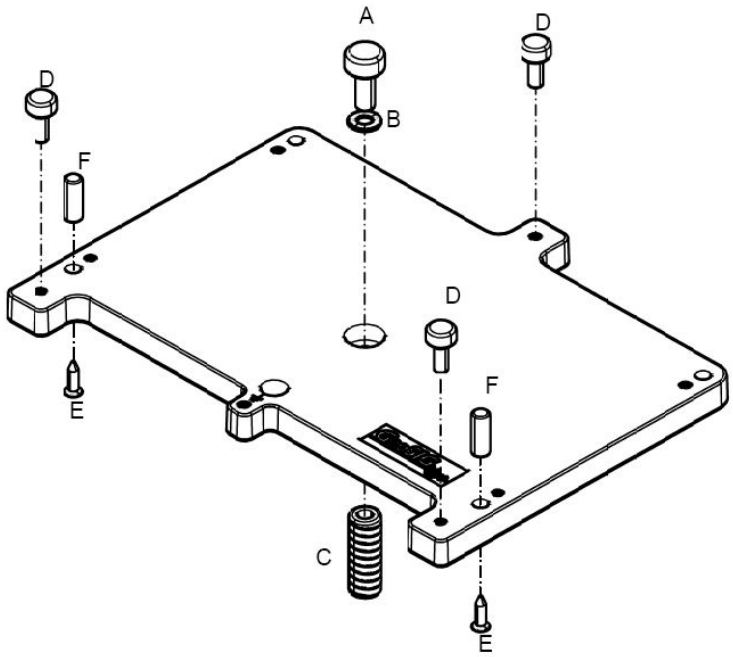


Figure 12. Installation of the base plate

Drill an 11 mm hole in the concrete with a typical depth of 50 mm for the supplied M8 concrete anchor ***(C)***. If another model is used, please adapt the hole dimensions accordingly. Clean the hole area of the dust. Insert the concrete anchor into the hole. Mount the plate in place and insert the M8 fixation screw ***(A/B)*** in its hole. Turn the plate so it is oriented according to requirement. Make a coarse levelling of the plate ***(D)***. Starts fixing the plate by tighten the M8 central screw ***(A)***. Check regularly the plate orientation and level till the plate is rigidly fixed ***(D)***. Remove the cover of the instrument and put it on the mounting plate using the 4 screws and washers to fix it. Keep care about the 2 orientation pins on the plate ***(E/F)***.

Do not overtighten the levelling screws.
Do not cause any short circuit on the battery poles or inside the unit.

4.2.3. Orientation, Levelling and Calibration of the Sensor

Check it is really fixed by pushing from all directions. If you feel any movement, recheck the fixation.

Internal Sensor: The sensor is located under the internal cover and as no setup is required for the sensor, there is no need to remove the internal cover. The levelling is done on the base plate and the sensor is already configured to operate with the recorder

External Sensor: Mount and level the sensor according to its manual and connect to the external sensor of the instrument.

4.2.4. Supply Voltage Selection

The instrument should be powered from 115 VAC up to 230 VAC, 50 or 60 Hz through the external AC/DC converter or any other option described in chapter 4.1.2.

4.2.5. Installing other Components, Options, Accessories

For installation of other components options or accessories please refer to the specified option manual.

4.3. First Start and Communication Setup

With the instrument correctly fixed on the ground through the fixation plate please proceed with chapter 5 for the first start-up and configuration.

5. Principle of Operation of the Instrument

This chapter gives an overview about the normal operation the instrument in a network or as a standalone unit.

5.1. Normal Operation

During normal operation the instruments are installed on sites and connected to a data server over Ethernet or Internet. The instrument check in a defined interval, if there are any requests or firmware updates ready for pick up on the server. Additionally – and if configured – the instruments uploads the ringbuffer files (from continuous recording) and the state of health files to the data server.

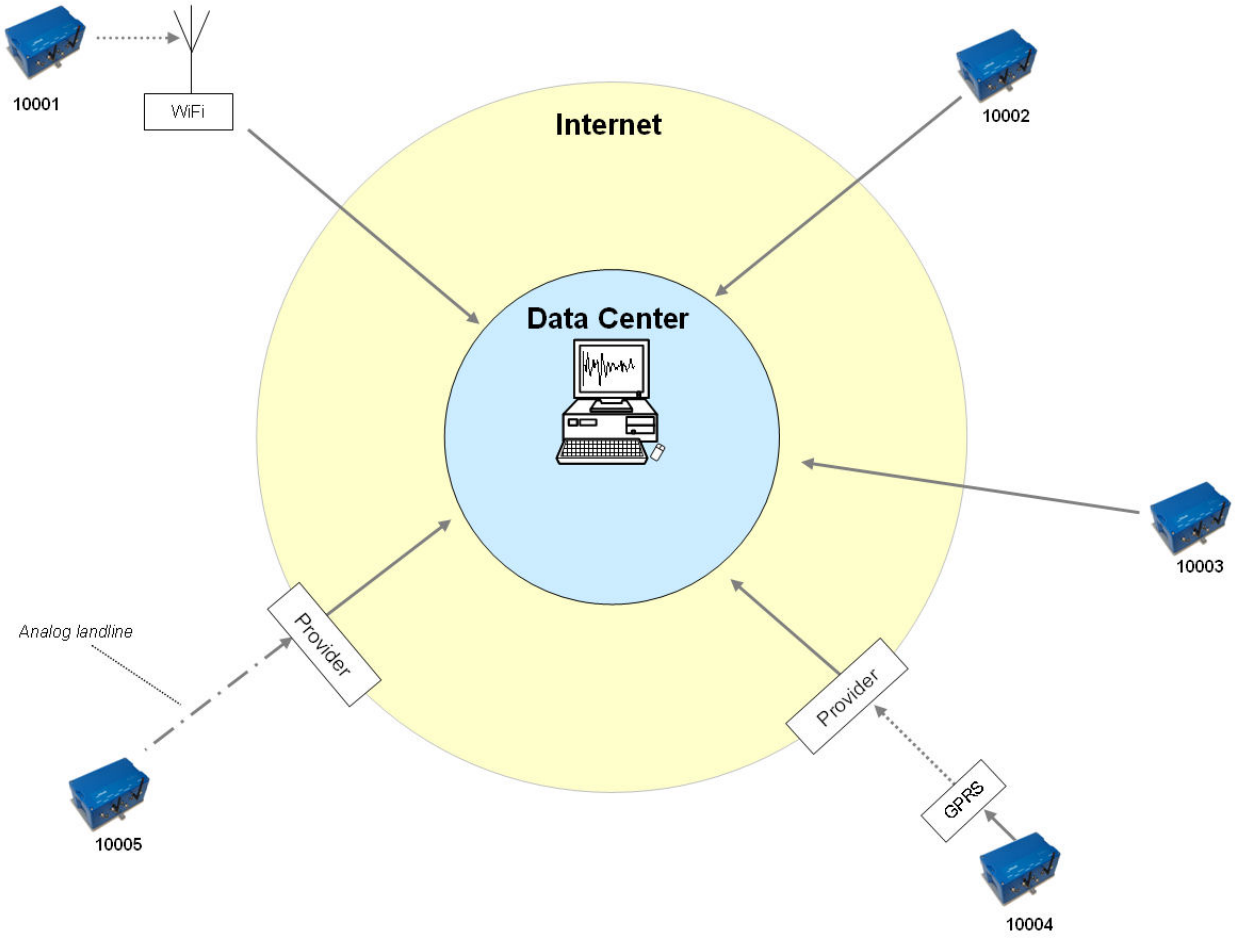


Figure 13. Normal operation in a network

5.2. Behaviour on a Seismic Event

In case there is an earthquake and the vibrations are above the trigger threshold, the instrument is recording the event and immediately uploading it to the data server (see Figure 14)

In case some of the stations are too far away from the epicentre to trigger, the data can still be collected from all instruments:

- A data request will be placed on the server
- All instruments will download the request during the next time checking the server (see Figure 15).

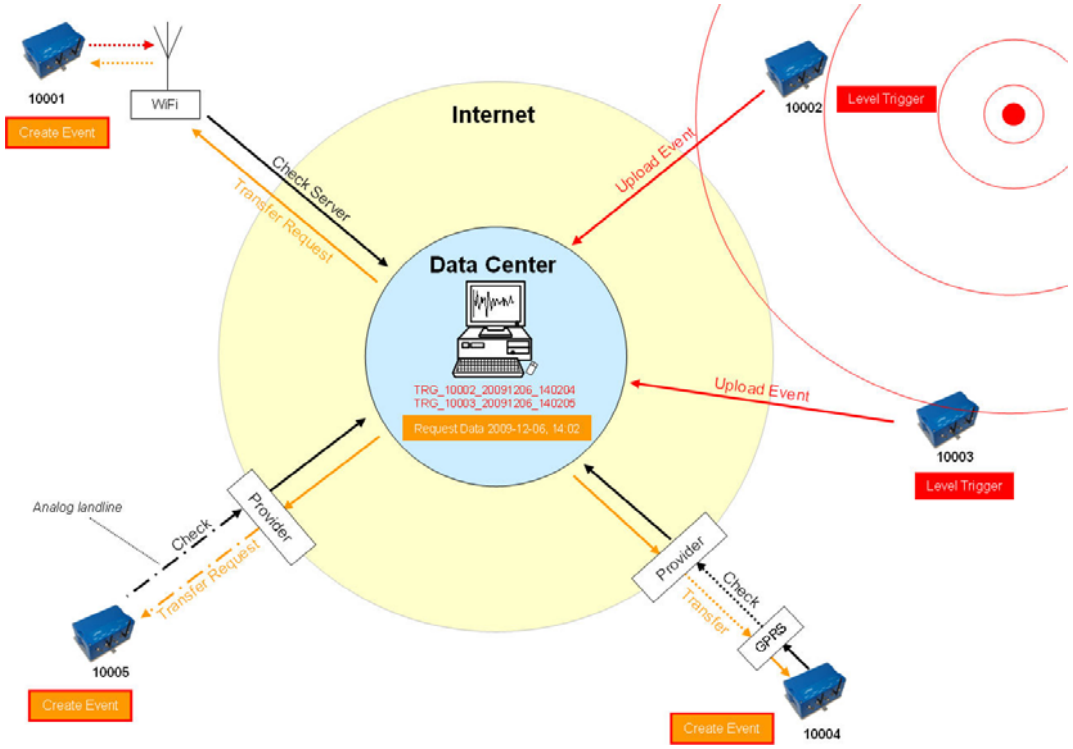


Figure 14. Upload of seismic events and download of requests from the server

- All instruments will create an event at the time listed inside the data request and extract these data out of the ringbuffer data
- The extracted event file will be uploaded to the data server (see Figure 15)

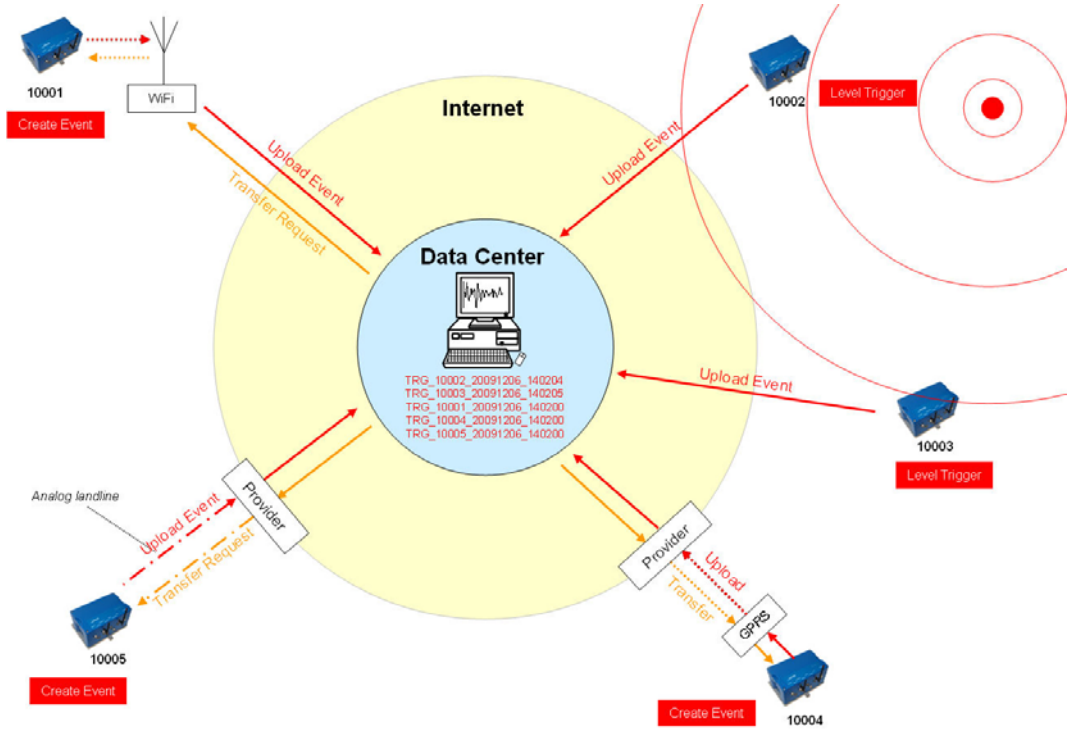


Figure 15. Behaviour on Events: Upload of extracted events

5.3. Firmware Upgrade

In case of a firmware upgrade, the new firmwares can be easily put on the server. All instruments will recognise the new firmware during the next server checkup, download and install it. See chapter 12 for details about the firmware upgrade.

The same happens also with new configurations.

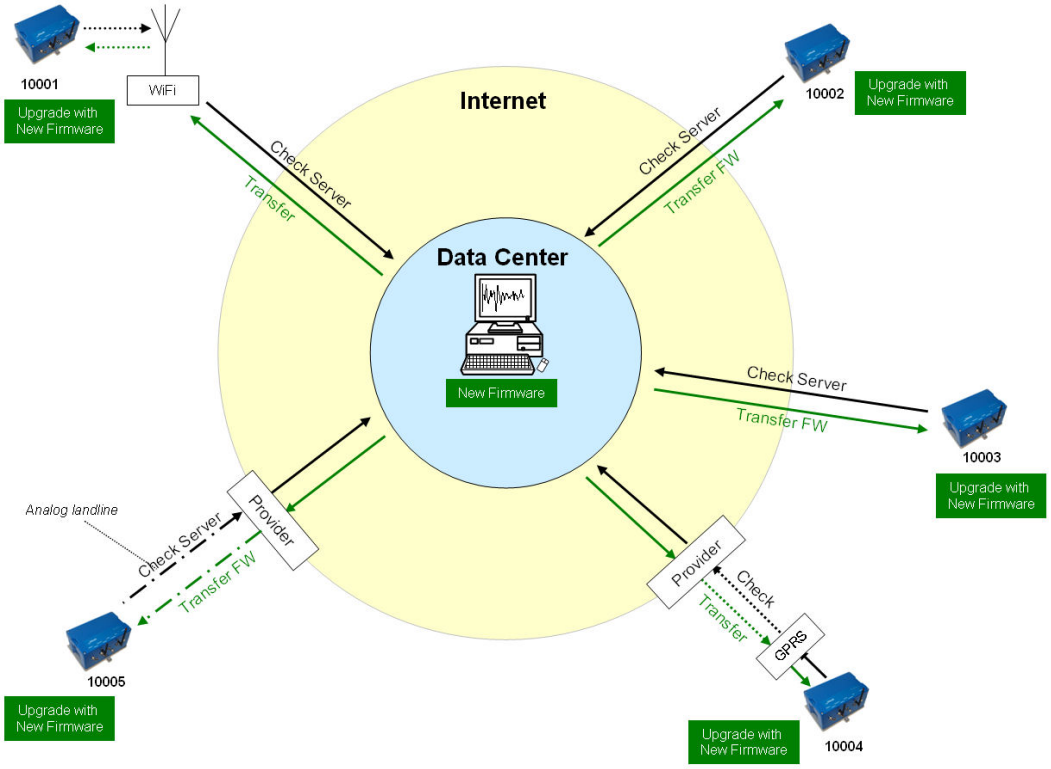


Figure 16. Firmware upgrade

5.4. Backup Server

It might be that the instrument is not able to contact the main data server anymore: Either because it is down or a wrong server has been configured, this can happen for example in case accidentally a configuration file with wrong server settings will be uploaded to an instrument. In this case the instrument will contact the backup server, configured in the bootloader. Therefore the configuration of the backup server is very important and should not be ignored. For more information how the set the backup server see chapter 6.2.

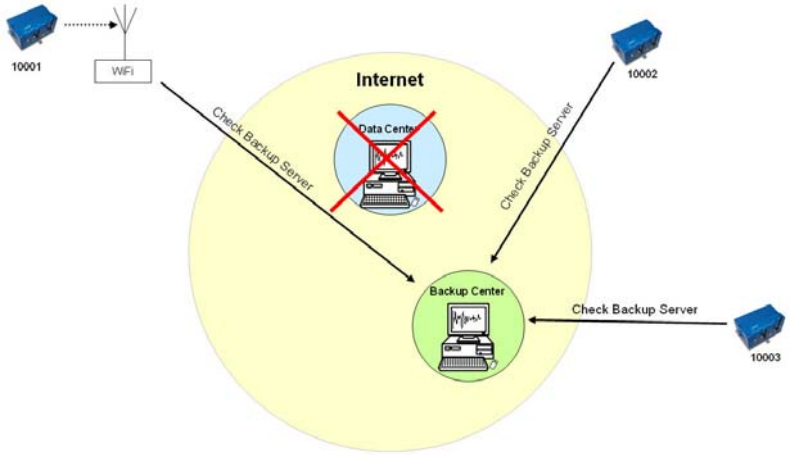


Figure 17. Connection to backup server in case connection to main server fails

6. Quick Start Up

This guide is intended to configure simple communication between the instrument and *GeoDAS* software running on a Windows workstation, working as data server.

> *It is assumed that the GeoDAS software is already installed on a computer. If not, please do the installation first with help of the GeoDAS User Manual before proceeding.*

6.1. Preparation

- Make sure the instrument is powered by the provided power supply, the green AC indicator should be ON
- Make sure the instrument is connected to a LAN by the supplied Ethernet cable.
- Remove instrument cover using the four screws on the top corners
- Verify that the battery is correctly fixed and connected to the system

> *In case there is no LAN available, the Ethernet cable can be connected directly to a computer. For this a crossed Ethernet cable is needed, nevertheless in modern computers normally it works as well with the supplied patch cable.*
> *In any way the instrument must be configured to have a fixed IP. Please follow the procedure to adjust these settings.*

- Connect the instrument to a serial port of your computer by using a standard RS-232 patch cable.
- Open any terminal program and chose the appropriate COM port. Baud rate is 19200. Alternatively open GeoDAS, go to ***Tools → Terminal…*** and chose the COM Port. As Baud rate select ***19200.*** Then Press ***Connect***

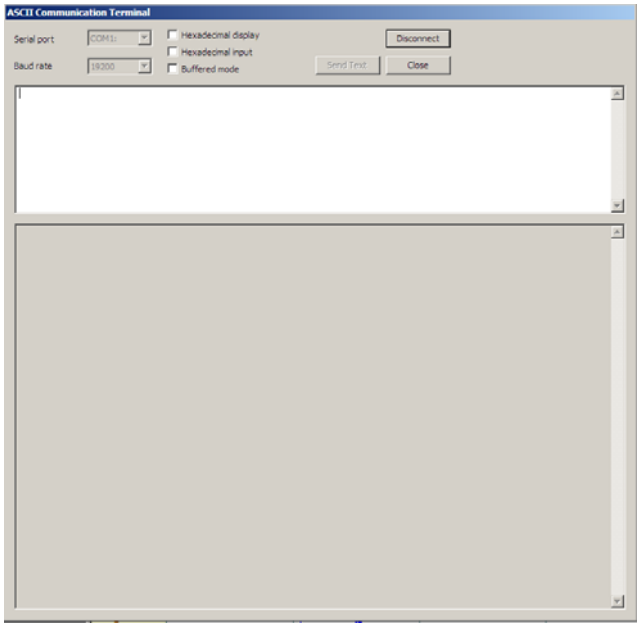


Figure 18. GeoDAS terminal

- Keep the terminal open for the next step.

6.2. Set IP Address of the Instrument

Network settings of the Instrument can be changed during startup of the instrument. By default the instrument has a dynamic IP.

- Switch on the instrument by press and hold the POWER button for 2 seconds.
- Press **<Ctr> + 'Z'** as soon the message appears on the console to enter the test and configuration mode

```
GSR-IA18 and GMS-XX Boot Loader, version 1.19 (16.07.2010)
Press Ctrl+Z to enter the test mode...
```

- Press '**N**' to enter the menu *Network setting*

```
 --- Hardware Setup and Monitor ---
S - WIFI setup
H - WIFI monitor without network connections
I - WIFI monitor with network connections (may take long to start)
K - Instrument hardware parameters
N - Network settings
```

```
==== Network Settings ====
Static IP address (1=YES, 0=AUTO)? (0 = 0x0):
```

- Select if the instrument should have a static or a dynamic IP by pressing '**1**' (Static) or '**0**' (dynamic). In case a dynamic IP is chosen, a DHCP server must be available in the network to provide the IP settings.
- In case a static IP is selected, an additional message will appear asking for the *Instrument IP address*, *Instrument network mask* and *Instrument gateway IP*. In case you don't know these parameters please ask your network administrator.

```
Static IP address (1=YES, 0=AUTO)? (0 = 0x0): 1
Instrument IP address (192.168.10.211):
Instrument network mask (255.255.255.0):
Instrument gateway IP (192.168.10.254):
```

- In case telnet is used to enter to the operating system from remote the telnet can be enabled. This feature is not needed for the normal operation of the instrument and therefore it should be kept disabled by default. To keep disabled press '**1**'

```
Disable telnet (1=Yes, 0=Enable)? (0 = 0x0): 1
```

- It's highly recommended to put a *recovery server IP* address and *recovery server port*. The instrument will contact this server in case the connection to the main data server (configured in the configuration of the instrument) is not possible anymore. This can happen for example in case accidentally a configuration file with wrong server settings will be uploaded to an instrument.

```
Recovery server IP address (192.168.10.107):
Recovery server port (3456 = 0xD80):
```

- Start instrument by pressing '**5**'

```
Bootloader Menu

 --- Flash Images and Boot Options ---
B - Load binary image to RAM via AUX COM port at 57600 baud
G - Run loaded image
L - List flash images
1 - Save the loaded RAM image to FLASH
2 - Load an image from FLASH to the RAM
3 - Copy raw RAM memory block to FLASH (0x20000 bytes)
4 - Boot from the selected image
5 - Boot from the default image
X - Reboot the instrument
Y - Power off
```

- As soon the instrument is running start ***GeoDAS***

6.3. No Stations Configured at first Start Up

The following steps require GeoDAS version 2.20 or higher. If you have any older version download the newest release from www.geosig.com → Support → Downloads

- When *GeoDAS* will be started for the first time, it will ask to add stations in its configuration.
- Click ***Yes***

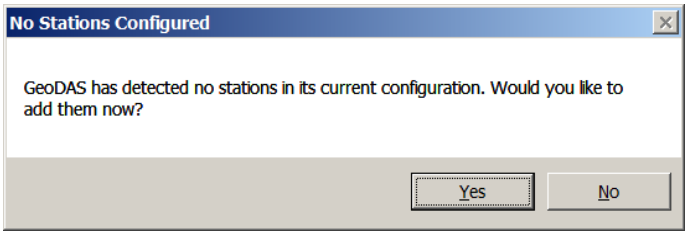


Figure 19. "No stations configured" message at startup of GeoDAS

If there are already stations configured in GeoDAS, this window will not appear. Please press the wizard button  *in the GeoDAS menu*

6.4. Adding New Stations…

- In the following window, select My GMS instrument is connected to the local network and press Next >

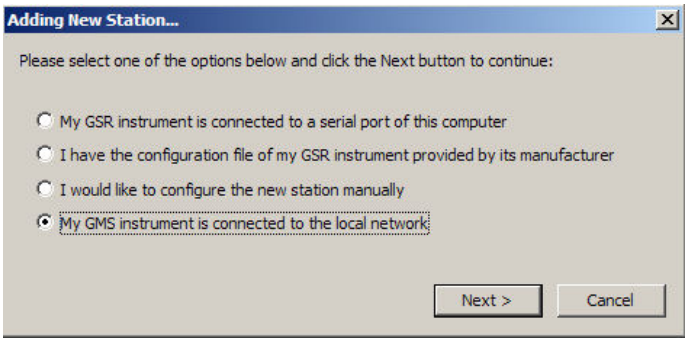


Figure 20. Instrument Wizard

- Enter the ***Serial number*** of the instrument and press ***Login >.*** It is also possible to add more than one station by entering only a fragment of the serial number which is similar on all instruments. For example if there are the serial numbers 100210, 100211 and 100234. By entering '1002' all the stations will be added. By putting '10021' just the stations 100210, 100211 will be added.

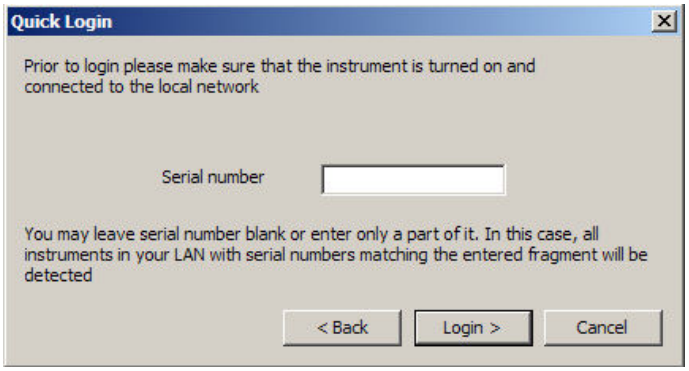


Figure 21. Quick Login Window

- All the found stations will be listed, press ***Finish*** to add them to GeoDAS

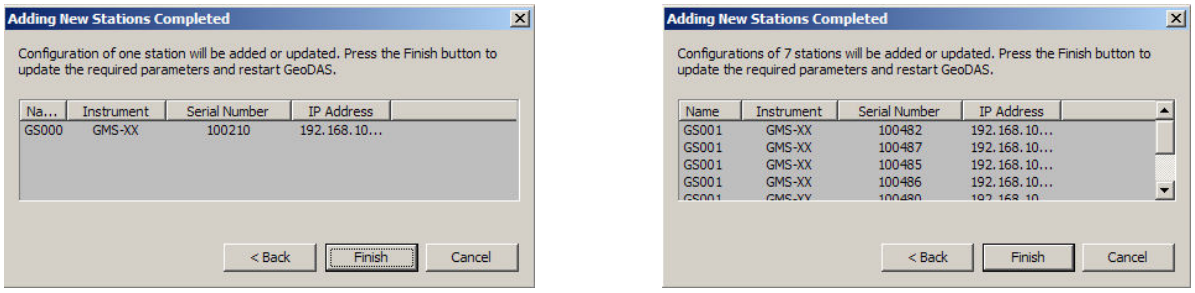


Figure 22. List of all stations found – single station left, multi-selection right side

6.5. Configuration of Data Server

- Proceed to the menu Settings → Configure Stations…
- The following window will appear where all the instruments are listed in the area 1. Please see chapter 8.8.1 for details.

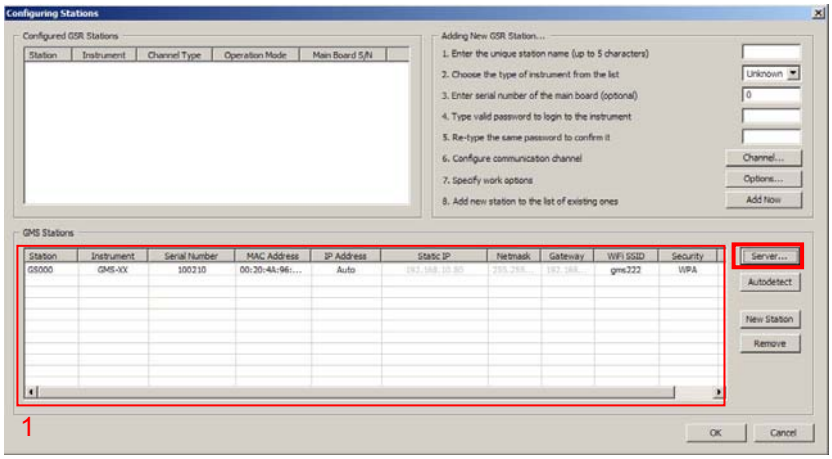


Figure 23. Configuration and overview of the stations

- Press the button ***Server…***, the window below appears and enter the following data:
  - *My server IP address* IP of your computer
  - *Server port* Select a user defined port, use ***3456*** by default

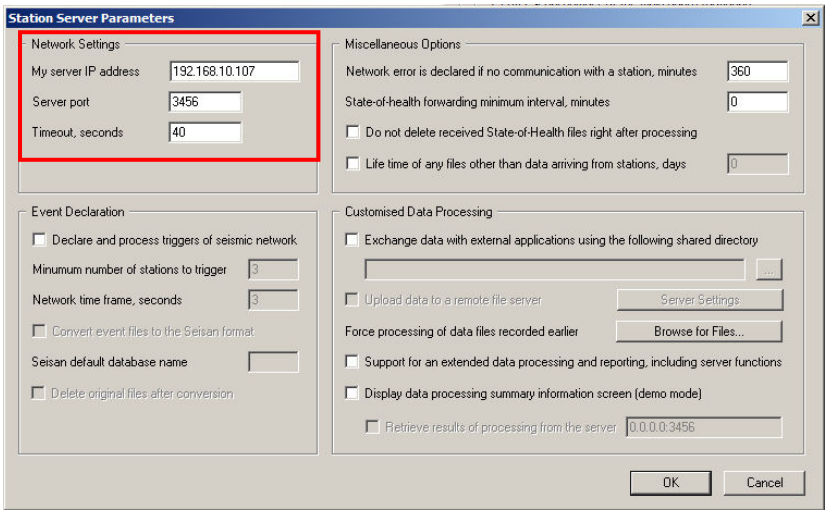
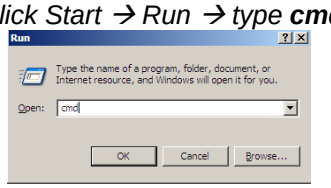
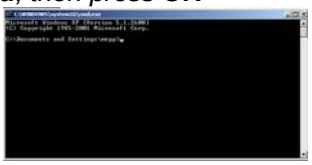


Figure 24. Data server parameter

If you don't know how to find out your IP Address, follow these steps:
*- Click Start → Run → type **cmd**, then press **OK***





*- Type **ipconfig**, then your IP appears*

```
Ethernet adapter Local Area Connection:
      Connection-specific DNS Suffix  . :
      IP Address. . . . . . . . . . . . : 192.168.10.107
      Subnet Mask . . . . . . . . . . . : 255.255.255.0
      Default Gateway . . . . . . . . . : 192.168.10.254
```

*- Type **exit***

- Write down the IP and port you have configured
- Press ***OK*** two times to exit again to the main window of *GeoDAS*

6.6. Basic Configuration of the Instrument

- In the window *Stations: General Information* make a ***right click*** on the station name

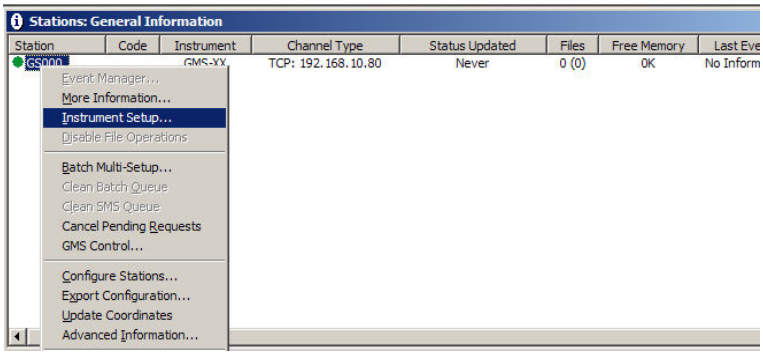


Figure 25. Instrument setup

- The following window will appear.

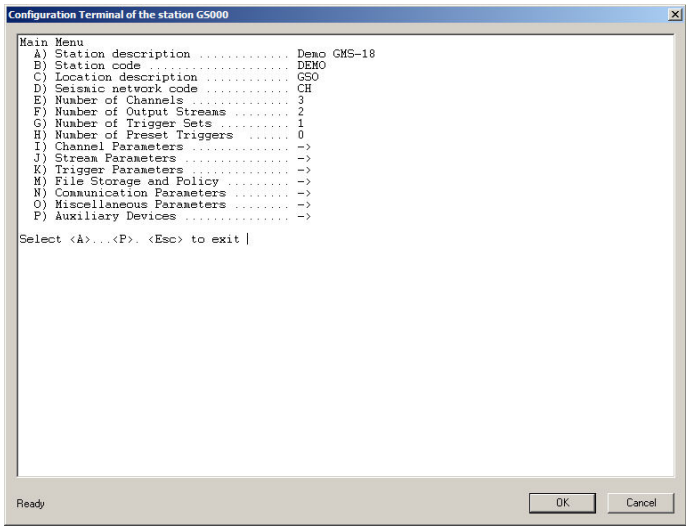


Figure 26. Configuration of the selected instrument

The red parameters marked are required to be adjusted.

```
Main Menu
  A) Station description ..... GS-IA18 Test Station
  B) Station code ..... GS_IA
  C) Location description ..... o
  D) Seismic network code ..... NC
  E) Number of Channels ..... 2
  F) Number of Output Streams ..... 0
  G) Number of Trigger Sets ..... 1
  H) Number of Preset Triggers  ..... 0
  I) Channel Parameters ..... ->
  K) Trigger Parameters ..... ->
  M) File Storage and Policy ..... ->
  N) Communication Parameters ..... ->
  O) Miscellaneous Parameters ..... ->
  P) Auxiliary Devices ..... ->

Select <A>...<P>. <Esc> to exit
```

- Press '***N***' to get to the *Communication Parameters* menu

- Press '***A***' and change *Contact remote servers* to **Yes** if not already set

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 60 (0x3C)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ No

Select <A>...<L>. <Esc> back to Main Menu
```

- Press '***G***' to get to the *Server Parameters* menu
- GeoDAS Server IP from the computer must be adjusted in the field *Server IP Address*, for this press '***A***', enter IP and press ***<Enter>***
- GeoDAS Server Port Number from the computer must be adjusted in the field Port, for this press '***C***', enter Port number (use ***3456*** as default) and press ***<Enter>***

```
Main Menu | Communication | Server
  A) Server IP Address ....................... 192.168.10.107
  B) Protocol ............................... Custom
  C) Port ................................... 3456 (0xD80)
  H) Transfer timeout, sec .................. 40 (0x28)
  I) Network triggers ....................... No
  J) Connect through PPP link ............... No

Select <A>...<Q>. <Esc> back to Main Menu | Communication
```

- After this adjustments exit from all submenus by pressing **<Esc>** two times and confirm the following message with ***Yes***.

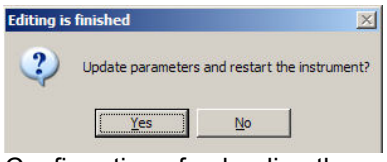


Figure 27. Confirmation of uploading the new settings

- After the instrument has restarted it is ready for operation and can be configured according to chapter 8.

7. Network Settings

The network configuration is the same in case of use of a wired network or wireless network. The specific settings related to the wireless network are described in chapter 7.3

7.1. Set IP through GeoDAS

- Open GeoDAS and go to ***Settings → Configure Stations…*** , the following window appears.

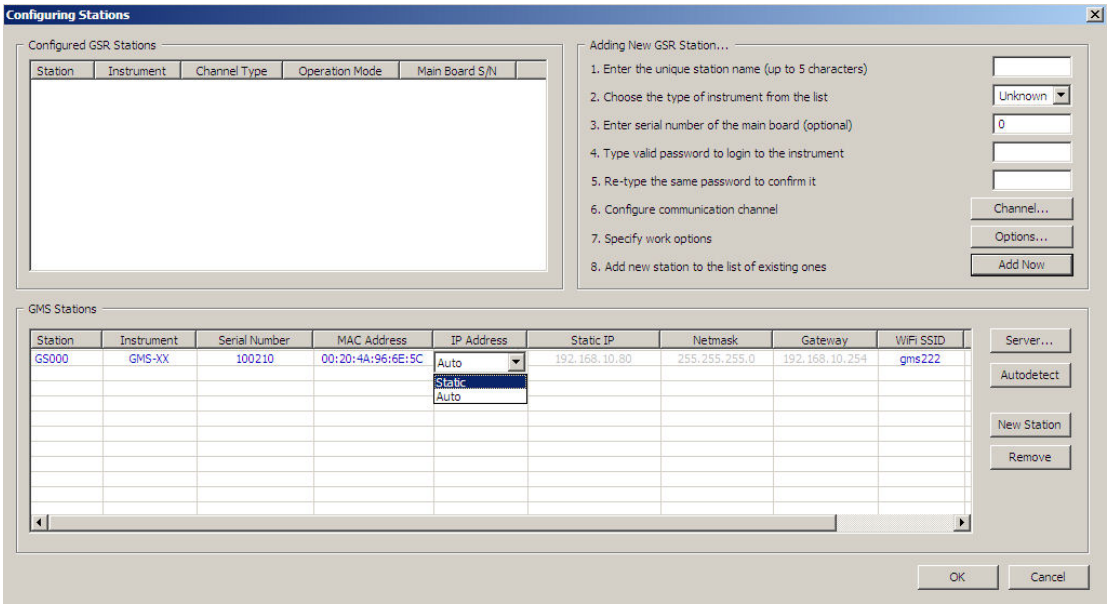


Figure 28. Station configuration

- With a double-click the filed *IP Address* it can be selected if the instrument should have a ***Static*** or dynamic IP (***Auto***) address. In case a *Static* IP address is chosen, the ***Static IP***, ***Netmask*** and ***Gateway*** must be configured as well by a double-click.
- Make a right click on the station name and select ***Upload Current Parameters to Instrument*** as shown in the figure below.

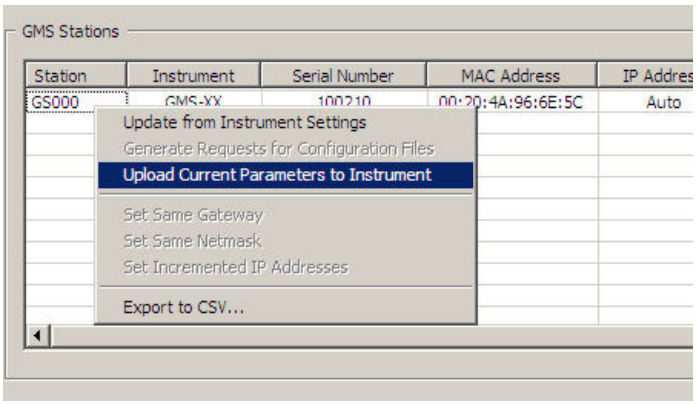


Figure 29. Upload parameters to the instrument

7.2. Set IP through the Bootloader

Please see chapter 6.2 for details.

7.3. Wireless Settings through GeoDAS

- Open GeoDAS and go to ***Settings → Configure Stations…*** , the window shown in Figure 28 appears.
- With a double-click the field of the column *WiFi SSID* or *Security* the following window appear.

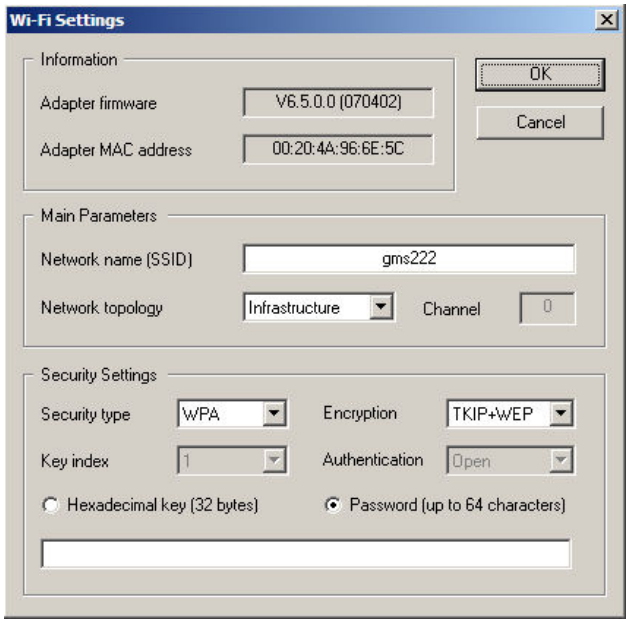


Figure 30. WiFi Settings

- Adjust all settings according to your network. In case not all information are available ask your network administrator for details.
- Press ***OK***
- Make a right click on the station name and select ***Upload Current Parameters to Instrument*** as shown in the Figure 29.

7.4. Wireless Settings through the Bootloader

In case there is no possibility to adjust the wireless settings from GeoDAS, these settings can also be done from the Bootloader menu.

The following chapter is for advanced users only

- Switch on the instrument by press and hold the POWER button for 2 seconds.
- Press **<Ctr> + 'Z'** as soon the message appears on the console to enter the test and configuration mode

```
GSR-IA18 and GMS-XX Boot Loader, version 1.19 (16.07.2010)
Press Ctrl+Z to enter the test mode...
```

- Press '**S**' to enter the menu *WIFI setup*

```
 --- Hardware Setup and Monitor ---
S - WIFI setup
H - WIFI monitor without network connections
I - WIFI monitor with network connections (may take long to start)
K - Instrument hardware parameters
N - Network settings
```

- The following menu will appear. Only settings in the menu *WLAN* are required to be changed.

```
(…)
*** WLAN
WLAN: enabled
Topology: Infrastructure
Network name: gms222
Country: US
Security suite: WPA
Authentication: PSK
Encryption: TKIP+WEP
TX Data rate: 54 Mbps auto fallback
Power management: disabled

Change Setup:
  0 Server
  1 Channel 1
  2 Channel 2
  3 E-mail
  4 WLAN
  5 Expert
  6 Security
  7 Defaults
  8 Exit without save
  9 Save and exit            Your choice ?
```

Do not change any other settings. Wrong parameters may result in stopping communication with the instrument completely.

- Press '***4***' to enter the WLAN menu.

```
Change Setup:
  0 Server
  1 Channel 1
  2 Channel 2
  3 E-mail
  4 WLAN
  5 Expert
  6 Security
  7 Defaults
  8 Exit without save
  9 Save and exit            Your choice ? 4

Topology: 0=Infrastructure, 1=Ad-Hoc (0) ? *
Network name (SSID) (GMS_0) ? *
Security suite: 0=none, 1=WEP, 2=WPA, 3=WPA2/802.11i (0) ? *
TX Data rate: 0=fixed, 1=auto fallback (1) ? 1
TX Data rate: 0=1, 1=2, 2=5.5, 3=11, 4=18, 5=24, 6=36, 7=54 Mbps (7) ? 7
Enable power management (N) ? N
```

- The menu points which have a * at the end are user defined, adjust these settings according your WLAN. Ask your network administrator in case you don't know your settings.

Topology	Select *Infrastructure* by pressing '***0***', if WLAN clients connect to an access point. Select *Ad-Hoc* by pressing '***1***', if instruments connect direct to each other
Network name (SSID)	Enter the network name (SSID) of the WLAN. Contact the network administrator to get the correct network name
Security suite	To get the proper security settings of the WLAN, contact the network administrator. WEP, WPA or WPA2 can be selected. Choose the correct security function and enter the passphrase. Note that WEP must be entered in a binary format, otherwise it won't work
TX Data rate	Must be set '***1***'. The *Auto fallback* will adjust the speed of the WiFi automatically
TX Data rate	Always select '***7***' to have the maximum speed of *54 Mbps* in the Infrastructure mode. In the Ad-hoc mode, the speed is limited by *11 Mbps* (rate 3)
Enable power management	Always press '***N***' to disable the power management function. Otherwise the instrument will not work

- Once all the parameters are set correct, enter '***9***' to *Save and exit* the WiFi configuration mode

```
Change Setup:
  0 Server
  1 Channel 1
  2 Channel 2
  3 E-mail
  4 WLAN
  5 Expert
  6 Security
  7 Defaults
  8 Exit without save
  9 Save and exit            Your choice ? 9

Parameters stored ...
```

- If the message '*Parameters stored …'* appeared, press ***<Esc>*** to go back into the Bootloader menu.
- Press '***5***' to boot normally

8. Detailed Configuration of the Instrument

8.1. General Comments

All the configuration changes can be either done by GeoDAS or on the Instrument itself using a RS-232 cable on the serial connector and a terminal program.

8.1.1. Changing Configuration by the Terminal

- Connect the GMS-xx to a serial port of your computer and switch on the GMS-xx if not already done.
- In GeoDAS go to ***Tools → Terminal…*** and chose your COM Port. As Baud rate select ***19200.*** Then Press ***Connect***
- Press ***<Enter>***, the following menu appears:

```
GS_IA18 version 20.00.63
Main menu:
C - Configuration
M - Messages ->
S - Shell command
X - Display errors (0) and warnings (0)
W - Clear errors and warnings
F - View/reset RTC trim values
G - View RTC status
H - Set RTC time
U - User request
R - Restart
Q – Quit
```

- To configure newdas, from GMS-xx console, press '**C**' and ***<Enter>***, if you are asked, select ***Edit current configuration***, by pressing '**C**' again.
- Change the configuration as described in the following chapters
- Press **<Esc>** to leaf the configuration menu. If asked, select ***save as current configuration***, by pressing '**C**'

8.1.2. Change Configuration by GeoDAS

- In the window *Stations: General Information* make a ***right click*** on the station name

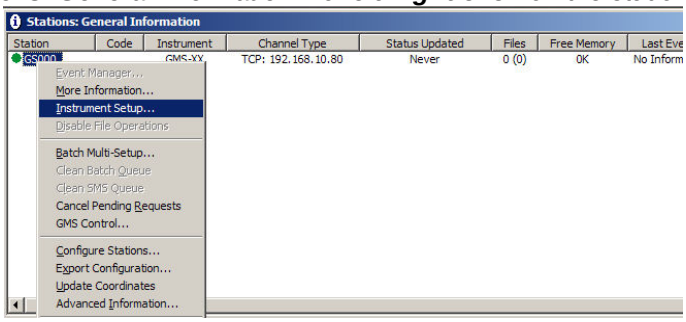


Figure 31. Instrument setup

- Change the configuration as described in the following chapters in the configuration window which appears

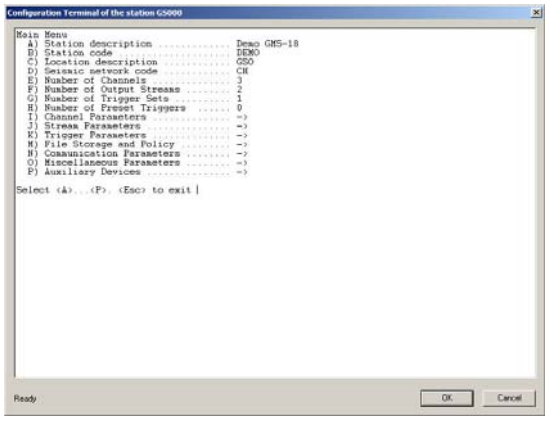


Figure 32. Configuration window

8.1.3. Explanation of the Structure in the Manual

As sometimes in the configuration the parameters depend on each other, not all parameters are shown all the time. The configuration is also sorted in several sub-menus. Therefore the explanation of the menu is explained as following:

Parameter in the menu	***Possible selections*** or 'User selectable'	Explanation
Switch-Parameter	***Possible selections*** or 'User selectable'	Explanation: The following three lines depend on the selection and are only visible if not set to '**No**'
This Parameter is only visible if Switch-Parameter has been set to Yes	***Possible selections*** or User selectable	Explanation
This Parameter is only visible if Switch-Parameter has been set to Yes	***Possible selections*** or User selectable	Explanation
Submenu, only visible if Switch-Parameter has been set to Yes — ***Parameter in the Submenu***	***Possible selections*** or 'User selectable'	Explanation
Submenu, only visible if Switch-Parameter has been set to Yes — ***Parameter in the Submenu***	***Possible selections*** or 'User selectable'	Explanation
Submenu — ***Parameter in the Submenu***	***Possible selections*** or 'User selectable'	Explanation
Submenu — ***Parameter in the Submenu***	***Possible selections*** or 'User selectable'	Explanation
Submenu — ***Switch-Parameter in the Submenu***	***Possible selections*** or 'User selectable'	Explanation
Submenu — ***This Parameter is only visible if Switch-Parameter has been set to Yes***	***Possible selections*** or 'User selectable'	Explanation

8.2. Switch ON and OFF the instrument

The main power switch operates as follow:

- Open the cover of the instrument by removing the four screws in the corners.
- Press the *POWER* button for 2 seconds to switch the instrument **ON**.
- The green *RUN* indicator blinks during 0.4 seconds every 2 seconds during the start-up procedure until it is ready to operate (see Figure 7 and Table 2 for details).
- The *RUN* indicator is blinking one time a second (20% ON) to show normal operation (see Figure 7 and Table 2 for details).
- To turn the instrument **OFF**, press the power button for a minimum of 2 seconds. The *RUN* indicator blinks approximately 16 seconds every 2 seconds during shutdown process and then turns OFF when power is really off. (see Figure 7 and Table 2 for details).

8.3. Configuration of the Channels

- Press '***E***' to select the number of channels. By default three channels are configured as most sensors have three channels normally.

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 2
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 0
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '***I***' to get to the *Channel Parameters* menu to adjust the settings of the channels. The following menu appears

```
Main Menu | Channel 1 of 3
  A) Data source ..................... ADC1
  E) Channel name .................... C01
  F) Location code ................... CH
  G) Data unit ....................... g
  H) LSB factor ...................... 3.97364e-007
  I) Sampling rate, sps .............. 200 (0xC8)
  K) Negative axis ................... No
  L) Offset compensation ............. No
  M) Signal simulator ................ ->
  N) Maintain the ringbuffer ......... Yes
  O) Online preprocessing ............ None
  R) Decimation and peaks ............ None
```

- Each channel can be adjusted according to your wishes. To change the channels press '**+**' or '**-**'. The following parameters can be adjusted:

Data source		The source of the channel can be defined	
		ADC1	X-Axis
		ADC2	Y-Axis
		ADC3	Z-Axis
		ADC4	X-Axis 2nd Sensor
		ADC5	Y-Axis 2nd Sensor
		ADC6	Z-Axis 2nd Sensor
		WS-SPEED:	Winds peed, for special applications only
		WS-DIR:	Winds direction, for special applications only
		WS-VALID:	Wind sensor validity , for special applications only
		DATACHAN	Virtual channels
		DATAVSUM	Vector sum of two channels
		DATAVSU3	Vector sum of three channels
	Source channel name	*User selectable*	The source of the channel can be any virtual channel
	Second source channel	*User selectable*	In case of the vector sum a second or third source has to be selected
	Third source channel	*User selectable*	
Channel name		*User selectable*	The channel name in the record is a combination of the location code and channel name
Location code		*User selectable*	
Data unit		*User selectable*	Data unit of the selected channel
LSB factor		*User selectable*	LSB factor, depending on the connected sensor. See chapter 8.3.1 for details and Table 7 for the specific values of the sensors.
Sampling rate		***50, 100, 200, 500***	Sampling rate of the selected channel
Negative axis		***Yes***	Inversion of the axis is enabled
		No	Inversion of the axis is disabled
Offset compensation		***Yes***	Compensation is enabled
		No	Compensation is disabled
			Detail behavior of the offset compensation can be configured as described in chapter 8.9
Signal Simulator	Configuration only, to activate the signal simulator switch on in the Miscellaneous menu (see chapter 8.9)		
	Channel type	***Sinus***	Applies a sinus signal to the channel
		Square	Applies a square wave signal to the channel
		Noise	Applies a random noise signal to the channel
		DC Level	Applies a DC (Offset) to the channel
	Frequency	*User selectable*	Frequency of the simulated signal
	Signal amplitude	*User selectable*	Amplitude of the signal in [Data units]
	Event amplitude	*User selectable*	Amplitude of the signal during simulation of an event in [Data units]
	Event duration	*User selectable*	Duration of the simulated event in [seconds]
	Event interval	*User selectable*	Interval between the events in [seconds]
Maintain Ringbuffer		***Yes***	Permanent recording is enabled
		No	Permanent recording is disabled

Online preprocessing		Some online-processing can be done on the selected channel	
		Filtering ***Integration*** ***Double Integration***	Filtering of the channel Integration of the channel Double integration of the channel
Filter Parameters	***Filter type***	***Highpass*** ***Lowpass*** ***Bandpass***	Highpass Lowpass Bandpass
	Filter order	***2, 4, 6, 8, 10, 12***	Filter order
	Flow ***Fhigh***	*User selectable*	Low and high corner frequency of the filter in [Hz]
Decimation and peaks		The data can be decimated or just peaks can be stored	
		Decimation ***Peak Values*** ***Average Values***	Additional down sampling of the data Peak values of the data within a certain interval Average values of the data within a certain interval
	Decimation factor	*User selectable*	The signal will be down sampled by the selected factor. E.g. if the sample rate is 50 and the decimation factor 10, then the output sample rate is 5 SPS
	Interval of averaging, sec	*User selectable*	The Peak or Average values of the signal within the time defined in the *Interval of averaging* will be written into the ringbuffer with the specified *Output sampling interval* in [seconds]. Interval of averaging should be equal or higher than the Output sampling interval.
	Output sampling interval	*User selectable*	

8.3.1. Calculation of the LSB factor

If you don't know how to calculate the LSB, follow these steps:

Sensors with given full scale

Output Voltage of the sensor must be +/- 10 V

$$\text{LSB} = \frac{FullScale}{0.9 \cdot 2^{23}} = \frac{FullScale}{754'9747.2}$$

Example, 3 g sensor

$$LSB = \frac{3g}{0.9 \cdot 2^{23} counts} = \frac{3g}{754'9747.2 \text{ counts}} = \underline{\underline{3.973643e-7 \, {}^{g}/_{count}}}$$

Sensors with given Sensitivity

$$\text{LSB} = \frac{\frac{10V}{Sensitivity}}{0.9 \cdot 2^{23} counts} = \frac{1.324547e-6 \frac{V}{counts}}{Sensitivity}$$

Example, 1000 V/m/s sensor

$$LSB = \frac{\frac{10V}{1000 \frac{V}{m/s}}}{0.9 \cdot 2^{23}} = \frac{1.324547e-6 \frac{V}{counts}}{1000 \frac{V}{m/s}} = \underline{\underline{1.324547e-9 \; \frac{m}{s} \Big/ count}}$$

The LSB's of all GeoSIG sensors can be found in the following table

Sensor type	Full Scale	Output Voltage Range	LSB
AC-xx	0.5 g	+/- 10 V	0.662'274e-7 g/count
	1 g	+/- 10 V	1.324'548e-7 g/count
	2 g	+/- 10 V	2.649'095e-7 g/count
	3 g	+/- 10 V	3.973'643e-7 g/count
	4 g	+/- 10 V	5.298'191e-7 g/count
VE-13 VE-23	1 mm/s	+/- 10 V	1.324'548e-7 mm/s/count
	10 mm/s	+/- 10 V	1.324'548e-6 mm/s/count
	100 mm/s	+/- 10 V	1.324'548e-5 mm/s/count
VE-33	**Sensitivity:** 27.3 V/m/s (27.3 Vs/m)		4.851'822e-8 m/s/count 4.851'822e-5 mm/s/count
VE-53	**Sensitivity:** 1000 V/m/s (2x 500 V/m/s)		1.324'548e-9 m/s/count 1.324'548e-6 mm/s/count
	Sensitivity: 200 V/m/s (2x 100 V/m/s)		6.622'738e-9 m/s/count 6.622'738e-6 mm/s/count

Table 7. LSB of different sensors

8.4. Configuration of Data Streams

- Press '***F***' to select the *Number of Output Streams*. One output stream can have several channels.

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '***J***' to get to the *Stream Parameters* menu to adjust the settings of the output streams. The following menu appears

```
Main Menu | Stream
  A) Stream name ................. Stream_1
  B) Stream type ................. GSBU
  C) Port configuration .......... ->
  D) Channels in the stream ...... 3
  E) List of streamed channels ... ->
  F) Data frames per packet ...... 4 (0x04)
```

- Each output stream can be adjusted according to your wishes. To change the output stream press '**+**' or '**-**'. The following parameters can be adjusted:

Stream name	*User selectable*	Name of the output stream
Stream type	***GSBU***	Streaming possibly in GSBU format only, Seedlink will be supported soon
Channels in the stream	*User selectable*	Number of channels which should be streamed
List of streamed channels	*User selectable*	Depending on the number of channels for every channel a different source can be selected, '**+**' and '**-**' can be used to change the channel, the source can be selected by pressing '***A***'
Data frames per packet	*User selectable*	Specifies the packet length of the streams, one data frame is equal to 200 ms. For example in case '***5***' is selected, then every second a packet with the last second of data will be sent

Port configuration	***Communication Port***		***TCP/IP*** ***ttyS01*** ***ttyS02*** ***ttyS03*** ***ttyS04*** ***ttyS05***	Streaming over the network Streaming over the external SERIAL connector Do NOT use this port Do NOT use this port Do NOT use this port Do NOT use this port
		Protocol	**TCP (Client)** **TCP (Server)** **UDP**	Not implemented at the moment, do NOT use GeoDAS software or any other client supporting the selected protocol connects to the IP configured under 'IP Address' for data streaming Not implemented at the moment, do NOT use
			IP Address	*User selectable*	Client mode: IP address of the remote server (NOT used so far) Server mode: not needed UDP mode: broadcast address (NOT used so far)
			Network Port	*User selectable*	Client mode: network port of the remote server (NOT used so far) Server mode: server port listening for incoming connections UDP mode: network port for broadcasting (NOT used so far)
		Baud Rate	***1200*** ***2400*** ***4800*** ***9600*** ***19200*** ***38400*** ***57600*** ***115200***	Baud rate of the serial data stream. Make sure that the serial port of the computer is configured to the same baud rate

8.4.1. Set up of Data Streams

In this chapter there will be described how to set up an Instrument for data streaming.

- Connect to the Instrument and Press '***F*** to select the *Number of Output Streams*. One output stream can have several channels.
- Press '***J***' to get to the *Stream Parameters* menu to adjust the settings of the output streams. The following menu appears

```
Main Menu | Stream
  A) Stream name ................. Stream_1
  B) Stream type ................. GSBU
  C) Port configuration .......... ->
  D) Channels in the stream ...... 3
  E) List of streamed channels ... ->
  F) Data frames per packet ...... 4 (0x04)
```

- Adjust the settings according to chapter 8.4. Carefully select the settings in the *Port Configuration*. In case you want to stream over Ethernet, choose ***TCP/IP*** and ***TCP (Server)***.

```
Main Menu | Stream | Port
  A) Communication port ... TCP/IP
  C) Protocol ............. TCP (Server)
  E) Network port ......... 4001 (0xFA1)
```

- In case you want to stream over the SERIAL port on the front of the instrument choose ***ttyS1***.

```
Main Menu | Stream | Port
  A) Communication port ... ttyS1
  B) Baud rate ............ 115200
```

- Open ***GeoDAS*** and go to the menu *Settings* → ***Channels of Digitizers...*** The following window appears:

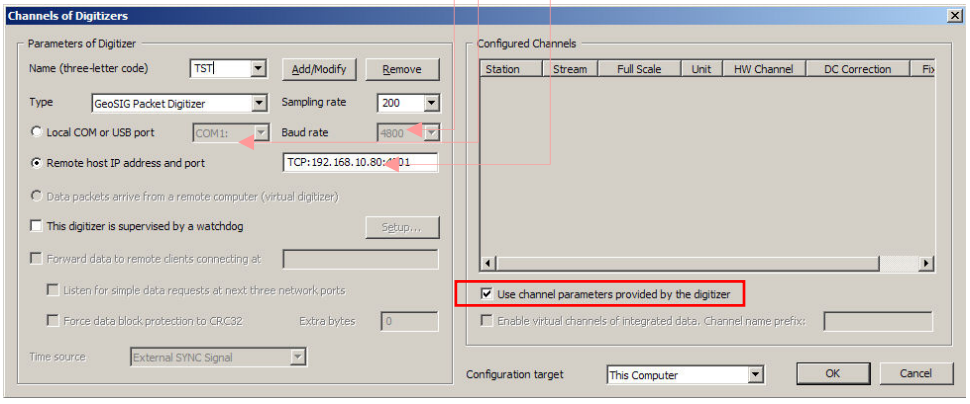


Figure 33. Channels of Digitisers...

- Adjust the ***Name,*** chose any three-letter code for the data stream
- Select as ***Type*** the ***GeoSIG Packet Digitiser***
- Press ***Add/Modify***
- Make sure the selected ***Sample rate*** is the same as in the instrument
- Chose either the ***Local COM port*** (in case connected over RS-232) or the ***Remote host IP address and port*** (in case connected over Ethernet). The IP must be known from the instrument.
- Check the flag ***Use channel parameters provided by the digitizer***
- Press ***OK***

- After a restart of *GeoDAS*, the window *Stations:Data Streams* appears

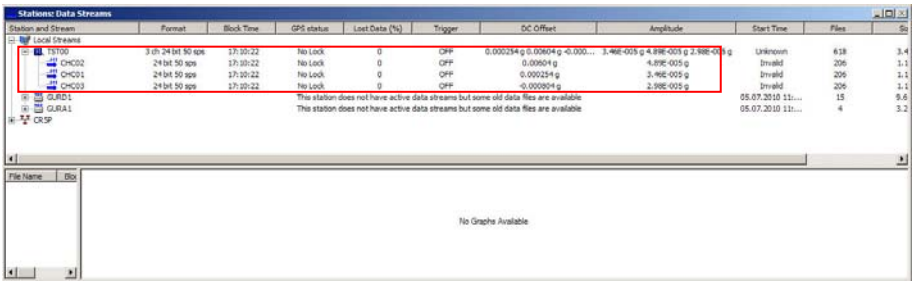


Figure 34. Stations: Data streams

- To view the data make a right click on the station name (here *TST00*) and select ***Data Monitor***

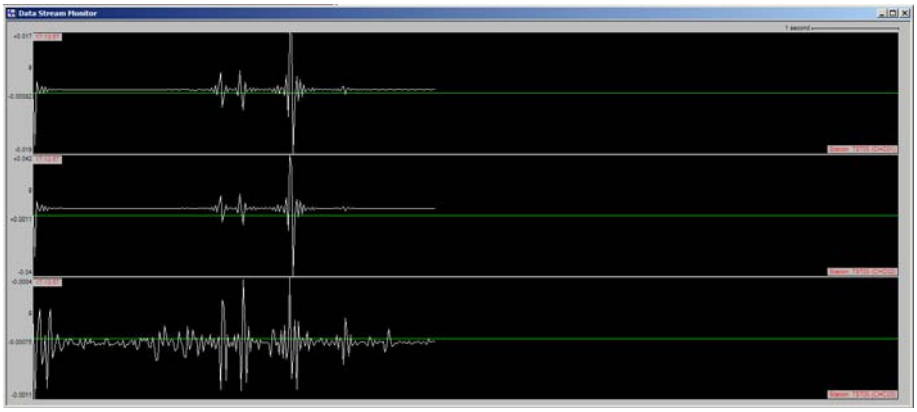


Figure 35. Data stream window

8.5. Trigger Settings

The instrument allows having several triggers with independent sources in parallel.

- Press '***G***' to select the *Number of Trigger Sets*

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

Press 'K' to get to the *Trigger Parameters* menu to adjust the settings of the triggers. The following menu appears. In case the *number of trigger sets* is set to '0' this menu can not be selected.

```
Main Menu | Triggerset
  A) Triggerset name ..................................... Trigger1
  B) Event recording ..................................... No
  D) Alarm activation .................................... No
  E) SMS Alarm ........................................... No
  I) Trigger time frame, sec ............................. 3 (0x03)
  K) Monitored channels .................................. 3
  L) Trigger settings .................................... ->
  O) Be a source of network triggers (received from LAN) ... No
  P) Activate on network triggers (received from LAN) ..... No
  Q) Be a source of network triggers (Interconnection) ..... No
  R) Activate on network triggers (Interconnection) ....... No
```

- Each trigger set can be adjusted according to your wishes. To change the trigger set press '**+**' or '**-**'. The following parameters can be adjusted:

Triggerset name	*User selectable*	Name of the trigger set
Event recording	***Yes*** ***No***	An event file will be recorded on a trigger No event file will be recorded on a trigger
Pre-Event	*User selectable*	Pre-Event time, seconds
Post-Event	*User selectable*	Post-Event time, seconds
Max. event duration, sec	*User selectable*	Maximum duration of an event in seconds. After this time, an event file will be closed
Stored channels	*User selectable*	Number of channels, which should be stored into an event file in case of a trigger
List of stored channels	*User selectable*	Depending on the number of stored channels different sources can be selected. '**+**' and '**-**' can be used to change the channel, the source can be selected by pressing '***A***'

Alarm activation		***Yes*** ***No***	An alarm relay will be activated on a trigger No alarm relay will be activated on a trigger This option has an effect only in case the instrument has internal alarm relays
	Alarm output to activate	***AL1, AL2, AL3, AL4***	Select alarm relay
	Alarm deactivation delay	*User selectable*	Time in seconds the alarm relay deactivates again after the signal falls below the trigger threshold. Can be compared to the post event time for the recording
SMS Alarm		***Yes*** ***No***	An SMS will be sent upon a trigger No SMS will be sent upon a trigger This option is available only in case an external GPRS modem is connected to the instrument. Note that this GPRS modem cannot be used for the PPP connection at the same time
SMS Alarm Configuration	***Serial Port of Modem***	***ttyS1… ttyS5***	By default use ttyS1
	Number of Recipients	*User selectable*	The number of recipients of the SMS alarm can be selected
	Recipient	*User selectable*	Phone number of the recipient. Use numbers only, no '+' or any other character allowed
Trigger time frame, sec		*User selectable*	See chapter *8.5.3* for details
***Monitored* channels**		*User selectable*	Number of channels which will be monitored by the selected trigger set
Trigger settings	To go through the monitored channels press '**+**' or '**-**'.		
	Assigned channel name	*User selectable*	
	Trigger filter	***Yes*** ***No***	Trigger filter is used as defined under Filter Parameters Trigger filter is not used
	Filter parameters	*User selectable*	One can select a trigger type (Low, High and Bandpass, order of the filter and corner frequency(ies))
	Level Trigger	***Yes*** ***No***	Level trigger is enabled Level trigger is disabled
	Threshold	*User selectable*	As soon the data is above the configured threshold the trigger is activated
	STA/LTA Trigger	***Yes*** ***No***	STA/LTA trigger is enabled STA/LTA trigger is disabled
	STA time frame	*User selectable*	Length of STA time window, seconds
	LTA time frame	*User selectable*	Length of LTA time window, seconds
	STA/LTA trigger ratio	*User selectable*	As soon the data is above the configured STA/LTA ratio the trigger is activated
	STA/LTA detrigger ratio	*User selectable*	As soon the data is below the configured STA/LTA ratio again the trigger is activated
	Clamp LTA during event	***Yes*** ***No***	The LTA value will not be updated during the event The LTA value will be updated during the event
	Min. level exceedance	*User selectable*	The threshold or STA/LTA ratio has to be exceeded at least for the configured time in

		seconds to active the trigger
Channel trigger weight	*User selectable*	See chapter 8.5.2 for details
Stored channels	*User selectable*	Number of channels, which should be stored into an event file in case of a trigger
List of stored channels	*User selectable*	Depending on the number of *stored channels* different sources can be selected. '**+**' and '**-**' can be used to change the channel, the source can be selected by pressing '***A***'
Be a source of network triggers (received from LAN)	***Yes*** ***No***	In case the instrument is interconnected over LAN with other instruments. It can be selected, if all the other instruments should be alerted in case of a local trigger A master instrument must be defined to use this functionality. See chapter 8.5.4 for details.
Activate on network triggers (received from LAN)	***Yes*** ***No***	In case the instrument is interconnected over LAN with other instruments. It can be selected if the instrument should trigger in case it will be alerted over the interconnection network A master instrument must be defined to use this functionality. See chapter 8.5.4 for details.
Be a source of network triggers (Interconnection)	***Yes*** ***No***	In case the instrument is interconnected over the RS-485 interconnection network with other instruments It can be selected, if all the other instruments should be alerted in case of a local trigger.
Activate on network triggers (Interconnection)	***Yes*** ***No***	In case the instrument is interconnected over the RS-485 interconnection network with other instruments It can be selected if the instrument should trigger in case it will be alerted over the interconnection network
Event processing	***None*** ***PGM Parameters***	No event processing will be done Peak ground motion parameters will be calculated in case of an event and will be sent to the server if configured according to chapter 8.7
Max. summary interval	*User selectable*	The PGM parameters will be sent after an earthquake record has been completed or latest after the defined time in seconds, whichever comes first

8.5.1. STA/LTA trigger

The STA/LTA (Short Time Average/Long Time Average) ratio trigger computes the short term and long term averages of the input (sensor) signal. When the STA exceeds a pre-selected multiple of the LTA (STA/LTA ratio), the instrument begins to record data. The advantage of this trigger type is that the trigger sensitivity adapts to the seismic background signal. With an increasing noise level the trigger sensitivity decreases. The probability of having a false trigger due to noise will be minimised if a long STA averaging time is selected. Obviously, the STA should not be chosen longer than the shortest event of interest. In addition, the STA should be shorter than the pre-event time. If not, the initial portion of an event may not be recorded. During the steady state of the system, the STA and the LTA will be nearly equal. The shorter STA averaging period, the more quickly it will change with the input.

8.5.2. Trigger Weight

To activate a trigger the total trigger weight must be equal or bigger than 100%. By default all channel have a weight of 100%, means if a threshold is exceeded on one channel only, then the trigger is activated. If the trigger weight would be reduced on all channels to 50%, then at least on two channels the threshold has to be exceeded to reach 100% (50% + 50%) and activate the trigger. See Figure 36 for details.

8.5.3. Trigger Time Frame

Depending on the settings it can be, that on two or more channels the threshold has to exceed to activate the trigger (see chapter 8.5.2 for details). The time of the threshold-exceedances might be slightly different on the channels, especially if two sensors are connected and installed on different places. To make sure that even due to this time difference the trigger is working a *trigger time frame* can be defined. See Figure 36 for details.

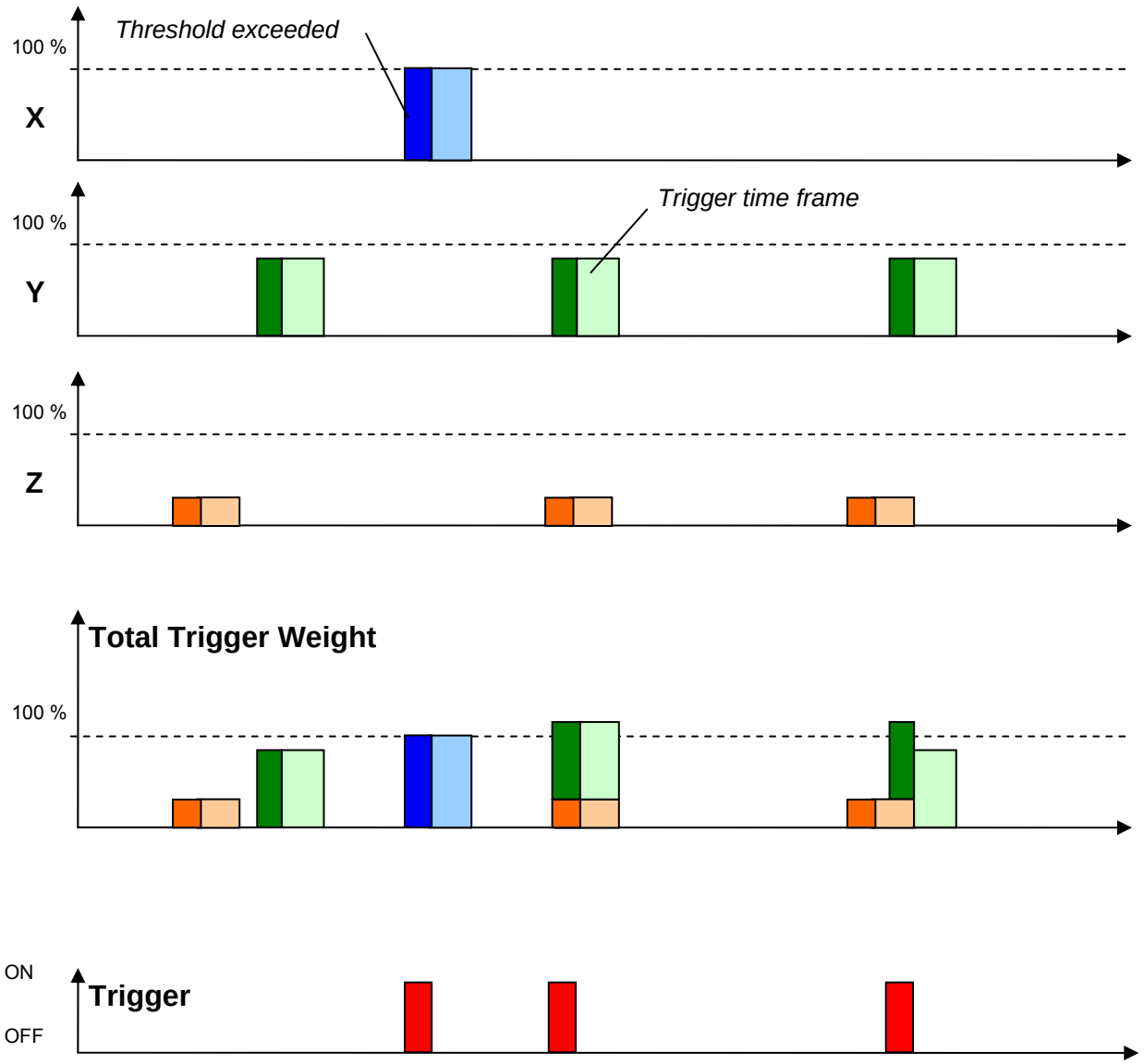


Figure 36. Overview of trigger weight and trigger time frame

8.5.4. Trigger Interconnection over LAN

In case there are several instruments in the same LAN, they can be interconnected over Ethernet for common triggering.

One instrument has to be set up as a master, whereas all other instruments are like slaves, sending the trigger alarms to the master instrument. The master instrument distributes then the trigger alarm to all slaves.

All the communication between the data server and the slave instruments will go via the master instrument. This means that the master instrument will download the requests first and forward it to the appropriate slave instrument. On the other hand, the slave instruments will upload all the files to the master, who will upload it to the data server.

8.5.4.1. Set up of the Master Instrument

- Press '***K***' to enter the menu *Communication Parameters* and activate the *Server mode* by pressing '***H***'

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Specify the *Port of incoming connections* and adjust the number of slaves in the parameter *Number of clients.* Write down the *Port of incoming connections* (use ***3456*** as default) and the *IP of the instrument*, as they are used again during the configuration of the slave instruments.

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 10 (0x0A)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  F) Connect by requests from clients ... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ Yes
  I) Port for incoming connections ...... 3456 (0xD80)
  J) Secure authentication .............. No
  K) Number of clients .................. 1
  L) Clients Parameters ................. ->
```

- The details of every slave instrument have to be filled out. Additionally make sure that the *Data forwarding* and the *Network triggers* is set to ***Yes***. To change the slave (client) instrument press '**+**' or '**-**'.

```
Main Menu | Communication | Client 1 of 2
  A) Client IP Address ....... 0.0.0.0
  B) Client serial number .... 000000
  C) Transfer timeout, sec ... 20 (0x14)
  D) Data forwarding ......... Yes
  E) Network triggers ........ Yes
```

8.5.4.2. Set up of the Slave Instruments

- Press 'K' to enter the menu *Communication Parameters*

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '***A***' and change *Contact remote servers* to **Yes** if not already set

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 10 (0x0A)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  F) Connect by requests from clients ... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ No
```

- Go to *Server Parameters* menu by pressing '***G***'

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 60 (0x3C)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ No

Select <A>...<L>. <Esc> back to Main Menu
```

- IP and Port from the master instrument must be adjusted in the field *Server IP Address* and *Port* (use ***3456*** as default). Make sure the *Network triggers* are activated by putting ***Yes***

```
Main Menu | Communication | Server
  A) Server IP Address ...................... 192.168.10.02 (IP of the Master)
  B) Protocol ............................... Custom
  C) Port ................................... 3456 (0xD80)
  H) Transfer timeout, sec .................. 40 (0x28)
  I) Network triggers ....................... Yes
  J) Connect through PPP link ............... No

Select <A>...<Q>. <Esc> back to Main Menu | Communication
```

8.5.4.3. Trigger Parameters for Master and Slave instruments

The following settings must be done on the master and the slave instruments.

- Make sure on all instruments that the *Number of Trigger Sets* is not zero and then press '***K***' to enter the menu *Trigger Parameters*

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Configure the triggerset according to the description in chapter 8.5 and make sure that on all instruments *Be a source of network triggers (received from LAN)* and *Activate on network triggers (received from LAN)* is set to ***Yes***

```
Main Menu | Triggerset
  A) Triggerset name ..................................... Trigger1
  B) Event recording ..................................... Yes
  C) Record on network triggers only ..................... No
  D) Alarm activation .................................... No
  E) SMS Alarm ........................................... No
  G) Pre-Event, seconds .................................. 5 (0x05)
  H) Post-Event, seconds ................................. 10 (0x0A)
  I) Trigger time frame, sec ............................. 3 (0x03)
  J) Max. event duration, sec ............................ 60 (0x3C)
  K) Monitored channels .................................. 3
  L) Trigger settings .................................... ->
  M) Stored channels ..................................... 3
  N) List of stored channels ............................. ->
  O) Be a source of network triggers (received from LAN) ... Yes
  P) Activate on network triggers (received from LAN) ..... Yes
  Q) Be a source of network triggers (Interconnection) ..... No
  R) Activate on network triggers (Interconnection) ....... No
  S) Event processing .................................... None
```

In case an instrument should trigger on network triggers, but not alarm the other instruments about an own trigger (e.g. in a noisy area) the *Be a source of network triggers (received from LAN)* should be set to ***No***

In case an instrument should alarm the other instruments over the LAN about a trigger, but not be activated on network triggers, then *Activate on network triggers (received from LAN)* should be set to ***No***

8.6. Preset Trigger Settings

The instrument allows having several predefined triggers, e.g. time triggers in parallel.

- Press '**H**' to select the Number of Preset Triggers

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '***L***' to get to the *Parameters of Preset Triggers* menu to adjust the settings of the preset triggers. The following menu appears only in case the *number of preset triggers* is higher than '***0***'.

```
Main Menu | TimeTableTrigger
  A) Preset trigger name .......... Trigger1
  B) First trigget type ........... After Startup
  H) Duration, seconds ............ 30 (0x1E)
  I) Total number of triggers ..... 1 (0x01)
  O) Stored channels .............. 1
  P) List of stored channels ...... ->
```

- Each trigger set can be adjusted according to your wishes. To change the preset trigger set press '**+**' or '**-**'. The following parameters can be adjusted:

Preset trigger name	*User selectable*	Name of the preset trigger set
First trigger type	There are several possible predefined triggers to choose	
	Manual Trigger	A trigger is activated/stopped by the user command TRIGGERNOW/STOPTRIGGER sent either from the console or remotely from a server
	After Event	A trigger is activated after recording of any event file
	After Startup	First trigger is activated after the instrument startup
	Date and Time	First trigger is activated at the defined date/time
Total number of triggers	*User selectable*	After reaching the configured number of triggers the preset trigger will not be activated anymore
Delay after event	*User selectable*	In case After Event is selected, then the time between the end of the event to the begin of the activation of the preset trigger can be configured
First trigger time, year	*User selectable*	Date and time of the first trigger
First trigger time, day	*User selectable*	
First trigger time, hour	*User selectable*	
First trigger time, minute	*User selectable*	
Stored channels	*User selectable*	Number of channels which should be stored into an event file in case of a trigger

List of stored channels	*User selectable*	Depending on the number of stored channels different sources can be selected. '**+**' and '**-**' can be used to change the channel, the source can be selected by pressing '**A**'

8.7. File Storage and Policy

It can be configured in the instrument how all the files should be treated.

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press 'M' to get to the *File Storage and Policy* menu to adjust the settings of the file storage. The following menu appears:

```
Main Menu | File Storage
  A) System reserved space, Mb ........ 12 (0x0C)
  B) Length of one RB file, minutes ... 10 (0x0A)
  C) SOH and requested data files ..... ->
  D) System log files ................. ->
  E) Events and PGM files ............. ->
  F) Ringbuffer files ................. ->
  G) Scheduled manual recordings ...... ->
```

- The following parameters can be adjusted:

System reserved space		*User selectable*	Amount of memory reserved for the operating system in [Mb]. Keep **12** Mb by default
Length of one RB file		*User selectable*	Permanent data will be stored in ringbuffer files; here the length of one ringbuffer file in minutes can be specified. After this time the file will be closed and a new one started.
SOH and requested data files	***Disk space quota***	*User selectable*	Reserved memory on the CF-Card for the SOH files in [%]
	If over quota	***Delete oldest files***	In case the reserved memory is full the oldest files will be deleted first
	Life time	*User selectable*	After the configured time in [days] the files will be deleted from the CF-Card
	Transfer priority	***Never Transfer*** ***Low*** ***Mid*** ***High*** ***Highest***	In case a lot of files have to transferred, the priority of the file upload can be configured here. If Never Transfer is configured, then no files will be uploaded
	Transfer order	***Newest first*** ***Oldest first***	Most recent files are transferred first Most old files are transferred first
	Delete transferred	***Yes*** ***No***	Files will be deleted after upload to the server Files will be not deleted after upload to the server

System log files	***Disk space quota***	*User selectable*	Reserved memory on the CF-Card for the Log files in [%]
	If over quota	***Delete oldest files***	In case the reserved memory is full the oldest files will be deleted first
	Life time	*User selectable*	After the configured time in [days] the files will be deleted from the CF-Card
	Transfer priority	***Never Transfer*** ***Low*** ***Mid*** ***High*** ***Highest***	In case a lot of files have to transferred, the priority of the file upload can be configured here. If Never Transfer is configured, then no files will be uploaded
	Transfer order	***Newest first*** ***Oldest first***	Most recent files are transferred first Most old files are transferred first
	Delete transferred	***Yes*** ***No***	Files will be deleted after upload to the server Files will be not deleted after upload to the server
Events and PGM files	***Disk space quota***	*User selectable*	Reserved memory on the CF-Card for the Log files in [%]
	If over quota	***Delete oldest files*** ***Stop recording*** ***Delete files with smaller PGV***	In case the reserved memory is full the oldest files will be deleted first Recording will be stopped in case reserved memory is full The records with the smallest PGV will be deleted first
	Life time	*User selectable*	After the configured time in [days] the files will be deleted from the CF-Card
	Transfer priority	***Never Transfer*** ***Low*** ***Mid*** ***High*** ***Highest***	In case a lot of files have to transferred, the priority of the file upload can be configured here. If Never Transfer is configured, then no files will be uploaded
	Transfer order	***Newest first*** ***Oldest first***	Most recent files are transferred first Most old files are transferred first
	Delete transferred	***Yes*** ***No***	Files will be deleted after upload to the server Files will be not deleted after upload to the server
Ringbuffer files	***Disk space quota***	*User selectable*	Reserved memory on the CF-Card for the Log files in [%]
	If over quota	***Delete oldest files***	In case the reserved memory is full the oldest files will be deleted first
	Life time	*User selectable*	After the configured time in [days] the files will be deleted from the CF-Card
	Transfer priority	***Never Transfer*** ***Low*** ***Mid*** ***High*** ***Highest***	In case a lot of files have to transferred, the priority of the file upload can be configured here. If Never Transfer is configured, then no files will be uploaded
	Transfer order	***Newest first*** ***Oldest first***	Most recent files are transferred first Most old files are transferred first
	Delete transferred	***Yes*** ***No***	Files will be deleted after upload to the server Files will be not deleted after upload to the server

Scheduled manual recordings	***Disk space quota***	*User selectable*	Reserved memory on the CF-Card for the Log files in [%]
	If over quota	***Delete oldest files***	In case the reserved memory is full the oldest files will be deleted first
	Life time	*User selectable*	After the configured time in [days] the files will be deleted from the CF-Card
	Transfer priority	***Never Transfer*** ***Low*** ***Mid*** ***High*** ***Highest***	In case a lot of files have to transferred, the priority of the file upload can be configured here. If Never Transfer is configured, then no files will be uploaded
	Transfer order	***Newest first*** ***Oldest first***	Most recent files are transferred first Most old files are transferred first
	Delete transferred	***Yes*** ***No***	Files will be deleted after upload to the server Files will be not deleted after upload to the server

8.8. Communication Parameters

To set up the connection to the server

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press ‘N’ to get to the *Communication Parameters* menu to adjust the settings of the file storage. The following menu appears:

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 10 (0x0A)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ No
```

- The following parameters can be adjusted:

Contact remote servers		***Yes*** ***No***	The instrument connects to the configured data server(s) The instrument does not connect to any data servers
	Number of servers	*User selectable*	Number of data servers. If the instrument can not connect to the first data server it will connect to the second data server, if this one is down it connect to the third and so on. Scanning of servers stops after first successful connection
	Time interval	*User selectable*	Interval of connection to data servers in seconds
	Maximum files per session	*User selectable*	Maximum number of files, which will be uploaded during one session. Although data servers support concurrent connections, this parameter helps distributing the load of data processing by the server among several instruments
	Connect if there are new files	***Yes*** ***No***	Instrument connect to the server in case there are new files recorded and are ready to be transmitted Instrument does not connect to the server in case there are new files. It just connects periodically as defined with the parameter **Time interval**
Server parameters	'**+**' and '**-**' can be used to change between the clients		
	Server IP Address	User selectable	IP address of the data server
	Protocol	**Custom**	Protocol of communication, can not be changed so far
	Port	User selectable	Communication port of the data server
	Transfer timeout	User selectable	Instruments gives up to contact the server after the configured timeout in seconds
	Network triggers	**Yes** **No**	Triggers are sent to the server, for event detection as described in chapter 8.8.1.1 Triggers are not sent to the server
	Connect through PPP link	***Yes*** ***No***	Instrument connects to the data through PPP link Instrument does not connect to the data server through PPP
	Use PPP only if main link fails	***Yes*** ***No***	Use PPP in case no connection is possible to the data server over Ethernet or Wifi Use PPP for every connection, independent from the main connection status
	Preferable PPP link type	**Internal analog modem** **External GPRS modem**	Use internal analog modem first Use external GPRS modem first
	Number of failures to give up	User selectable	Number of trials until giving up
	Try alternate PPP link on failure	***Yes*** ***No***	Tries the alternative modem in case the first one fails Does not try further in case connection fails with the first modem

Server mode		***Yes***	The instrument acts as a data server for other instruments
		No	The instrument does not act as a data server
	Port for incoming connections	User selectable	Port for incoming connections. Other instruments have to set the same port under Server parameters
	Secure authentication	***Yes***	Secure authentication (SSL encryption) enabled
		No	Secure authentication (SSL encryption) disabled
	Number of clients	User selectable	Number of client instruments which upload data to this instrument
Clients Parameters	'**+**' and '**-**' can be used to change between the clients		
	Client IP Address	User selectable	IP of the client instrument which connects to this instrument
	Client serial number	***Custom***	Serial number of the client instrument. Use 000000 to allow instruments with any serial numbers to connect
	Transfer timeout	User selectable	Network timeout in seconds
	Data forwarding	***Yes***	Data from the data server will be forwarded to the client instruments and the other way round
		No	Data will not be forwarded
	Network triggers	***Yes***	Network triggers will be sent to the server
		No	Network triggers will not be sent to the server

8.8.1. Server Settings in GeoDAS

To be able to communicate with the instrument, the GeoDAS must act as a server. This chapter should help to find the correct settings.

- Open *GeoDAS* and Go to the menu ***Settings → Configure Stations…*** , the following window will appear

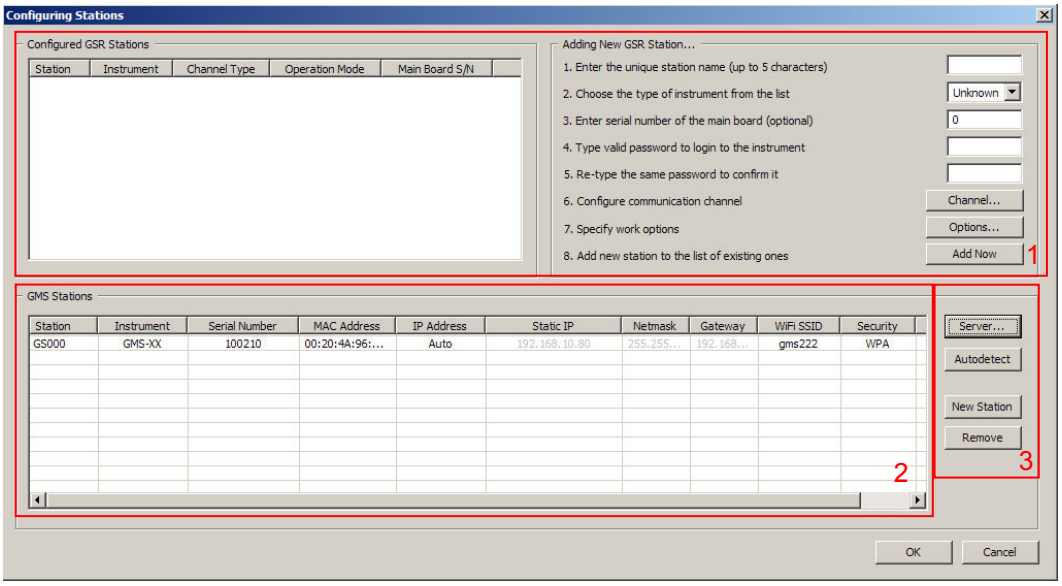


Figure 37. Configuration Stations

Area	***Topic***	Description
1	Configured GSR Stations	Details about the configured GSR-xx and GCR-xx stations. Check separate *GeoDAS Manual* for details.
2	GMS Stations	Details about the configured instruments. ***Station*** name can be changed by a double click on the field you want to change. Network settings can be done according to chapter 7. The last column in the table is *Status*, which is indicated by one or more letters, which are the following: • N – New instrument • C – already Configured earlier • A – Altered parameters • R – actual settings were Received from the instrument
3	Buttons	***Server*** Configuration of the Server, see chapter 8.8.1.1
		Autodetect Checks for instruments which are located in the same LAN. Autodetection must be enabled in the instrument, see chapter 8.9 for configuration (by default it is set to ON)
		New Station Add manually an instrument. S/N of the instrument must be known

For more details please see *GeoDAS Manual*

8.8.1.1. Configuration of Server Parameters

- Press the button ***Server…***, the window below appears

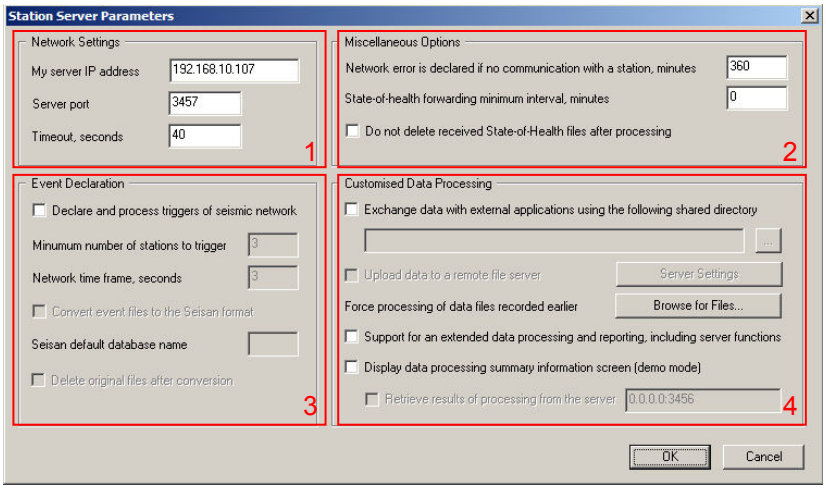


Figure 38. Data server parameter

Area	***Topic***	Description
1	Network Settings	***IP address and port*** of the server, i.e. computer which GeoDAS is running on as well as the network ***Timeout*** in seconds. If server has several network interfaces and connections from Instruments are expected from only one of them, then its IP address must be specified. Otherwise, leave it zero, which means that GeoDAS accepts incoming connection at any interface. The timeout is used to decide when to terminate current network connection if the remote party does not respond within the indicated time interval.
2	Miscellaneous Options	***Network error*** is declared if an instrument did not communicate with *GeoDAS* within the indicated period of time. Make sure that this parameter is higher that the communication interval set in the instrument as described in chapter 8.8. If **State-of-health forwarding interval** is set to nonzero value, then SOH reports are collected within this period of time and only then are forwarded. You can also choose not to delete SOH reports after processing. If this option is selected, all received SOH reports remain in the directory *\\GeoDAS_DATA\StatusFiles\InfoSOH*
3	Event Detection	GeoDAS can be instructed to analyse event data files received from configured GMS instruments to see if they belong to the same earthquake and to declare an event if it is so. You need to enable the option ***Declare and process triggers of seismic network*** in order to do so. A network event is declared if at least ***Minimum number of stations triggered*** within the ***Network time frame***. Received even files can be converted to Seisan format and stored in Seisan database on the same computer.
4	Customised Data Processing	This is not a standard feature of GeoDAS. Therefore please check the GeoDAS Manual and contact GeoSIG for further details if you need to use this functionality.

8.8.2. PPP Link Configuration

The following chapter is for advanced users only

If it is required to use PPP link for communication of GMS-xx with the GeoDAS server, then the configuration must be set accordingly in newdas. It is also required to configure PPP for selected ISP (Internet Service Provider). The ISP configuration settings is separated from configuration of newdas and described in chapter 8.8.2.2.

The GeoDAS server must have a real static IP-address (please, consult with ISP to obtain such a service). In this example, 62.15.87.98 IP-address will be used for the GeoDAS server. GeoDAS server must be configured as described in chapter 8.8.1

8.8.2.1. NewDAS Configuration

To configure newdas, connect to GMS-xx through serial console or from GeoDAS as described in chapter 8.1. From GMS-xx console, press '***C***' button and ***<Enter>***, select Edit Current configuration.

```
Main Menu
  A) Station description ............. GS-IA18 Test Station
  B) Station code .................... GS_IA
  C) Location description ............ o
  D) Seismic network code ............ NC
  E) Number of Channels .............. 2
  F) Number of Output Streams ........ 0
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 0
  I) Channel Parameters .............. ->
  K) Trigger Parameters .............. ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->

Select <A>...<P>. <Esc> to exit
```

- Press '**N**' to enter the Communication Parameters

```
Main Menu | Communication
  A) Contact remote servers ............. Yes
  B) Number of servers .................. 1
  C) Time interval, sec ................. 60 (0x3C)
  D) Maximum files per session .......... 10 (0x0A)
  E) Connect if there are new files ..... Yes
  G) Server Parameters .................. ->
  H) Server mode ........................ No

Select <A>...<L>. <Esc> back to Main Menu
```

- Change *Contact remote servers* to ***Yes***, then adjust the *Server Parameters* by pressing '***G***'

```
Main Menu | Communication | Server
  A) Server IP Address ...................... 62.15.87.98
  B) Protocol ............................... Custom
  C) Port ................................... 3456
  H) Transfer timeout, sec .................. 40 (0x28)
  I) Network triggers ....................... No
  J) Connect through PPP link ............... Yes
  K) Preferable PPP link type ............... Internal analog modem
  L) Number of failures to give up .......... 3 (0x03)
  M) Try alternate PPP link on failure ...... Yes
  N) Startup time for analog modem (temp) ... 2 (0x02)
  O) Startup time for GPRS modem (temp) ..... 20 (0x14)
  P) Connect time for analog modem (temp) ... 30 (0x1E)
  Q) Connect time for GPRS modem (temp) ..... 5 (0x05)
```

GeoDAS server IP address must be set as *Server IP Address* and port number for *Port* parameter such as for server in GeoDAS configuration (see Figure 24).

Connect through PPP link should be ***Yes***.

Preferable PPP link type can be ***Internal analog modem*** or ***External GPRS modem*** (depends from used modem type).

If the user wants to use two modems (analog and GSM) together, one of which is in a role of an alternate link, then required to set *Try alternate PPP link on failure* to ***Yes***. In this case, if the preferred modem will fail after the *Number of failures to give up*, then alternate modem will be used to establish link.

After this adjustments exit from submenus by ***<ESC>*** key, save configuration with '***C***' and restart newdas by pressing '***R***'.

8.8.2.2. The ISP Configuration for PPP

The files which are required for a dialup connection are located in a "/var/disk1/dialup" directory of the Linux filesystem (or "dialup" directory of the CompactFlash card inserted in a PC's card reader).

The main configuration of PPP link stored in a chatscript files and must be adjusted by user for selected ISP (Internet Service Provider).

The ISP configuration files:

chatscript — chatscript file for analog modem.

chatscript-gprs — chatscript file for GSM modem.

This is a typical unix configuration files where '**#**' sign mean that string in commented out and therefore not used. These files can be edited directly from the GMS-xx console with the vi editor or by another editor at the host workstation if a card reader used.

- To edit chatscript file on the instrument, press '***Q***' in the newdas main menu, then <Enter> to exit newdas. A command prompt (an empty line with a '**#**' character at the beginning) will appear. Then run the following command to launch the vi-editor.

```
vi /var/disk1/dialup/chatscript
```

or

```
vi /var/disk1/dialup/chatscript-gprs
```

- Press ***i*** (Attention: Case sensitive) to get to the EDIT MODE and change the settings as described below

To configure PPP for the used ISP (Internet Service Provider) it is required to adjust a phone number (for the analog modem), APN (for the GPRS modem), username and password.

All this parameters marked **red** inside of the listed chatscripts below

Chat script for analog modem ("chatscript")

The "Sunrise.ch" ISP used in this EXAMPLE, where the following settings must be set

- Phone number: 0840555555
- Username: sunrise
- Password: freesurf

Phone number is concatenated to "ATDT" AT command. The chatscript file content is:

```
ABORT "BUSY"
ABORT "NO CARRIER"
ABORT "NO DIALTONE"
ABORT "NO ANSWER"
ABORT "ERROR"
ABORT "Username/Password Incorrect"
# wait for the newline and send AT command
"" "AT"
"OK" "AT+IFC=1,1"
# wait for the "OK" responce and dial to the phone number in tone mode
OK "ATDT0840555555"
CONNECT ""
# wait for the login prompt and send a username
":" "sunrise"
# wait for the colon and send a password
":" "freesurf"
"" "ATQ0"
```

Chat script for GSM modem with GPRS ("chatscript-gprs").

The "Vodafone" ISP used in this EXAMPLE, where the following settings must be set

- APN: *internet*
- Username: is empty (field inside of first **red** empty quotation-marks).
- Password: is empty (field inside of second **red** empty quotation-marks).

The chatscript file content is:

```
ABORT "BUSY"
ABORT "ERROR"
ABORT "Username/Password Incorrect"
"" "ATZ"
"OK" "AT"
"OK" "AT+IFC=1,1"
# Here is an APN must be specified.
# Vodafone Italy
"OK" 'AT+CGDCONT=1,"IP","internet"'
# Attach to the GPRS service.  Strictly, we don't need this step,
# as AT+CGDATA will do it for us, but doing it explicitly makes it
# a little easier to debug.
OK        'AT+CGATT=1'
SAY        "\n + attaching to GPRS"
# Enter data state
#  Teltonika ModemCOM/G10 doesn't do the CGDATA command, use the magic number
instead
"OK" "ATDT*99#"
TIMEOUT 30
CONNECT
# wait for the login prompt and send a username
":" ""
# wait for the colon and send a password
":" ""
```

- Save the file and leave the EDIT MODE by pressing ***<Esc>***, then ***ZZ*** (Attention: Case sensitive). To abort and cancel without saving your changes, press ***<Esc>***, then type ***:q!***
- Switch off the Instrument by press and hold the POWER button for 2 seconds. Attention: Shutdown will take longer than normal.
- Then connect the instrument to the network and restart again.

In case of troubles with connection to the used ISP, please contact the ISP support service.

8.9. Miscellaneous Parameters

The Time synchronisation, State of Health files, messaging and debugging

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '**O**' to get to the *Miscellaneous Parameters* menu to adjust time synchronisation offset detection, signal simulator and other settings. The following menu appears:

```
Main Menu | Miscellaneous
  A) Offset detection time, sec ............... 10 (0x0A)
  B) Offset correction time, sec .............. 0 (0x00)
  C) Offset correction counts ................. 1 (0x01)
  D) Active signal simulator .................. No
  E) MiniSEED record length ................... 512
  F) Extended MiniSEED format ................. Yes
  G) State of health .......................... ->
  H) Test configuration ....................... ->
  I) Messaging and debugging .................. ->
  J) Time synchronization ..................... ->
  K) Instrument configuration options ......... ->
  L) Time for sending daily logfile, hour ..... 0 (0x00)
  M) Time for sending daily logfile, minute ... 0 (0x00)
```

- The following parameters can be adjusted:

Offset detection time	*User selectable*	Time in seconds, which the input values is measured after start-up to define the offset
Offset correction time	*User selectable*	The instrument takes the average over the number of seconds, configured in the *Offset correction time* and adds or subtracts the number of counts defined under *Offset correction counts*
Offset correction counts	*User selectable*	
Active signal simulator	***No*** ***Yes***	Signal simulator is disabled Activates the signal simulator, the signals on the channels must be configured as described in the chapter 8.3
MiniSEED record length	*User selectable*	Length of one data block inside the miniSEED file. In most applications, the default value 512 shall be kept.
Extended MiniSEED format	***No***	MiniSEED files do not include any additional information. This option shall be used only if you face any problems in reading extended format of miniSEED files with your customized software.

		Yes *(default)*	MiniSEED files include configuration and state of health information. When you open such files with GeoDAS, there is no need to enter LSB factors and units (see the section 9 Open recorded miniSEED files in GeoDAS) as this information is retrieved from files. This feature is supported from GeoDAS version 2.21.

State of health	***SOH report type***		***None*** ***No***	No State-Of-Health file will be created State-Of-Health files will be created and uploaded to the server according to the settings in chapter 8.7
		SOH reporting interval , days	*User selectable*	Defines the interval between the SOH reports in days, hours and minutes
		SOH reporting interval, hours	*User selectable*	
		SOH reporting interval, minutes	*User selectable*	
	Time of the first SOH report		***Startup*** ***Random*** ***User defined***	First SOH report will be created at startup Time of the first SOH is random. This is to avoid all instruments use the network at the same time. First SOH report will be created at the user defined time
		First SOH report time, hours	*User selectable*	Defines the hour and minute of the first SOH report
		First SOH report time, minutes	*User selectable*	
	Activate alarm on errors		***Yes*** ***No***	Activates an alarm relay in case of an error Alarm relay will not be activated in case of an error
		Activate alarm when system is inactive	***Yes*** ***No***	Alarm relay is activated in case *newdas* is not running (e.g. during startup or after quit) Alarm relay will not be activated
		Error and inactivity alarm output	***AL1, AL2, AL3, AL4***	Alarm relay which should be activated in case of an error or *newdas* is not running
		Activate alarm on selected errors only	***No*** ***Yes***	Selected alarm relay is activated on all errors Selected alarm relay is activated on selected errors only. The errors can be selected by pressing '***L***' to '***T***'
Test configuration	***Sensor test type***		***None*** ***Pulse***	No test pulse is generated Test pulse is generated, depending on the following settings
		Sensor test interval	*User selectable*	Interval between two sensor tests
		Time of the first test	***Startup*** ***Random*** ***User defined***	First test will be done at startup, next after the defined interval Time of the fist test is random. This is to avoid, that all instruments in a network are doing the test in exactly the same moment. This would be critical in case of an earthquake at this time. First test will be done at the user defined time

Messaging and debugging	***Console messages***	***Yes*** ***No***	Enables console messages Disables all consol messages
	Debug: memory allocation	***Yes*** ***No***	Enables or disables specific debug messages. These are for service or advances users only. Keep *No* by default.
	Debug: system and processes		
	Debug: flash memory		
	Debug: configuration		
	Debug: network links		
	Debug: data streams		
	Debug: data sources		
	Debug: ring buffers		
	Debug: event triggers		
	Debug: time synchronisation		
	Debug: file manager		
	Debug: cryptographic info		
	Debug: hardware related info		
Time Synchronization	***Time source***	***RTC*** ***GPS*** ***NTP*** ***AUTO*** ***NET1PPS***	RTC is not synchronizing itself to any source RTC is synchronizing to the connected GPS RTC is synchronizing to a NTP server RTC synchronizes to NTP in case GPS is not available RTC is synchronizing to the 1PPS signal distributed by the 433 MHz module or the interconnection network.
	NTP server 1	*User selectable*	IP of the primary NTP Server
	NTP server 2	*User selectable*	IP of the secondary NTP Server
	NTP server query interval	*User selectable*	Interval time in seconds the NTP server is contacted by the instrument
	NTP requests in a row	*User selectable*	Every time the instrument is contacting the NTP server the configured number of requests will be sent. **For service and advanced user only, do not change** the default value of '***4***'
	NTP network timeout	*User selectable*	Maximum time to receive a reply from the NTP server in [seconds]. **For service and advanced user only, do not change** the default value of '***3***'
	NTP maximum error	*User selectable*	Above this time in [seconds] the RTC will make a time jump to the NTP time. Otherwise the time will be tuned slowly. **For service and advanced user only, do not change** the default value of '***1***'
	GPS reception timeout, min	*User selectable*	If GPS signal is lost, after this time in [minutes] the RTC will change its synchronization to NTP

	GPS check interval in NTP mode, min	*User selectable*	If in the '***Auto***' mode, the RTC is synchronized to the NTP the instruments checks in the configured interval if the GPS is available again
	GPS check duration in NTP mode, sec	*User selectable*	
	Send SOH upon RTC status change	***Yes***	In case RTC status changes, a SOH message will be uploaded to the server
		No	No SOH message will be sent upon RTC status change
Instrument configuration options	***Enable autodetection of the instrument***	***Yes***	Instrument can automatically be found by GeoDAS in the LAN
		No	Instrument can not automatically be found by GeoDAS
Time for sending daily logfile, hour		User selectable	If transfer is activated in chapter 8.7 at this time the daily logfile will be sent to the server. Can be adjusted to avoid that all instruments send the logfile at exactly the same time

8.10. Auxiliary Devices

For specific applications a data processor, a wind sensor and a related MODBUS touch panel has been implemented.

This is not a standard feature of the instrument. Therefore please check separate manual and contact GeoSIG for further details.

```
Main Menu
  A) Station description ............. Demo GMS-18
  B) Station code .................... DEMO
  C) Location description ............ GSO
  D) Seismic network code ............ CH
  E) Number of Channels .............. 3
  F) Number of Output Streams ........ 1
  G) Number of Trigger Sets .......... 1
  H) Number of Preset Triggers  ...... 1
  I) Channel Parameters .............. ->
  J) Stream Parameters ............... ->
  K) Trigger Parameters .............. ->
  L) Parameters of Preset Triggers ... ->
  M) File Storage and Policy ......... ->
  N) Communication Parameters ........ ->
  O) Miscellaneous Parameters ........ ->
  P) Auxiliary Devices ............... ->
```

- Press '**P**' to get to the *Auxiliary Devices* menu to adjust settings about Wind Sensor, Data Processor and Modbus Touch Panel. This is not a standard feature of the instrument. Therefore please check separate manual and contact GeoSIG for further details.

```
Main Menu | Auxiliary Devices
  A) Wind Sensor (WS) ................ No
  C) Data Processor (DP) ............. No
  K) Modbus Touch Panel .............. No
```

8.11. Other Options in the Instrument Main Menu

Next to the edit of the instrument configuration, there are other actions possible from the main menu shown below:

```
GS_IA18 version 20.00.63
Main menu:
C - Configuration
M - Messages ->
S - Shell command
X - Display errors (0) and warnings (0)
W - Clear errors and warnings
F - View/reset RTC trim values
G - View RTC status
H - Set RTC time
U - User request
R - Restart
Q – Quit
```

	Action or command	Description
C	***Configuration***	Change of the configuration of the instrument. See chapter 8.1.1 for details
M	***Messages →***	Possibility to configure, what kind of messages are shown in the console.
S	***Shell command***	Allows executing a Linux shell command from *newdas*. For advanced users only
X	***Display errors (n) and warnings (m)***	Shows present errors and warnings
W	***Clear errors and warnings***	Clears all errors and warnings
F	***View/reset trim values***	Shows trim values of the RTC. Trim table can be erased as well. For advanced users only.
G	***View RTC status***	Shows the actual state of the real time clock and if the RTC is synchronized to NTP or GPS
H	***Set RTC time***	Allows setting the time of the instrument manually. Keep in mind, that if a GPS is connected or a NTP server is configured, the time will be synchronized to them after a while
U	***User request***	See chapter 8.11.1 for details
R	***Restart***	Restarts the instrument, e.g. after a change of the configuration
Q	***Quit***	Stops *newdas* data acquisition and exits to the Linux console. For advanced users only

8.11.1. User requests

Several actions can be initiated by the user:

- In the main menu press '**U**' to enter the *User request* menu, type ***HELP*** to see all the possible commands

```
GS_IA18 version 20.00.63
Main menu:
C - Configuration
M - Messages ->
S - Shell command
X - Display errors (0) and warnings (0)
W - Clear errors and warnings
F - View/reset RTC trim values
G - View RTC status
H - Set RTC time
U - User request
R - Restart
Q - Quit

Command or HELP for more information --> help
```

- The following user requests are possible

The same request can also be done from GeoDAS by choosing 'Send a Request' from the 'GMS Communication Interface'. See chapter 10.4 for details.

```
Supported commands are:
 GETEVT YYYY-MM-DD HH:MM:SS N - request N seconds of ringbuffer data, starting f
rom the indicated date and time
 LASTDT YYYY-MM-DD HH:MM:SS - set date and time of the last transferred file to
the indicated ones
 GETSOH - generate SOH file with the current state-of-health information
 GETLOG - force uploading current logfile to a server
 SETMSG flags - enable debug log messages, see the manual for details
 CLRMSG flags - disable debug log messages, see the manual for details
 TSTSENSOR 1 - generate a sensor test pulse
 RESETERR - reset errors and warnings of the instrument
 TRIGGERNOW [trigger_name] - activate manual trigger to start recording
 STOPTRIGGER [trigger_name] - deactivate manual trigger
 GETTRIM - retrieve RTC trim values
 CLRTRIM - reset RTC trim table
 REMOVEDC - remove offsets from signals
 TCAL <Tcur> - calibrate temperature correction using current temperature Tcur i
n C
 CANCEL - go out if you are here by mistake
```

Action or command	Description
GETEVT YYYY-MM-DD HH:MM:SS N	The instrument creates an event with the length of N seconds from the ringbuffer data, starting from the indicated date and time and uploads the data to the server if configured (see chapter 8.8 Communication Parameters).
LASTDT YYYY-MM-DD HH:MM:SS	Set date and time of the last transferred file The instrument saves the date and time of the latest uploaded file and will not upload any file which is created before this date and time. Under normal conditions this will be never the case. But if the time is changed backwards by the user - e.g. from 10:00 to 06:00 - the instrument will not upload any data till 10:00 again. So the time of the last transferred file can be adjusted here and should be set to 06:00 in this example.
GETSOH	The instrument generates a SOH file with the current state-of-health information and uploads to the server if configured (see chapter 8.9 Miscellaneous Parameters).
GETLOG	The instrument uploads today's logfile to the server.
SETMSG flags	For service only, do not change
CLRMSG flags	
TSTSENSOR 1	The instrument generates a sensor test pulse. When a level trigger is activated an event will be recorded of this test pulse and uploaded to *GeoDAS_DATA\Incoming\NNNNNN*\
RESETERR	Reset errors and warnings of the instrument
TRIGGERNOW [trigger_name]	Activate manual trigger to start recording, the manual trigger must be configured as described in the chapter 8.5
STOPTRIGGER [trigger_name]	Deactivates the manual trigger
GETTRIM	The instrument will upload a SOH file containing the actual values from the RTC trim table. The latest SOH file can be found under *GeoDAS_DATA\StatusFiles\InfoSOH.xml*
CLRTRIM	The instrument will clear the RTC trim table
REMOVEDC	Remove offsets from signals
TCAL <Tcur>	Calibration of the internal temperature sensor by applying the actual temperature in °C. Temperature is used for the learning of the RTC.
CANCEL	Leave the menu

9. Open recorded miniSEED files in GeoDAS

The system is recording miniSEED files (.MSD). For viewing such files, GeoDAS can be used. As the signal is stored inside the mini-seed file in counts, a scaling factor has to be applied when opening the data. If an extended format of MiniSEED files is used (see the chapter 8.9 Miscellaneous Parameters), scaling factors are applied by GeoDAS automatically, and you may skip the information below.

- Open ***GeoDAS***
- Open recorded mini-seed file from the menu ***File → Open…***

Event files are stored under:	*\\GeoDAS_DATA\Data\STATION_NAME*
Ringbuffer files are stored under:	*\\GeoDAS_DATA\DataStreams\STATION_NAME*
Testpulses are stored under:	*\\GeoDAS_DATA\Incoming\NNNNNN*

- When you open a '.MSD' file with *GeoDAS*, the following dialog box for scaling factor appears

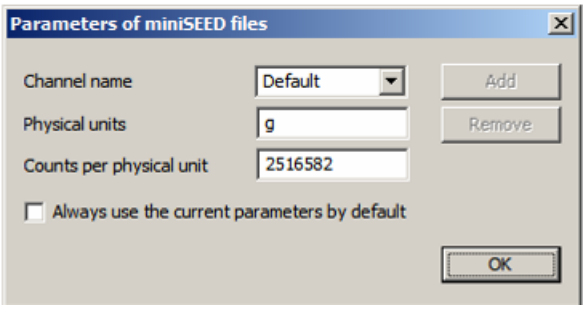


Figure 39, GeoDAS miniSEED parameters

- The values *Physical unit* and *Counts per physical unit* must be set for correct display data in GeoSIG software GeoDAS. The values can be found in the Table 8 or calculated as described in chapter 9.2.

Do not tick "Always use the current parameters by default" as it is better to be remembered that scale has to be defined manually for such file type.

- Press ***OK***

- If instead of the scale prompt you get directly the graph, use menu: *Analyse → Parameters… → Parameters of miniSEED files* and press **Edit**:

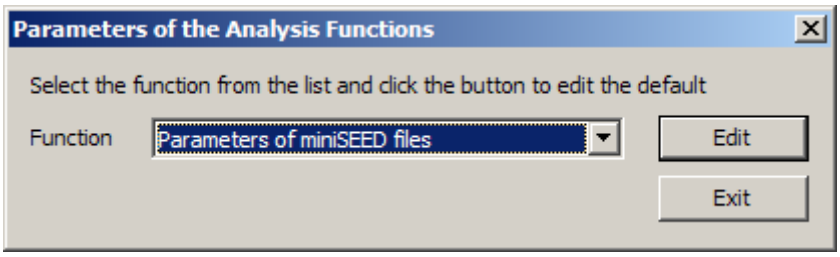


Figure 40, GeoDAS analyses parameters

- Now the dialog box for scaling factor should be seen. Enter the correct values, close and reopen the file you want to see. You will be prompted again for scale, just press Ok as the scale is now correct.

9.1. Save predefined Scaling Factors

The scaling factor set under Counts per physical unit is always valid for all channels in the same miniSEED file. In case the channels have different physical units (e.g. if a six channel instrument with two different types of sensors is used) a scaling factor for each channel separately can be defined.

To define a scaling factor for a specific channel, enter the full channel name (e.g. LCAX1) in the *filed Channel name* and press ***Add***

All channels which are not specifically defined are converted with the scaling factor saved under *Default*.

9.2. Calculation of the Scaling Factors

If you don't know how to calculate the scaling factor, follow these steps:

Sensors with given full scale

Output Voltage of the sensor must be +/- 10 V

$$\text{LSB} = \frac{FullScale}{0.9 \cdot 2^{23}} = \frac{FullScale}{754'9747.2}$$

$$\text{Scale factor} = \frac{1}{LSB} = \frac{0.9 \cdot 2^{23}}{FullScale} = \frac{754'9747.2}{FullScale}$$

Example, 3 g sensor

$$\textit{Scaling factor} = \frac{0.9 \cdot 2^{23} counts}{3g} = \frac{754'9747.2\,\text{counts}}{3g} = \underline{\underline{2516582\,\text{counts/g}}}$$

Sensors with given Sensitivity

$$\text{LSB} = \frac{\frac{10V}{Sensitivity}}{0.9 \cdot 2^{23} counts} = \frac{1.324547e-6\frac{V}{counts}}{Sensitivity}$$

$$\text{Scale factor} = \frac{1}{LSB} = \frac{0.9 \cdot 2^{23} counts}{\frac{10V}{Sensitivity}} = \frac{Sensitivity}{1.324547e-6\frac{V}{counts}}$$

Example, 1000 V/m/s sensor

$$LSB = \frac{0.9 \cdot 2^{23}}{\frac{10V}{1000\frac{V}{m/s}}} = \frac{1000\frac{V}{m/s}}{1.324547e-6\frac{V}{counts}} = \underline{\underline{150994944\,counts/m/s}}$$

The scaling factors of all GeoSIG sensors can be found in the following table

Sensor type	Full Scale	Output Voltage Range	Scaling factor
AC-xx	0.5 g	+/- 10 V	15’099’494 counts/g
	1 g	+/- 10 V	7’549’747 counts/g
	2 g	+/- 10 V	3’774’874 counts/g
	3 g	+/- 10 V	2’516’582 counts/g
	4 g	+/- 10 V	1’887’437 counts/g
VE-13 VE-23	1 mm/s	+/- 10 V	7’549’747 counts/mm/s
	10 mm/s	+/- 10 V	754’975 counts/mm/s
	100 mm/s	+/- 10 V	75’497 counts/mm/s
VE-33	**Sensitivity:** 27.3 V/m/s (27.3 Vs/m)		20’610’820 counts/m/s 20’611 counts/mm/s
VE-53	**Sensitivity:** 1000 V/m/s (2x 500 V/m/s)		754’974’720 counts/m/s 754’974 counts/mm/s
	Sensitivity: 200 V/m/s (2x 100 V/m/s)		150’994’944 counts/m/s 150’994 counts/mm/s

Table 8. Scaling factors of different sensors

10. Instrument Control in GeoDAS

By making a right click on the station name in the window *Stations: General Information* several options become available to control and check the instrument. See the figure below:

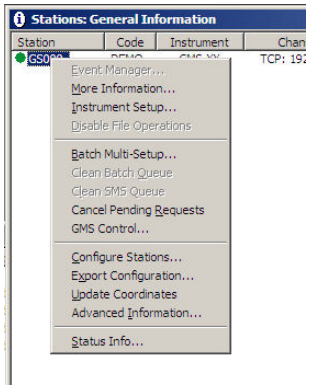
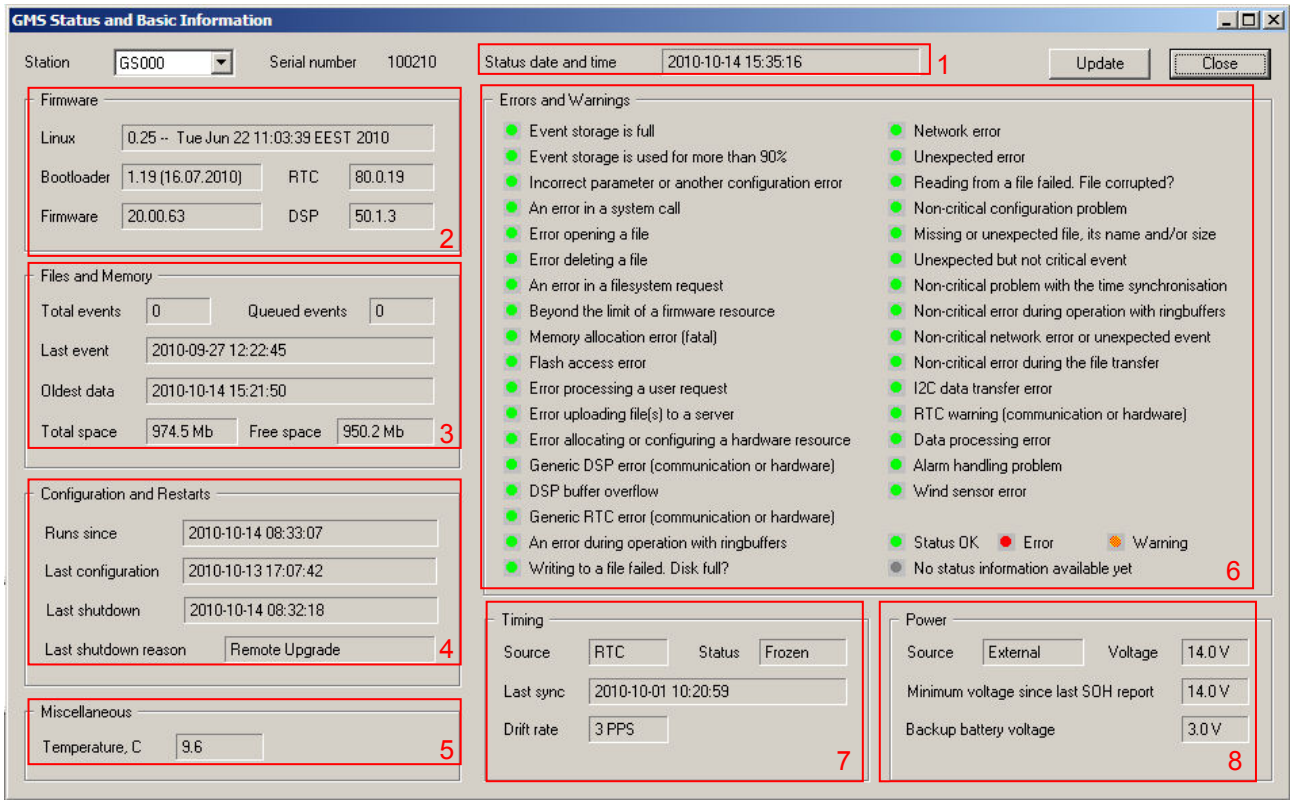


Figure 41, Instrument control of the GMS in GeoDAS

10.1. More Information… (State of Health of the instrument)

The status of the instruments can be easily checked, if the instrument is set up to transfer periodically the SOH file to the server (See details about SOH configuration in chapter 8.7 and 8.9).

- Make right click on the Station in the GeoDAS main window and select ***More Information…*** , the following window will appear:



Area	*Topic*	Description
1	Status date and time	Before analysing the SOH data always make sure that the SOH files are current ones by checking the time and date here.
2	Firmware	Here the firmware versions of all components can be viewed.
3	File and Memory	Information about events and available memory.
4	Configuration and Restarts	Date and time of the last restart, the last configuration change and the last shutdown are shown. Additionally the reason of the last shutdown is indicated.
5	Miscellaneous	Ambient temperature, measured inside the instrument.
6	Errors and Warnings	List of all errors and warnings of the instrument.
7	Timing	Status of the RTC.
8	Power	Status of the power supply and the battery voltages.

10.2. Instrument Setup…

See the chapter 8.1.2 for details.

10.3. Cancel Pending Request

The pending requests on the server as shown in the Figure 38 can be cancelled by the user.

10.4. GMS Communication Interface

- Make right click on the Station in the GeoDAS main window and select ***GMS Control…*** , the following window will appear:

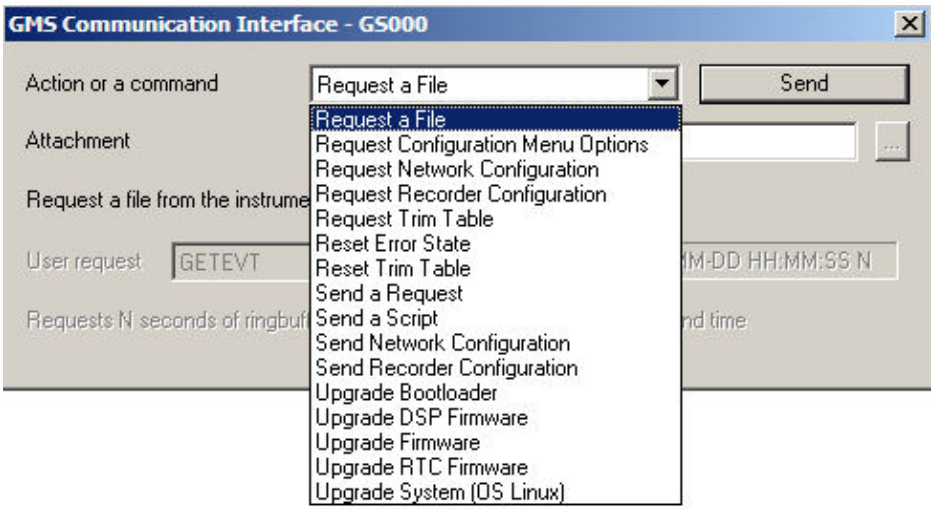


Figure 42. GMS Communication Interface

Action or command	Description
Request a File	Request a file from the instrument, the full path to the file must be specified
Request Configuration Menu Options	The instrument uploads the structure of the configuration menu and saves the file in *\\GeoDAS_DATA\Config\Stationname.mnu.* This file is needed for offline configuration of the instrument as described in chapter 8.1.2.
Request Network Configuration	The instrument uploads the network settings of the instrument and saves the file in *\\GeoDAS_DATA\Config\Stationname.net*
Request Recorder Configuration	The instrument uploads the configuration of the instrument and saves the file in *\\GeoDAS_DATA\Config\Stationname.xml.* This file is needed for offline configuration of the instrument as described in chapter 8.1.2.
Request Trim Table	The instrument will upload a SOH file containing the actual values from the RTC trim table. The latest SOH file can be found under *\\GeoDAS_DATA\StatusFiles\InfoSOH.xml*
Reset Error State	The instrument will clear all errors and warnings
Reset Trim Table	The instrument will clear the RTC trim table
Send a Request	Sends a user request to the instrument. For details see chapter 8.11.1
Sends a Script	The instrument will download and execute the attached script. This function is for advanced users only, as it can seriously damage the instrument if the script is not written correctly.
Send Network Configuration	The instrument will download the attached manual adjusted network configuration file from the server.
Send Recorder Configuration	The instrument will download the attached manual adjusted recorder configuration from the server.
Upgrade Bootloader	The instrument will download the attached firmware. More details about the upgrade of the firmware see chapter 12.
Upgrade DSP Firmware	
Upgrade Firmware	
Upgrade RTC Firmware	
Upgrade System (OS Linux)	

11. Bootloader

- Switch on the instrument by press and hold the POWER button for 2 seconds.
- Press ***<Ctr> + 'Z'*** as soon the message appears on the console to enter the test and configuration mode, the following message appear

Service only

Service only

```
Bootloader Menu

 --- Flash Images and Boot Options ---
B - Load binary image to RAM via AUX COM port at 57600 baud
G - Run loaded image
L - List flash images
1 - Save the loaded RAM image to FLASH
2 - Load an image from FLASH to the RAM
3 - Copy raw RAM memory block to FLASH (0x20000 bytes)
4 - Boot from the selected image
5 - Boot from the default image
X - Reboot the instrument
Y - Power off

 --- Hardware Setup and Monitor ---
S - WIFI setup
H - WIFI monitor without network connections
I - WIFI monitor with network connections (may take long to start)
K - Instrument hardware parameters
N - Network settings

 --- Test Functions ---
P - Test RTC
D - Test RAM
F - Test FLASH
M - Test GPS
C - Test CF Card
E - Test CS8900A Ethernet controller
W - Write word to an address
R - Read word from an address
Z - Test everything
```

They grey shaded options are for service only and should not be selected, wrong handling can destroy the instrument.

- The following options can be adjusted

5	***Boot from the default image***	Exits the bootloader menu and starts the instrument normally
X	***Reboot the instrument***	Forces the watchdog to completely restart the instrument
Y	***Power off***	Forces the watchdog to switch off the instrument
S	***WIFI setup***	Alternative option to set the WiFi parameters. For advanced users only. See chapter 7.4 for details.
N	***Network settings***	Enters the menu to adjust the network settings (dynamic or fixed IP, subnet and gateway), enable/disable the telnet and configure the backup server. For details see chapter 6.2.

- Leaf the *Bootloader* by pressing '***5***' or '***Y***'

12. Firmware Upgrades

All the firmwares for

- Bootloader
- Newdas firmware
- DSP
- RTC
- Linux operating System

can be upgraded by the user by using *GeoDAS* as described in the following chapters.

Upgrading the firmware should be done only after any recorded data and the configuration of the unit is backed up.

After any firmware upgrade the configuration should be fully verified.

If the instruments are configured to contact a Server, it is possible to upgrade all or specific Instruments remotely using GeoDAS. Before trying upgrade remotely, be sure the Instruments have a working network connection to the server. Do the following steps to proceed

- Make right click on the Station in the GeoDAS main window and select ***GMS Control…***

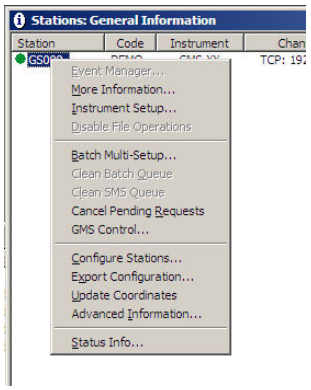


Figure 43, Select GMS Control

- A list box will appear.

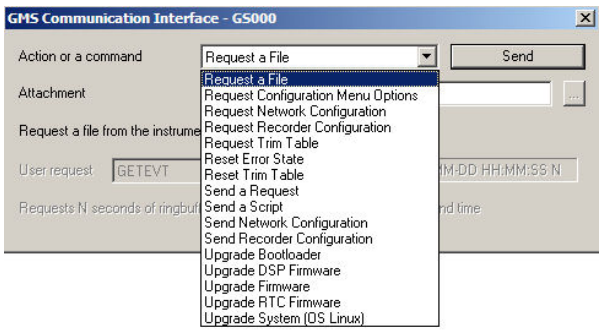


Figure 44, GMS Communication Interface

- Select the type of firmware you want to upgrade. Only the grey highlighted options in the table below are for upgrades:

Action or command	Description
Request Configuration	
Request Trim Table	
Reset Error State	
Reset Trim Table	
Send a Request	
Send a Script	
Send Configuration	
Upgrade Bootloader	Upgrade the bootloader *(e.g. GSBOT119_20100716.BIN)*
Upgrade DSP Firmware	Upgrade the DSP Firmware *(e.g. GSR-IA-DSP-FW_V500103.hex)*
Upgrade Firmware	Upgrade the NewDAS Firmware *(e.g. newdas_v200061_20100812.bin)*
Upgrade RTC Firmware	Upgrade the RTC Firmware *(e.g. RTCUPGCF_V800019.hex)*
Upgrade System (OS Linux)	Upgrade the Linux operating system *(e.g. linux_v025_20100622.bin)*

- Choose one of the blue highlighted GMS firmware options
- Press on the "***...***" button to select the firmware, provided by GeoSIG

Make sure the correct file is selected! Wrong files can damage the device

- As soon the correct file is selected, press the ***Send*** button. The firmware will be placed, so that it can be collected by the instrument(s).

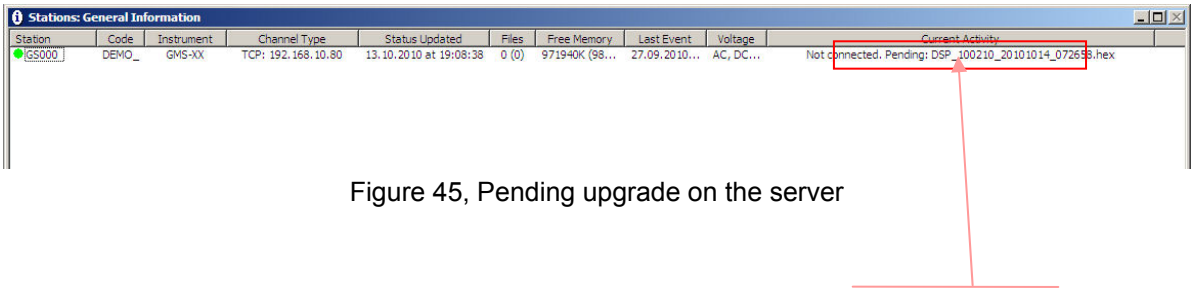


Figure 45, Pending upgrade on the server

- As soon the instrument has downloaded the new firmware, the text *Pending: xxx.hex* disappears. The instrument will verify the firmware and once the upgrade process is finished, the instrument will restart.

When the software finds such a file, it checks the actual version and if the found file is newer, it will start the upgrade. After the upgrade, the new firmware will be in "trial" mode and a reboot is done. If the reboot and instrument operation is correct, the new firmware will be accepted. If the instrument reboots through its watchdog because the firmware was faulty the previous firmware version will be used and the system will be restored to its state before the upgrade.

13. Time synchronization

The system has a Real Time Clock (RTC) that maintains internal time when the unit is turned off. During normal operation the RTC is responsible to provide the most accurate time possible to the system and perform time synchronization with other available external time source as:

- NTP (Network Time Protocol) server from the Ethernet interface.
- GPS time code receiver on the GPS interface.

It also keeps under control the sampling clock of the ADCs and is self-calibrating its oscillator against temperature and aging when it is connected with an accurate external time signal.

The DSP receive a continuous 1 PPS signal from the RTC with the best accuracy that can provide the RTC, including temperature compensation, based on the saved coefficients. The DSP will sync the sampling clock with this 1 PPS signal to have accurate sample timing.

13.1.1. Temperature compensation

RTC uses the internal temperature sensor of the micro-controller to define the current operating temperature. When good time synchronization occurred, typically using a GPS, the RTC check its own drift against the signal of the GPS and adds the correction coefficients in a trim table. With a NTP time source, the accuracy is worst but the same process occurred with more averaging and on longer period of time.

During factory test, all the coefficients are initialized to the room temperature coefficient using a GPS. After installation, the unit will learn it self on site the correction parameters according to the ambient conditions at site and also according to the aging of the oscillator.

14. Telnet Access

The following chapter is for advanced users only

Telnet is a network protocol used on the internet or local area networks to provide a bidirectional interactive communication facility. Telnet provides access to a command-line interface on a remote host via a virtual terminal connection. The instrument supports remote access to terminal through telnet.

The newdas consol can not be shown in the telnet

14.1. Telnet Client for Windows OS

- Terminal emulator can be launched from menu ***Start → Run***. Type ***cmd*** and hit ***<Enter>*** or ***OK*** button.

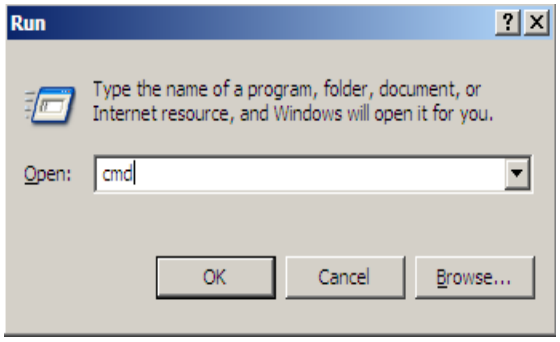


Figure 46. Windows Run window

- Then, terminal emulator window will appear:

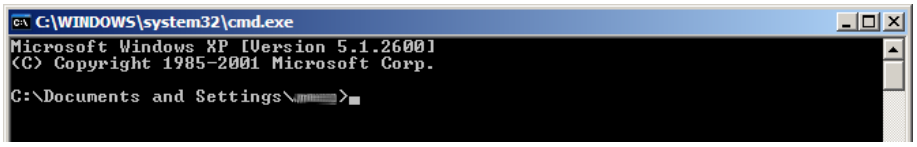


Figure 47. Windows terminal emulator

If installed version of Windows OS doesn't contain *telnet* command, then alternative Telnet client program can be used. For example, PuTTY Telnet client can be downloaded from http://www.chiark.greenend.org.uk/~sgtatham/putty/.

14.2. Telnet client for Linux OS

For Ubuntu or other Debian like GNU/Linux OS, Telnet client program can be installed by command

```
$ sudo apt-get install telnet
```

- Terminal emulator can be found in a menu ***Applications → Accessories → Terminal*** and it looks as following:

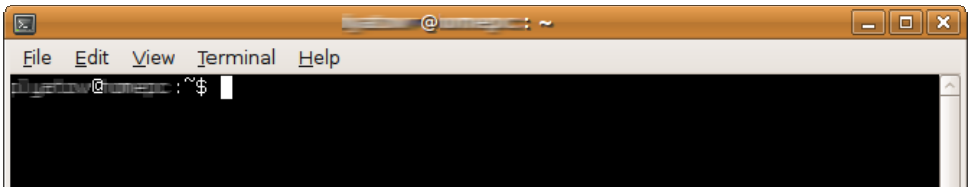


Figure 48. Linux terminal emulator

14.2.1.1. Example of Telnet session

- To use telnet, in a terminal emulator, type *telnet* command with *IP address* or *host name* of GMS-xx station as a parameter and hit <*Enter*>.

For example if instrument IP address is a 192.168.1.14 and hostname GS100014:

```
$ telnet 192.168.1.14
```

or

```
$ telnet GS100014
```

- Typical Telnet session shown on a picture below.

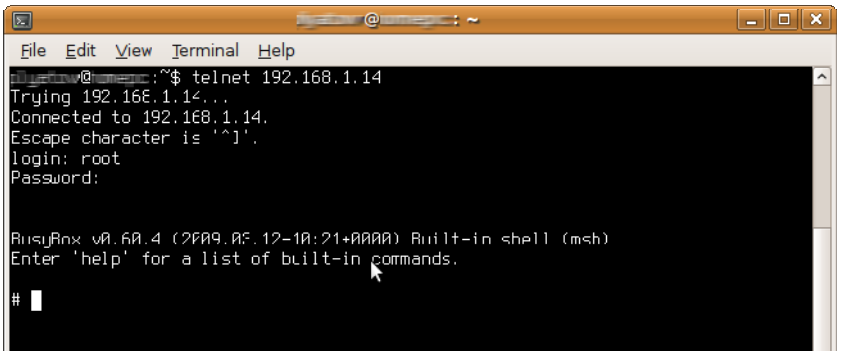


Figure 49. Telnet Session

- Use *root* as login and corresponding password (Instrument default password is *geosysag*)

15. Index