

GammALERT SYSTEM

**EARLY WARNING Gamma Ray
ENVIRONMENTAL RADIOACTIVITY MONITORING SYSTEM
with real-time data and alarm transmission**



- ◆ Radioactive Monitoring Networks
- ◆ Hospital Surveillance
- ◆ Supervision of borders, airports and railway stations
- ◆ Nuclear Power Plants
- ◆ Radioactive Waste Storage

GENERAL DESCRIPTION GammALERT SYSTEM

The **GammALERT SYSTEM** has been developed having in mind the importance of counting on a first quality early warning Gamma Ray Environmental Radioactivity Monitoring Solution with an extensive range of applications, such as in monitoring networks for early warning civil protection, with coverage of wide areas; hospital surveillance at radiation therapy wards; supervision at borders, airports, railway stations; accidental radiation generated by Nuclear Power Plants, storage and truck/train transportation of fusionable materials, etc. The **GammALERT SYSTEM** can be made up of one or more **Remote Measuring Stations** that would store and transmit air levels of gamma radiation as well as alarms to a **Central Receiving Station** and /or to the Civil Protection Authorities in case of an event.

The Remote Measuring Station consists of two main parts:

- The first one is a very advanced digital gamma detector Model RS04 or GSP02 (spectral).
- The second element is the Data Acquisition and Transmission Unit Model **METEODATA**. It receives the digital signal generated by the gamma detector RS04 and stores all the measurements and calculations on its internal memory. Data and alarms, are also transmitted by the **METEODATA** Unit to a Central Receiving Station and to the Civil Protection Authorities.

Both the Gamma detector and the **METEODATA** unit that configure the Remote Radioactive Monitoring Station, are described below.

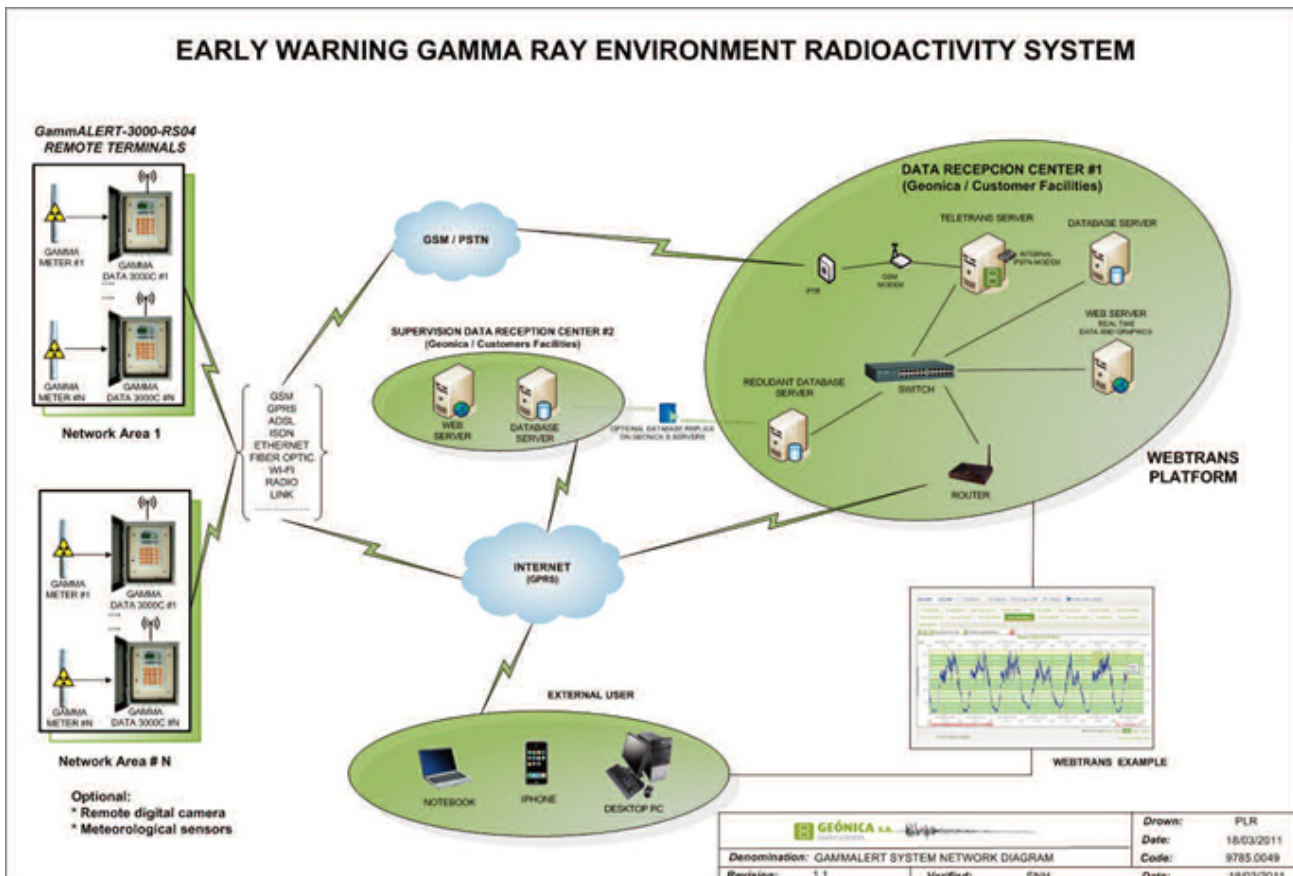
GENERAL DESCRIPTION METEODATA

Model **METEODATA** is an automatic Data Acquisition and Transmission Unit, specially designed for outdoors installation in remote unattended areas, with the possibility of building gamma alert monitoring networks, comprising an undetermined number of field stations, and one or more Central Stations for receiving, storing, presenting and processing environmental gamma ray data and alarms generated by the Gamma Meter detector connected to this unit.

Gamma ray data and alarms can be transmitted from the Remote Measuring Station to Central Station using any of the communication options and alternative available such as:

- cellular networks 3G/GPRS/CDMA,
- point-to-point radio link,
- Ethernet connection
- via satellite (INMARSAT, IRIDIUM, etc.).

From the Central Receiving Station it is possible to manually or automatically get data and alarms in real-time from each and every one of the remote measuring stations, as well as remotely program all their functionalities. Data transmission using TCP/IP and FTP protocols is also possible as shown in the following communication diagram:



GENERAL DESCRIPTION GammaMETER RS04

The Gamma detector, type RS04, has been designed to measure radioactivity of gamma radiation. It is calibrated in "ambient dose equivalent rate" $[H^*(10)]$ and its measuring range comprises 9 decades (from 10 nSv/h up to 10 Sv/h). This wide measuring range allows to detect minor changes in the ambient natural radioactivity as well as to measure high dosage rates. The detector is available in two versions: type RS04H for wide energy range and type RS04L for low energy range.



The GammaMETER RS04 consists on a proportional counter tube (type NPGD02). A large number of these counter tubes have been in operation in several European countries for many years and have set a new worldwide environmental surveillance standard. This specific model is unique as it is the only one able to cover a 9-decade measuring range with a single detector.

One of the major advantages is that the counter tube's sensitivity to natural ambient radiation is rather high despite its wide measuring range. The tube's durability is practically independent of the number of pulses. After a high dose of irradiation the detector can be regenerated automatically by a one month refresh (out of operation).

The signal processing unit was developed on the basis of extensive experiences gained over many years. This microprocessor performs the following tasks: processes the signals of the detector tube, converts them into the quantity of ambient dose equivalent rate $[H^*(10)]$, controls continuously the operation of the detector, stores the measured data and ensures the communication between the detector and **METEODATA** Unit.

An extra stable high-voltage unit ensures the solid operation of the counter tube. Additionally all electric inputs and outputs are equipped with special protection filters (NEMP¹) providing excellent lightning protection.

The complete equipment of the detector is housed in a waterproof aluminum tube with a wall thickness of 2 mm. The connector is waterproof as well.

¹ Nuclear Electromagnetic Pulse

TECHNICAL SPECIFICATIONS GammaMETER RS04 (1 of 2)

Adjustable parameters:

- Date, time
- Data storage period
- History limit
- 8 alarm level with hysteresis
- Accumulated dose values reset
- Reports generation enable/disable (in type RS485 disable is default)

Available data and parameters:

- Ambient dose-equivalent rate
- Accumulated dose-equivalent values at alarm levels.
- Ambient dose-equivalent values, measured in the last 10 minutes in 1 minute interval
- Ambient dose-equivalent rate values measured in the last 72 hours and in 10 minutes interval
- Reports
- Status (Power voltage/current, temperature inside, etc.)

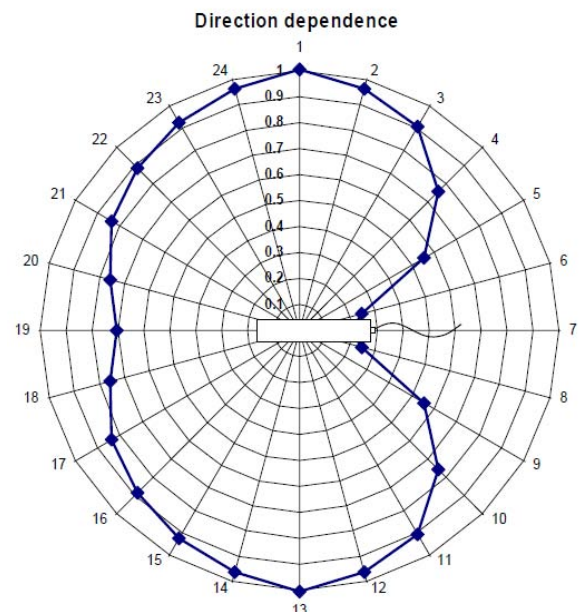
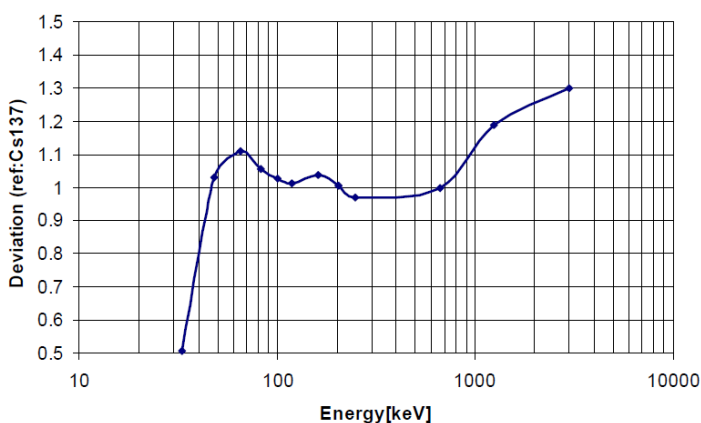
Preset parameters

Measured values:

- Ambient dose-equivalent rate in Sv/h
- Status
- Input power voltage in Volt-s
- Current consumption in mA-s
- High-voltage in Volt-s
- Inside temperature in °C
- Analogue power voltage (inside) in Volt-s
- The last measured counts (pulses) normalized for 1 second.
- The last measured detector current in mA-s

TECHNICAL SPECIFICATIONS GammaMETER RS04 (2 of 2)

Model	RS04H	RS04L
Detector	Proportional Counter, model NPGD 02 with energy compensation	
Microprocessor	Model C8051F022 Silicon Labs, Intel 8051 compatible	
Mesure Range	10 nSv/h ÷ 10 Sv/h	10 nSv/h ÷ 15 mSv/h
Energy Range (±30%, ref. Cs137)	H* (10) ≤ 30 mSv/h: 35 keV ÷ 3 MeV H* (10) > 30 mSv/h: 100 keV ÷ 3MeV	35 keV ÷ 3 MeV
Energy Dependence ref. Cs137	70 keV ÷ 1.3 MeV: -3% / +18% 40 keV ÷ 3 MeV: -20% / +30%	
Temperature Range	-30°C ÷ +70°C	
Temperature Dependence	less than ±5%	
Mesasuring Uncertainty	±10%	
Output	RS-232 or RS-485 or RS-422	
Real Time Clock	Yes	
Data Storage Memory	Yes	
Datalogger	Direct Connection to METEODATA	
Real Time Data	Yes	
Power Consumption ¹	0.7 - 1 W	
Dimensions	Ø76 mm x 500 mm	
Weight	ca. 2.5 kg	
Max. cable length between Detector and Datalogger	RS232 ... 500m RS485 ... 1200m (with ext. power supply ²)	



¹ Power consumption on working point (higher on startup).

² Max. 100m when using the same cable also for power supply.

TECHNICAL SPECIFICATIONS GSP02 Gamma Spectrum Probe (1 of 2)

The Gamma Spectrum Probe model GSP02 has the following main features:

- All in one: NaI(Tl) or LaBr3(Ce) scintillator with digitally regulated HV, amplifier, 1k MCA, continuously automatic energy calibration in full temperature range, communication by RS232, 485, 422, USB
- Measuring radioactivity of the gamma radiation in the quantity of "ambient dose equivalent rate" [$H^*(10)$],
- Spectroscopic detection of gamma radiation with NaI or LaBr3
- In-situ isotope identification

This wide measuring range permits detecting minor changes in the ambient natural radioactivity as well as autonomous spectroscopic monitoring.

DATA ANALYSIS

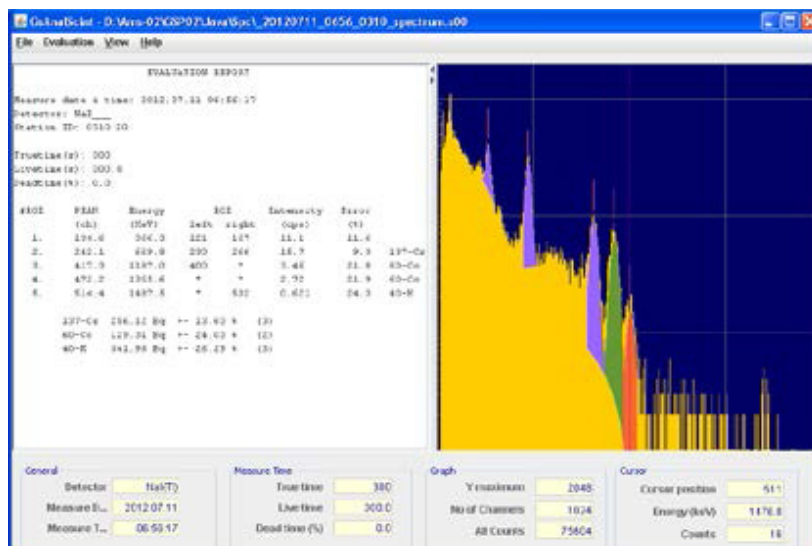
- Continuous evaluation of the gamma spectra
- Isotope identification from an isotope library
- Isotope-based alarm management

For best reliability the GSP02 uses continuously automatic energy and efficiency calibration by embedded 40K source avoiding false data and alarm.

MAIN APPLICATIONS

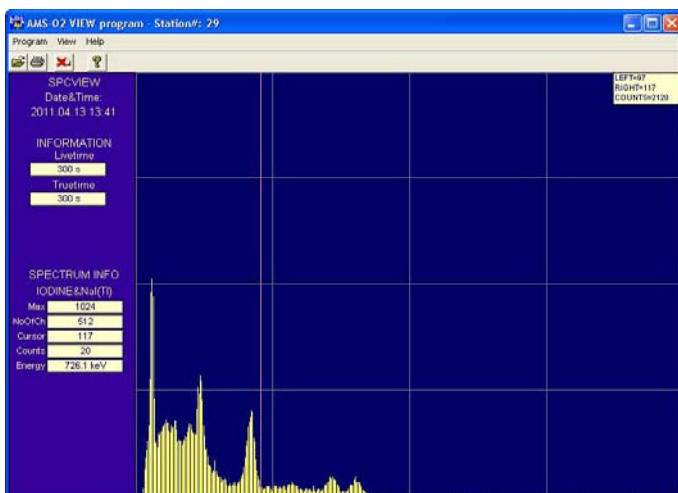
This robust and unique detector lends itself to an extensive range of possible uses:

- Sensor in monitoring network for early warning system covering a wide area;
- Hospital surveillance at radiation therapy wards;
- Measuring unit in scientific institutions and development centres;
- Supervision unit at borders, airports, railway stations and in aircrafts,
- Control unit in municipal sector mainly for the instant check of accidental radiation, generated by nuclear
- Industry (nuclear power plants, storage of fusionable material and truck/train transportation of such materials),
- Measuring unit in private sector, especially for owners of fallout shelters.
- Underwater, diver measurement
- Food Contamination Monitor (FCM10)



TECHNICAL SPECIFICATIONS GSP02 Gamma Spectrum Probe (2 of 2)

Model	GSP02-N55	GSP02-N76	GSP02- L38
Spectral Detector	NaI (TI)		LaBr3(Ce) SGC
Detector size	55x55mm (2")	76x76mm (3")	38x38mm (1.5")
Measuring range	10 nSv/h ÷ 50 µSv/h ext1: 10 nSv/h ÷ 1 Sv/h ext10: 10 nSv/h ÷ 10 Sv/h		10 nSv/h ÷ 100 µSv/h
Energy range	33 keV ÷ 2 MeV	33 keV ÷ 3 MeV	33 keV ÷ 2 MeV
Dose-rate energy dependence	±30%, ref. Cs137		
Energy resolution FWHM at Cs137	< 7%		< 3.5%
Multichannel analyser	2048 channels		
Temperature range	-30°C ÷ +60°C		
Temperature dependence	less than ±3keV		
Measuring uncertainty	H*10 ≤ 50 µSv/h: ±15%		
Output	RS-232 or RS-485 or RS-422 or USB		
Real time clock	Yes		
Real time data	Yes		
Datalogger	Direct connection to METEODATA		
Power consumption	approx.1W		
Max. cable length between detector and Datalogger	RS232 - 500m / RS485,422 - 1200m (with ext. power supply)		
Dimensions	Ø76mm x 480mm	Ø100mm x 505mm	Ø76mm x 480mm
Weight	< 3 kg		



TECHNICAL SPECIFICATIONS METEODATA**Inputs/Outputs (total 16 or 24, plus 4/6 serial ports):**

- 8 or 16 Analog Input channels (differential) with 24 bit A/D converter
- 2 Digital Inputs; 4000 V galvanic insulation
- 2 Digital Outputs; 4000 V galvanic insulation
- 4 Pulse channels (16 bits) for pluviometers, anemometers and other similar sensors with impulse output.

Communication Ports (4 standard; 6 optional):

- Com 1: General purpose RS232 serial port
- Com 2: Serial Port (Ethernet Optional)
- Com 3: General purpose, programmable RS232/422/485 serial port
- Com 4: Serial port for connection to modems 3G, GPRS, PTSN, etc.
- Com 5/6: Two additional optional ports (TCP/IP, RS232/422/485, SDI-12, etc.)

Storage memory:

- 64 MB internal memory.
- Optional 2GB removable SD memory card.

Data Transmission:

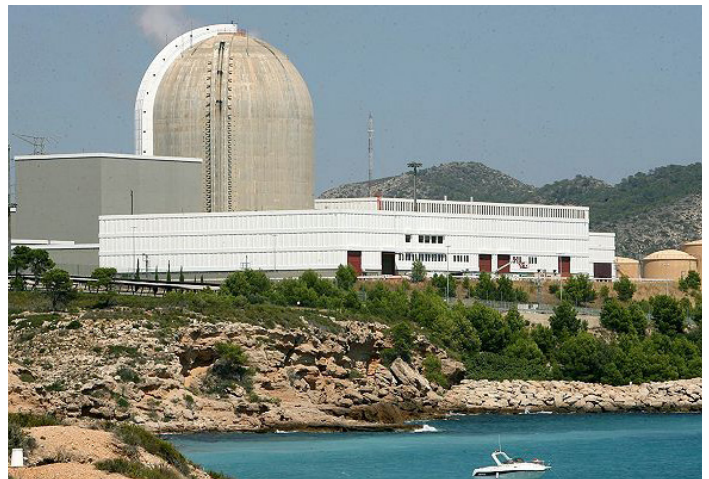
Depending on the user requirements, Unit 3000 is capable of transmitting the data to the central facility in several ways:

- Serial port RS232/422/485
- Cellular Modem GSM/GPRS/3G
- Ethernet connection - Radio link
- Fiber optic
- Wi-Fi/Bluetooth
- Satellite (INMARSAT, VSAT, etc)
- Internet



Such flexibility of the communication ports, inputs and outputs and memory capacity, allows the system to be connected to a large number of different sensors like anemometers, visibilimeters, rain gauges, etc., and also noise processors or digital cameras for image acquisition and transmission.

The Data Recording and Transmission Unit is mounted either on a IP-67 Polypropylene housing (dimensions 41x33x18cm) or on an IP-66 Metallic housing (dimensions 43x33x20cm). Batteries, charge regulator, communications modem, keyboard and visual display (optional) are also enclosed into the same cabinet.



TECHNICAL SPECIFICATIONS GEO-DRC DATA RECEIVING CENTER

GEONICA SUITE MANAGEMENT SOFTWARE

Geonica Suite 4K is the last generation of a software package developed by **GEONICA** for the interaction, configuration, data presentation, data analysis and real-time data monitoring of **GEONICA's** data acquisition stations (**METEODATA** series).

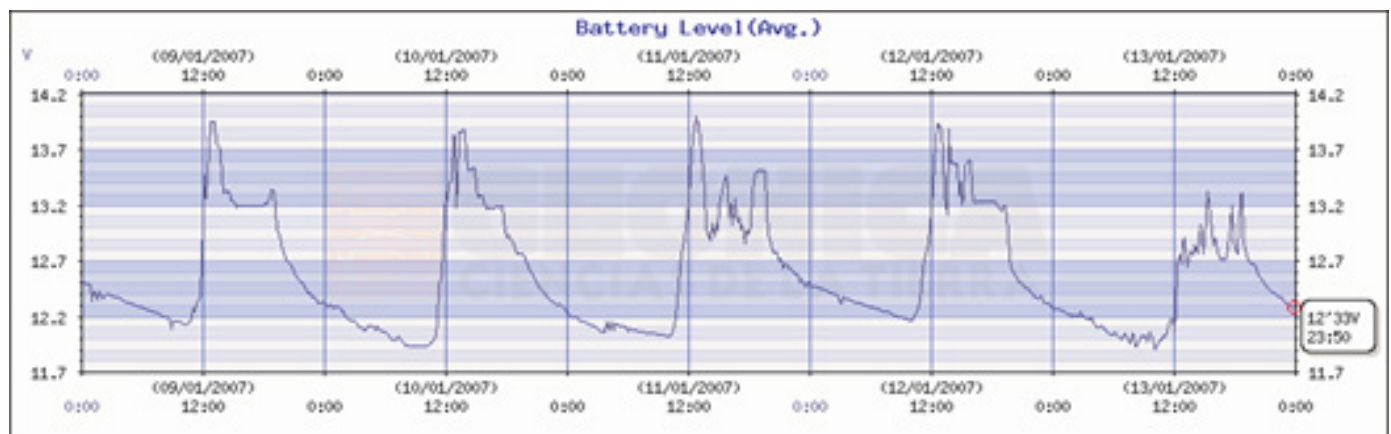
The package consists of four main applications:

- **TELETRANS-W4K** This application is designed for the communication between PC and stations, which allows the data recovery and other configuration commands as: date and time synchronization, station parameter setup, tests, firmware update, calibration, image requests, etc.
- **DATAGRAPH-W4K**. This application is designed for data query, data management and real-time data monitoring. This data captured by the station is stored in the database by TELETRANS-W4K application or accessible by means of a web service.
- **FLASH READER**. This application can convert raw data (stored by **METEODATA** stations in a SD card or captured through satellite systems) into a binary format that can be used by the final user (CSV or Access).
- **METAR/SYNOP/BUFR Reporter**. This application accesses the station database and generates encoded meteorological reports according to METAR standard (frequently used in aerodromes), SYNOP standard (widely extended in meteorology) and BUFR standard (defined by the WMO-World Meteorological Organization).

WEBTRANS UBIQUITAS INTERNET PLATFORM

A very valuable option offered by **GEONICA** with the **GammALERT System**, is the possibility of WEB Posting, in such a way to provide worldwide access via INTERNET to the historical and instant values of all the parameters measured at the remote station.

Data visualization in Internet is possible thanks to **WEBTRANS Ubiquitas** Application. Access is granted for every user in order to remotely check any station parameter.



GEO-DRC HARDWARE

In the Central Station a typical configuration includes the following elements:

- Communications Hardware for the reception of the data transmitted by the Remote Stations (i.e. GPRS/3G modems, switching devices, Satellite Receivers)
- Communications (**TELETRANS**) Server: For querying data from the Remote Stations
- Database Server, that includes: Processor Power EdgeT100 or similar, including:
 - SQL Database
 - SQL License
- Web Server: That hosts the Web Hosting Service. (**WEBTRANS**)
- Optional workstations: stations' management for one / several users in Client mode For a small size layout Communications SW and Database may be settled in the same Server. The Central station admits fully redundancy for both Communication Hardware and servers that gives the System maximum robustness.