



MAIN FEATURES

Myriaseis is a multipurpose telemetry acquisition system designed to record seismic data from up to 10,000 seismic channels.

The seismic data is digitized at each hydrophone or geophone group and transmitted sequentially to the central recording unit either by radio on a single 76 MHz FM frequency or by a single pair conductor cable.

Designed to operate under the most adverse topographical and climatic conditions, the main advantages of the system are:

- undifferentiated telemetry station units and cables,
- elimination of cable noise and cross talk,
- identical damping of detector groups,
- faster spread layout/pick up,
- unattended operations up to 9 days,
- low cost operation and improved field capabilities.

CENTRAL RECORDING UNIT

Myriaseis' central recording unit is designed to monitor the operation for 1 to 10,000 telemetry station units. It transmits commands to all station units, collects multiplexed seismic data from each unit and controls their quality by an output onto monitor camera, video display or magnetic tape.

The easy-to-operate central recording unit:

- determines and transmits telemetry station unit operating parameters by means of a command-response dialogue;
- verifies the triggering of the shot;
- commands the station unit to transmit the data acquired;
- displays this data as a seismic trace either on the monitor camera or on the video screen;
- records this data on magnetic tape;
- performs routine tests on the telemetry station units.

* CGG-IFP trademark



Fig. 1: Central recording unit

Constructed around three 16 bit 8086 INTEL microprocessors, the central recording unit includes the following peripheral units:

- An FM transceiver unit with a radio signal processor and spectrum analyzer to enhance the quality of the radio transmission;
- One or two SEGY 1/2 inch 9 tracks 1600 bpi/PE, 25 ips tape transport units;
- One play-back unit for 64 channel camera output.
This unit includes a 256 Kbyte mass memory and adjustable LC/HC filters operating with 1 Hz increment;
- One miniprinter unit tracking the operator log;
- One 12 V DC or 110/220 V AC power supply;
- One logic unit to check the system configuration.

This unit permits the dialogue through a keyboard and a video display unit which visualizes the roll along spread, noise level, seismic signal, instruments and telemetry station unit tests as well as the system configuration.

TELEMETRY STATION UNIT

Each unit, entirely controlled by an NSC 800 microprocessor, is equipped with a 10 W FM transceiver and a 4000 seismic word memory.



Fig. 2: Telemetry station units (land operations)

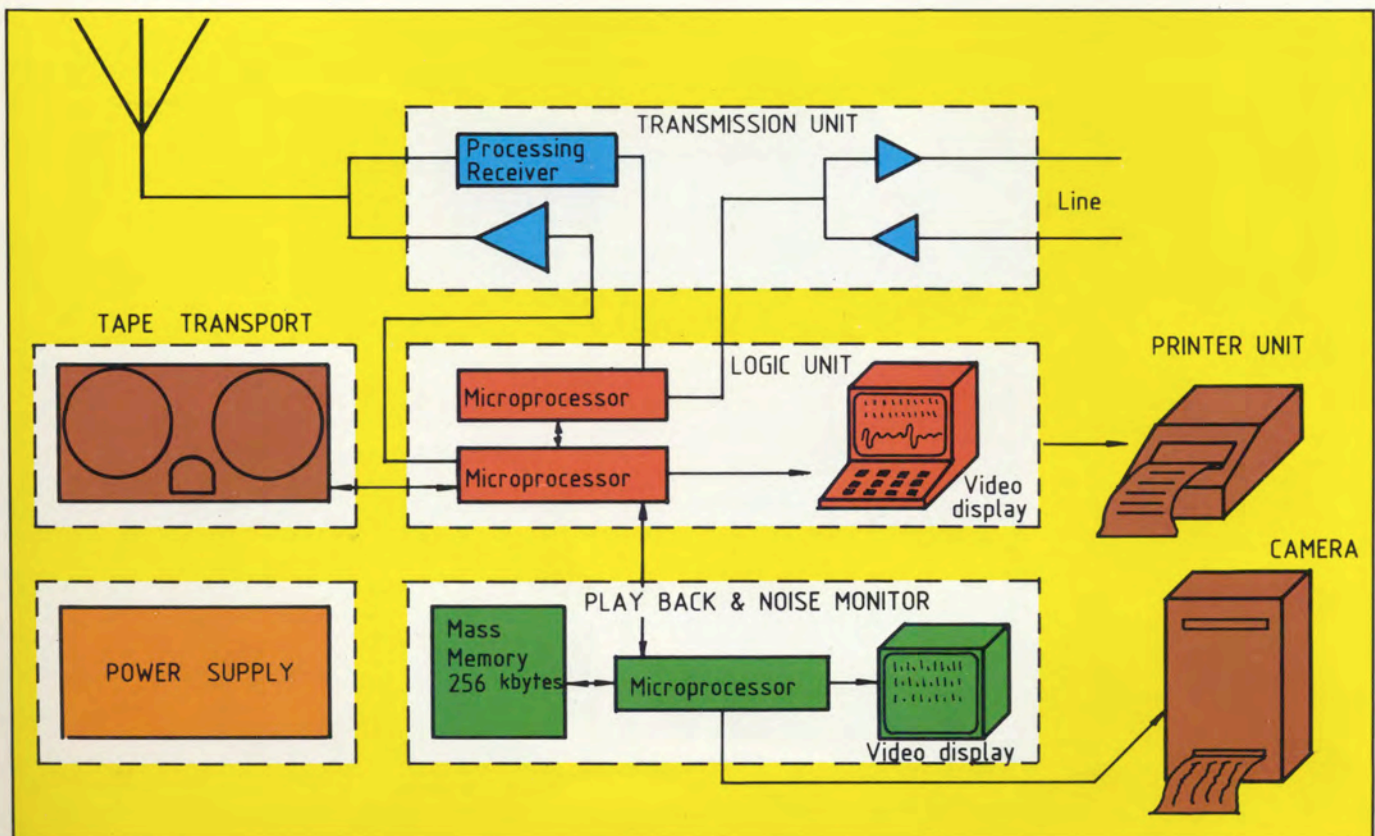


Fig. 3: Central recording unit block diagram

Before each series of seismic shots, the station units receive the operating instructions from the central recording unit.

Just before each shot, the data acquisition com-

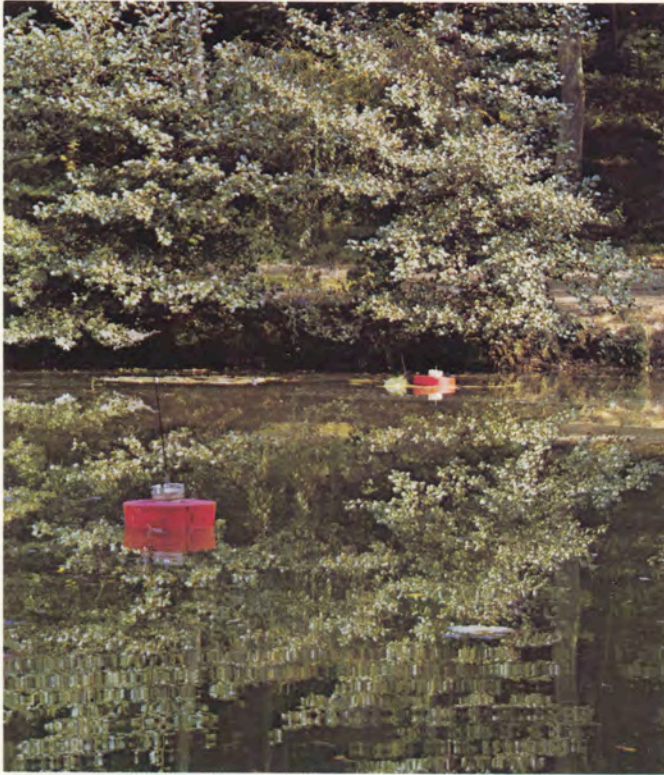


Fig. 4: Telemetry station units (swamp operations)

mand is transmitted simultaneously to all units. Seismic data is transmitted to the central unit by specific interrogation of each station unit.

3D surveys can be easily performed since each station unit is identified by a line number (from 0 to 9) and by a hydrophone or geophone group number along each line (from 0 to 999).

The system provides a record length of up to 16 seconds with 1-2-4 ms sampling rates.

Each unit contains an Instantaneous Floating point amplifier, a 12 bit A/D converter, a remote controlled low cut filter and a C-MOS microprocessor controlled summing memory allowing up to 128 stacks. It weighs only 10 kg and is connected to a horizontal or vertical radiating antenna.

Powered by a rechargeable battery, each unit operating at 200 records per day provides either 9 days of cable transmission recording or 5 days of radiotransmission recording between charges.

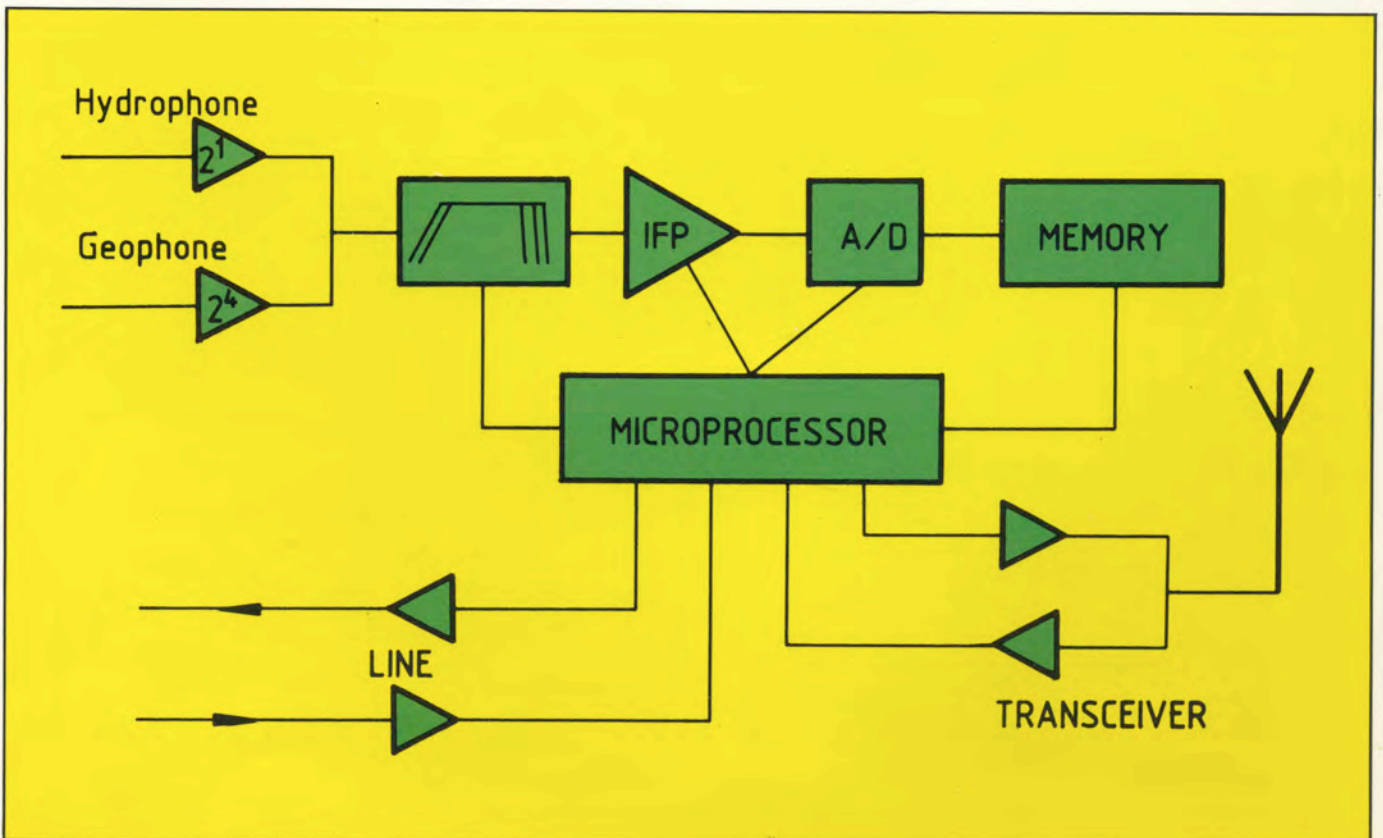


Fig. 5: Telemetry station unit block diagram

TECHNICAL SPECIFICATIONS

ANALOG

Single channel unit, expandable from 1 to 10,000 channels.

Double input: Hydrophone/geophone

Input noise: $\leq 1.8 \mu\text{V RMS}$ with $G = 2^4$

DC offset: $\leq 1 \mu\text{V}$ with $G = 2^4$

Max. input: 225 mV (2^4) 1800 mV (2^1) RMS

Filters: Low cut 2 and 16 Hz
Slope 18 dB/oct. Remote selection
Other frequencies available.

High cut 75-150-300 Hz
Slope 54 dB/oct.
Plug in module

Sampling rate: 1-2-4 ms

Gain control: IFP 78 dB
13 steps of 6 dB
Accuracy 0.05% step-to-step

DIGITAL

Converter: 12 bit mantissa - 4 gain bits

Memory: C-MOS RAM 16 K
Capacity: 4096 words of 32 bits

Recording capacity: 4 s 1 ms sampling
8 s 2 ms "
16 s 4 ms "

Memory extension: to 16 Kwords of 32 bits

Stacking: Max. 128 Σ

Type of stacking: $\Sigma + / \Sigma -$

Microprocessor: C-MOS NSC 800

TRANSMITTER

Power: 10 watts

Modulation: Frequency modulation

Frequency: 76,675 MHz
2 spare frequencies
76,900/76,300

Transmission code: NRZ

Transmission rate: 128 kbauds

RECEIVER

Sensitivity: $\leq 0.3 \mu\text{V}$ 10 dB S/N

Band width: 200 Hz to 2.7 kHz

Frequency: 71,675 MHz
2 spare frequencies
71,800/71,400

Modulation: Phase

Modulation code: FSK

Modulation rate: 320 bauds

Line transmission: 2 twisted pair cable, braided and polyurethane jacket. External diameter 6.2 mm

Maximum distance without repeater: 3 km or 256 channels

Memory read out transmission time: 725 ms per station unit
(6 second length - 2 ms sampling rate) 70 seconds for 96 station units
2 min 2 s for 200 station units

Autonomy:

	200 records/day
radio transmission	5 days
cable transmission	9 days

PHYSICAL CHARACTERISTICS

CENTRAL RECORDING UNIT

Power: 500 W 12 V DC or 110/220 V AC

	Size (cm) H x L x D	Weight (kg)
Transceiver unit	36 x 53 x 63	28
Logic unit	63 x 55 x 35	23
Tape transport unit	54 x 53 x 50	45
Playback unit	63 x 53 x 35	21
Printer unit	10 x 25 x 25	5
Power supply unit	32 x 53 x 50	40

TELEMETRY STATION UNIT

Power: 12 V DC - 9.5 A sealed lead battery

Height: 75 cm

Diameter: 16 cm

Weight: 10 kg

Temperature range (operating): -20°C to $+60^\circ\text{C}$

Humidity: Waterproof



MAIN FEATURES

Myriaseis is a multipurpose telemetry acquisition system designed to record seismic data from up to 10000 seismic channels.

The seismic data is digitized at each hydrophone or geophone group and transmitted sequentially to the central recording unit either by radio on a single 76 MHz FM frequency or by a single pair conductor cable.

Designed to operate under the most adverse topographical and climatic conditions, the main advantages of the system are :

- undifferentiated telemetry station units and cables,
- elimination of cable noise and cross talk,
- identical damping of detector groups,
- faster spread layout/pick up,
- unattended operations up to 9 days,
- low cost operation and improved field capabilities.



Telemetry station unit for land use

TELEMETRY STATION UNIT

Each unit, entirely controlled by an NSC 8000 microprocessor, is equipped with a 10 W FM transceiver and a 4000 seismic word memory.

Before each series of seismic shots, the station units receive the operating instructions from the central recording unit.

Just before each shot, the data acquisition command is transmitted simultaneously to all units. Seismic data is transmitted to the central unit by specific interrogation of each station unit.

3D surveys can be easily performed since each station unit is identified by a line number (from 0 to 9) and by a hydrophone or geophone group number along each line (from 0 to 999).

The system provides a record length of up to 16 seconds with 1-2-4 ms sampling rates.

Each unit contains an Instantaneous Floating Point amplifier, a 12 bit A/D converter, a remote controlled low cut filter and a C-MOS microprocessor summing memory allowing up to 128 stacks. It weighs only 10 kg and is connected to a horizontal or vertical radiating antenna.

Powered by rechargeable battery, each unit operating at 200 records per day provides either 9 days of cable transmission recording or 5 days of radiotransmission recording between charges.

CENTRAL RECORDING UNIT

Myriaseis' central recording unit is designed to monitor the operation of the telemetry station units. It transmits commands to all station units, collects multiplexed seismic data from each unit and controls their quality by an output onto monitor camera, video display or magnetic tape.

The easy-to-operate central recording unit :

- determines and transmits telemetry station unit operating parameters by means of a command-response dialogue;
- verifies the triggering of the shot;
- commands the station unit to transmit the data acquired;
- displays this data as a seismic trace either on the monitor camera or on the video screen;
- records this data on magnetic tape;
- performs routine tests on the telemetry station units.

Constructed around an SBC 86/12 INTEL micro-computer, the central recording unit includes the following peripheral units :

- a monitor unit including FM transceiver,
- an alphanumeric keyboard,
- a video display unit,
- a magnetic tape system,
- a monitor camera.

The SBC 86/12 INTEL microcomputer

Built around a triple bus supporting a 20 bit address and 16 bits for seismic data, this micro-computer consists of :

- an HMOS 8086 processor (5 MHz),
- a 64 Kbytes RAM memory,
- a 32 Kbytes EPROM memory,
- 24 programmable parallel input/outputs,
- one RS 232 programmable synch./asynch. input/output,
- 2 x16 bit programmable clocks,
- 18 vectorized interruption levels,
- a multimaster/multibus logic.

Peripherals

Information is entered into the central recording unit by means of an alphanumeric and function keyboard.

The video display is used for dialogue with the operator, graphic display of the seismic traces and checking of the operations being performed. The 256 x 1024 point screen is controlled by a memory equipped interface. The RAM capacity corresponds to the number of points capable of being shown on the screen.

The magnetic tape system consists of a KENNEDY 1600 bpi recorder with a tape speed of 25 ips. It is controlled by means of a card interface.

A conventional seismic monitor camera can be interconnected to the central recording unit by means of an analog interface. This interface makes it possible to output 64 analog signals.



MYRIASEIS*

TRANSITION ZONE & SPECIAL TERRAIN RECORDING SYSTEM

TECHNICAL SUMMARY
2-502/07-4

INTRODUCTION

Conventional land or marine equipment generally hamper seismic operations when used for transitional shallow water surveys and nearly always produce seismic data of substandard quality.

To improve the efficiency of data acquisition in:

- water depths of less than five meters
- deltaic zones

and provide a reliable link with land data systems, CGG and IFP have jointly developed Myriaseis, an amphibious, radiotelemetry acquisition system designed to record seismic data from up to 10,000 station units.

Designed to operate under the most adverse topographical and climatic conditions, Myriaseis's main characteristics are:

- lightweight, portable central recording unit
- single receiving radio frequency
- standard, interchangeable telemetry station units (TSU) with up to 9 days autonomy
- digitization of seismic signal by each TSU for storage and transmission
- one seismic channel per TSU
- combined radio and cable transmission capability, with automatic switchover transmission mode at the CRU
- summing capacity of up to 128 seismic records with each TSU.

*CGG-IFP trademark and product development



Myriaseis radiotelemetry station units ready to be launched into the water during a land/sea transition zone survey.

TELEMETRY STATION UNITS (TSUs)

Each TSU consists of a 30" high, watertight, metal cylinder weighing 22 lbs and equipped with a horizontal (land) or vertical (marine) antenna.

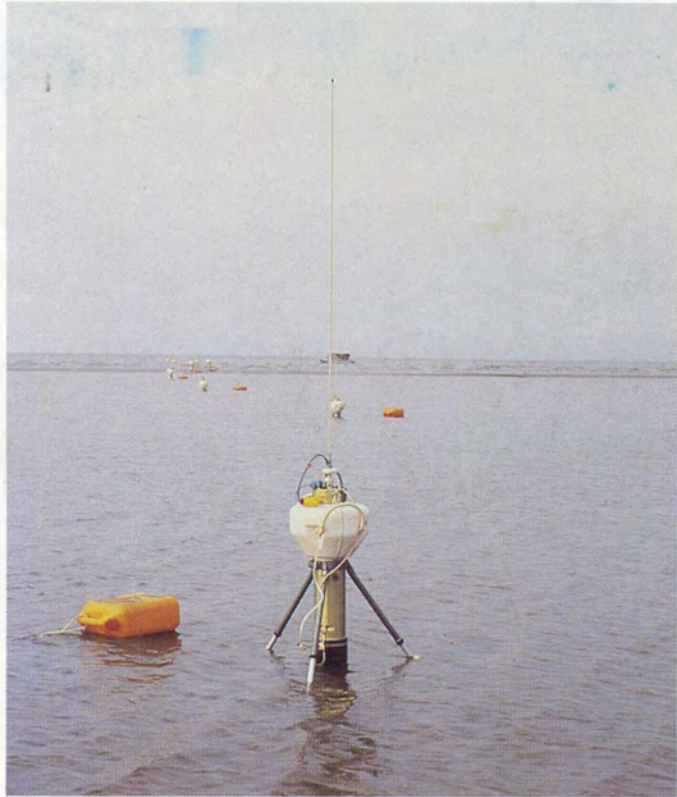
The TSUs are kept vertical by using either a buoy (shallow water operations) or a tripod (land operations).

Each TSU is controlled by an NSC 800 microprocessor and has the following characteristics:

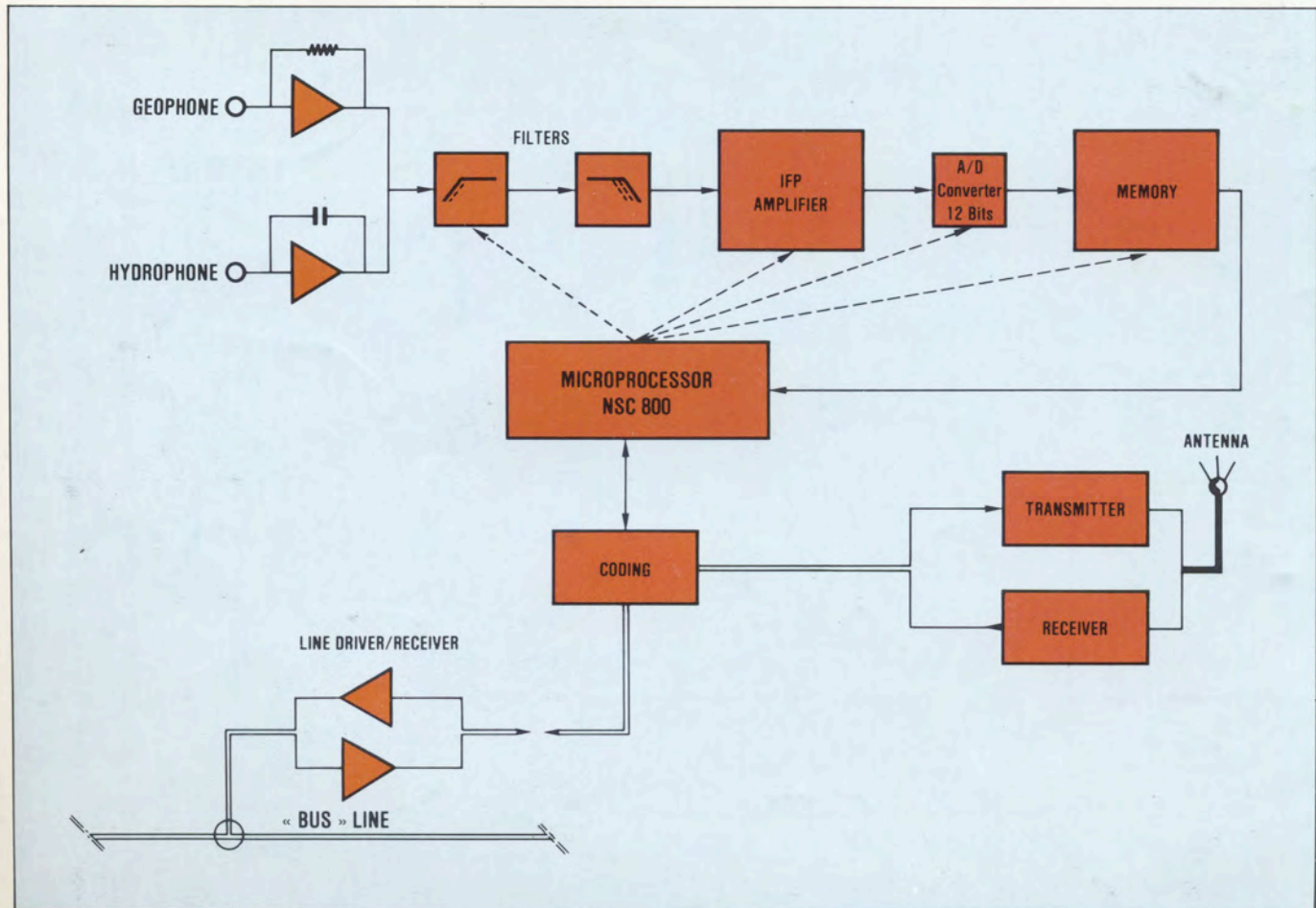
- instantaneous floating point amplifier
- 12 bit A/D converter
- remote-controlled low-cut filter
- C-MOS microprocessor controlled summing memory with a 4096, 32 bit word storage capacity allowing up to 128 stacks
- 10 W FM radio transceiver to transmit data stored
- rechargeable battery.

The system provides a record length between 4 and 16 s with 1-2-4 ms sampling rate.

Before each seismic shot, a data acquisition command is transmitted simultaneously to all TSUs. Seismic data is transmitted to the CRU by specific interrogation of each TSU.



Telemetry station unit.



Telemetry station unit block diagram.

CENTRAL RECORDING UNIT (CRU)

The Myriaseis recording unit is designed to monitor operation of 1 to 10,000 TSUs. It transmits commands to all TSUs, collects multiplexed seismic data from each unit and monitors data quality by output onto monitor camera, video display screen and magnetic tape.

The easy-to-operate CRU

- determines and transmits TSUs operating parameters by means of a command-response dialogue
- verifies shot triggering
- commands the TSU to transmit data acquired
- displays data as a seismic trace on the monitor camera or the video screen
- records data on magnetic tape
- runs routine tests on TSUs.

Constructed around three, 16 bit 8086 Intel microprocessors, the CRU includes the following peripheral units:

- FM transceiver unit with a radio signal processor and spectrum analyzer to enhance the quality of the radio transmission.
- SEG D, 1/2 inch 9 track 1,600 bpi PE 25 ips tape transport unit.
- playback VDU unit for 60 channel camera output. This unit has a READ AFTER WRITE function for data recorded on tape and can also display and monitor field noise on the VDU. It includes a 256 kbyte mass-memory and adjustable L/CHC filters operating with a 1 Hz increment.
- control VDU unit to check system configuration. By means of a command-response dialogue using the control unit keyboard and screen, the operator can control and check the noise level, seismic signal and recording parameters. He can also check and display on the VDU screen the various TSU tests, radio or cable transmission, seismic spread as well as system configuration.



Central recording unit (CRU).

A RELIABLE AND HIGHLY FLEXIBLE SYSTEM

There is virtually no limit to the number of TSUs which can be laid out as desired.

3-D surveys can be easily performed since each TSU is identified by a line number (from 0 to 9) and by a hydrophone or geophone group number along each line (from 0 to 999).

On the basis of 200 records per day, each TSU provides nine days of cable transmission recording or five days of radio transmission between two battery charges.

Data is transmitted from TSUs to CRU by a single radio frequency selected in the lower part of the FM band for better quality transmission.

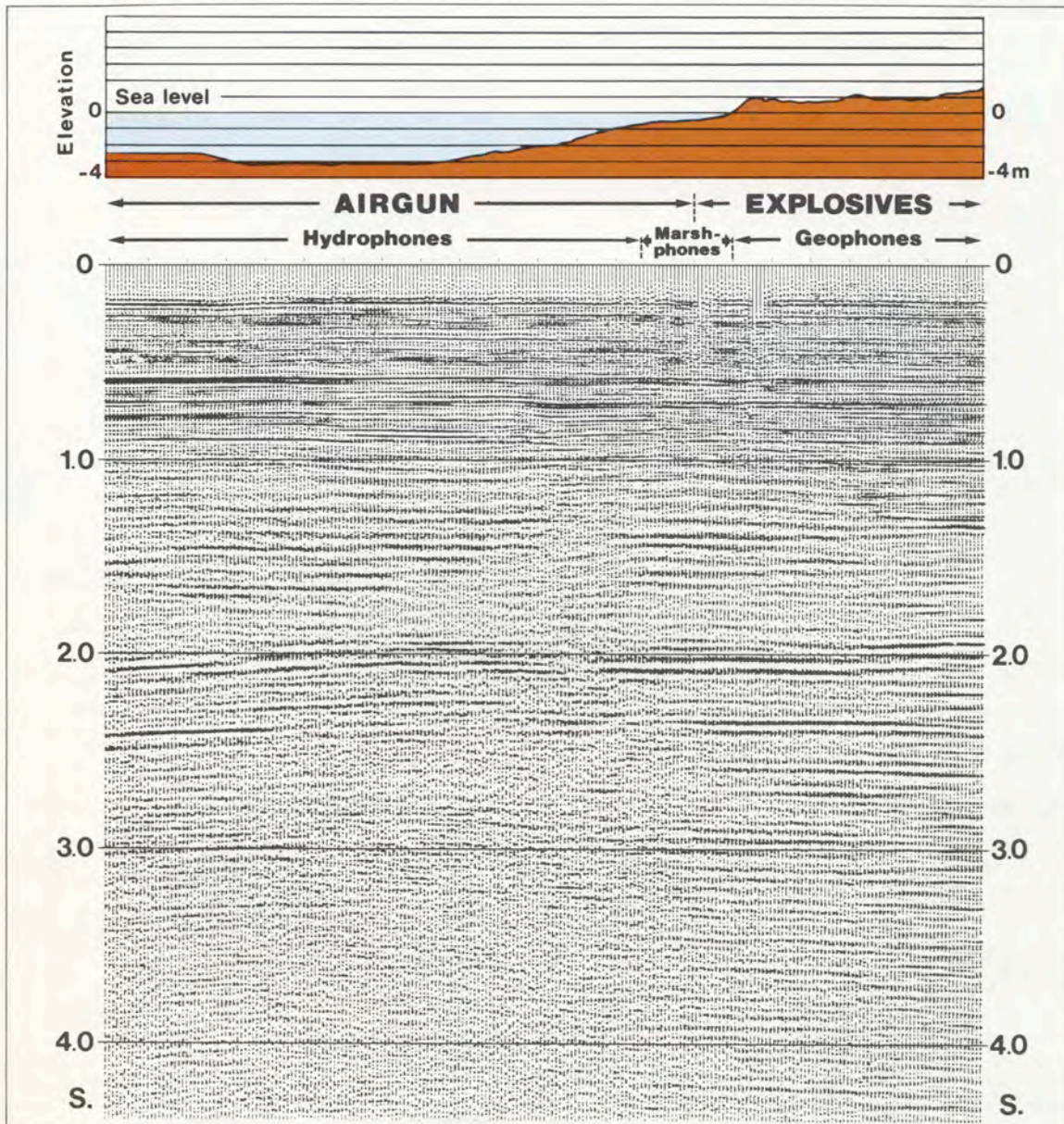
The technology is entirely digital. Transmission range can be as high as 30 km.

Cable transmission, using a single pair of conductor cables, can be used when radio transmission is precluded for legal or technical reasons.

Currently, less than one second is needed to transmit a trace record. The sequential transmission of seismic data takes 1.2 minutes for a 96 geophone/hydrophone group.

Myriaseis is an ideal tool

- for performing seismic surveys in aquatic environments, such as transitional zones or deltaic areas and also in mountainous terrain inaccessible to conventional means
- for high resolution and 3-D surveys due to the ease in laying out any geometrical pattern and the high number of geophone/hydrophone groups available.



Example of transition zone seismic section recorded with Myriaseis.

TECHNICAL SPECIFICATIONS

ANALOG

Single channel unit, expandable from 1 to 10,000 channels

Double input: Hydrophone/geophone

Input noise: 1.2 μ V RMS with $G = 2^4$

DC offset: 0.7 μ V with $G = 2^4$

Max. input: 225 mV (2^4) 1,800 mV (2^1) RMS

Filters: Low cut 2 and 16 Hz
Slope 18 dB/oct. Remote controlled
Other frequencies available

High cut 75-150-300 Hz
Slope 54 dB/oct.
Plug in module

Sampling rate: 1-2-4 ms

Gain control: IFP 78 dB
13 steps of 6 dB
Accuracy 0.05% step-to-step

DIGITAL

Converter: 12 bit mantissa - 4 gain bits

Memory: C-MOS RAM 16 k
Capacity: 4,096 words of 32 bits

Recording capacity: 4 s 1 ms sampling
8 s 2 ms sampling
16 s 4 ms sampling

Memory extension: to 16 kwords of 32 bits

Stacking: Max. 128 Σ

Type of stacking: $\Sigma + / \Sigma -$

Microprocessor: C-MOS NSC 800

TRANSMITTER

Power: 10 Watts

Modulation: Frequency modulation

Frequency: 76 to 78.575 MHz by 25 kHz steps

Transmission code: NRZ

Transmission rate: 128 kbauds

Sensitivity: $\leq 0.3 \mu$ V 10 dB S/N

Band width: 200 Hz to 2.7 kHz

Frequency: 70 to 71.800 MHz

Modulation: Phase

Modulation code: FSK

Modulation rate: 320 bauds

Memory read out transmission time: 725 ms per station unit
(6 second length - 2 ms sampling rate)
70 seconds for 96 station units
2 min 2 s for 200 station units

Line transmission: 2 twisted pair cable, polyurethane jacket.
External diameter < 8 mm

Maximum distance without repeater: 3 km or 256 channels

Autonomy:

	200 records/day
radio transmission	5 days
cable transmission	9 days

PHYSICAL CHARACTERISTICS

CENTRAL RECORDING UNIT

Power: 800 W 24 V DC or 110/220 V AC

	Size (cm) LxHxD	Weight (kg)
Transceiver unit	53x36x63	42
Logic unit	53x36x63	42
Tape transport unit	53x54x50	50
Playback unit	53x63x36	30
Printer unit	21x 7x21	3
Power supply unit	52x42x51	65

TELEMETRY STATION UNIT

Power: 12 VDC - 9.5 Ah sealed lead battery

Height: 75 cm

Diameter: 16 cm

Weight: 10 kg

Temperature range (operating): -20°C to $+60^{\circ}\text{C}$

Humidity: Waterproof



Myriaseis operations in Gabon.



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- 47/55 The Vale - Acton - London W3 7RR (U.K.) - Ph: (01) 749.25.65 - Telex: 8812454



MYRIASEIS* NEW DEVELOPMENTS

(UPDATE TO TECHNICAL
SUMMARY No. 2-502/07-4)

The Myriaseis radiotelemetry acquisition system is specifically designed for seismic operations in land-sea transition zones. Since 1983 the system has proved its capabilities on a large number of surveys on all the continents; the Gulf and California coasts of the USA, North and West Africa, the Amazon basin, South East Asia, the Netherlands, China, etc.

In order to extend the field of application and the operating flexibility of the system even further, CGG and IFP are offering Myriaseis users two significant new features:

DUAL ACQUISITION CHANNEL TELEMETRY STATION UNITS (TSU)

Single channel TSUs (current model) and dual channel TSUs (new model) are used simultaneously in the same spread. Single or dual channel mode is selected automatically when connecting the seismic sensors; in both cases only one trace address needs to be entered.

Application examples

- Mixed land-sea spreads can be formed, with the land part using dual channel TSUs in order to reduce handling and the sea part using single channel TSUs.
- In zones that are periodically covered by tides, each trace can be recorded both on geophones and hydrophones; the best result can then be selected during processing.

NEW FREQUENCY BAND AVAILABLE

In addition to the currently available transmission band (76-78.5 MHz), users now have access to the FCC "type accepted" 216-220 MHz band.

Equipment available:

- Retrofit kit to upgrade single channel units to dual channel units and to change the frequency band.
- Optional charge amplifier input.

*CGG-IFP trademark & product development.

REPRESENTATION AND EQUIPMENT SALES

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• Geomecanique - 212, avenue Paul-Doumer,
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SUMMARIZED SPECIFICATIONS

ELECTRICAL CHARACTERISTICS (for each channel)

Input characteristics

- a) Geophone input
Input impedance: 10 kohms
Mode: Differential
Maximum level: 225 mV RMS for a gain of 2^4
- b) Hydrophone input (transformerless hydrophone) – *Optional*
Mode: Charge amplifier
Maximum level: 1800 mV RMS for a gain of 2^1
- c) Common Mode Rejection Ratio: > 80 dB

Noise characteristics

Geophone input: $1.2 \mu\text{V}$ RMS for a gain of 2^4

Offset characteristics

Geophone input: $\pm 2 \mu\text{V}$ for a gain of 2^4

Input dynamics

Geophone input: 105 dB for a gain of 2^4

Filter characteristics

- a) Passband: 3.5 Hz to 300 Hz
- b) Low frequency filters: Two frequencies available: 2 and 16 Hz, gradient: 18 dB/oct. Selected by remote control
- c) High frequency filters: Determined by the sample interval:
- | | | |
|------|--------|------------|
| 1 ms | 300 Hz | 54 dB/oct. |
| 2 ms | 150 Hz | 54 dB/oct. |
| 4 ms | 75 Hz | 54 dB/oct. |

Distortion characteristics

Total harmonic distortion: < 0.1 % from 7.5 to 250 Hz - Gain = 2^4

Gain characteristics

- Fixed gain:
- geophone input: 2^4
 - hydrophone input: 2^1 for hydrophone capacitance of 36.4 nF
- Accuracy of fixed gain: ± 2.5 %
- Variable gain:
- mode: Instantaneous floating point
 - gain variation: 2^0 to 2^{13} (78 dB)
 - steps of 2^1 (13 steps of 6 dB)
 - accuracy of variable gain: $0.5 \cdot 10^{-3}$
 - linearity of gain steps: $5 \cdot 10^{-3}$ from $G = 2^1$ to $G = 2^{10}$
 - dynamic gain control range: 78 dB
 - dynamic recording range: 66 dB at minimum gain
27 dB at maximum gain

Digital characteristics

- a) Analog-to-digital converter: 13 bits (12 + sign)
 Code: Two's complement
 Full scale level: ± 5.12 V
 Accuracy: $\pm 1/2$ LSB
- b) Definition of data
 Mantissa: 12 bits (amplitude)
 Exponent: 4 bits (gain)
- c) Recording format: SEG D 8024 (demultiplexed)
- d) Sampling rate: 1 ms/2 ms/4 ms
- e) Memory
 Dynamic memory: 32 Kbytes (262144 bits)
 Storage capacity: 2×4096 32-bit words or 1×8192 32-bit words (option)

This memory stacks consecutive shots, thereby permitting the use of a low-energy source and also shear wave emitters which require stacking of alternate signs.

Stacking capacity: 128 terms (\pm)

Fixed 32-bit format with no noise rejection.

Power supply characteristics

- Internally mounted rechargeable battery: Sonnenschein SA 200, 12 V, 9.5 Ah. (19 Ah. optional)
 Minimum voltage: 10.8 V (15 % of available capacity)
 Maximum voltage: 13.8 V
 Number of charging/recharging cycles at 20°C: 260

Power draw:

	Radio transmission	Line transmission
Standby	61 mA	30 mA
Acquisition	300 mA	280 mA
Transmission	3 A (0.8 s)	200 mA

Autonomy:

(20°C - Full use of rated capacity)

	Radio transmission	Line transmission
200 shots/day	5 days	9 days
200 shots Σ 4/day	3 days	5 days

Autonomy can be doubled with optional 19 Ah. battery.

SUMMARIZED SPECIFICATIONS

TRANSMISSION CHARACTERISTICS

Radio transmission

	<u>Standard frequency band</u>	<u>FCC approved frequency band</u>
a) Transmitter		
Radiated power:	10 W (+ 40 dBm)	10 W (+ 40 dBm)
Frequency modulation:	NRZ code	NRZ code
Modulation index:	0.7 at 64 kHz, i.e. excursion of ± 50 kHz	0.7 at 64 kHz, i.e. excursion of ± 50 kHz
Rate of transmission:	128 kbauds	128 kbauds
Frequency range:	76 to 78.575 MHz in steps of 25 kHz	216 to 220 MHz FCC: E9K5 HL 220 FMO - 10 W
b) Receiver		
Sensitivity:	0.7 μ V (50 Ohms) (- 110 dBm for 12 dB S + N/N)	0.7 μ V (50 Ohms) (- 110 dBm for 12 dB S + N/N)
Modulation:	FSK (2025 Hz/2250 Hz)	FSK (2025 Hz/2250 Hz)
Passband:	IF 21.4 MHz \pm 7.5 kHz at - 3 dB	IF 21.4 MHz \pm 7.5 kHz at - 3 dB
Rate at which messages are received:	320 bauds	320 bauds
Frequency range:	70 to 71.800 MHz	73 MHz FCC: E9K5 HL 73 FMO - 10 W
c) Antennas		
Marine version:	Whip: $5/8 \lambda$, length 1.9 m Vertical polarization Omnidirectional Gain: + 3 dB	Whip: $1/4 \lambda$, length 1.4 m Vertical polarization Omnidirectional Gain: 0 dB
Land version:	Dipole, $2 \times \lambda/4$ Horizontal polarization Directivity: $\pm 60^\circ$ Gain: + 4 dB	Yaghi $2 \times \lambda/4$ Horizontal polarization Directivity: $\pm 30^\circ$ Gain: + 3 dB

Line transmission

Order transmission code:	FSK
Data transmission code:	HDB 3
Transmission cable:	2 twisted pairs
Maximum transmission range without booster unit:	1 \times (8 km or 256 stations)
Maximum transmission range with booster unit:	2 \times (8 km or 256 stations)

MECHANICAL CHARACTERISTICS

Height:	745 mm
Diameter:	152 mm
Weight:	10 kg without accessories
Operating temperature:	- 10°C to + 55°C
Storage temperature:	- 30°C to + 85°C
Resistance to leakage:	2 bars
Internal pressurization of electronic compartment:	0.1 bar