Geospace Combined Recorder (GCX)

USER MANUAL

7007 Pinemont
Houston, TX 77040 USA

CAUTION: Any changes or modifications to this device not explicitly approved by the manufacturer could void your authority to operate this equipment.

FCC
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The device has been found to be compliant to the requirements set forth in CFR 47 Sections 2.1091 and Industry Canada RSS-102 for an uncontrolled environment. It is expected that this equipment will generally be operated with a separation distance of at least 20centimeters between the transmitter's radiating structure and the body of the user or nearby persons.

Industry Canada
(English)
This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

(French)
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

GCX MODULE

Deployment

The GCX should be deployed with the metal plate down. This provides sufficient earth grounding and maximum cooling of the unit as well as providing the GPS receiver in the top to the unit with an ideal "view" of the satellite constellation. The grounding spike should be fastened to the unit prior to deployment to provide maximum earth coupling. The unit should be transported on its side in order to put the unit into standby mode and minimize battery consumption prior to use. Once the unit is ready to be deployed it should be flipped spike down and the GCX will immediately begin power on self-test.

The GCX will test all of its internal circuits followed immediately by an impedance test of the seismic sensors. The LED that can be seen from the top of the GCX will flash codes to indicate the GCX's condition. The GCX will enable the Global Positioning System (GPD) receiver and begin to flash the code that indicates that it is searching for satellites. Within a few seconds the GPS receiver will have sufficient satellite information to obtain a 3 dimensional fix. The flash code will change to indicate this condition and the GSR will now begin to acquire seismic data if it has been programmed to begin recording immediately. See Programming below. After several minutes the internal GSR clock will be sufficiently disciplined and the GPS receiver will be turned off. The flash code will again change to indicate this state. See the flash codes below.

Radio Status Monitoring

A GSR may be connected to a laptop computer and used as a hub to monitor the status of any GSRs within a 50m to 100m radius via a high frequency radio link. In this mode the laptop/hub monitors and logs status information from all of the GSRs that it communicates with. The laptop stores the GPS location, acquisition status, temperature, battery status and the nonvolatile memory status of each GSR. By moving the hub throughout the seismic spread all of the GSRs in the survey may be monitored and logged. This logging may take place during acquisition of seismic data with no adverse effect on the data quality.

Flash Codes

GSR Start-up Error Codes

Critical GSR Error:	LED flashes repeatedly on solid for 1 second followed by off for one second.
Critical Seis Input 1 Error:	LED on solid for 1 second followed by 1 short pulse.
Critical Seis Input 2 Error:	LED on solid for 1 second followed by 2 short pulses.
Critical Seis Input 3 Error:	LED on solid for 1 second followed by 3 short pulses.
Critical Seis Input 4 Error:	LED on solid for 1 second followed by 4 short pulses.
Critical Battery Error:	LED on solid for 1 second followed by 5 short pulses.
Non-Volatile Memory Error:	LED on solid for 1 second followed by 6 short pulses.
Non-Volatile Memory Full:	LED on solid for 1 second followed by 7 short pulses.

GSR Run Time Codes

GPS on but no GPS fix:	One LED flash per second.
GPS on with GPS fix:	Two quick flashes once per second.
Recording with GPS off:	One quick flash each 8 seconds.
Sleeping:	Two quick flashes each 10 seconds.
Running geophone tests:	LED flashes on for 10 ms 5 times per second.

Downloading

The GSR non-volatile memory may be read and cleared by removing the battery connection and inserting the unit into one of the outlets in the GeoReaper. See the GeoReaper User Manual for further instruction.

Programming

The GSR recording parameters such as sample rate, pre-amp gain, record mode, and testing, are programmed and stored in non-volatile memory in the GSR by the GeoReaper. See the GeoReaper User Manual for further instruction.

- **Scalability - Unlimited number of channels**
- **Delivers high resolution data with a 24-bit delta-sigma ADC**
- **Built-in GPS receiver and disciplined clock**
- **Greater than 30 days of continuous recording**
- **Compatible with explosive, vibratory and impulsive energy sources**
- **Internal GS-ONE geophone and Extended Life Battery**
- **Built-in full resolution test generator**
- **Available as 1 or 3 channel versions**
- **LED Status/Deployment State Indicator**

GEOSPACE Technologies

www.geospace.com

Geospace Combined Recorder (GCX)

Cable/Radio-Free
Autonomous Data Recording Node

The GCX is designed for cable-free/radio-free seismic data recording. The self-contained unit includes 1 or 3 channels of 24-bit digitization, an integrated/high sensitivity GPS receiver, built-in test signal generator, up to 16 GB per channel of non-volatile solid-state data storage, and a high-speed data port. The unit is housed in a sealed case, with internal GS-ONE geophone and ex-tended life battery.

GCX System Tests

The seismic channel performance and sensor tests can be performed by the GCX System. The user can choose a partial or complete set of tests that can be run in sequence and display all of the results or only the failures. In the tests described below, the system software automatically controls the Channel Input Switch Positions and Test Oscillator Settings during the tests. All tests can be run at all sample intervals and preamp gains of the GCX.

- **Harmonic Distortion**
- **Impulse Response**
- **Equivalent Input Noise**
- **Instantaneous System Dynamic Range**
- **Gain Accuracy**
- **Common Mode Rejection**
- **Geophone Impedance and THD**
- **Crossfeed (multi-channel)**

GEOSPACE Technologies

www.geospace.com

Geospace Combined Recorder (GCX)

Features and Spceifications

- 24-bit digital recorder
- Built-in GPS and disciplined clock
- Built-in full resolution test signal generator
- Solid-state flash memory
- Scalability - Unlimited # of channels
- Greater than 30 days of continuous recording
- Compatible with vibratory, explosive and impulsive energy sources
- LED Status/Deployment State Indicator
- Internal GS-ONE geophone
- Available as 1 or 3 channel versions
- 24-bit delta-sigma ADC
- 1 Hz to 1600 Hz freq. response
- <20 μsec. of UTC (GPS clock)
- Up to 16 GBytes per channel flash memory storage
- Internal extended life battery
- Operating Temperature: -40° C to +85° C
- Humidity: 0 to 100%
- Selectable Gains:
  - X1, X2, X4, X8, X16, X32, X64
  - 0, 6, 12, 18, 24, 30, 36 dB
- Sample Intervals:
  - 0.25, 0.5, 1, 2, 4 milliseconds

Max input signal: 1.8 VRMS @ 0 Gain
Total Dynamic Range: 140 dB
System Dynamic Range @ 0dB Gain:
- 126 dB @ 4 msec SI
- 124 dB @ 2 msec SI
- 120 dB @ 1 msec SI
- 117 dB @ .5 msec SI
- 106 dB @ .25 msec SI

Equivalent Input Noise @ 2 msec SI:
- 1.13 μV @ Gain 0 dB
- .58 μV @ Gain 6 dB
- .33 μV @ Gain 12 dB
- .22 μV @ Gain 18 dB
- .19 μV @ Gain 24 dB
- .18 μV @ Gain 30 dB
- .17 μV @ Gain 36 dB

Input Impedance:
- 20 kohms/0.06 μf Difference Mode
- 205 kohms Common Mode

System Dynamic Range @ 2 msec SI
- 124 dB @ Gain 0 dB
- 123 dB @ Gain 6 dB
- 122 dB @ Gain 12 dB
- 120 dB @ Gain 18 dB
- 115 dB @ Gain 24 dB
- 110 dB @ Gain 30 dB
- 105 dB @ Gain 36 dB

Total Harmonic Distortion: 0.0005%
Common Mode Rejection: 0.001%
Gain Accuracy: 1%
Anti-Alias Filter:
- Rejection @ Nyquist: 130 dB
- Frequency @ -3 dB: 0.83 Nyquist
- Linear or Minimum Phase

GPS Time Standard: <1 ppm
Weight: 6 pounds
Max. Dimension: 6.125”dia x 5.375”h
Geophone Sensitivity: 2.00 V/in/s

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Geospace Combined Recorder (GCX)

GeoRes-XTC GCX Data Management System

The GeoRes-XTC consists of two embedded software modules:

GeoReaper performs pre-deployment parameter programming, i.e. sample rate, pre-amp gain, record mode, testing, etc. and data collection via Ethernet connection to the Data Transfer Module (DTM) and a high speed PC. A full set of instrument tests can be performed and analyzed while the GCX is installed in the Data Transfer Module (DTM).

GeoMerge allows the system to read and import all three major components of SPS (R, S and X records). It will merge all GCX data into SEG-D or SEG-2 files according to SPS X records (Cross-Reference File, sorted in the same order as the Source 'S' File) and convert all latitude and longitude information into the same coordinates used in the SPS files. These data are then output to the field database (RAID memory) and/or hard media (tape, disk, etc.).

The GeoRes-XTC is compatible with third party generated SPS files.

GeoRes-XTC High Speed Computer

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