

# 428XL SPECIFICATIONS

## CENTRAL UNIT

### CENTRAL UNIT ARCHITECTURE

Client-server architecture: clients can be located anywhere and access server through the web. Server is connected to line interface LCI-428.

### SERVER

|                   |  |
|-------------------|--|
| Workstation:      | Sun or PC desktop or laptop, depending on configuration, no screen required  |
| Solaris           | Blade 2500 or Ultra 45 mono-processor dual disk 4 GB for impulsive operations and vibroseis up to 4,000 channels @ 2 ms<br><br>Blade 2500 or Ultra 45 bi-processor dual disk 8 GB for vibroseis operation above 4,000 channels @ 2 ms  |
| Linux             | IBM Zpro 9228 mono-processor 3 disk 4 GB for impulsive operations and vibroseis up to 4,000 channels @ 2 ms<br><br>IBM Zpro 9228 bi-processor 3 disk 8 GB for vibroseis operation above 4,000 channels @ 2 ms.<br><br>Dell Latitude D520 2GB for impulsive operations up to 1,000 channels @ 2 ms (428Lite). |
| Operating system: | Solaris 8 or 10, Linux Red Hat WS4   |
| Software:         | e-428 Server Software, performing data computation, storage and handling of local or remote clients  |

### CLIENT

|                   |   |
|-------------------|---|
| Station:          | PC desktop or laptop, local or remote   |
| Screens:          | Up to 3 per client  |
| Operating system: | Windows 2000, XP, Linux   |
| Software:         | e-428 Client software, performing operator interface and parameters display. It can be ran on the server machine for small configurations (i.e. 2,000 channels @ 2 ms on a IBM Zpro 9228 mono-processor). |

### LCI-428

Field units management, up to 10,000 channels real time @ 2 ms.

Up to 10 LCI-428 can be linked together to handle up to 100,000 channels real time @ 2 ms.

|                        |   |
|------------------------|---|
| Operating voltage:     | 110-220 VAC, 50/60 Hz   |
| Power consumption:     | 6.7 W   |
| Operating temperature: | 0 to +45°C  |
| Storage temperature:   | -40° to +70°C   |
| Dimensions (HxWxD):    | 2U 19" rackable, 86.1 x 483 x 420.7 mm<br>(19 x 16.5 x 3.4 in.) |
| Weight:                | 4.1 kg (9.0 lbs.)   |

### PERFORMANCES

Performances are easily scalable, depending on server workstation configuration.

### PROCESSING CAPABILITIES

- Correlation before or after stack
- Vertical or diversity stack
- Spike editing: zeroing or clipping
- Alternate or simultaneous multi-source operation
- Slip sweep
- HFVS

### TRANSMISSION CAPABILITIES

|                       |  |
|-----------------------|--|
| Line data rate:       | 8 Mbps, compatible with 408UL equipment<br>16 Mbps, 428XL equipment only |
| Transverse data rate: | TCP-IP protocol, 100 Mbps Ethernet-based transmission                    |

### HARDWARE CAPABILITIES

SEG-D files are stored temporarily in the server disk prior to be transferred to tape or NAS or QC tools, allowing acquisition to continue during taping incident (tape recording fault tolerant), and allowing SEG-D to be annotated with source and receiver QCs.

Maximum record length:

|                            |   |
|----------------------------|---|
| Depending on server memory | 8 GB allows 10,000 channels 4 fleets vibroseis, 22 s acq. length @ 2 ms |
| Real-time links:           | eSQC Pro for data QC<br>SGA for specific trace analysis                 |
| Play-back:                 | eSQC Pro<br>Plotter   |

### STORAGE CAPABILITIES

|              |                              |
|--------------|------------------------------|
| Tape drives: | Listed in compatibility list |
| NAS          |                              |



Ahead of the Curve<sup>SM</sup>

# GROUND EQUIPMENT

## FDU-428

|                         |   |
|-------------------------|---|
| Functions:              | <ul style="list-style-type: none"><li>● Data transmission with CRC control</li><li>● 24 bits A/D conversion</li><li>● D/A conversion with programmable bit stream</li></ul> |
| Input impedance:        |   |
| Differential mode       | 20 k $\Omega$ // 77 nF  |
| Common mode             | 105 k $\Omega$  |
| Full scale input levels |   |
| @ G1600                 | 1.6 V RMS   |
| @ G400                  | 400 mV RMS  |
| Offset:                 | 0 (digitally zeroed)  |
| Crosstalk:              | > 130 dB  |
| Low-cut filter:         | None  |
| High-cut filter:        | 0.8 FN (linear or minimum phase)  |
| Stop band attenuation:  | > 120 dB (above Nyquist)  |
| Sample rates:           | 4, 2, 1, 0.5, 0.25 ms   |
| Word size:              | 24 bits   |
| Time standard:          | True synchronous system   |
| Interval between FDUs:  | @ 8 Mbps: up to 110 m with ST+ cable,<br>90 m with WPSR cable   |
|                         | @ 16 Mbps: up to 90 m with ST+ cable,<br>75 m with WPSR cable   |

|                         |   |
|-------------------------|---|
| Power consumption:      | 120 mW @ 8 Mbps, 132 mW @ 16 Mbps             |
| Noise (3-200Hz) :       |   |
| @ G1600                 | 450 nV RMS                                    |
| @ G400                  | 145 nV RMS                                    |
| Instant dynamic range:  | 130 dB  |
| System dynamic range:   | 140 dB  |
| Distortion:             | -110 dB                                       |
| Gain accuracy:          | < 0.1%  |
| Phase accuracy:         | 20 $\mu$ s                                    |
| CMRR:                   | 110 dB  |
| Operating power voltage | 22 to 50V DC                                  |
| Dimensions (HxWxD):     | 82.5 x 71.4 x 194 mm<br>(3.2 x 2.8 x 7.6 in.) |
| Weight:                 | 0.35 kg (0.77 lbs.) with ST+ cable            |
| Operating temperatures: | -40° to +70°C                                 |
| Storage temperatures:   | -40° to +70°C                                 |
| Water depth:            | 15 m (for WPSR)<br>1 m (for ST+)              |

**DSU3-428**

|                                     |  |
|-------------------------------------|--|
| Functions:                          | <ul style="list-style-type: none"> <li>● Acceleration measurement and data transmission with CRC control</li> <li>● 24 bits digital acquisition</li> </ul> |
| Full scale:                         | 5 m/s <sup>2</sup>   |
| Tilt max value:                     | +/- 180°   |
| Noise (10-200Hz):                   | 0.4 μm/s <sup>2</sup> /√Hz   |
| System dynamic range:               | 120 dB @ 4 ms  |
| Sampling rate:                      | 4, 2, 1, 0.5, 0.25 ms  |
| Bandwidth:                          | 0 - 800 Hz (up to 1600 Hz with degraded specifications)  |
| Distortion:                         | -90 dB   |
| Amplitude calibration accuracy:     | ± 0.25%  |
| Orthogonality calibration accuracy: | ± 0.25°  |
| Power consumption:                  | 285 mW @ 8 Mbps, 300 mW @ 16 Mbps  |
| Static sensor tests:                | Tilt, gravity, noise   |
| Dynamic sensor tests:               | Distortion, gain, phase  |
| Dimensions (HxWxD):                 | 159.2 x 70 x 194 mm<br>(6.2 x 2.7 x 7.6 in.)   |
| Weight:                             | 0.43 kg (0.9 lbs.)   |
| Operating temperatures:             | -40° to +70°C  |
| Storage temperatures:               | -40° to +70°C  |
| Water depth:                        | 15 m (for WPSR)<br>1 m (for ST+)   |

**LAUL-428**

|  |   |         |
|--|---|---------|
| Functions:   | <ul style="list-style-type: none"> <li>● FDUs, DSUs and line management, data transmission with error recovery and temporary storage</li> <li>● 50 V line power supply</li> <li>● Tests</li> </ul>  |         |
| Tests capabilities                                 | <ul style="list-style-type: none"> <li>● Power supply</li> <li>● Data transmission</li> <li>● Field tests (resistance, tilt, leakage, noise, CMRR)</li> <li>● Instrument tests (noise, distortion, phase, gain, CMRR, crosstalk)</li> </ul> |         |
| Operating power voltage:                           | 10.5 to 15 VDC, 2 battery connectors, to allow uninterrupted operation during battery replacement   |         |
| Power consumption:                                 | 2.8 W (idle: 320 mW)  |         |
| Maximum number of FDUs/DSUs between LAUs (@ 2 ms): |   |         |
| Cable length between FDUs/DSUs                     |   |         |
|  | 8 Mbps  | 16 Mbps |
| 5 m  | 60/20   | 102/40  |
| 10 m   | 60/20   | 90/40   |
| 15 m   | 60/20   | 81/40   |
| 20 m   | 60/20   | 74/40   |
| 25 m   | 60/20   | 68/40   |
| 30 m   | 60/20   | 64/40   |
| 35 m   | 60/20   | 60/40   |
| 40 m   | 59/20   | 57/40   |
| 45 m   | 56/20   | 55/39   |
| 50 m   | 54/20   | 52/37   |
| 55 m   | 52/20   | 50/36   |
| 60 m   | 50/20   | 48/34   |
| 70 m   | 47/20   | 45/32   |
| 80 m   | 44/20   | 43/30   |
| 90 m   | 42/20   | 40/29   |
| 100 m  | 38/20   | NA/NA   |
| 110 m  | 37/20   | NA/NA   |
| Line data rate:                                    | 1000 ch. @ 2 ms @ 8 Mbps,<br>2000 @ 16 Mbps   |         |
| Memory:  | 30 MB local buffer for non-real time mode transmission  |         |
| Material:  | Aluminium   |         |
| Dimensions (HxWxD):                                | 108 x 93 x 224 mm<br>(4.2 x 3.6 x 8.8 in.)  |         |
| Weight:  | 2.4 kg (5.3 lbs.)   |         |
| Operating temperatures:                            | -40° to +70°C   |         |
| Storage temperatures:                              | -40° to +70°C   |         |
| Water depth:                                       | 15 m  |         |

## LAUX-428

|  |  |
|--|--|
| Functions:   | <ul style="list-style-type: none"><li>● Ethernet-TCP/IP data transmission and routing (transverse) with error recovery and temporary storage</li><li>● 50 V line power supply</li><li>● Tests</li></ul>                                |
| Tests capabilities:  | <ul style="list-style-type: none"><li>● Power supply</li><li>● Data transmission</li><li>● Field tests (resistance, tilt, leakage, noise, CMRR)</li><li>● Instrument tests (noise, distortion, phase, gain, CMRR, crosstalk)</li></ul> |
| Operating power voltage:                                       | 10.5 to 15 VDC, 2 battery connectors to allow uninterrupted operation during battery replacement   |
| Power consumption:   |  |
| LAUX-428   | 6.7 W (idle 1 W)   |
| TREP-428   | 1.3 W  |
| TFOI-428   | 1.1 W  |
| Interval between LAUX on transverse:                           |  |
| Copper wire  | up to 6 x 125 m with TREP-428 repeaters and SRHRF cable  |
| Fiber optics   | up to 10 km (one piece fiber) with TFOI-428 interfaces   |
| TREP-428 and TFOI-428 are powered through the line by LAUX-428 |  |
| Transverse data rate:  | 10,000 ch. @ 2 ms  |
| Memory:  | 3 MB local buffer for non-real time mode transmission  |
| Material:  | Aluminium  |
| Water depth:   | 15 m (also for TREP-428 and TFOI-428)  |
| Operating temperature:   | -40° to +70°C  |
| Storage temperature:   | -40° to +70°C  |
| Dimensions (HxWxD):  | 137 x 312 x 242 mm<br>(5.4 x 12.3 x 9.5 in.)   |
| Weight:  | 5.5 kg (12.1 lbs.)   |

## LAUR-428

|                           |   |
|---------------------------|---|
| Functions:                | <ul style="list-style-type: none"><li>● Handles 408UL or 428XL links of FDU's or DSUs</li><li>● Up to 30 channels each side of LAUR-428</li><li>● Slave of a cell handled by master LRU</li></ul>   |
| Tests capabilities:       | <ul style="list-style-type: none"><li>● Power supply</li><li>● Data transmission</li><li>● Field tests (resistance, tilt, leakage, noise, CMRR)</li><li>● Instrument tests (noise, distortion, phase, gain, CMRR, crosstalk)</li></ul>  |
| RF transmission:          | <ul style="list-style-type: none"><li>● 30 channels @ 2 ms real-time radio transmission</li><li>● Bandwidth occupancy           200 kHz</li><li>● Data rate                        256 kbps</li><li>● Up to 6 W automatically adjusted output power<ul style="list-style-type: none"><li>- 215-250 MHz international use</li><li>- 217-218 MHz &amp; 219-220 MHz USA use</li><li>- 217-220 MHz Canada use</li></ul></li></ul> |
| FCC emission designators: | 200 KD1D  |
| Operating power voltage:  | 10.5 to 15 V DC, 2 battery connectors to allow uninterrupted operation during battery replacement   |
| Power consumption:        |   |
| When retrieving           | 40.6 W with 30 FDU's connected  |
| Sleep mode                | 2.4 W with receive ON<br>0.2 W without receiving  |
| Memory:                   | 3 MB local buffer for non-real time mode transmission   |
| Material:                 | Aluminium   |
| Water depth:              | 1 m   |
| Operating temperature:    | -40° to +70°C   |
| Storage temperature:      | -40° to +70°C   |
| Dimensions (HxWxD):       | 169.5 x 380 x 380 mm<br>(6.7 x 15 x 15 in.) without antenna   |
| Weight:                   | 12.2 kg (26.8 lbs.)   |

## LRU

|  |   |
|--|---|
| Radio functions:                                     | <p><b>1</b> - Communication with another LRU for data transmission with error recovery and temporary storage</p> <ul style="list-style-type: none"><li>● Up to 16 km up to 240 channels* @ 2 ms real-time with Yagi type antenna (8 m mast)</li><li>● Up to 24 km up to 60 channels* @ 2 ms real-time with Yagi type antenna (8 m mast)</li></ul> <p><b>2</b> - Master of a cell composed of several LAURs for data transmission with error recovery and temporary storage</p> <ul style="list-style-type: none"><li>● Up to 24 km with Yagi type antenna (18 m mast)</li><li>● Up to 8 km with omni-directional antenna (8 m mast)</li></ul> |
| Cable functions:                                     | Full LAUX capabilities  |
| Tests capabilities:                                  | <ul style="list-style-type: none"><li>● Power supply</li><li>● Radio data transmission</li><li>● Cable data transmission</li><li>● Field tests (resistance, tilt, leakage, noise, CMRR)</li><li>● Instrument tests (noise, distortion, phase, gain, CMRR, crosstalk)</li></ul>  |
| Antenna spectrum monitoring capability               |   |
| Radio setup:   | Pocket terminal connection capability   |
| Memory:  | 3 MB local buffer for non-real time transmission mode   |
| Interval between LRUs or LRU and LAUX on transverse: | <ul style="list-style-type: none"><li>● Up to 300 m with ST+ cable</li><li>● Up to 250 m with WPSR</li><li>● Up to 400 m with WPSRLR</li></ul>  |
| Material:  | Aluminium   |
| Dimensions (HxWxD):                                  | 225 x 380 x 380 mm<br>(8.8 x 14.9 x 14.9 in.)   |
| Weight:  | 12.6 kg (27.8 lbs.)   |
| Operating power voltage:                             | 10.5 to 15 VDC, 2 battery connectors, to allow uninterrupted operation during battery replacement   |

|                           |  |
|---------------------------|--|
| Power consumption:        |  |
| Master                    | 23 W   |
| Slave                     | 80 W when retrieving   |
| Sleep                     | 1.2 W  |
| Operating temperatures:   | -40° to 70°C   |
| Storage temperatures:     | -40° to 70°C   |
| Water depth:              | 1 m  |
| RF Frequencies:           | <ul style="list-style-type: none"><li>● 215-250 MHz international use</li><li>● 217-218 MHz &amp; 219-200 MHz USA use</li><li>● 217-220 MHz Canada use</li></ul> |
| RF Output power:          | RF power management; 6 W nominal   |
| RF Output impedance:      | 50 Ω   |
| FCC emission designators: | 200 KD1D and 800 KD1D  |

### Cable performances:

(Typical @ 2 ms sample rate and 25°C)

Maximum number of FDUs per LRU :

- 120 with up to 30 m interval
- 96 with up to 55 m interval
- 80 with up to 75 m interval

Maximum number of FDUs between LRUs or between LRU and LAU :

- 60 with up to 30 m interval
- 48 with up to 55 m interval
- 40 with up to 75 m interval

\* the number of channels increases proportionally with the ratio:  
(shot time)/(acquisition time)

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