

408UL Specifications

Central Units

HUMAN COMPUTER INTERFACE (HCI)

Workstations	Laptop or desktop with high-resolution CRT or flat screen monitors. Medium range Workstations are available for small configurations and more powerful ones for larger configurations can be provided.
Maximum number of stations	5
Maximum number of monitors per station	3
Software	Fully integrated application software, with distributed resources within the entire acquisition network and object oriented database Operating system : Unix™ X-window system : X11™ Window environment : MOTIF™ The software can be remotely controlled using commercial communication means

PERFORMANCES

CM408-V (Vibroseis)

Processing capabilities	Correlation before or after stack Vertical or Diversity stack Spike editing : zeroing or clipping Alternate or simultaneous dual-source operation Slip-sweep
Processing power (real time) per module	1800 Ch @ 2 ms

CM408-I (Impulsive)

Maximum number of channels per module	10800 Ch @ 2 ms/8 s
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SYSTEMS ARCHITECTURE

Easily expandable using several parallel modules connected to a single set of tape drives and camera (2 portable modules in maximum within the multi-module architecture).

Maximum number of channels	Unlimited
Maximum number of lines	Unlimited
Start of acquisition (from T_0)	< 20 μ s
Maximum record length	99 s @ 4 ms 64 s @ 2 ms 32 s @ 1 ms 16 s @ 0.5 ms(*) 8 s @ 0.25 ms(*)
Maximum acquisition length	128 s @ 4 ms 64 s @ 2 ms 32 s @ 1 ms 16 s @ 0.5 ms(*) 8 s @ 0.25 ms(*)
Sampling skew	True synchronous sampling
Gain setting	G1600 full scale = 1600 mV RMS

	G1600	G400	G100	G50	G25
Cable only	3	3	3	N/A	N/A
RF only	N/A	3	3	3	3
Combined	N/A	3	3	N/A	N/A

Play-back and monitoring

Versatile hard copy output on plotter
 Fixed gain, linear gain or AGC
 Low-cut filter from 10 Hz to F_N in 1-Hz steps
 High-cut filter from 30 Hz to F_N in 1-Hz steps
 Notch filter from 30 Hz to F_N in 1-Hz steps

Real-time links with SQC-Pro & VQC for QC analysis

(*) N/A for RF acquisition



TAPE DRIVES	
Drive and Media	Up to 6 drives (simultaneous and or alternate mode)
Format	SEG-D demultiplexed, 4 byte per sample (SEG-D, Rev. 2)
CD 490E (single or dual drive)	
Media	36 track IBM 3490-E type ½" cartridge
Format	IBM 36 track 3490E interchange
Maximum trace length	64 s @ 2 ms or equivalent
CD 590 (single or dual drive)	
Media	128 track IBM 3590 type ½" cartridge
Format	IBM 128 track 3590 interchange
Maximum trace length	64 s @ 2 ms or equivalent

PHYSICAL SPECIFICATIONS	
CM408 RACKABLE	
Operating voltage	110V - 220 VAC 50/60 Hz
Power consumption	250 W with 1 NEP & 1 FTP 330 W with 2 NEP & 2 FTP 410 W with 3 NEP & 3 FTP
Environmental	
Humidity	20-80% non-condensing
Operating temperature	0° to 40°C (*)
Storage temperature	- 40° to +70°C
Dimensions & weights (without rack)	
Size (HxWxD)	355x480x560 mm (14x18.9x22 in)
Weight	23.5 kg (51.8 lbs)

CM408 STANDALONE	
Operating voltage	110 V - 220 VAC 50/60 Hz
Power consumption	250 W with 1 NEP & 1 FTP 330 W with 2 NEP & 2 FTP 410 W with 3 NEP & 3 FTP
Environmental	
Humidity	20-80% non-condensing
Operating temperature	0° to 40°C (*)
Storage temperature	- 40° to +70°C
Dimensions & weights (with lid)	
Size (HxWxD)	460x580x720 mm (18.1x22.8x28.3 in)
Weight	38 kg (83.8 lbs)

CM408 PORTABLE	
Operating voltage	110 V - 220 VAC 50/60 Hz
Power consumption	120 W
Environmental	
Humidity	20-80% non-condensing
Operating temperature	0° to 40°C (*)
Storage temperature	- 40° to +70°C
Dimensions & weights (with lid)	
Size (HxWxD)	610x380x450 mm (24x15x17.7 in)
Weight	38 kg (83.8 lbs)

TAPE DRIVES	
CD 490E	
Operating Voltage	110 V - 220 VAC 50/60 Hz
Power Consumption	Single drive : 150 W Dual drive : 300 W Idle : 120 W
Environmental	
Operating temperature	10 to 40°C
Storage temperature (without tape)	-40° to +60°C
Humidity	20-80 % non-condensing
Dimensions and weight	
Size with lid (HxWxD)	332x332x590 mm (13.1x13.1x23.2 in)
Weight	24 kg (single drive) (52.9 lbs) 35 kg (dual drive) (77.2 lbs)
CD 590	
Operating Voltage	100 V - 220 V AC 50/60 Hz
Power consumption	Single drive : 170 W Dual drive : 340 W
Environmental	
Operating temperature	10 to 40°C
Storage temperature (without tape)	0° to 50°C
Humidity	20-80% non condensing
Dimensions & weight	
Size with lid (HxWxD)	360x370x695 mm (14.2x14.6x27.4 in)
Weight	28.5 kg (Single drive) (62.8 lbs) 41.5 kg (Dual drive) (91.5 lbs)

(*) Overall system limited by peripheral equipment

Ground Equipment for Cable Telemetry

FDU	
GENERAL	
Functions	data transmission with CRC control 24 bits A/D conversion D/A conversion with programmable bit stream
Input Impedance	
Differential Mode	20 k Ω // 77 nF
Common Mode	105 k Ω
Full Scale Input Levels	
@ G1600	1.6 V RMS
@ G400	400 mV RMS
Offset	0 (digitally zeroed)
Max. Common Mode Voltage	\pm 10 V
Crosstalk	> 130 dB
Low Cut Filter	None
High Cut Filter	0.8 F _N (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 FDU's	up to 110 m with ST cable up to 90 m with WPSR cable
PERFORMANCES (*)	
Noise (3-200 Hz)	
@ G1600 (3.5 k Ω)	620 nV RMS
@ G400 (500 Ω)	170 nV RMS
Instant Dynamic Range	130 dB
System Dynamic Range	140 dB
Distortion	-110 dB
Gain Accuracy	< 0.1%
Phase Accuracy	0 μ s
CMRR	110 dB
PHYSICAL	
Material	Polyurethane & Polyamide
Dimensions and Weights	
Size	300x75x85 mm (11.8x3x3.3 in)
Weights	
ST	0.415 Kg (0.9 lbs) 2.890 Kg with 55 m cable (6.4 lbs)
WPSR	0.490 Kg (1.1 lbs) 5.440 Kg with 55 m cable (12 lbs)
Power	
Operating Power Voltage	27 to 50 V DC
Power Consumption	140 mW
Environmental	
Operating Temperatures	-40° to +70°C
Storage Temperatures	-40° to +70°C
Water Depth	15 m (for WPSR) 1 m (for ST)

LAUL	
GENERAL	
Functions	FDU's and line management, data transmission with error recovery and temporary storage 48 V line power supply Tests
Tests capabilities	Power supply Data transmission Field tests (resistance, tilt, Leakage, noise, CMRR) Instrument tests (noise, distortion, phase, gain, CMRR)
Memory	4 Mb local buffer for non-real time mode transmission
PERFORMANCES	
Maximum number of FDU's between LAU's is function of the interval between FDU's and of the sample rate.	
	110 m* 90 m 70 m 55 m 30 m
4 ms	34 33 42 48 60
2 ms	34 38 42 48 60
1 ms	34 38 42 48 60
0.5 ms	34 38 42 48 60
0.25 ms	32 32 32 32 32
* ST cable only	
PHYSICAL	
Material	Aluminium or Stainless steel
Dimensions and Weights	
Size	224x93x108 mm (8.8x3.7x4.3 in)
Weights	2.400 Kg/3.700 Kg (5.3 lbs/8.2 lbs)
Power	
Operating Power Voltage	10.5 to 15 VDC, 2 battery connectors, to allow uninterrupted operation during battery replacement
Power Consumption	3.4 W (idle : 420 mW)
Environmental	
Operating Temperatures	-40° to +70°C
Storage Temperatures	-40° to +70°C
Water Depth	15 m

(*) typical @ 2 ms sample rate and 25°C

LAUX

GENERAL

Functions	data transmission and routing (transverse) with error recovery and temporary storage 48 V line power generation Tests
Tests capabilities	power supply data transmission field tests (resistance, tilt, leakage, noise, CMRR) instrument tests (noise, distortion, phase, gain, CMRR)
Memory	4 Mb local buffer for non-real time mode transmission
Interval between LAUX's on transverse	up to 300 m with ST cable up to 250 m with WPSR cable up to 400 m with WPSRLR cable

PERFORMANCES (*)

Maximum number of FDU's between LAU's is function of the interval between FDU's and of the sample rate.

	110 m*	90 m	70 m	55 m	30 m
4 ms	34	33	42	48	60
2 ms	34	38	42	48	60
1 ms	34	38	42	48	60
0.5 ms	34	38	42	48	60
0.25 ms	32	32	32	32	32

* ST cable only

PHYSICAL

Material	Aluminium
Dimensions and Weights	
Size	312x242x137 mm (12.3x9.5x5.4 in)
Weights	5.500 Kg (12.1 lbs)
Power	
Operating Power Voltage	10.5 to 15 VDC, 2 battery connectors, to allow uninterrupted operation during battery replacement
Power Consumption	5.7 W (idle : 320 mW)
Environmental	
Operating Temperatures	-40° to +70°C
Storage Temperatures	-40° to +70°C
Water Depth	15 m

* typical @ 2 ms sample rate and 25°C

Ground Equipment for Radio Telemetry

REM	
GENERAL	
RF Units	SU6R and SAR
Test capabilities	Battery Voltage Geophone Circuit Continuity Leakage and Tilt Geophone noise Digital RF spectrum monitor (Relative noise level, TX and RX strength) Distortion Common mode Impulse Crosstalk Noise RMS
Radio Tester	Pocket Terminal connection capability
PERFORMANCES (*)	
Maximum number of SU6R, SAR	1200
Maximum Record Length	16 K samples
Range : Typically	With single 6 dB antenna (Yagi) from 0.2 to 10/15 miles (0.30 to 16/24 km) With 0dB antenna (Omni) from 0.1 to 7 miles Mast mount preamplifier capability
Multi-REM capability	Up to 6 REMs on the same antenna Approximately 1dB s/n ratio loss for each REM added Up to 16 REMs per Central Unit
CABLE TRANSMISSION	
Two bi-directional transverse connections Compatible CM408 transverse connection, with standard cable up to 200 m (660 ft) All CM408 Transverse extension option capabilities	
PHYSICAL	
Operating voltage	10 to 15 VDC, 2 battery connectors, to allow uninterrupted operation during battery replacement
Power consumption	
Receiving	Typically 22 W (w/o pocket terminal) Typically 28 W (w/pocket terminal)
Transmitting	Typically 96 W (w/o pocket terminal) Typically 102 W (w/pocket terminal)
Environmental	
Operating Temperature	-40°C to +70°C (except audio) -40°C to +55°C (when using audio)

Storage Temperature	-40°C to +70°C
Humidity	0-100% (case sealed)
Dimension and Weights	
Sizes (HxWxD)	
REM	426x514x274 mm (16.8x20.2x10.8 in)
REM Transportation Case	566x690x381 mm (22.3x27.1x15.0 in)
Accessories	
Transportation Case	378 x483 x231 mm (14.9x19x9.1 in)
Weights	
REM	18 kg (40 lbs)
REM and Case	30.2 kg (67 lbs)
Accessories and Case	6.7 kg (15 lbs)

RF TRANSMISSION	
CONTROL/DATA TRANSMISSION	
One bi-directional channel	
Frequencies	
USA use	Receive/Transmit 216 to 220 MHz with 50 kHz step
Canadian use	Receive/Transmit 217 to 218 MHz and 219 to 220 MHz with 50 kHz step
Overall capability	Receive/Transmit 216 to 230 MHz with 50 kHz step
RF Transmission Error	Less than one bit in 10 ⁶ with receiver RF s/n ratio greater than 18 dB
RF Transmission Link (assume 25 ft high antenna and single REM)	
Operate with 140 dB path loss with 0 dB gain antennas and SU6R.	
Auto re-transmit on detection of CRC error	
Mast mount preamplifier	Improves low level signals, typically 3 dB S/N ratio improvement
AUDIO TRANSMISSION	
One bi-directional channel	
Frequencies	
USA use	Receive/Transmit 216 to 220 MHz with 50 kHz step
Canadian use	Receive/Transmit 217 to 218 MHz and 219 to 220 MHz with 50 kHz step
Overall capability	Receive/Transmit 216 to 230 MHz with 50 kHz step
Antenna Spectrum Monitor	Internal Spectrum Analyser controlled by the CM408 HCI External Spectrum analyzer output connector, with typically 20 dB gain

(*) typical @ 2 ms sample rate and 25°C

SU6-R

GENERAL

Input Impedance				
Differential Mode	40 k Ω // 50 nF			
Common Mode	22 M Ω // 66 nF			
Full Scale Input Levels (RMS differential with external signal source)				
Gain	G400	G100	G50	G25
Signal	452	113	56 (*)	28 mV (*)
Offset	automatically zeroed			
Max. Common Mode Voltage	\pm 2.5 V			
Crosstalk	> 95 dB			
Low Cut Filter	2.5 Hz @ -3 dB			
High Cut Filter	0.8 F _N (linear phase)			
Stop Band Attenuation	> 130 dB (above Nyquist)			
Sample Rates	4, 2, 1 ms			
Word Size	24 bits			
Memory	700 kBytes/Ch			
Max. Record Length	26 s @ 2 ms			
Data Integrity	CRC computed on every 125 samples. Auto re-transmit on detection of CRC errors.			
Time Standard	Accurate to 2.5 ppm			
Performed Tests	Battery Voltages Geophone Circuit Continuity Leakage and tilt			
Shot stacking in remote				
Data Compression				
Tri-mode communication	RF, wireline (total length = 2000m) or combination			
SU built-in test capabilities	internal D/A with programmable bit stream			

PERFORMANCES (**)

Noise (2.5-206 Hz/400 Ω)	
G400	520 nV RMS
G100	190 nV RMS
G50	160 nV RMS
G25	140 nV RMS
Distortion	
Internal oscillator	-96 dB
External oscillator	-100 dB
CMRR	
G400	83 dB
G100	95 dB
G50	101 dB
G25	107 dB

PHYSICAL

Material	Aluminium
Dimensions and Weight	
Size without antenna	200x214x214 mm (8x8.5x8.5 in)
Weight without antenna	8.500 Kg (18 lbs)
Weight with antenna base & solar panel	11 Kg (24 lbs)
Power	
Internal Power Pack	12 V 5 Ah
	Optional external Battery and/or solar panel
Environmental	
Operating Temperatures	
Standard	-30° to +70°C
Low temperature option (without internal battery)	-40° to +70°C
Storage Temperatures	
Standard	-35° to +85°C
Low temperature option (without internal battery)	-40° to +85°C
Weatherproof	0 – 100% humidity

RF TRANSMISSION

Operates with 150 dB path loss
Typically 8-15 miles (13-24 Km)
RF Power selectable over the RF Link
10 W minimum @ 12 V, 15 W nominal
or 30 W minimum @ 12 V, 35 W nominal
216-220 MHz USA use
217-218, 219-220 MHz Canadian use
216-230 MHz international use
0.0005% freq. tol., -20° to + 55°C
RF Transmission Error
Less than one bit in 10 ⁶ with receiver input power level = -100 dBm

(*) if only SU6R or SAR on the spread

(**) over temperature range @ 2 ms sample rate

Cables

LINE & TRANSVERSE CABLES		
	ST	WPSR
Field Operation Type	dry	submersible
Cable Name	Standard	WaterProof Strain Relief
Cable Reference P/N	352 500 402	32 500 404
Specifications		
Water blocking potting	no	yes
Maxi operational water depth	Rain	15 m
Double jacket	no	yes
Jackets thickness	1.4 mm	1.4 mm (int.) 1.5 mm (ext.)
Jacket materials	PU	PU+PU
Anchoring device	yes ⁽¹⁾	yes ⁽¹⁾
Type and location of stress member	N/A	Kevlar/ peripheral braid
Mechanical characteristics		
Operating temperature range	-45° +70°C	-10° +70°C
Storage temperature range	-55° +85°C	-55° + 85°C
Outside diameter	6.5 mm	9.5 mm
Weight in air (Kg/km)	50	90
Breaking strength (bulk)	50 daN	410 daN (250 daN with connectors)
Connectors		
Name	FM4	FM4
P/N	512 110 211	512 110 210

(1) integrated for FDU, LAUL & connectors external for LAUX

Detour Management

Passive Links (standard FDU's)	Software controlled	
Cable extension Link (with Cable Extension Interface Unit)	Maximum length	400 m
Optic fiber Link	Maximum range	2 Km
WRU	Typical range Frequency	3 Km 2.3-2.52 and 5.607-5.838 GHz
Transmit power	100 mW	
Power supply	12 V DC	
Operating temperature	-40 to +70°C	
Dimensions (HxWxD)(*))	217x217x240 mm	
Weight(*)	8.250 Kg	

(*) without antenna and tripod

Testing Equipment

LT408	
GENERAL	
Pocket terminal to be connected to LAUL or LAUX to perform the following tests :	
On line	look on line power supply data transmission field tests (resistance, tilt, leakage, noise, CMRR) instrument tests (noise, distortion, phase, gain, CMRR)
On transverse	look on transverse power supply data transmission

PHYSICAL	
Dimensions and Weight	
Size	236x128x43 mm (9.3x5x1.7 in)
Weight	1.2 Kg (with cable) (2.6 lbs)
Environmental	
Operating temperatures	-30° to +60°C
Storage temperatures	-30° to +70°C
Weatherproof	5 – 90% humidity
Power	
Operating Power Voltage	10.5 to 15 V DC
Internal battery recharged by LAU	

TMS408	
GENERAL	
Standard PC connected to a Test and Maintenance Unit (TMU408).	
Tests of LAU's	
	Test of the processor
	Tests of power function on each port
	Transmission/Reception tests on each port
	In local loop mode
	With short cables
	With standard cables
	Test of long duration transmission on each port
	Control of the switchings
	Functional control of each port
	Control of the local internal clock
	Measurement of the power consumption

Tests of FDU's	
	Calibration (saved on EEPROM)
	Continuity test of the Link
	Long duration transmission test
	Polarity test
	Test of the functioning LED's
	Measurement of the power consumption
Instrument tests	Internal and external Noise/Offset Response to a sinusoidal signal Internal and external CMRR Internal and external resistance Internal voltage reference Sensor leakage Impulse on external resistance

PHYSICAL (TMU408)	
Dimensions and Weight	
Size	370x400x220 mm (14.6x15.7x3.7 in)
Weight	9 kg (19.8 lbs)
Environmental	
Operating temperatures	+10° to +35°C
Storage temperatures	-40° to +60°C
Weatherproof	5 – 90% humidity
Power	
Operating Power Voltage	110-220 V
Power Consumption	60 W

QUICK TESTER	
GENERAL	
Power voltage and transmission tests on cables	
PHYSICAL	
Dimensions and Weight	
Size (φ, L)	60, 290 mm (2.4, 11.4 in)
Weight	0.800 Kg (1.8 lbs)
Environmental	
Operating temperatures	-40° to +70°C
Storage temperatures	-40° to +70°C
Weatherproof	5 – 90% humidity
Power	
Operating Power Voltage	27 to 50 V DC
Power Consumption	200 mW max.