

# QUANTERRA Q730

## ADVANCED BROAD BAND REMOTE DATA ACQUISITION SYSTEM

### **General Description**

The Q730 data acquisition system is an advanced low-cost remote broad-band data acquisition system incorporating Quanterra's leading, proven broad-band technology. The system combines a 3-channel 24-bit digitizer having an independent digital signal processors (DSP), and a powerful CMOS computer system with RAM memory that supports Quanterra's real-time packetized communications protocol.



***Q730 system with the cover open. The sealed polyethylene enclosure, standard on all Quanterra products, is water tight.***

***Rear view of water-tight Q730 system enclosure showing connector panel.***



### **140+dB dynamic range A/D and DSP**

Quanterra set the world standard for data acquisition at 24 bits and beyond. Our systems are the acknowledged high performers in broad-band seismological instrumentation. The Q730 analog front-end incorporates Quanterra's own patented (US Patent 4866442, others pending) delta-sigma modulator and operates at a fixed sample rate of 20kHz, with other rates derived by digital filtration and decimation in the DSP module. This is the same technique employed in Quanterra's Q680, and Q4120 family 24-bit digitizers, in use world wide in leading programs such as the IRIS GSN, TERRAScope, and US National Seismic Network. Quanterra A/D technology consistently outclasses all others in side-by-side evaluation.

### **Proven Software - Ultra-SHEAR**

The CPU/DSP module is a CMOS 32-bit 68030, and 32-bit floating-point digital signal processor. The CPU/DSP supports Quanterra's proven *Ultra-SHEAR* comprehensive data acquisition software suite. *Ultra-SHEAR* is compatible across the entire line of Quanterra's products, and has been continuously refined over more than 10 years in highly scrutinized installations world-wide.

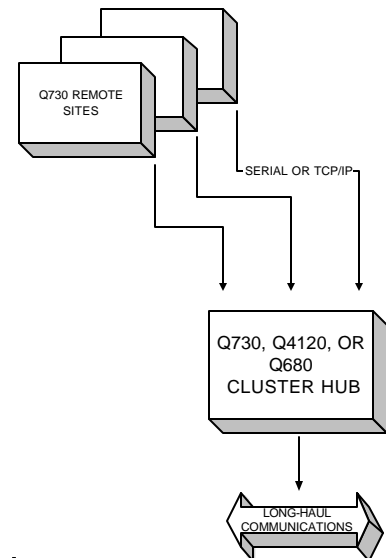
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## **Minimum or Linear Phase Filters**

The FIR digital filters may be either linear-phase (constant delay) or minimum-phase, which are causal. Causal filters may be essential where unambiguous onset times are a principal requirement. The user may also specify recursive filters used to filter broad-band data before event detection.

## **Clustered Operation**

Quanterra's new *Multi-SHEAR* data acquisition software suite allows any Quanterra system running *Ultra-SHEAR* or *Multi-SHEAR* to operate as a remote node transmitting data to a "cluster hub". In turn, within the limits of the number of I/O ports and processing power, cluster hubs may themselves report to another hub. Network topologies can be constructed to meet many needs without special hardware and software. Economical use can also be made of "long-haul" communications.



## **Real-time Packetized Transmission**

All Quanterra processors support a real-time telemetry protocol, developed for and proven in leading networks such as the IRIS/GSN, Caltech and UC Berkeley. The protocol allows selective user-definable priority transmission of specific data types, such as broad-band event or long-period continuous, over a single link. The link may be temporarily completely cut, and the receiver powered down without loss of data. Extensive CRC error correction and sliding-window retransmission virtually eliminate the possibility of incorrectly-received data. The protocol includes advisory messages and event detections from the remote stations, and allows central-site triggering and reconfiguration without affecting data acquisition.

## **Serial or TCP/IP or UDP/IP links**

Telemetry may be through an ordinary serial asynchronous links, or a TCP/IP SLIP serial connection. TCP/IP communications with the Q730 allows remote maintenance and configuration using industry-standard networking protocols. Either ordinary serial or SLIP connections may use hardwire, modem or spread-spectrum duplex radio links. TCP/IP connections support advanced features such as origination of e-mail notification directly from the Q730, for example, when the power supply voltage drops too low. *Multi-SHEAR* supports advanced virtually-zero overhead stateless UDP/IP telemetry.

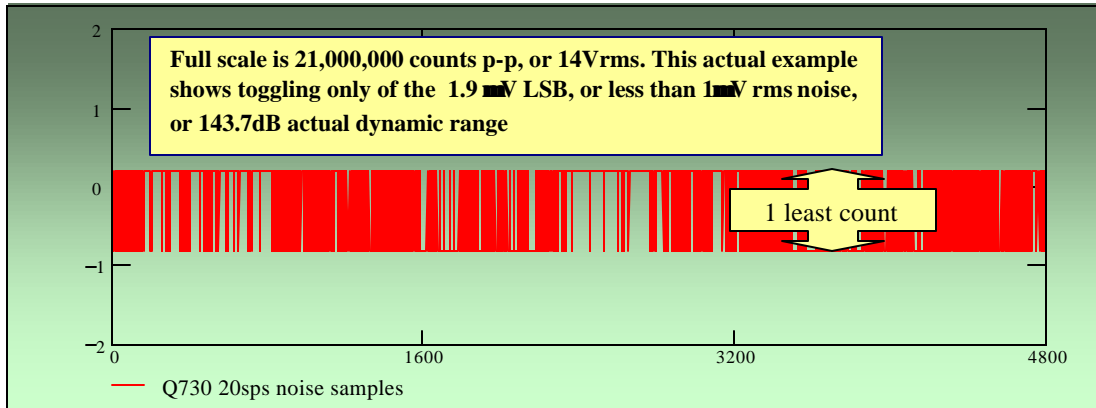
## **Data Compression**

Data are stored using Federation of Digital Seismic Network standard Level 1 or 2 compression algorithms used on IRIS stations, which was also developed by Quanterra. Advanced Level 3 compression achieves near theoretical "entropy coding" levels.

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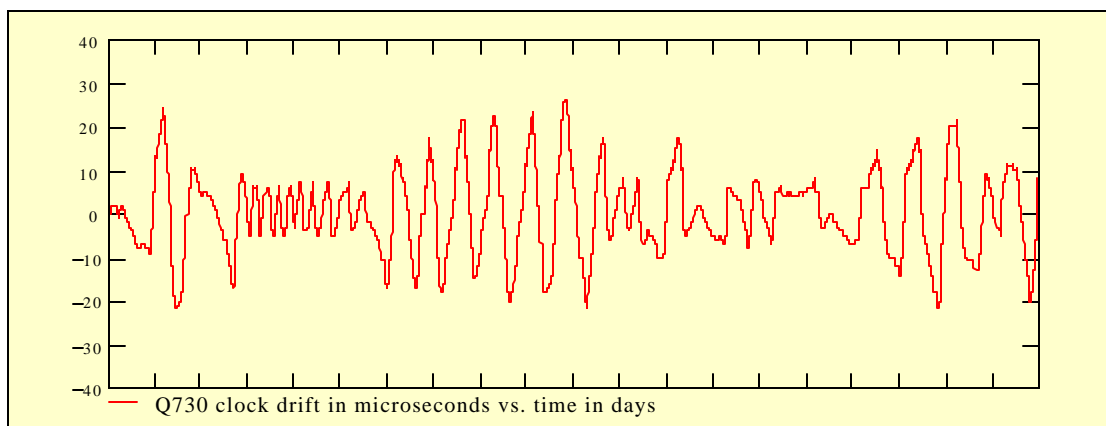
## High-Performance Analog – a Quanterra exclusive...

The figure below shows the actual acquired time series from a terminated-input test:



## ...accurately timed

The figure below shows the uncorrected drift of the internal TCXO-derived timebase versus GPS time. The time stamp of recorded data are corrected using these measurements to maintain accuracy less than 1  $\mu$ s relative to UTC. The ticks on the horizontal axis are days (total interval 20 days), and the vertical axis is microseconds. The maximum deviation in this period is 30  $\mu$ s, while the RMS deviation is less than 10, and the long-term trend is zero. This data was taken from an actual deployed field station.



## Very affordable

Typical configurations of the Q730 are very economical. Contact Quanterra for a quote or to discuss special configuration requirements.

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<b>Q730 System Specifications</b>	
<b>Specification</b>	<b>Description</b>
<b>Channels</b>	3 standard, 3 additional optional. 3-channel groups separately galvanically and optically isolated for connection to separate sensors.
<b>Sample Rate</b>	20000 Hz, simultaneous. user rates: 250,125,200,100,50,40, 25,20,10,1Hz.
<b>Resolution and Dynamic Range</b>	LSB (Least Significant Bit) = 1.9 $\mu$ V. 148 dB max. ( $\pm 10.5 \times 10^6$ digital counts) Matched optimally to electronic broad-band force feedback sensors, e.g. STS-2
<b>Bandwidth</b>	0-0.8 Nyquist (-6dB point). Response controlled by digital FIR filter.
<b>Noise and Distortion</b>	Terminated input noise level typical -142 dBrmsrel to Full Scale, 0.25-50Hz. May exceed 146 dBrmsrel at sub-Hz frequencies and constant temperature.
<b>Full Scale</b>	$\pm 20$ V (40V p-p) differential input.
<b>Operating Temp Range</b>	-10 to 70 °C ambient temperature external to sealed enclosure.
<b>Signal Processing</b>	Digital. One fixed-point ADSP2105 used per channel, one floating-point TMS320C31 master. Linear or minimum-phase FIR or IIR filters.
<b>Sensor Calibration</b>	Optional calibration/state-of-health module available for 3-channel sensor mass position acquisition, generation of mass-centering pulse, and sine/step/random noise sensor calibration signal. Plug-in module, field installable.
<b>Timing</b>	GPS C/A code. 1 $\mu$ sec accuracy to UTC. Position error 100 meter RMS. Sampling timebase phase-locked to GPS using software-controlled slew-limited low-distortion loop. Integral to Q730 processor module.
<b>Main Processor</b>	One 32-bit 10 MHz Motorola MC68EC030 microprocessor.
<b>Recording Modes</b>	Continuous or event, selectable by channel. Murdock-Hutt or STA/LTA detector
<b>Parameter Setting</b>	ASCII text “keys” stored in flash EEPROM set operating modes.
<b>Memory</b>	8Mb RAM on plug-in module. Optional additional 8Mb available. RAM used for program operation and temporary data storage. Up to 8Mb EPROM for permanent program storage.
<b>Communications</b>	2 asynchronous serial ports standard, 1 for terminal, others available for data transmission.
<b>Networking</b>	Supports standard TCP/IP and UDP/IP protocols, with remote login via telnet, and data transmission via finger and ftp. Email “alerts” sent to SMTP mail server.
<b>Software</b>	( <i>UltraSHEAR</i> or <i>MultiSHEAR</i> ), resident in EPROM, fully installed.
<b>Environmental</b>	Sealed, polyethylene environmental enclosure. 9 X 16 X 23 in.
<b>Auxiliary Monitoring</b>	Ambient Temperature, Input DC power voltage digitized standard.
<b>Construction</b>	Fabrication to ANSI/IPC-A-600D Class 3. Single-board digital, factory replacement and repair only. Each 3/4 analog channel group on a single board. Field-replaceable individual analog-channel pre-processors.
<b>Power</b>	12VDC, 10-11W average. Fully isolating DC/DC converters.

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