



# 130-REN-3

## RAPID EVENT NOTIFICATION SEISMIC RECORDER

Rapid detection and characterization of earthquakes is essential for earthquake early warning systems, which have the ability to alert nearby populations about the approach of potentially damaging seismic waves.

The seismic recorder, model 130-REN-3 has been specifically designed to meet the key requirements for Earthquake Early Warning Systems (EEWS) and Rapid Event Notification (REN) which includes:

- ▶ Quick delivery of digital data from the seismic stations to the acquisition processing center; and
- ▶ data integrity for real-time earthquake notification in order to provide warning prior to significant ground shaking.

The modified telemetry algorithm in the 130-REN recorder provides a unique opportunity for customers to meet these critical requirements to detect strong ground shaking at one or several locations and transmit the notification ahead of the seismic energy affecting the populated area.

The 130-REN uses RTPD as the communication server. The latest version of RTPD is backward compatible to handle both standard 130 data transmission (RTP) and rapid event notification (REN).

The 130-REN recorder allows output of digital data every 0.2 sec with minimal latency. This is a significant reduction in the time delay of real-time transmission of the currently available digitizers.

The modified REF TEK Protocol Daemon (RTPD) receives the digital data and acknowledges data received without error. RTPD forwards all received data in real-time to the processing clients.

The 130-REN keeps track of what data has not been acknowledged and re-transmits the data giving priority to current data using a backfilling algorithm. When a re-transmitted packet is acknowledged by RTPD, the packet is then stored in an Archive in proper time order.

Multiplexed recording format (MRF) modified data transmission provides:

- ▶ Acquires data into 200 msec multiplexed packets.
- ▶ Digital filter delay is ~150 msec.
- ▶ Time to construct the the packet average 50 msec.
- ▶ Delay time from sample time to transmission and receive nominally 400 msec

To summarize, data is transmitted every 200 msec and has a 400 msec nominal delay time when decoded across a direct LAN connection.

### Key Features

- ▶ Low Power
- ▶ Wide Input Voltage Range
- ▶ High Dynamic Range
- ▶ 100% End-to-End Error Correction
- ▶ Data Latency over LAN 0.4 sec.
- ▶ Backfilling of Missing Data
- ▶ Dual RTP Links for Redundancy

### Applications:

- ▶ Earthquake Early Warning (EEW)
- ▶ Rapid Event Notification (REN)
- ▶ Broadband Studies
- ▶ Aftershock Studies



# 130-REN-3 RAPID EVENT NOTIFICATION SEISMIC RECORDER

<b>Model</b>	<b>130-REN-3 (P/N 97102-00)</b>
<b>Mechanical</b>	
Size	3.375" high x 7" wide x 19" long (8.6 cm x 17.8 cm x 48.3 cm)(rack mounted)
Weight	4.5 lbs (2 Kg)
Watertight Integrity	IP67
Shock	Survives a 1 meter drop on any axis
<b>Environmental</b>	
Operating Temperature	-30° to + 70°C
Storage Temperature	-40° to + 85°C
Humidity	0 – 100% not-condensing
<b>Power</b>	
Input Voltage	9 to 24 VDC (RT680A)
Average Power (no communications)	~1 W (3 channel)
Average Power (with communications)	~1.25 W (3 channel)
<b>Communications</b>	
NET Connector: Ethernet Serial	10-BaseT, TCP/IP, UDP/IP, FTP, RTP Asynchronous, RS-232, PPP, TCP/IP, UDP/IP, FTP, RTP
Serial Connector: Terminal	Asynchronous, RS-232, 130 Command
<b>A/D Converter</b>	
Type	Modulation, 24-bit Output Resolution
Dynamic Range	>138 dB
Channels	3 Channels
Input Impedance	2 Mohms, 0.002 uFd, differential @ x32; 25 Kohms, 0.002 uFd, differential @ 1
Common Mode Rejection	>70 dB within ±2.5 VDC
Gain Selection	x1 and x32
Input Full Scale	20 VPP @ x1 and 0.625 VPP @ x32
Bit Weight	1.589 μvolts @ x1 and 49 nV @ x32
Noise Level	~1 count RMS @ 50 sps @x1
Sample Rates	1000, 500, 250, 200, 125, 100, 50, 40, 20, 10, 5 sps
<b>Compliance</b>	
Compliance	CE
<b>Time Base</b>	
Type	GPS Receiver/Clock plus Disciplined Oscillator
Accuracy with GPS	±10 μsec after validated 3-D Fix and Locked
Free-Running Accuracy	0.1 ppm over the temp. range of 0° to 70°C and 0.2 ppm from -20° to 0°C

<b>Recording Capacity</b>	
Battery Backed SRAM	5 MB (for data)
Flash Disk	8GB CFII Card
<b>Recording Modes</b>	
Continuous	Record length
Time Trigger	A list of record times and lengths
Event Trigger	STA/LTA with advanced features including bandpass filter LTA hold, etc.
Level Trigger	Absolute value, user selectable: g, or % of full scale, or counts including bandpass filter
External Trigger	External pulse on trigger input line
<b>Recording Format</b>	
Format	Multiplexed Recording Format (MRF)

<b>Ordering Information</b>	
Part No.	Description
97102-00	130-REN-3 Recorder, 3 Ch., 24-Bit, 1ppm x 1 gain, Rapid Event Notification
97150-00	130-GPS Receiver/Clock
97180-00	130-FLASH/8GB Disk Compact Flash II
97181-00	130-FLASH/16GB Disk Compact Flash II
97176-00	130-8002: Channel Input Mating Connector
97211-00	130-8004: Cable, Ethernet/Modem, Ext.
97163-00	130-8015-33: Cable 130 to GPS, 33 ft. (~10m)
97170-00	130-8019: Cable NET, 130 to Ethernet RJ45 Hub, Ext
97167-00	130-8075: Cable Power B, 130S to Battery, 6 ft. (~2m)
97182-10	IFSC/W Kit: Includes WiFi Serial Adaptor, IFSC 16GB Controller, CD
97134-00	97134-00 SW-RTI-NC: Software, REF TEK Interface
97279-00	97279-00 130 Series Ops Doc Set CD
97162-00	97162-00 130 Fieldcase, Transit (holds one 130, GPS, Cables)

**RELATED SUB-SYSTEMS:**

High Resolution Seismic Recorders, 130S-01  
 High Resolution Aftershock System, 160-03  
 Accelerometers, 147-01 & 131B  
 Broadband Seismometers, 151B-120, 151B-60, 151B-30

Specifications subject to change without notice.

Contact your local dealer today

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