# REF TEK® strong motion and earthquake engineering

REF TEK® strong motion and earthquake engineering products combine the 3rd generation Broadband Seismic Recorder (REFTEK 130S) and advanced low-noise force-balance accelerometers.



The 130-SMHR Strong Motion Accelerographs provide accurate and timely data and information for seismic events, including their effects on buildings and structures by employing modern monitoring methods and technologies. Both models are made for continuous monitoring of earthquakes and other seismic events, and the recording of strong earthquake shaking at ground sites, in buildings and critical structures.

The 130-SMHR advanced communications features include TCP/IP over Ethernet and Asynchronous Serial. An LCD continuously displays state-of-health and status information.

The 130-SMHR has three channels connected to an internal triaxial accelerometer. When ordered as a six-channel unit, the three additional channels can be connected to an external sensor.

# The 130-SMHR family:

- » Has provision for an optional internal V.90 modem for communication over standard telephone lines;
- » Includes a battery charger for maintaining a lead-acid battery;
- » Is housed in an anodized aluminum instrument case with single point mounting and 3-point leveling.

# **KEY FEATURES**

- » State-of-the-Art 24-Bit ADC
- » Wide Dynamic Range
- » Low Noise, Force-Balance accelerometer
- » Simultaneous Telemetry/Self Recording
- » IP over Ethernet and Asynchronous Serial
- » Embedded / Removable Mass Storage
- » Low Power

# **APPLICATIONS**

- » Free Field Recording
- Structural Monitoring
- » Dam Monitoring
- » Building Arrays
- » Telemetry Networks
- » Aftershock Studies



# 130-SMHR STRONG MOTION ACCELEROGRAPH

SPECIFICATIONS	FULL FEATURED ACCELEROGRAPH, MODEL 130-SMHR (STANDARD)	ACCELEROGRAPH, MODEL 130-SMHI COMMAND LINE				
MECHANICAL						
Size	9.25" high x 8.0" wide x 13.25" long (23.5 cm x 20.3 cm x 33.7 cm)	9.25" high x 8.0" wide x 13.25" long (23.5 cm x 20.3 cm x 33.7 cm)				
Weight	10.5 lbs (4.8 kg), without internal battery	10.5 lbs (4.8 kg), without internal battery				
Watertight Integrity	IP 67	IP 67				
Shock	Survives a 1 meter drop on any axis	Survives a 1 meter drop on any axis				
Operating Temperature	-20°C to +70°C	-20°C to +70°C				
POWER						
Input Voltage	10 to 16 VDC	10 to 16 VDC				
Operating Power	2 W (3-ch. @ 125 sps)	2 W (3-ch. @ 125 sps)				
Peak Power	3 W (DAS & GPS active, writing to CF)	3 W (DAS & GPS active, writing to CF)				
Battery Charger	15 V, 800 mAmp (internal)	15 V, 800 mAmp (internal)				
Battery	12 VDC, sealed lead-acid, 12 AmpHr (optional, internal)	12 VDC, sealed lead-acid, 12 AmpHr (optional, internal)				
A/D CONVERTER						
Туре	±-Σ modulation, 24-bit resolution	±-Σ modulation, 24-bit resolution				
Channels	3 or 6 channels	3, 6 or 9 channels				
Input Impedance	Matched to accelerometer	Matched to accelerometer				
Input Full Scale	Matched to accelerometer	Matched to accelerometer				
Bit Weight	1.589 µV	1.589 μV				
Self Noise Level	2 counts RMS @ 200 sps	2 counts RMS @ 200 sps				
Sample Rates (user selectable)	1000, 500, 250, 200, 125, 100, 50, 40, 20, 10, 5, 1 sps	200, 100, 50 sps				
Dynamic Range	>138 dB	>138 dB				
TIME BASE						
Туре	GPS Receiver/Clock plus a disciplined oscillator	GPS Receiver/Clock plus a disciplined oscillator				
Accuracy	$\pm 10~\mu sec$ with GPS locked and a validated 3-D fix	±10 µsec with GPS locked and a validated 3-D fix				
Accuracy without GPS	0.1 ppm from 0 $^{\circ}$ to 60 $^{\circ}$ C, 0.2 ppm from –20 $^{\circ}$ to 0 $^{\circ}$ C	0.1 ppm from 0 $^{\circ}$ to 60 $^{\circ}$ C, 0.2 ppm from –20 $^{\circ}$ to 0 $^{\circ}$ C				
AUXILIARY CHANNELS						
Inputs	Battery, Temperature, Backup Battery	Battery, Temperature, Backup Battery				
CALIBRATION						
Enable	User Command	User Command				
Туре	Step applied to feedback	User Command				
COMMUNICATION						
Ethernet	10-BaseT: TCP/IP, UDP/IP, FTP, RTP	10-BaseT: TCP/IP, UDP/IP, FTP, RTP				
Serial	Asynchronous RS-232: PPP, TCP/IP, UDP/IP, FTP, RTP	Asynchronous RS-232: PPP, TCP/IP, UDP/IP, FTP, RTP				
Modem	N/A	V.90 (internal)				

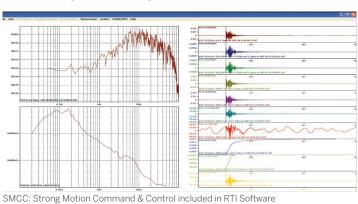


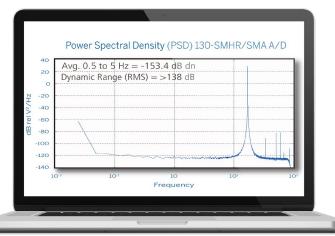
# 130-SMHR STRONG MOTION ACCELEROGRAPH

SPECIFICATIONS	FULL FEATURED ACCELEROGRAPH, MODEL 130-SMHR (STANDARD)	ACCELEROGRAPH, MODEL 130-SMHR COMMAND LINE			
RECORDING MODE					
Trigger Type	Continuous, Event (STA/LTA), External, Level, Time, Time List, Cross, and Vote Trigger (0.0001 to 4g)	Continuous, External, Level and Vote Trigger (0.0001 to 4g)			
Media	Compact Flash, Ethernet	Compact Flash, Ethernet			
Format	PASSCAL Recording Format	PASSCAL Recording Format			
Relay Closure	N/A	3 independently programmable relay closures			
RECORDING CAPACITY					
Battery Backed SRAM	8 MB	8 MB			
Flash Disk (2 per unit)	8GB or 16GB	8 GB or 16 GB			
COMPLIANCE					
Compliance	CE	CE			
INTERNAL ACCELEROMETER					
Туре	Force-balance (internal)	Force-balance (internal)			
Full Scale Range	$>\pm4$ g	>±4 g			
Full Scale Output	±10V, 20 VPP	±10 V, 20 VPP			
Dynamic Range	>155 dB (DC to 2 Hz)	>155 dB (DC to 2 Hz)			
Sensitivity	2.5 V/g nominal (exact value in EEPROM)	2.5 V/g nominal (exact value in EEPROM)			
Linearity	< 0.03 % of full scale	< 0.03 % of full scale			
Cross-axis Sensitivity	< 0.001 g/g	< 0.001 g/g			
Frequency Response	Flat DC-100 Hz +/- 0.05 dB ; DC-250 Hz +/- 3 dB	Flat DC-100 Hz +/- 0.05 dB ; DC-250 Hz +/- 3 dB			

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COMPASS: Strong Motion Processing Software





Power Spectral Density



# **130-SMHR**

# STRONG MOTION ACCELEROGRAPH

# **ORDERING INFORMATION**

130 STRONG MOTION HIGH RESOLUTION (SMHR) ACCELEROGRAPH

PART NO.	DESCRIPTION
STANDARD FIRMWARE	
97112-00	130-SMHR: Strong Motion Accelerograph
97125-00	130-SMHR/6: Strong Motion Accelerograph 6 Ch.
COMMAND LINE FIRMWARE	
97237-00	130-SMHR-C: Strong Motion Accelerograph 3 Ch.
97238-00	130-SMHR/6-C: Strong Motion Accelerograph 6 Ch.
98060-00	130-SMHR/9: Strong Motion Accelerograph 9 Ch.
ACCESSORIES	
97150-00	130-GPS: Receiver/Clock
97180-00	130-FLASH/8G: Disk, Compact Flash II
97181-00	130-FLASH/16G: Disk, Compact Flash II
97163-00	130-8015-33: Cable, 130 to GPS, 33 ft. (~10m)
97170-00	130-8019: Cable, NET, 130 to Ethernet RJ45 Hub, Ext.
97168-00	130-8039: Cable Power Supply, AC, Pin A
97169-00	130-8039A: Cable, Power Supply, AC w/ Batt. A&B
97172-00	130-8018: Cable, PC Command & Control
97151-01	130-GPS-Repeater: RS-485 for 130-GPS
97155-00	130-GPS-EXTENDER: RS-485 extender for 130-GPS
97192-00	130-Reader-USB: Reader, CF I/II, External (readers with other interfaces available on request)
97182-10	iFSC/W-KIT: Includes WiFi Serial Adaptor, IFSC 16GB Controller, CD
97134-00	SW-RTI-NC: Software, REF TEK Interface
97131-00	SW-COMPASS: Software, Seismic Signal Data Processing, Interactive

### **NORTH AMERICA**

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# sales@reftek.com

Contact your local dealer today

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Specifications subject to change without notice.

# **CUSTOMER SUPPORT**

REF TEK products are installed in locations around the world, from urban settings to rainforests to deserts. The environments are often challenging for electronics and REF TEK Systems is committed to providing reliable, practical support. Our team includes seismologists and seismic installation experts as well as engineers and technicians.

Contact support@reftek.com.

