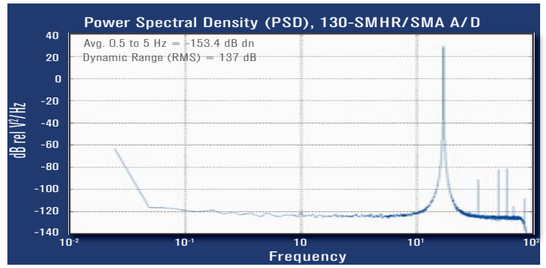
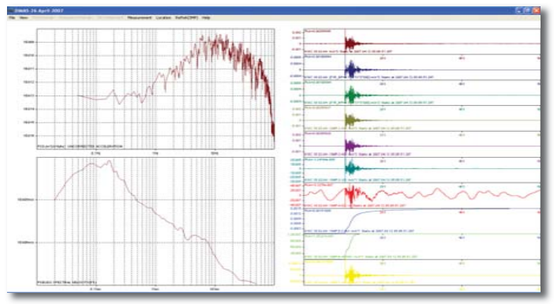
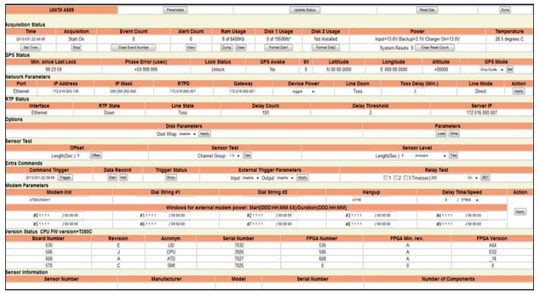
REF TEK 24-BIT STRONG MOTION ACCELEROGRAPH SPECIFICATIONS



Power Spectral Density



COMPASS: Strong Motion Processing Software



SMCC: Strong Motion Command & Control included in RTI Software

Ordering Information

Part No.	Description
130 STRONG MOTION HIGH RESOLUTION (SMHR) ACCELEROGRAPH	
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
97238-00	130-SMHR/6-C: Strong Motion Accelerograph 6 Ch.
98060-00	130-SMHR/9: Strong Motion Accelerograph 9 Ch.
130 STRONG MOTION (SMA) ACCELEROGRAPH	
Standard Firmware	
97110-00	130-SMA: Strong Motion Accelerograph
97234-00	130-SMA/6: Strong Motion Accelerograph 6 Ch.
Command Line Firmware	
97235-00	130-SMA-C: Strong Motion Accelerograph
97236-00	130-SMA/6-C: Strong Motion Accelerograph 6 Ch.
97111-00	130-SMA/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
97211-00	130-8004: Assembly, 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.
97169-00	130-8039A: Cable, Power Supply, AC w/ Batt. A&B
97172-00	130-8018: Cable, PC Command & Control
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
97279-00	130 Series Ops Doc Set CD

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Related Sub-systems:

3rd Generation Seismic Recorders, 130S-01
Accelerometers, 147-01 & 131B
Miniature Seismic Recorders, 125A “Texan”
Broadband Seismometers, 151B-120, 151B-60, 151B-30

KEY FEATURES:

- State-of-the-Art 24-Bit ADC
- Wide Dynamic Range
- Low Noise Force-Balance
- 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

Model 130-SMHR
Model 130-SMA

REF TEK 24-BIT STRONG MOTION ACCELEROGRAPH

REF TEK strong motion and earthquake engineering products combine the 3rd generation Broadband Seismic Recorder (REF TEK 130S) and advanced low-noise force-balance accelerometers with a flat frequency response from DC to > 150 Hz.

The 130-SMHR and 130-SMA 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 and 130-SMA advanced communications features include TCP/IP over Ethernet and Asynchronous Serial. An LCD continuously displays State-Of-Health and status information.

Both models have 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 and 130-SMA both:

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

The instrument case size allows the installation of an internal battery to provide backup power for more than 48 hours. An external battery can also be used.

The low cost 130-SMA uses command line firmware, which was specifically designed for structural monitoring applications. Setup and control is accomplished using the strong motion GUI (Graphic User Interface), that runs on multiple platforms. This firmware allows control of three relay closure contacts for external alarm activation and can automatically dial the optional modem for remote notification of events and alarms.

The 130-SMHR full featured Accelerograph can also run the command line firmware, but typically runs the standard REF TEK 130 firmware. The standard firmware provides more options for sampling rate and triggering than the command line firmware, but does not include relay control. Setup and control is accomplished with either the iFSC Kit or a desktop computer running RTI. These interfaces allow the user to program the instrument’s operating parameters and perform diagnostic functions.

The performance of the 130-SMHR and 130-SMA hardware is similar, with two notable differences.

- The 130-SMHR has a higher-precision oscillator for more precise timekeeping.
- The accelerometer in the 130-SMHR has a full-scale range of greater than +/- 4g with a dynamic range of 145 dB (at 2 Hz) while the accelerometer in the 130-SMA has a full-scale range of greater than +/- 4g with a dynamic range of 112 dB (at 1 Hz).

Specifications	Full Featured Accelerograph, Model 130-SMHR	Accelerograph, Model 130-SMA (Standard)	Accelerograph, Model 130-SMA (Command Line)*
			(* Hardware identical: Firmware different)
Mechanical:			
Size:	• 9.25" high x 8.0" wide x 13.25" long (23.5cm x 20.3cm x 33.7cm)	• 9.25" high x 8.0" wide x 13.25" long (23.5cm x 20.3cm x 33.7cm)	• 9.25" high x 8.0" wide x 13.25" long (23.5cm x 20.3cm x 33.7cm)
Weight:	• 10.5 lbs (4.8 kg), without internal battery	• 10.5 lbs (4.8 kg), without internal battery	• 10.5 lbs (4.8 kg), without internal battery
Watertight Integrity:	• IP 67	• IP 67	• IP 67
Shock:	• Survives a 1 meter drop on any axis	• 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	• -20˚C to +70˚C
Power:			
Input Voltage:	• 10 to 16 VDC	• 10 to 16 VDC	• 10 to 16 VDC
Operating Power:	• 2 W (3-ch. @ 125 sps)	• 2 W (3-ch. @ 125 sps)• 2 W (3-ch. @ 125 sps)	• 2 W (DAS & GPS active, writing to CF)
Peak Power:	• 3 W (DAS & GPS active, writing to CF)	• 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)	• 15 V, 800 mAmp (internal)
Battery:	• 12 VDC, sealed lead-acid, 12 AmpH (optional, internal)	• 12 VDC, sealed lead-acid, 12 AmpH (optional, internal)	• 12 VDC, sealed lead-acid, 12 AmpH (optional, internal)
A/D Converter:			
Type:	• Δ-∑ modulation, 24-bit resolution	• Δ-∑ modulation, 24-bit resolution	• Δ-∑ modulation, 24-bit resolution
Channels:	• 3 or 6 channels	• 3, 6, and 9 channels	• 3, 6, and 9 channels
Input Impedance:	• Matched to accelerometer	• Matched to accelerometer	• Matched to accelerometer
Input Full Scale:	• Matched to accelerometer	• Matched to accelerometer	• Matched to accelerometer
Bit Weight:	• 1.589 µV	• 1.589 µV	• 1.589 µV
Self Noise Level:	• 2 counts RMS @ 200 sps	• 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	• 1000, 500, 250, 200, 125, 100, 50, 40, 20, 10, 5, 1 sps	• 200, 100, 50 sps
Dynamic Range:	• >137 dB	• > 137 dB	• > 137 dB
Time Base:			
Type:	• GPS Receiver/Clock plus a disciplined oscillator	• GPS Receiver/Clock plus a disciplined oscillator	• GPS Receiver/Clock plus a disciplined oscillator
Accuracy:	• ±10 µsec with GPS locked and a validated 3-D fix	• ±100 µsec with GPS locked and a validated 3-D fix	• ±100 µsec with GPS locked and a validated 3-D fix
Accuracy without GPS:	• 0.1 ppm from 0˚ to 60˚C, 0.2 ppm from -20˚ to 0˚C	• 2.5 ppm from -20˚C to 60˚C	• 2.5 ppm from -20˚C to 60˚C
Auxiliary Channels:			
Inputs:	• Battery, Temperature, Backup Battery	• Battery, Temperature, Backup Battery	• Battery, Temperature, Backup Battery
Calibration:			
Enable:	• User Command	• User Command	• User Command
Type:	• Step applied to feedback	• Step applied to feedback	• Step applied to feedback
Communication:			
Ethernet:	• 10-BaseT: TCP/IP, UDP/IP, FTP, RTP	• 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	• Asynchronous RS-232: 1K XMODEM, YMODEM
Modem:	• N/A	• N/A	• V.90 (internal)
Recording Mode:			
Trigger Type:	• Continuous, Event (STA/LTA), External, Level, Time, Time List, Cross, and Vote Trigger (0.0001 to 4g)	• 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	• Compact Flash, Ethernet
Format:	• PASSCAL Recording Format	• PASSCAL Recording Format	• PASSCAL Recording Format
Relay Closure:	• N/A	• N/A	• 3 independently programmable relay closures
Recording Capacity:			
Battery Backed SRAM:	• 8 MB	• 8 MB	• 8 MB
Flash Disk:	• 8GB or 16GB	• 8GB or 16GB	• 8GB or 16GB
Compliance:	• CE	• CE	• CE
Internal Accelerometer:			
Type:	• Force-balance (internal)	• Force-balance (internal MEMS)	• Force-balance (internal MEMS)
Full Scale Range:	• > ±4g	• > ±4g	• > ±4g
Full Scale Output:	• ±10V, 20 VPP	• ±10V, 20 VPP	• ±10V, 20 VPP
Dynamic Range:	• 145 dB (DC to 2 Hz)	• 112 dB @1 Hz	• 112 dB @1 Hz
Sensitivity:	• 2.5 V/g nominal (exact value in EEPROM)	• 1.6 V/g nominal (exact value in EEPROM)	• 1.6 V/g nominal (exact value in EEPROM
Linearity:	• < 0.03% of full scale	• < 0.02% of full scale	• < 0.02% of full scale
Cross-axis Sensitivity:	• < 0.001 g/g	• < 0.005 g/g	• < 0.005 g/g
Frequency Response:	• Flat DC - >150 Hz	• Flat DC - 500 Hz	• Flat DC - 500 Hz