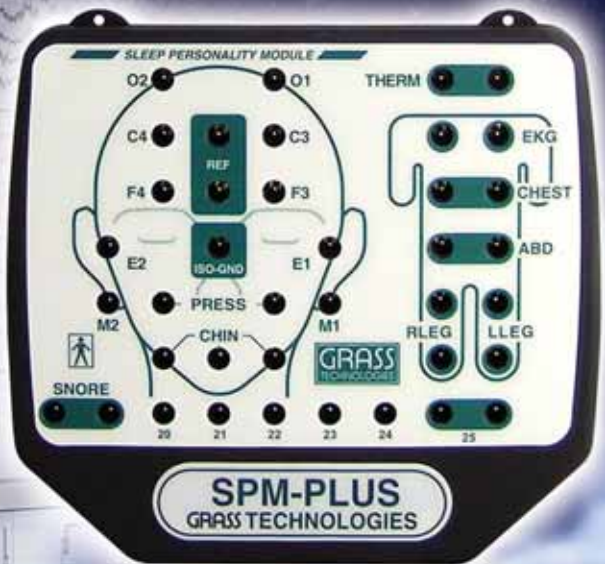


Comet-PLUS PSG

Lab-based & Portable PSG Systems



PSG Systems

Powerful & unique PSG systems

With over 75 years experience in designing and manufacturing reliable, high-quality instrumentation for the neurodiagnostic community, Grass Technologies brings you the Comet-PLUS systems, and continues to provide complete solutions for all of your PSG monitoring needs.



Comet-PLUS XL PSG
with Panorama video, optional IT9 mobile
rack cart, and 24" flat panel monitor

These powerful, easy-to-use sleep diagnostic systems consist of the high response 57-channel AS40-PLUS Amplifier System, a quick-disconnect headbox with electrode inputs designed especially for PSG, TWin PSG Record and Review Software and powerful Panorama digital video. These flexible systems upgrade easily to also record EEG-type studies. Grass's FASS Fully-Automated Sleep Stager software, other advanced analysis programs, and a wide selection of supplies and accessories are also available.

Features:

- Limited Lifetime Warranty on Grass manufactured parts
- Compact design that is rugged, lightweight, and easy to use
- On-board analog to digital conversion for interference-free recordings
- Easily connect to any PC with the on-board Ethernet port
- Flexible enough for both PSG and EEG applications
- Up to 57 total available channels
- Integrated pulse-oximeter connection providing SpO2, Rate, PPG, and Plethmograph
- Easy, identifiable electrode input with the head and body diagram layout
- On-board impedance checking and calibrations at the amplifier system
- Easily mounted next to a patient bed or attached to a cart

Comet-PLUS XL Lab-based PSG:

Comet-PLUS XL is a complete PSG system designed to satisfy the needs of the physician's office, hospital, or medical center. Ready to use, Comet-PLUS XL is supplied with the latest high performance PC and Panorama Digital Video/Audio software. Select from various mobile carts, cabinets and monitor sizes to suit your individual needs.

Comet-PLUS Portable PSG:

Comet-PLUS Portable PSG system is supplied with the latest high-performance laptop computer and Panorama Digital Video/Audio software. A wide selection of accessories can be added.



Comet-PLUS Portable PSG
with Panorama video,
and optional IT-11 mobile rack cart

Amplifier System

reliable, state-of-the-art

Grass Technologies amplifiers are world-renowned in the field of neurophysiology for their quality, reliability, simplicity, and serviceability. At the heart of the Comet PSG-PLUS is the AS40-PLUS Amplifier System. The amplifier is designed specifically for the PSG and EEG monitoring lab and combines the latest digital design techniques with years of amplifier design and manufacturing experience.

The AS40-PLUS is a compact amplifier unit which includes 30 AC channels with the SPM-PLUS sleep personality module, 4 built-in auxiliary DC channels, and 4 channels from the built-in pulse oximeter. The optional UPM-PLUS (40-channel) universal personality module, DCM8 8-input auxiliary DC input module, and Patient Event Button can be added to the system for a total of 57 channels. This flexibility allows for wide range of physiological parameters to be monitored and recorded.



The amplifier system provides for patient safety isolation, signal conditioning (physiological signal amplification and filtering), and digitization. Communications with a host computer are accomplished using TCP/IP protocol over a 10BaseT Ethernet network or dedicated cable. A host computer, using TWin software, sets the sample rate, starts and stops the data transmission, monitors the digital data, and stores it to hard disk.

An intuitive user interface with LCD screen is present with the amplifier. From the amplifier itself, a user is able to implement such features as electrode impedance checking, amplifier calibration, and photic stimulator control. Also from the LCD display a user is able to obtain information such as connection status to the host computer, and oximetry/pulse rate information when an oximeter is in use.

Support and Service: All Grass instrumentation is backed by a strong support staff ready to respond to all of your needs. Technical support is available 24 hours a day, 7 days a week. Request information on our Customer Support Plans. Training is also available.



Personality Modules*: The flexible design of the amplifier allows different Personality Modules to be used. The small, lightweight Personality Modules are tethered with a Quick Disconnect feature.

The SPM-PLUS Sleep Personality Module is supplied with the amplifier in Comet-PLUS PSG systems. The SPM-PLUS provides 30 AC channels and can be worn by the patient or conveniently placed bedside. The compact headbox is especially useful with the Comet-PLUS PSG system which includes all the latest features for AASM requirements. The powerful bedside amplifier and fully-featured TWin software make Comet-PLUS the leading choice of sleep professionals.

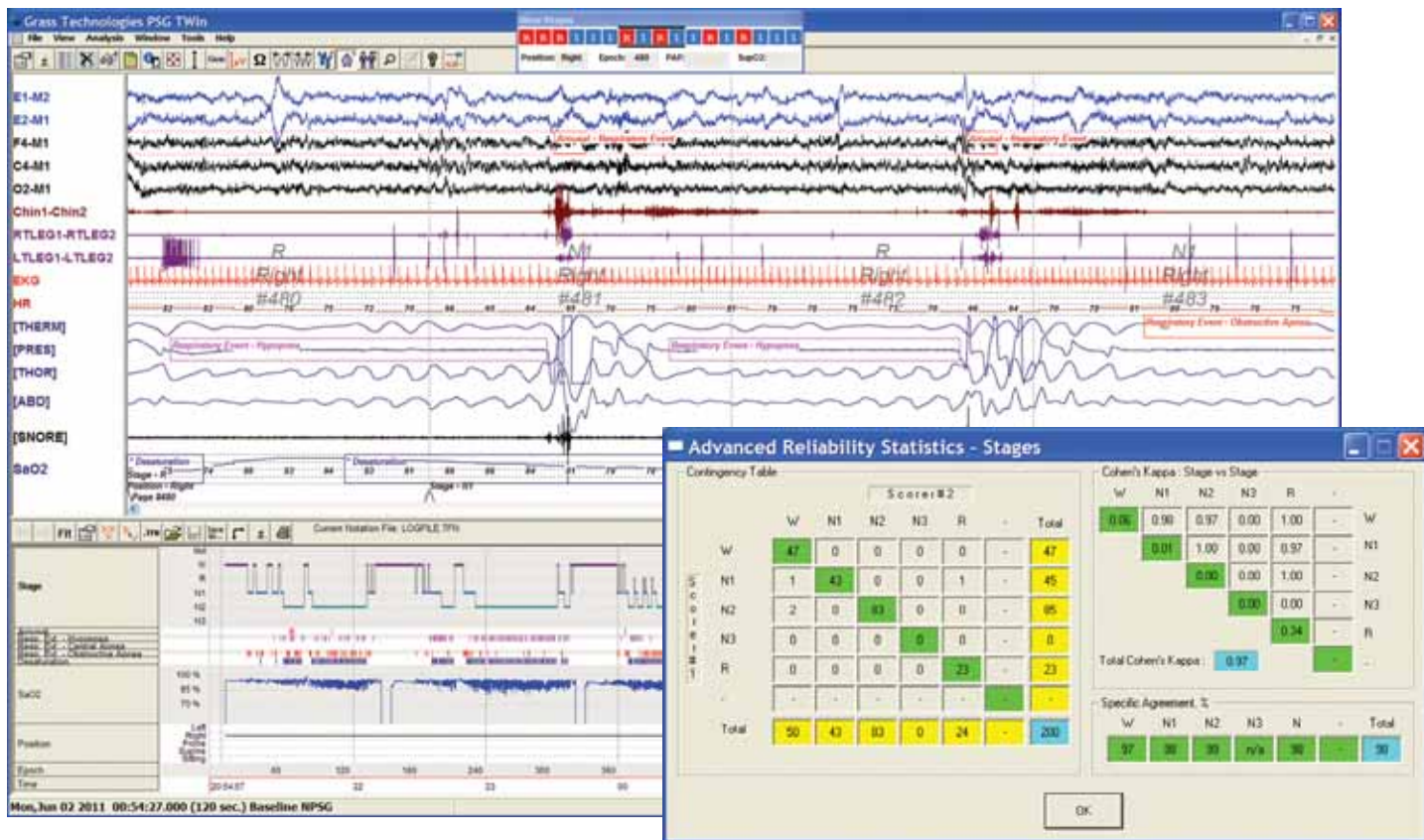


An optional UPM-PLUS, Universal Personality Module, is also available for extended sleep studies. The UPM-PLUS offers a combination of referential and bipolar inputs for a total of 40 AC channels.

* Patent Number: 5,265,607

TWin PSG

flexible, easy-to-use software



Twin Sleep Staging and Scoring Comparison for laboratory inter-scorer reliability comparison

Many years of dedication to the field of sleep diagnostics has allowed Grass to develop a software platform that is easy to use, yet flexible enough to change with the latest standards.

Flexibility: TWin PSG will meet your specific needs, requirements and preferences. Easy to use tools allow the user to customize notation lists, montages, event definitions, keyboard triggers, waveform display views and more.

Montages: Create virtually unlimited montages, off-line or in real-time, with the intuitive Montage Editor. Average M1 and M2 to eliminate artifact, average referencing, assign specific channel types to facilitate event scoring, and colored tracings are some of the features within the Montage Editor. The Montages used for a given study are also stored with the PSG data for retrieval during review or in the future when reviewing archived data.

Work Spaces: Use Profile Manager to configure a profile for each technician or doctor using the system. Their montage, trace color, record configuration, review setup, and other preferences are stored and loaded at any time. Specific test applications and parameters can also be saved as different profiles.

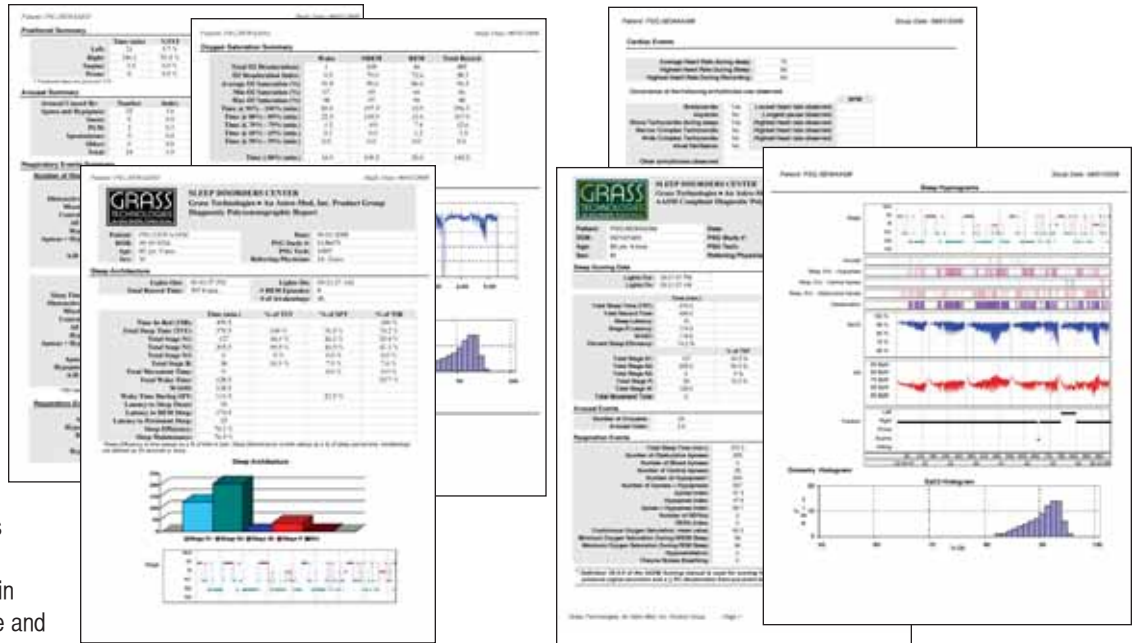
Recorder: The recording module opens instantly, with just a click on the "Start Recording" icon. Easily perform impedance checks, calibrations, and montage adjustments. Entering user-defined events and annotations is as simple as a single keystroke. Accurate, high-quality digital PSG recording is guaranteed.

Reviewer: Easily bring up a patient study for quick review with TWin's intuitive Database Explorer. Utilize keyboard or on-screen controls to navigate through a record. Amplitude and measurement tools, along with zoom capabilities allow the user to accurately analyze specific waveforms. Potential Mapping, Spectral Analysis, and other measurement tools are included with TWin for advanced data review.

TWin export functions allow output of information (raw data, graphics, and text to standard formats (including ASCII and EDF), as well as direct links to programs in Microsoft Office® for report generation and database management. TWin can also import EDF files.

Sleep Scoring: Stage and score recordings efficiently and accurately. A predefined list of stages and scores can be utilized, or create new events to meet your specific needs. Computer assisted sleep scoring is available for Respiratory, Leg Movement, Snore, Bruxism, and Desaturation events. Automatic Arousal correlations and EKG, body position, EtCO2, TCO2, and DC channel trending is also available. Finally, utilize the Sleep Scoring Comparison Module to assist with laboratory inter-scorer reliability comparisons.

Reports: Select from various pre-configured single and multi-page sleep reports! Use Sleep Report Wizard to create additional sleep report statistics. Customization of reports can be implemented to meet the specific needs of your sleep lab. Reports include examples of diagnostic, therapeutic, split-night, MSLT, MWT, and physician interpretation reports.



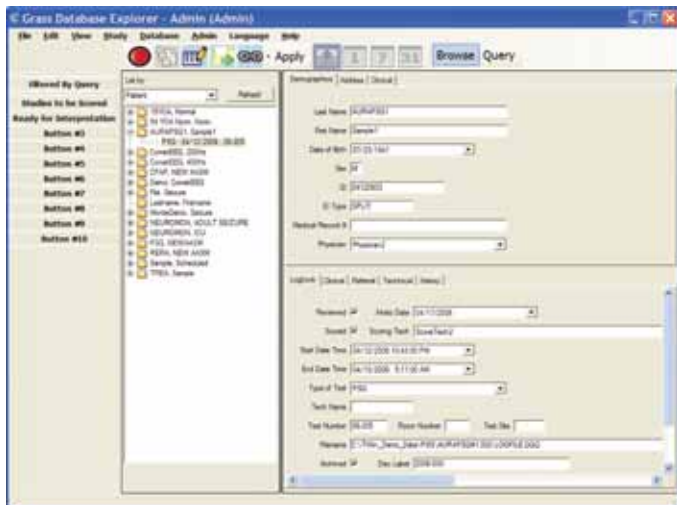
Patient & Study Database

TWin's Database Explorer allows efficient manage of patients and studies. Fully integrated with TWin acquisition/review/report software and Patient Scheduler, the Database Explorer allows the user to:

- Launch TWin Acquisition and Review
- Search, sort, and query patient and study information
- Add user-definable fields which can be queried
- Define and save frequently used queries
- Link to, and easily access other files (Word, Reports, images, etc.)
- Quickly archive study data to CD/DVD/USB Drives
- Track patient progress
- Track activity of laboratory staff and referring physicians

TWin exports the calculated sleep statistics, hypnogram, graphs, and trends to a Microsoft Word template. Also export EtCO2, TCO2, or PCO2 data to useful breakdown tables.

system. The user can change montages and adjust filter and amplitude settings, review synchronized video, view annotations, scoring and reports. TWinLOOK can be incorporated into PowerPoint slide shows for presenting patient data and video samples. The PSG and video data will automatically start and stop playing based upon user editing. TWinLOOK also allows physicians and hospital to send data acquired in their laboratory to others for review, facilitating exchange of data with referring physicians, colleagues, collaborators, and/or to obtain second opinions.



This HIPAA compliant software is password protected, allows multiple users and log-ins, allows user access levels to restrict features, and tracks user activity.

TWinLOOK® Review Software

- Review patient data anywhere
- Friendly, easy-to-use interface
- Ideal for sharing data with colleagues
- Compatible with Microsoft PowerPoint®

With the TWinLOOK review-only software, PSG and video recordings can be reviewed on any Windows® XP/Vista/7 computer, without the need to purchase additional software. TWinLOOK offers a friendly interface that allows the user to review studies recorded on any TWin-based acquisition

Remote Video/Data Review

TWin PSG software is Citrix compatible. Having TWin PSG installed on the lab's or hospital's Citrix Server allows multiple and simultaneous users to review and score PSG data and video from virtually anywhere in the world from any PC with Internet access.

Twin Portal Software Add-on for HL7 interface to the Hospital Information System (HIS)

TWin Portal runs as a service to facilitate the exchange of patient and study information with a HIS. TWin Portal waits for HL7 messages and returns messages when appropriate. Information can be transferred to the TWin database and Grass Scheduler applications. The TWin Portal configuration utility will assist in the setup of the TWin Portal service.



PANORAMA

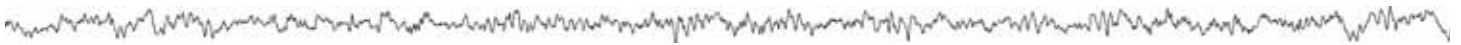
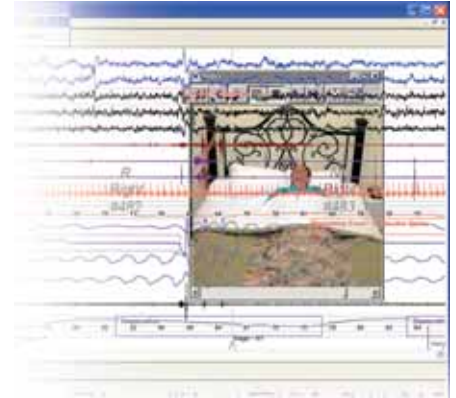
synchronized digital video/audio software

Panorama® Digital Video & Audio Software

- Grass Technologies MPEG4 video compression for 640x480 NTSC (768x576 PAL) high resolution video with ultra low data rates
- Full window resizing during acquisition & review
- Overlay: up to full screen digital video display with waveform data appearing over the video image with transparent background
- Virtual Pan & Zoom features during acquisition & review
- Digital brightness, contrast and color saturation controls during record and review

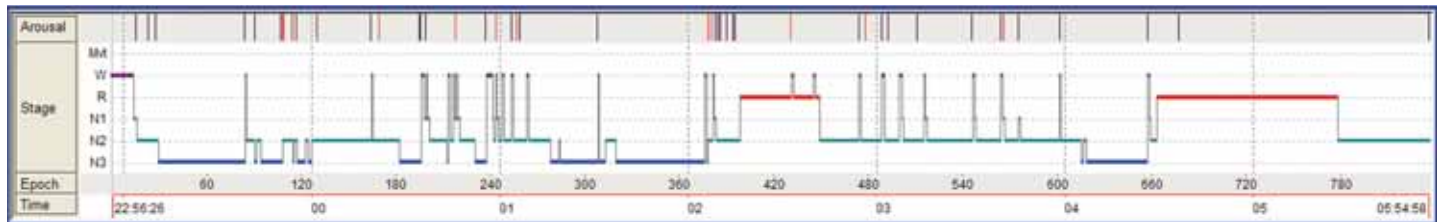
The Panorama Digital Video Recorder uses the latest Grass MPEG4-based video compression. Grass digital video compression permits the highest resolution with the lowest storage needs. The compression techniques are optimized for smooth network functionality and it uses a self-adjusting variable data rate depending on the amount of motion in the picture, while maintaining the same level of quality. Lower data rates require lower disk storage space and result in faster data transfer.

The Overlay feature, unique to Grass Technologies, allows display of the video image behind the waveforms with a transparent background. This allows you to see both the patient image and all of the waveform traces. Video and data can be viewed in real-time from remote locations (Nurses' station, physician's offices, etc.) over the network. A complete line of portable or wall/ceiling mounted cameras, infrared illuminators, audio systems and monitors are available.



FASS

fully-automated sleep stager software



Fully-Automated Sleep Stager (FASS) is an add-on analysis module for TWin® PSG review software. FASS software identifies standard sleep stages automatically, deriving information from various parameters of the EEG, EOG, and Chin EMG.

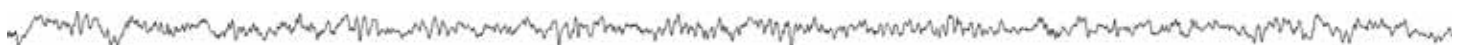
FASS is extremely accurate and easy to use. With FASS, a sleep study is completely staged in less than one minute, providing a great time savings to the sleep lab.

FASS uses a rule-based approach to sleep staging, which combines automatically-detected sleep events (spindles, phasic REM, etc.) with automatically-computed parameters (FFT frequency analysis, amplitude, etc.), to replicate standard sleep staging. FASS provides full staging of wakefulness, 4 stages of sleep, automatic arousal detection, k-complexes, and spindles.

Two levels of analysis are performed by FASS: individual page analysis (First Pass), and context and stage transition analysis (Second Pass). During the First Pass, FASS assigns a sleep stage to each page. The stage is determined based on a decision flow chart that takes into account the presence/absence of sleep events and the values of the computed parameters on that page. During the Second Pass, FASS applies context rules and stage transition rules.

The comprehensive user interface of FASS permits changing some of the staging parameter thresholds and rules, as well as default settings. Amplitude and EEG frequency trends, such as Delta and Alpha percentage trends and Chin EMG amplitude trends, are also computed and can be displayed on the PSG timeline along with the sleep staging hypnogram.

FASS creates a fully-staged study that can be reviewed, modified, and exported to a standard report. The study results can be compared to an expert PSG scorer's staging using TWin's Scoring Comparison program.



More Optional Software Add-ons

Request more information on the following TWin Software packages:

- **Neuromonitoring Software** for amplitude, frequency and burst-suppression trending

- **Patient Scheduler Software** integrated with the TWin Database for complete lab management
- **Twin Monitor2 Software** for remote video/PSG real-time viewing and system control

Specifications

Amplifier	Grass Technologies AS40-PLUS with 57* channels of data AC channels: <i>Sleep Personality Module (included):</i> 24 referential EEG/PSG AC inputs, 1 reference input, 1 patient ground, 6 bipolar AC channels <i>Universal Personality Module (optional):</i> 32 referential EEG/PSG AC inputs, 1 reference input, 1 patient ground, 8 bipolar AC channels DC inputs: 4 auxiliary DC inputs, 1 integrated pulse oximeter connection for SpO2, Rate, PPG, and plethysmograph DC Input Module for up to 8 auxiliary DC channels and 1 Event Button input * Expandable to 57 channels with UPM-PLUS, DCM8-KIT, and Event Button. Maximum data channel count is determined by the type of AC and DC input modules in use.
AC Input Signal Range	<i>Referential and Bipolar AC channels:</i> 4 mV peak to peak full-scale <i>Differential DC voltage tolerance:</i> 500 mV maximum
DC Input Signal Range	±2.5 volts
Input Characteristics	≥20 Megohm impedance, all inputs including reference All referential and bipolar AC inputs electrically isolated from earth ground
Frequency Response	<i>Standard Bandwidth:</i> 0.5 Hz to 100 Hz, -3 dB, 0.1 to 100 Hz recoverable with TWin <i>Respiratory Bandwidth:</i> 0.015 Hz to 100 Hz, -3 dB
Amplification	AC channels: 1200 ±2%
Vertical Resolution	16 bits (0.06 µV/bit)
Sampling Rate	800 samples/second/channel
Storage Rate	Definable via TWin software
CMR	>80 dB, all AC channels, at 50/60 Hz
CMRR	>80 dB (signal ref), >100 dB (earth ref)
Noise	<2 µV peak to peak referred to input
Impedance Test Mode	<i>Referential inputs only:</i> range, 1 kohm to 100 kohms, 10%
Calibration Signal	<i>Referential inputs only:</i> 500 µV peak to peak ±2%
Patient Bias Current	<i>Maximum:</i> <4 nA <i>Typically:</i> 300 pA
Event Input	1 pushbutton patient signaling input
Photic	1 photic (flash unit) control line
Connectivity to Host PC	Standard Ethernet, TCP/IP protocol
Power	Medical-grade Isolated Power System
Physical Size	<i>AS40-PLUS Amplifier System:</i> approximately 7"W x 6"H x 2"D (17.8 x 15.3 x 5.1 cm) <i>Weight:</i> 2.3 lbs (1.1 kg) <i>Personality Module alone:</i> approximately 5.5"W x 5"H x 1"D (14 x 12.3 x 2.5 cm) <i>Weight:</i> 0.4 lbs (0.2 kg)
Software	Powerful and user-friendly TWin record, review and analysis EEG software
Operating System	Windows® 7
Warranty	Lifetime Limited Warranty on Grass Technologies manufactured parts (see our full warranty for details)
Regulatory	<i>AS40-PLUS Amplifier System:</i> certified to UL2601-1, IEC 60601-1, IEC 60601-1-1, IEC 60601-1-2, IEC 60601-1-4, IEC 60601-1-6, IEC 60601-2-26, CAN/CSA22.2.No.601.1; CE marked to EC MDD (93/42/EEC), Referential and Bipolar AC (patient) inputs isolated, Type BF

ORDERING INFORMATION

Comet-PLUS XL 57-Channel lab-based Digital PSG Record & Review System (Model CMXL-PLUS-P)

Software includes: Grass Technologies TWin Sleep acquisition and review software, Archiving software, Windows 7 Professional, and Microsoft Office

Hardware includes: Grass Technologies AS40-PLUS Amplifier System (57-channel*) with Sleep Personality Module, 10-foot (3 m) Tether, RPSAS40 Medical-grade power supply, amplifier wall-mount bracket, Integrated Pulse Oximeter, and Pulse Oximeter Extension Cable. Latest high-performance PC-based acquisition system (network ready), Keyboard, Mouse, 20-button programmable keypad for notation entry and system operation, and AS40-PLUS Cabling Kit

Archiving: DVD+/-RW Archiver, internal

Digital Video: Includes TWin Panorama digital video/audio acquisition software and PC-based video capture device

Comet Plus Portable 57-Channel Digital PSG Record & Review System (Model CMP-PLUS-P)

Software includes: Grass Technologies TWin Sleep acquisition and review software, Archiving software, Windows 7 Professional, and Microsoft Office

Hardware includes: Grass Technologies AS40-PLUS Amplifier System (57-channel*) with Sleep Personality Module, 10-foot (3 m) Tether, RPSAS40 Medical-grade power supply, amplifier wall-mount bracket, Integrated Pulse Oximeter, and Pulse Oximeter Extension Cable. Latest high-performance laptop-based acquisition system (network ready), AS40-PLUS Cabling Kit, and ACS-20749 Carrying Case.

Archiving: DVD+/-RW Archiver, internal

Digital Video: Includes TWin Panorama digital video/audio acquisition software and PC-based video capture device

Comet-PLUS PSG recorder (Model CM-PLUS-P) base only includes:

TWin PSG Record and Review software, 57-channel* AS40-PLUS Amplifier System with Universal Personality Module, 10-foot (3 m) Tether, and Power Supply (provide your own PC or laptop).**

** Grass Technologies personnel must approve all personal computers or laptops used with the Comet-PLUS base unit. Please contact Grass Technologies with any questions.

CABINET & MOBILE RACK CART OPTIONS

Several cabinet and mobile rack cart sizes are available.



All specifications subject to change without notice.

Genuine Grass Electrodes and Accessories

A complete line of high quality genuine Grass electrodes, electrode application products, transducers, digital impedance meters, etc. are available to suit all of your needs.

For your shopping convenience these items may be purchased from our Online Store or your local representative.



HIGH PERFORMANCE SYSTEMS

from GRASS

Complete systems for all your recording needs – from
Lab-based to Portable to Ambulatory to Wireless to Long-term Monitoring

PSG Systems

In-lab systems to meet new AASM standards

- Comet-PLUS PSG for high channel needs
- AURA PSG Wireless for maximizing patient comfort

Portable Monitoring to fit all needs

- AURA PSG 25-channel Type I device
- AURA PSG LITE 16-channel Type II/III device
- SleepTrek3 6-channel Type III device



EEG/LTM Systems

In-lab systems

- Comet-PLUS EEG up to 57 channels
- Beehive Horizon LTM up to 128-channels

Portable Monitoring

- TREA Ambulatory EEG

Neuromonitoring

- NeuroTrac III



**Grass
Technologies**
An Astro-Med, Inc.
Subsidiary

World Headquarters

Astro-Med Industrial Park, 600 East Greenwich Avenue
West Warwick, RI 02893 U.S.A.
Phone: 401-828-4000 • Fax: 401-822-2430
Toll-Free Phone (U.S.A. & Canada only): 1-877-472-7779
E-mail: grass@astromed.com
Web-site: www.grasstechnologies.com



World Headquarters
West Warwick, RI

Sales Centers

Canada: Phone: (450) 619-9973
Fax: (450) 619-9976
Toll-Free Phone (Canada Only): 1-800-565-2216
E-mail: astromedcanada@astromed.com

United Kingdom: Phone: (01628) 668836
Fax: (01628) 664994
E-mail: astromeduk@astromed.com

France: Phone: (1) 34.82.09.00
Fax: (1) 34.82.05.71
E-mail: astromedfrance@astromed.com

Germany: Phone: (49) 06106-28368-0
Fax: (49) 06106/771121
E-mail: astromeddeutschland@astromed.com