

MAC 5000 ECG System

Clinical excellence and workflow productivity

Non-Invasive Cardiology

Product Sheet

MAC® 5000, GE's premier ECG system, delivers advanced disease management capabilities through its vast collection of proven algorithms.

The MAC 5000 system offers the sophistication required for advanced ECG applications, while its ease of use extends this level of performance to the broadest range of users possible. And it's part of the complete GE suite of networked, non-invasive testing solutions designed to maximize patient throughput and department productivity.

Add the stress option, and you combine the industry's leading high-performance resting ECG system with comprehensive, equally advanced exercise-testing capabilities in a single, compact system.

Built on GE's proven performance in ECG analysis:

- Advanced algorithms set the standard in ECG analysis and interpretation.
- Easy-to-use applications and features streamline productivity and workflow.
- Seamless connectivity to the MUSE® Cardiology Information System speeds data storage and ECG retrieval.
- Comprehensive training helps maximize your return on investment.

Now with new features that expand your capabilities:

- Barcode and magnetic card scanning options help reduce patient data errors.
- New trolley incorporates customer-requested ease-of-use features.
- XML capabilities ensure flexible, open communications.
- User-configurable password protection addresses security concerns.



Setting the mark for clinical validity and excellence in ECG analysis

Since the introduction of the Marquette® 12SL™ ECG analysis program in 1980, GE Medical Systems Information Technologies has steadily expanded its electrocardiograph-based suite of ECG analysis programs and capabilities.

Today, we continue to lead developments in computerized ECG analysis, setting even higher levels of clinical accuracy, validity, and performance. Through extensive clinical evaluation and the use of classic and newly developed ECG interpretation criteria and measurement technologies, we steadily refine and improve our state-of-the-art suite of ECG analysis programs.

- **Regular clinical input from the world's top consulting cardiologists and physicians** helps our own research and development engineers enhance our programs.
- **Ongoing acquisition of clinically correlated, "gold-standard" databases** allow us to continually evaluate and verify our algorithm performance. Use of the same patient assessment tests employed by practicing physicians ensures clinically accurate values.
- Rapid assessments and improvements on very large databases are made possible by sophisticated analysis techniques, developed by our own engineers, that enable us to quickly evaluate the accuracy of our ECG analysis programs.

Our commitment to improving the science of ECG analysis has led to the use of our algorithms across GE's diagnostic and monitoring systems.

This implementation makes our programs the preferred choice in a variety of care settings and industries including hospitals, clinics, physician offices, and clinical research organizations (CRO's).

A complete suite of analysis algorithms for advanced ECG applications

With the MAC 5000's arrhythmia and chest pain assessment tools, you can address a wider range of disease management needs, make more efficient decisions, and use involved invasive tests more judiciously.

Ongoing development by one of the industry's leading algorithm design staff provides the latest in advanced capabilities, while validation against clinically-verified databases offers unmatched accuracy across a diverse range of patient populations, from pediatrics to adults.

- **Marquette 12SL ECG Analysis Program for Adults and Pediatrics** – the industry's most thoroughly documented, simultaneous 12-lead ECG acquisition analysis program for uncompromising quality and reliability – remains your most clinically valuable second opinion.
- **Marquette 12SL with Gender-Specific Interpretation** features criteria that help you more easily detect acute myocardial infarction (MI) in female patients, enhancing diagnostic confidence even among occasional readers of ECGs.
- **Marquette 12SL with ACI-TIPI (Acute Cardiac Ischemia Time-Insensitive Predictive Instrument)** – this option considers a patient's age, gender, and chief complaint as well as ECG measurements to generate a numerical score that helps predict the probability of acute cardiac ischemia and provides important additional triage information for patients with chest pain.
- **Simultaneous 15-Lead Acquisition, Storage, and Assessment** provides additional ST measurements for the detection of changes that occur in some non-diagnostic 12-lead cases to facilitate the prompt detection of right ventricular and posterior MI.
- **P-Wave Signal Averaging** option for atrial arrhythmia assessment features a patented templating algorithm that enhances P-wave measurement accuracy.
- **Hi-Res Late Potential Analysis** option supports effective ventricular arrhythmia assessment, with an intuitive design that creates a practical, non-invasive alternative to involved invasive testing.
- **Enhanced Pacemaker-Detection Software** improves sensitivity to electronically paced hearts.
- **Serial ECG Comparison** program, through the MUSE Cardiology Information System, leverages the Marquette 12SL ECG analysis program and analyzes both short- and long-term changes in patient's ECGs.





Features to enhance productivity and workflow

Specifically designed to enhance your entire staff's efficiency, the MAC 5000 combines technological advances with ease-of-use features in one system.

- The digital CAM-14 Module reduces noise and artifact for clearer ECG tracings.
- Large field-of-view display gives you a clear view of the screen from any angle.
- Analog ECG output facilitates easy integration with other cardiac-diagnostic devices, such as echocardiography and nuclear medicine systems.
- Compact system design offers easy mobility.
- Extensive customization – including display and final-report formatting – accommodates individual user preferences.
- Trolley design features a convenient holder for the acquisition module, ample writing surface area, wider bins, and a covered storage compartment.
 - The MAC 5000's stress option incorporates our leading exercise-testing technologies. Signal-acquisition advances help reduce baseline wander and ST-segment distortion to generate clearer, more well-defined ECGs.
 - Barcode and magnetic card reader options help reduce errors by automating the input of patient data.



Barcode and magnetic card reading options

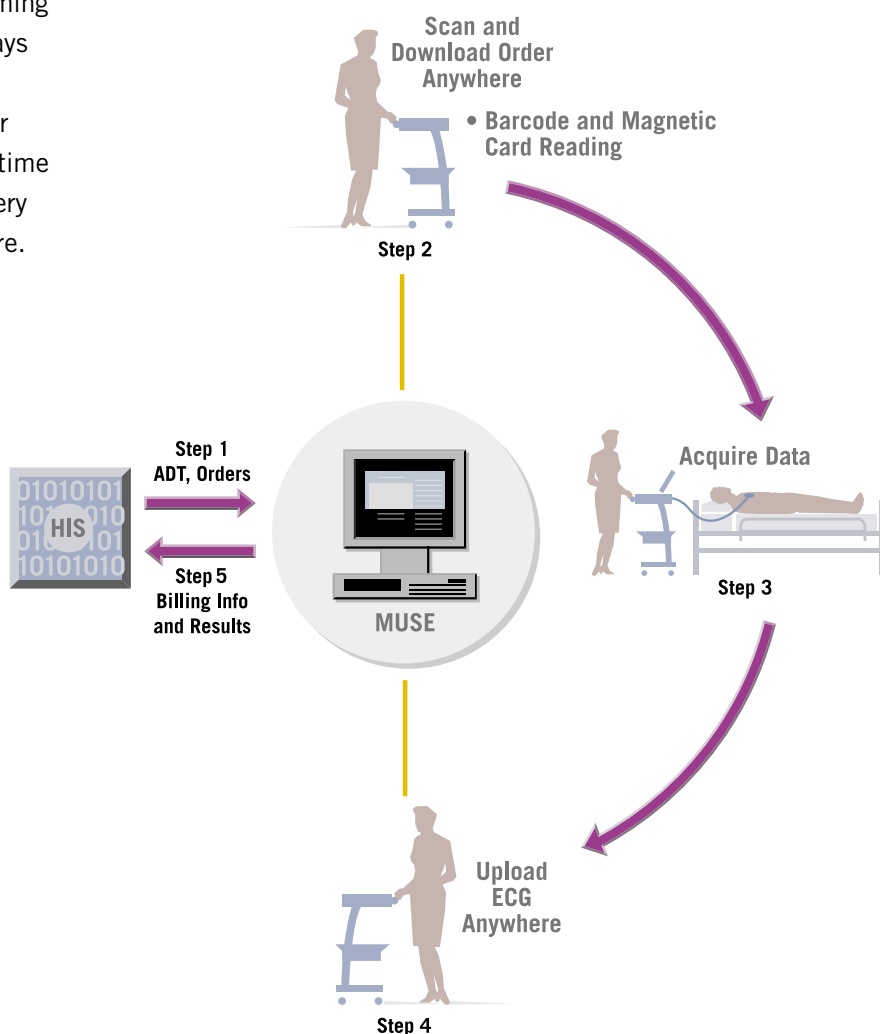
Complete connectivity and network access for improved accuracy and decision support

Tap into the power of GE's MUSE Cardiology Information System – the industry's predominant cardiology management system – to take full advantage of your resting ECG patient information records.

- Quickly retrieve, manage, and archive patient data through seamless, bi-directional communication with the MUSE System.
- Instantly access procedure requests and download patient demographic data from the MUSE System and Order Manager. This functionality reduces time-consuming patient data entry and minimizes delays in procedure billing.
- Review results or access the computer ECG patient record immediately, any time of day or night, using the Remote Query option for more responsive patient care.

- Access results from the clinic, office, or other remote facility using a standard modem for maximum decision-making efficiency.
- Export and store data in XML format.

Wireless ECG Workflow Process



Performance Specifications

Instrument type

Microprocessor augmented automatic electrocardiograph; 14 -leadwire acquisition with programmable lead configuration

Processing

ECG Interpretation: Marquette 12SL ECG Analysis Program for Adults and Pediatrics

Computerized Measurements: 15-lead analysis includes measurements of user-selectable additional 3 leads

Optional: Hi-Res Late Potential Analysis and P-Wave Signal – Averaged ECG

Additional ECG Function: Vectorcardiography

ECG Analysis Frequency: 500 samples/second (sps)

ECG Storage: 150 typical, 200 ECGs maximum on removable media (1.44 MB, 3.5 in diskette) 15 typical in XML format

Digital Sampling Rate: 4000 samples/second/channel

Pre-Acquisition: Provides 10 seconds of instantaneous ECG acquisition

Dynamic Range: AC Differential ± 5 mV DC offset ± 320 mV

Resolution: 4.88 $\mu\text{V}/\text{LSB}$ @ 250 sps 1.22 $\mu\text{V}/\text{LSB}$ @ 500 sps

Frequency Response: -3 dB @ 0.01 to 150 Hz

Common Mode: >140 dB (123 dB with

Rejection: AC filter disabled)

Input Impedance: $>10\text{M } \Omega$ @ 10 Hz, defibrillator protected

Patient Leakage: <10 μA

Pace Detect: Orthogonal LA, LL, and V6; 750 μV @ 50 μs

Special Acquisition Functions: Disconnected lead detection, electrode impedance, excessive AC noise, baseline wander and muscle tremor messages

Heart Rate Meter: 30 to 300 BPM $\pm 10\%$ or 5 BPM, whichever is greater. Heart rates outside this range will not be displayed.

Communications

MUSE Cardiology Information System compatible

Optional: Modem and Fax transmission, Remote Retrieval (Remote Query)

Performance Specifications (cont.)

Display

Display Type: 10.4 in (264 mm) diagonal graphics backlit AM LCD (color optional)

Display Resolution: 640 x 480 pixels with waveform enhancement

Display Data: Heart rate, patient name, ID, clock, waveforms, lead labels, speed, gain and filter settings, warning messages, prompts, and help messages

Writer

Writer Technology: Thermal dot array

Writer Speeds: 5, 12.5, 25, & 50 mm/s (same as displayed)

Number of Traces: 3, 6, 12, or 15, user-selectable (same as displayed)

Writer Sensitivity/Gain: 2.5, 5, 10, 20, 10/5 (split calibration) mm/mV (same as displayed)

Writer Speed Accuracy: $\pm 2\%$

Writer Amplitude Accuracy: $\pm 5\%$

Writer Resolution: Horizontal 1000 dpi @ 25 mm/s, 200 dpi vertical

Paper Type: Thermal, Z-fold, perforated, fan fold, 300 sheets/pack

Paper Size:

A Size: 8.45 in x 11 in (214.63 mm x 280 mm)

A4 Size: 8.27 in x 11.7 in (210 mm x 297.5 mm)

Keyboard

Type: Sealed elastomer with soft function keys, alphanumeric keys, writer controls, and TrimPad cursor controls

Electrical

Power Supply: AC or battery operation

Voltage: 100 to 240 VAC $+10$, -15%

Current: 0.5A @ 115 VAC, 0.3A @ 240 VAC, typical

Frequency: 50 to 60 Hz $\pm 10\%$

Battery Type: User replaceable, 18V @ 3.5 AH $\pm 10\%$ rechargeable NiMH

Battery Capacity: 100 single page reports (typical) or 6 hours continuous display (without printing)

Battery Charge Time: Approximately 4.5 hours from total discharge (with display off)

Performance Specifications

Vectorcardiography

Report Formats:	Vector loops of component vectors (P, QRS, ST-T)
Sensitivity:	20, 40, 80, or 160 mm/mV
Time Resolution:	2 ms

Hi-Res Late Potential Analysis and P-Wave Signal-Averaged ECG

Frequency	-3 dB @ 0.01 and
Response/Input:	250 Hz
Frequency	
Response/Output:	
Upper Limit:	250 Hz
Lower Limit:	0.01, 25, 40, or 80 Hz
Sensitivities:	
Raw Data Template:	20 mm/mV
Average Beat:	20 mm/mV and 50 mm/mV
Filtered Signals and Vector Magnitude:	1 mm/ μ V
Analysis Sampling Rate:	1000 samples/second/channel
Digital Sampling Rate:	4000 samples/second/channel
High/Low Pass Filters:	Special filter using Fast Fourier Transform (FFT)
ADC Resolution:	1.22 μ V/LSB
Analysis Resolution:	0.1525 μ V/LSB

Physical Specifications

Height:	3.7 in (9.4 cm)* with display closed
Width:	15 in (38.1 cm)*
Depth:	13.8 in (35.1 cm)*
Weight:	Approximately 6.8 kg (15 lbs)* including battery without paper

Environmental Specifications

Temperature:

Operating:	50° to 104° F (10° to 40° C)
Transport/Storage:	-40° to 158° F (-40° to 70° C)

Humidity:

Operating:	20% to 95% RH non-condensing
Transport/Storage:	15% to 95% RH non-condensing

Pressure:

Operating:	700 to 1060 hPA
Transport/Storage:	500 to 1060 hPA

* without cart

Trolley

Specifications

Dimensions:	
Height:	39 in (99 cm)
Width:	21 in (54 cm)
Depth:	28 in (72 cm)
Temperature with acquisition module holder	52.5 in (134 cm)
Weight:	55 lbs (25 kg)

Magnetic Card Reader

Specifications

Character Set	ANSI/ISO ALPHA alphanumeric characters and ANSI/ISO BCD (subset of ASCII (ISO 646 IRV:1991))
Dimensions:	
Height:	1.17 in (28 mm)
Length:	3.94 in (100 mm)
Width:	1.34 in (34 mm)
Temperature Range	50° F to 104° F
Operating:	(-10° C to 40° C)
Humidity:	10% to 90% humidity
Agency Conformance:	Complies with FCC Class A.
CE:	The system has been tested to and conforms with the provisions within 89/336/EEC, Electromagnetic Compatibility directive (EMC)

Keyboard Wedge/Decoder

Specifications

Dimensions:	
Height:	1.18 in (3.0 cm)
Length:	3.25 in (8.3 cm)
Width:	2.88 in (7.3 cm)
Electrical:	Complies with UL, CSA, and VDE
Temperature Ranges:	
Operating:	32° F to 104° F (0° C to 40° C)
Storage:	40°F to 158°F (-40°C to 70°C)
Humidity:	0% to 95% non-condensing
Mechanical Shock:	Functions normally after twelve 6ft.(1.8 cm) drops onto a concrete surface
EMI Radiation:	FCC Class A and **EN55022 Class B (1988)
ESD Sensitivity:	Meets **IEC 801-2: 1991/1984 and a minimum of 300 discharges at 2.5kv intervals from 2.5kv to 17.5kv
Radiated Susceptibility:	Meets **IEC 801-3; 1984
Electrical Fast Transients:	Meets **IEC 801-4; 1988

**These requirements combined with EN50082-1; 1992 indicate conformity to the EMC directive 89/336/EEC



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Bar Code Scanner

Specifications

Symbologies:	Code 39 (extended), PDF- 417
Dimensions:	
Height:	6.0 in (15.2 cm)
Length:	5.3 in (13.5 cm)
Width:	3.1 in (7.9 cm)
Light Source:	630 nm visible red LED
Temperature Ranges:	
Operating:	32° F to +122° F (0° C to 50° C)
Storage:	-4° F to +140° F (-20° C to +60° C)
Humidity:	0 to 95% non-condensing
Mechanical:	Operational after 25 drops from 5 feet (1.53 m) to concrete
Vibration:	Withstands 5G peak from 20 to 300 Hz
ESD Sensitivity:	15 kV to any external surface
Agency Compliance:	FCC Class B, EMC Class B, CE Low Voltage Directive, EN60825-1, IEC60825-1 LED Safety: Class 1, UL, cUL, TÜV Certified to EN60950, C-Tic

Certification

UL classification, CSA classification, CE marked in accordance with the Directive 93/42/EEC for Medical Devices, CB certified

Warranty

Standard warranty is one year

Ordering Information

Available in: Dutch, English, French, German, Italian, Spanish, Swedish, Japanese, Danish and Norwegian

Visit gemedical.com or contact your local GE Medical Systems Information Technologies representative.

Accessories available from www.gemedical.com

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