Specifications

General
Dimensions with pads 31.5 cm (W) x 21.0 cm (D) x 29.5 cm (H); (12.4 in. x 8.3 in. x 11.7 in.)
Dimensions with paddles 34.0 cm (W) x 21.0 cm (D) x 34.5 cm (H); (13.4 in. x 8.3 in. x 13.6 in.)
Weight Less than 13.2 lbs. including pads, pads cable, battery, and full roll of paper. Incremental weight of external standard paddles and paddle tray is less than 2.5 lbs. Additional battery weighs less than 1.6 lbs.

Defibrillator Waveform Biphasic Truncated Exponential. Waveform parameters adjusted as a function of patient impedance.
Shock Delivery Via multifunction electrode pads or paddles.
Delivered Energy Accuracy
Charge Time:
- Less than 5 seconds to 200 Joules with a new, fully charged Lithium Ion battery pack at 25oC.
- Less than 15 seconds when operating without a battery, using the M3539A AC power module alone at 90-100% rated mains voltage.
- Less than 15 seconds with a new, fully charged Lithium Ion battery pack at 25oC, depleted by up to 15 200 Joule discharges.
- Less than 25 seconds from initial power on, with a new, fully charged Lithium Ion battery pack at 25oC, depleted by up to 15 200 Joule discharges.
- Less than 25 seconds from initial power on when operating without a battery, using the M3539A AC power module alone at 90-100% rated mains voltage.
- Less than 30 seconds from initiation of rhythm analysis (AED Mode) with a new, fully charged Lithium Ion battery pack at 25oC, depleted by up to 15 200 Joule discharges.
- Less than 30 seconds from initiation of rhythm analysis (AED Mode) when operating without a battery, using the M3539A AC power module alone at 90-100% rated mains voltage.

Selected Energy
Nominal Delivered Energy vs. Patient Impedance
Accuracy Load Impedance (ohms)
25 50 75 100 125 150 175
1J 1.2 1.3 1.2 1.1 1.0 0.9 0.8 ±2J
2J 1.8 2.0 2.0 1.9 1.7 1.6 1.5 ±2J
3J 2.8 3.0 3.0 3.1 3.0 2.9 2.7 ±2J
4J 3.7 4.0 4.0 4.1 4.2 4.2 4.0 ±2J
5J 4.6 5.0 5.1 5.1 5.2 5.2 5.0 ±2J
6J 5.5 6.0 6.1 6.2 6.3 6.3 6.1 ±2J
7J 6.4 7.0 7.1 7.2 7.3 7.3 7.1 ±2J
8J 7.4 8.0 8.1 8.2 8.4 8.3 8.1 ±2J
9J 8.3 9.0 9.1 9.3 9.4 9.4 9.1 ±2J
10J 9.2 10 10 10 10 10 10 ±2J
15J 14 15 15 16 16 15 ±15%
20J 18 20 20 21 21 20 ±15%
30J 28 30 30 31 31 30 ±15%
50J 46 50 51 52 52 50 ±15%
70J 64 70 71 73 73 71 ±15%
100J 92 100 101 103 104 104 ±15%
120J 110 120 121 123 125 125 ±15%
150J 138 150 152 154 157 156 ±15%
170J 156 170 172 175 177 177 ±15%
200J 184 200 202 206 209 209 ±15%

- Less than 40 seconds from initial power on (AED Mode) with a new, fully charged Lithium Ion battery pack at 25°C, depleted by up to 15 200 Joule discharges.
- Less than 40 seconds from initial power on (AED Mode) when operating without a battery, using the 3539A AC power module alone at 90-100% rated mains voltage.

**Patient Impedance Range:**

- Minimum: 25 Ohm (external defibrillation); 15 Ohm (internal defibrillation)
- Maximum: 180 Ohm

Note: Actual functional range may exceed the above values.

**Manual Defib Mode**

**Manual Output Energy (Selected):** 1-10, 15, 20, 30, 50, 70, 100, 120, 150, 170, 200 Joules; maximum energy limited to 50J with internal paddles

**Controls:** On/Off Therapy Knob, Charge, Shock, Sync, Print, Mark Event, ECG Lead Select, Alarm Pause, Event Review, Disarm

**Energy Selection:** Front panel Therapy Knob

**Charge Control:** Front panel button, button on external paddles

**Shock Control:** Front panel button, buttons on external or switched internal paddles

**Synchronized Control:** Front panel SYNC button

**Indicators:** Text Prompts, Audio Alerts, QRS Beep, Battery Status, Ready For Use, External Power, Sync Mode

**Armed Indicators:** Charging tone, charge done tone, flashing shock button, and energy level indicated on display

**AED Mode**

**AED Energy Profile:** 150 Joules nominal into a 50 ohm test load

**Text and Voice Prompts:** Extensive text/audible messages guide user through configured protocol.

**AED Controls:** On/off, Shock

**Indicators:** Monitor display messages and prompts, voice prompts, battery status, Ready For Use,

**Armed Indicators:** Charging tone, charged tone, flashing shock button, and energy level indicated on display

**ECG Analysis:** Evaluates patient ECG and signal quality to determine if a shock is appropriate and evaluates connection impedance for proper defibrillation pad contact
**Shockable Rhythms**: Ventricular fibrillation and certain ventricular tachycardias, including ventricular flutter and polymorphic ventricular tachycardia

**Shock Advisory Algorithm Sensitivity and Specificity**: Meets AAMI DF-39

**ECG and Arrhythmia Monitoring**

**Inputs**: Up to four (4) ECG waves may be viewed on display and up to two (2) waves printed simultaneously. Lead I, II, or III is obtained through the 3-wire ECG cable and separate monitoring electrodes. With a 5-lead ECG cable, leads aVR, aVL, aVF, and V can also be obtained. Pads ECG is obtained through 2 multifunction electrode pads.

**Lead Fault**: LEAD OFF message and dashed line appear on the display if an electrode or lead becomes disconnected.

**Pad Fault**: Dashed line appears on the display if a pad becomes disconnected.

**Heart Rate Display**: Digital readout on display from 15 to 300 bpm, with an accuracy of + 10%

**Heart Rate/Arrhythmia Alarms**: HR, Asystole, VFIB/VTACH, VTACH, Extreme Tachy, Extreme Brady, PVC rate, Pacer Not Capture, Pacer Not Pacing

**Hands Free Defibrillation Patient Cable Length**:
- M3508A - 2.2 m (7 ft.)
- M3507A - 2.2 m (7 ft.)

**ECG Cable Length**: 2.7 m (9 ft.)

**Rhythm Class ECG Test**

**Sample Size**

**Nominal Specifications**

**Shockable Rhythm**

Ventricular Fibrillation
- 600 Meets AAMI DF39 requirement and AHA recommendation (sensitivity > 90%) for adult defibrillation

Ventricular Tachycardia
- 300 Meets AAMI DF39 requirement and AHA recommendation (sensitivity > 75%) for adult defibrillation

**Non-shockable Rhythm**

Normal Sinus Rhythm
- 250 Meets AAMI DF39 requirement (specificity > 95%) and AHA recommendation (specificity > 99%) for adult defibrillation

Asystole
- 500 Meets AAMI DF39 requirements and AHA recommendation (specificity > 95%) for adult defibrillation

All other non-shockable rhythms
- 600 Meets AAMI DF39 requirements and AHA recommendation (specificity > 95%) for adult defibrillation

**Common Mode Rejection**: Greater than 90 dB measured per AAMI standard for cardiac monitors (EC 13)

**ECG Size**: 2.5, 5, 10, 20, 40 mm/mV, autogain

**Frequency Response**:
- AC Line Filter - 60 Hz or 50 Hz
- Pads ECG for Display: Monitor - (.15-40 Hz) or EMS (1-30 Hz)
- Pads ECG for Printer - Monitor (.15-40 Hz) or EMS (1-30 Hz)
- Leads ECG for Display - Monitor (.15-40 Hz) or EMS (1-30 Hz)
- Leads ECG for Printer - Diagnostic (.05-150 Hz) or Monitor (.15-40 Hz) or EMS (1-30 Hz)
Patient Isolation (defibrillation proof):
• ECG: Type CF
• SpO2: Type CF
• EtCO2: Type CF
• NBP: Type CF
• External Defib: Type BF
• Internal Defib: Type CF

Other Considerations: The HeartStart MRx is suitable for use in the presence of electrosurgery. Burn hazard protection is provided via a 1K current limiting resistor contained in each ECG lead wire.

Display
Size: 128 mm x 171 mm
Type: TFT Color LCD
Resolution: 640 x 480 pixels (VGA)
Sweep Speed: 25mm/s nominal (stationary trace; sweeping erase bar) for ECG and SpO2; 6.25 mm/sec for CO2
Wave Viewing Time: 5 seconds (ECG)

Battery
Type: 6.0 Ah, 14.8 V, rechargeable, Lithium Ion
Dimensions: 165 mm (H) x 95 mm (W) x 42 mm (D); (6.5 in. x 3.8 in. x 1.6 in)
Weight: Less than 1.6 lb. (0.73 kg)
Charge Time with instrument off: Approximately 3 hours to 100%. Approximately 2 hours to 80%, indicated by indicator. Charging the battery at temperatures above 45ºC may degrade battery life.
Capacity: At least 5 hours of monitoring with ECG, SpO2, and CO2 monitored continuously and NBP measured every 15 minutes, or at least 50 full-energy discharges (with a new, fully charged battery, operating at room temperature, 25ºC).
Battery Indicators: Battery gauge on battery, capacity indicator on display; flashing RFU indicator, chirp, and LOW BATTERY message appears on display for low battery condition*
*When LOW BATTERY message first appears, there is still enough energy remaining for at least 10 minutes of monitoring time and six maximum energy discharges (with a new battery at room temperature, 25ºC).

Battery Storage: Storing the battery for extended periods at temperatures above 40ºC will reduce battery capacity and degrade battery life.

Thermal Array Printer
Continuous ECG Strip: The Print key starts and stops the strip. The printer can be configured to run real time or with a 10-second delay. The strip prints the primary ECG lead with event annotations and measurements.
Auto Printing: The printer can be configured to automatically print on Mark Events, Charge, Shock, and Alarm. When an alarm condition occurs, the unit prints the Primary ECG wave and the alarming wave, if configured.
Reports: The following can be printed:
• Event Summary (short, medium, and long)
• 12-Lead
• Operational Check
• Configuration
• Status Log
• Device Information
Speed: 25 or 50 mm/s with an accuracy of +5%
Amplitude Accuracy: +5% or + 40 uV, whichever is greater

Paper Size:
• 50 mm (W) x 30 m (100 ft.) (L)
• 75 mm (W) x 30 m (100 ft.) (L)
Noninvasive Pacing
Waveform: Monophasic Truncated Exponential
Current Pulse Amplitude: 10 mA to 175 mA (5 mA resolution); accuracy 10% or 5 mA, whichever is greater
Pulse Width: 40 ms with +10% accuracy
Rate: 30 ppm to 180 ppm (10 ppm increments); accuracy + 1.5%
Modes: Demand or Fixed Rate
Refractory Period: 340 msec (30 to 80 ppm); 240 msec (90 to 180 ppm)
SpO2 Pulse Oximetry Range:
- SpO2: 0-100%
- Pulse Rate: 30 to 300 bpm
Resolution: 1%
Display Update Period: 1 sec typical numeric update rate
Pulse Rate Accuracy: 2% or 1 bpm (whichever is greater)
Alarm Range:
- Low Limit: 50 to 99% (Adult/Pediatric)
- High Limit: 51 to 100% (Adult/Pediatric)
Alarm Delay: 10 seconds
NBP
Pressure Range:
- Systolic: 40-260 mmHg
- Diastolic: 20-200 mmHg
Initial Pressure: 160 mmHg Adult; 120 mmHg Pediatric
Maximum Pressure: 280 mmHg
Overpressure Safety Limits: Maximum of 300 mmHg
Cuff Inflation Time: 75 second maximum (pediatric or adult)
Accuracy: ±3 mmHg
Alarm Range:
- Systolic high limit: 35-270 (Adult), 35-180 (Pediatric)
- Systolic low limit: 30-265 (Adult), 30-175 (Pediatric)
- Diastolic high limit: 15-245 (Adult), 15-150 (Pediatric)
- Diastolic low limit: 10-240 (Adult), 10-145 (Pediatric)
- Mean high limit: 25-255 (Adult), 25-160 (Pediatric)
- Mean low limit: 20-250 (Adult), 20-155 (Pediatric)
Rated Life: 50,000 measurement cycles (36/day for 2.3 years)
Auto Mode Repetition Time: 1, 2.5, 5, 10, 15, 30, 60, or 120 minutes
Measurement Time: Auto/manual mode: 30 seconds (average) @ HR>60 bpm, 170 seconds maximum
Interconnect Tube Length:
- M1598B Connect tubing 1.5 m
- M1599B Connect tubing 3.0 m
EtCO2
Range: 0 to 99 mmHg
Resolution: 1 mmHg (0.1kPa)
Accuracy: For values between 0 and 38 mmHg: ±2 mmHg. For values between 39 and 99 mmHg: ±5% of reading + 0.08% for every 1 mmHg (above 40 mmHg). Values read at sea level after >20 min warm up. The accuracy specification is maintained to within 4% for the following gas mixtures (all values are in Vol. %).
Rise Time: 190 ms maximum @ 10ml/min
Delay Time: 2.7 seconds typical
System Response Time: 2.9 seconds typical

SOMA TECHNOLOGY, INC.
Worldwide Medical Equipment Sales and Service

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Tel: (860) 218-2575 Fax: (860) 218-2565 Email: soma@somatechnology.com
Rev 1 1/06
Sample Flow Rate: Nominally 50 ml/min, +7.5 ml/min

Microstream CO2 Humidity Correction Factor:
BTPS (Body Temperature and Pressure, Saturated - 37oC, 750mmHg, 100% humidity or 47mmHg) is the humidity correction factor for the Microstream CO2 readings. The formula for the correction calculation is:

\[ PBTPS = FCO2 \times (Pb-47) \]
\[ \sim FCO2 \times 0.94 \]

where \( FCO2 = \) fractional concentration of CO2 in dry gas.

\( FCO2 = \%CO2/100 \)

\( Pb = \) ambient pressure

Alarm Range:
- Low Limit: 10 to 94 mmHg (Adult/Pediatric)
- High Limit: 20 to 95 mmHg (Adult/Pediatric)

AwRR
- Range: 0 to 150 rpm
- Resolution: 1 rpm
- Accuracy:
  - 0 to 40 rpm ±1 rpm
  - 41 to 70 rpm ±2 rpm
  - 71 to 100 rpm ±3 rpm
  - 101 to 150 rpm ± 5 rpm

Alarm Range:
- Low Limit: 0 to 95 rpm (Adult/Pediatric)
- High Limit: 10 to 100 rpm (Adult/Pediatric)

Apnea Alarm: 10-40 seconds, in increments of 5

CO2 N2O O2 N2O H2O Anesthetic Agents
0 to 13 0 to 97.5 0 to 100 0 to 80 dry to saturated According to EN864

Calibration Gas for CO2 Measurement System
- Ingredients: 5% Carbon Dioxide, 21% Oxygen, 74% Nitrogen
- Cylinder Size: BD
- Method of Preparation: Gravimetric
- Blend Tolerance: 0.03%
- Accuracy: 0.03% absolute
- Moisture: 10 PPM Maximum
- Expiration Period: 2 years
- Pressure: 144 PSIG, Volume: 10L

12-Lead ECG
- Inputs: With a 10-lead cable, leads I, II, III, aVR, aVL, aVF, V1-C1-V6 can be obtained. All 12-Lead ECG waves can be viewed on the display simultaneously. All 12 leads can be printed on the strip chart printer in 3x4 format.

Patient Data Storage
- Internal Event Summary: The internal Event Summary stores up to 8 hours of continuous ECG waveforms and events per Event Summary, with a maximum capacity of 60 Event Summaries or 62 megabytes of patient data, whichever comes first.
- Data Card Event Summary: The Data Card stores up to 8 hours of continuous ECG waveforms and events per Event Summary, with a maximum capacity of 60 Event Summaries or 62 megabytes of patient data, whichever comes first.