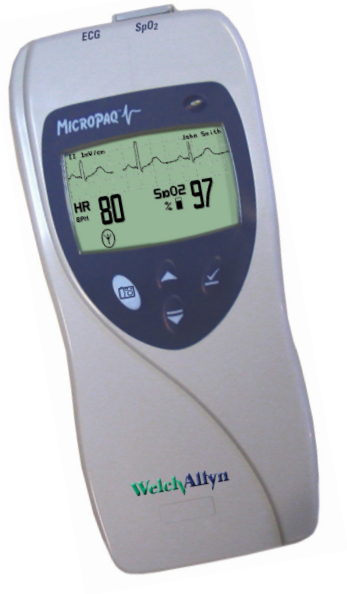
Micropaq® Monitor



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Directions for Use

Model 406 and Model 408
Software version 1.7X

WelchAllyn®
Advancing Frontline Care™

Welch Allyn assumes no responsibility for injury or for any illegal or improper use of the product that may result from failure to use this product in accordance with the instructions, cautions, warnings, or indications for use published in this manual.

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Singapore	+ 656 419 8100	South Africa	+ 2711 777 7555
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This device complies with Part 15 of the FCC rules and with the rules of the Canadian ICES-003. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

Reorder Part Number 810-2691-XX
Manual Part Number 810-2702-00 Rev A, 10/2007

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MASIMO SET® NELLCOR OXIMAX WORKS HERE™ CE 0297 WelchAllyn®

Contents

1 General information

Intended use

The Micropaq™ monitor is intended to be used by clinicians for single or multiparameter vital signs monitoring of ambulatory and nonambulatory pediatric and adult patients in health care facilities. The monitor is able to withstand light rain exposure over short periods of time (uniform distribution of approximately 1 mm of water/ minute for 10 minutes or less).

The Micropaq monitor is intended to operate with an Acuity® Central Monitoring System through wireless communication over Welch Allyn's FlexNet™ network. FlexNet connects multiple devices to the Acuity Central Monitoring System through hardwired Ethernet networks and Wireless Local Area Networks (WLANs). If the Micropaq monitor is moved out of range or loses communication with the FlexNet network, it continues to monitor the patient, display patient data, and generate local patient alarms or alert messages.

- The ECG channel is intended primarily for five-lead ECG monitoring, although three-lead ECG monitoring is supported.
- The Pulse Oximetry channel is intended for continuous noninvasive monitoring of functional oxygen saturation of arterial hemoglobin (SpO_2) and pulse rate (measured by an SpO_2 sensor).

The most likely locations for patients monitored by this device are step-down units, telemetry departments, general medical/surgical floors, emergency departments, and in-hospital transport.

This guide was written for clinicians. Although this guide may describe some monitoring techniques, Welch Allyn expects that the operator is a trained clinician who knows how to take and interpret a patient's vital signs.

Federal USA law restricts sale of the device identified in this manual to, or on the order of, a licensed medical practitioner.

Symbols

	**Warning** Warning statements in this manual identify conditions or practices that could result in personal injury.
	**Caution** Caution statements in this manual identify conditions or practices that could result in damage to the equipment or other property.
	**Caution** On the product, means “Consult the accompanying documentation.”

The following symbols appear on the monitor or accessories.

Symbol	Definition	Symbol	Definition
	Direct current	IPX1	Enclosure Protection Drip proof: Classification IPX1 per EN60529: 1991
	Alternating current (battery charger)		Fuse
CE 0297	The CE Mark and Notified Body Registration Number signify the device has met all essential requirements of European Medical Device Directive 93/42/EEC	C SA US	This device has been tested and certified by the Canadian Standards Association International to comply with applicable U.S. and Canadian medical safety standards.
	Restrictions for use of wireless device in Europe. European Communities Class 2 radio equipment	CE	Signifies the device has met all essential requirements of European Medical Device Directive 93/42/EEC for a Class 1 product (battery charger)
	Protective earth ground (battery charger)	 Li+	Separate batteries from other disposables for recycling
Li++	Lithium Ion battery		For indoor use only (battery charger)
	Caution: Refer to Directions For Use and accompanying documentation		Keep away from rain
	See the accompanying manual		Recycle the monitor and battery separately from other waste. Refer to www.welchallyn.com/weee for collection point and additional information.
	Alarm(s) off		Patient connections are Type CF, isolated for direct cardiac application, and protected against defibrillation
	This way up		Stacking limit (by number)
95%	Humidity limit		Altitude limit
	Fragile		IATA/ICAO Hazard Class 9 Package (International Air Transport Association/ International Civil Aviation Organization)
	Temperature limits		Single use only

Symbol	Definition	Symbol	Definition
	Non-ionizing electromagnetic radiation. This device contains an approved RLAN module frequency 2402 to 2480 MHz	802.11a 5150-5825 MHz	Non-ionizing electromagnetic radiation. This device contains an approved RLAN module frequency 5150 to 5825 MHz
	This device complies with the 47 CFR Part 15 radiated and conducted emissions requirements.	FCC ID: PGUWA11AO7 IC: 4168a-WA11A07	This device complies with FCC and Industry Canada requirements for international radiators (802.11 wireless)
	The monitor is connected to Acuity		The monitor is not connected to Acuity
	(Flashing) The monitor is searching for a connection to Acuity		

Monitor Front Panel Keys			
	Select Key and Silence Patient Alarm/ Equipment Alert Key- Selects the choice highlighted on the menu. During patient alarms, silences the tone at the monitor and at Acuity (if connected) for 90 seconds. During equipment alerts, silences or acknowledges (dismisses) the alert.		Scroll Up Key and Reset Alarm Tone Key- Scrolls up menus on the display. During patient alarms, resets the tone at the monitor and at Acuity (if connected).
	Snapshot Key - When connected to Acuity, pressing this key sends Acuity a snapshot print to the Acuity central station printer. A total of 21 seconds of patient numeric and waveform data (14 seconds of history, 7 seconds after the key is pressed) will be sent to the printer. See "Snapshot key" on page 10 for more information.		Scroll Down Key and Main Menu Key- Pressing this key scrolls down menus on the display, or causes the Main Menu to appear if no menu is displayed.

Battery charger labels and LEDs

Eight-bay battery charger (008-0651-XX)		
Green LED on continuously		Battery is fully charged.
Green LED flashing		Battery is charging.
Green LED flashing very slowly		Battery detected and waiting to be charged.
Yellow LED on continuously		Something is wrong with the battery or the charger. (See "Battery Status and Possible Response" on page 44.)

General warnings and cautions

Familiarize yourself with all warnings and cautions before using the monitor.

WARNING When considering a treatment protocol that involves wireless communication of patient data, be sure to recognize some limitations inherent in wireless communications. When the monitor is not connected to the network:

- There are no patient alarms or alerts at the Acuity Central Station.
- Acuity does not perform arrhythmia and ST analysis on the patient data and does not generate related alarms.
- Patient data is not saved.

WARNING Do not try to monitor neonatal patients with the monitor. The monitor is intended for adult or pediatric patients. It is not intended for use with pediatric patients (or infants) weighing less than 22 lbs (10 kg).

WARNING Always check the patient mode at Acuity when monitoring a new patient. The patient mode determines default alarm limits and internal algorithm settings.

WARNING The monitor may not meet its performance specifications if stored or used outside the specified temperature and humidity ranges.

WARNING Do not connect more than one patient to a monitor. Do not connect more than one monitor to a patient.

WARNING During defibrillation, keep the discharge paddles away from ECG and other electrodes, as well as other conductive parts in contact with the patient.

WARNING Do not operate this product in the presence of flammable anesthetics or other flammable substances in combination with air, oxygen-enriched environments, or nitrous oxide; explosion can result.

WARNING Do not use the monitor in a Magnetic Resonance Imaging (MRI) suite or a hyperbaric chamber. Such use can cause fire or explosion resulting in patient injury and monitor damage.

WARNING Electronic equipment that emits strong electromagnetic or radio frequency signals can cause electrical interference with monitor operation. This interference may distort the ECG signal, thereby preventing accurate rhythm analysis. Avoid operating this device near equipment of this type.

WARNING Exposure to Radio Frequency (RF) radiation. To comply with Federal Communications Commission (FCC) RF exposure requirements, this device shall be used in accordance with the operating conditions and instructions provided in this manual, including the section ”Install the carrying pouch” on page 28.

WARNING Pacemaker signals can differ from one pacemaker to the next. The Association for Advancement of Medical Instrumentation (AAMI) cautions that “in some devices, rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. All pacemaker patients should be kept under close or constant observation.” See ”ECG specifications” on page 51 for disclosure of the pacemaker pulse rejection capability of this instrument.

WARNING This wireless medical device was tested and, when used with a metal-free accessory between the monitor and the patient, complies with FCC RF Exposure (SAR) guidelines. The use of accessories containing metal may not ensure compliance with FCC RF exposure guidelines. Specific Absorption Rate (SAR) is a measurement of radio frequency energy. The FCC permits a maximum SAR value of 1.6 mW/g. The highest SAR value for this patient monitor, when worn by a patient in accordance with the directions for use, is 0.560 mW/g.

WARNING High-power radars are allocated as primary users of the 5.25 to 5.35 GHz and 5.65 to 5.85 GHz bands. These radar stations can cause interference with and/or damage this device.

WARNING Changes or modifications not expressly approved by Welch Allyn could void the purchaser’s authority to operate the equipment. This product does not contain any user serviceable components. Any unauthorized product changes or modifications will invalidate Welch Allyn's warranty and all applicable regulatory certifications and approvals.

WARNING For patients with a pacemaker, position the monitor to maintain a minimum 6-inch distance between the monitor and pacemaker. Immediately turn the monitor off and provide appropriate patient care if you have any reason to suspect that the monitor is interfering with the pacemaker. The Health Industry Manufacturers Association recommends this minimum 6-inch distance between a hand-held wireless radio and a pacemaker, which is consistent with the independent research by, and recommendations of, Wireless Technology Research.

WARNING Make frequent electrical and visual checks on cables, sensors, and electrode wires. All cables, sensors, and electrode wires must be inspected and properly maintained and in proper working order to allow the equipment to function properly and protect patient safety.

WARNING Avoid electrosurgery burns at monitoring sites by ensuring proper connection of the electrosurgery return circuit so that the return paths cannot be made through monitoring electrodes and probes.

WARNING Use of ECG and SpO_2 cables not specified by Welch Allyn may negate defibrillator protection and risk patient injury.

WARNING Use of Masimo LNOP® sensors/cables will not provide protection in accordance with IEC defibrillation standards when used with this device.

WARNING To ensure patient safety, the conductive parts of the ECG electrodes (including associated connectors) and other patient-applied parts should not contact other conductive parts, including earth ground, at any time.

WARNING Motion artifact can affect the accuracy of patient vital sign measurements. Minimize patient motion whenever possible.

WARNING Use only accessories supplied by Welch Allyn or recommended in the Welch Allyn *Products and Accessories* booklet (810-0409-XX). The monitor will only meet the listed specifications when using accessories listed by Welch Allyn. Use accessories according to your facility's standards and the manufacturer's recommendations. Always refer to the manufacturer's Directions for Use.

WARNING As with all medical equipment, carefully route the patient cabling to reduce the possibility of patient entanglement or strangulation. Use the supplied garment clips to secure the cable properly.

WARNING When positioning the monitor pouch on the patient, make sure the straps do not entangle the patient's neck or cause choking. Make sure the straps do not restrict the movement of the patient's limbs or create a hazard when walking or moving.

WARNING If a product has been dropped or severely abused, send it to a qualified service person to confirm proper operation.

Caution Do not autoclave the monitor. Autoclave accessories only if the manufacturer's instructions clearly approve it. Many accessories can be severely damaged by autoclaving.

It is possible for the monitor to detect a problem that prevents the monitor from operating properly. If this occurs, the monitor displays an error message and error number. Report such errors to Welch Allyn. The monitor should be serviced only by a Welch Allyn service technician while under warranty. Contact Welch Allyn for information about post-warranty period service.

Introducing the monitor

The monitor is a patient-worn vital signs monitor for use by adult or pediatric ambulatory patients.

- One or two ECG channels displayed
- Up to 2 ECG leads displayed at the monitor: I, II, III, V, aV_R, aV_L, or aV_F with 5-lead cable
- Up to 7 ECG leads displayed at Acuity: I, II, III, V, aV_R, aV_L, or aV_F with 5-lead cable
- One ECG lead displayed at the monitor and at Acuity: Fixed lead II with 3-lead cable, or 5-lead cable with only RA, LA and LL electrodes attached.
- Pulse oximetry (SpO_2) monitoring (Model 408 only)
- Two-way wireless communication within Welch Allyn's FlexNet network
- LCD for display of ECG waveforms, SpO_2 and heart rate/pulse rate data, and messages from Acuity
- Standalone operation with patient alarms when out of range of the network
- Patient alarm limits that can be set at the monitor or at Acuity
- Configurable formats for single- or dual-waveform ECG display
- Internal antenna
- Snapshot key
- Lightweight (less than two pounds with battery)
- Rugged and tolerant of brief water exposure
- Rechargeable battery
- Sleep mode to extend battery life
- Your model may be shipped with an attached identification number on the front of the monitor.

Model 406

ECG monitoring

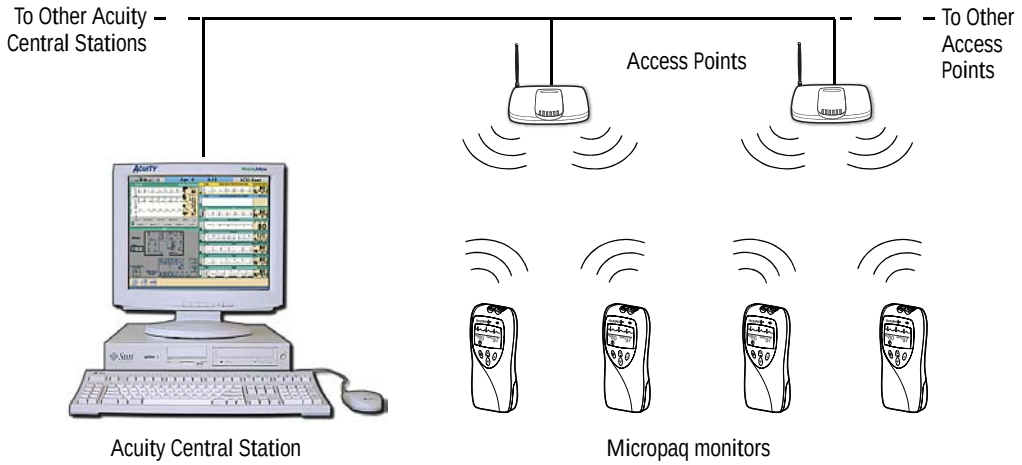
Model 408

ECG monitoring and either one of two pulse oximetry (SpO_2) monitoring options:

- SpO_2 with Masimo® SET® technology, indicated by: Masimo SET
- SpO_2 with NELLCOR® OxiMax™ technology, indicated by: Nellcor OxiMax Works

Understanding the monitor and the FlexNet Network

The monitor is intended to operate with an Acuity® Central Station as part of Welch Allyn's FlexNet network. FlexNet allows multiple devices to communicate through hardwired Ethernet networks and Wireless Local Area Networks (WLANs). The Acuity Central Station provides the primary display and entry of patient data for a patient connected to the monitor.



FlexNet Network

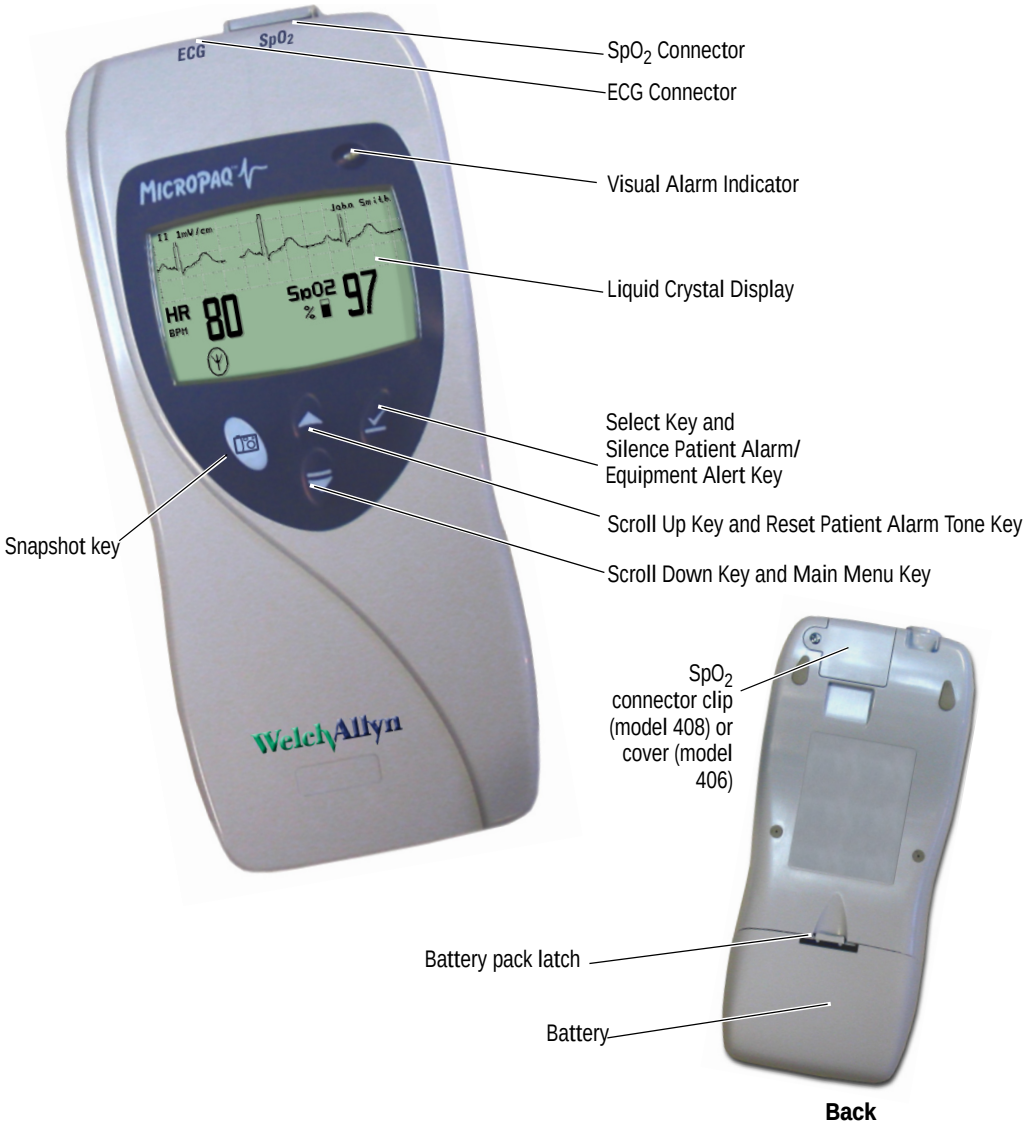
Each patient-worn monitor supports two-way communication with an Acuity Central Station through an access point in the FlexNet network. The access point is a digital radio transceiver that connects to the FlexNet network. During monitoring, the monitor sends the patient data to Acuity. Acuity and the monitor continuously analyze the data. Acuity provides appropriate alarm or alert messages at the Central Station and other network devices such as a hallway message panel and the monitor itself. Acuity also stores the patient data for viewing or report printing.

If the monitor is moved out of range or loses communication with the FlexNet network and Acuity, it continues to monitor the patient and display patient data. While not communicating with Acuity, the monitor continues to generate local patient alarms or alert messages. Patient data is not stored and Acuity does not perform waveform analysis or generate arrhythmia messages while the monitor is not communicating with Acuity.

When the monitor is returned to within range of the FlexNet network, it automatically reconnects to Acuity.

Monitor features

Controls and connectors



Visual alarm indicator

Green	Flashes slowly during normal operation.
Red	Flashes during patient alarm, remains on continuously when alarms are silenced or suspended.
Yellow	Flashes during an equipment alert or while not connected to the network. Remains on continuously if the operator suspends an alert at Acuity for 90 seconds or acknowledges (dismisses) a low battery alert from the monitor or Acuity.

Note The flashing green LED indicates that the monitor is connected to the network but not necessarily connected to a patient. If the monitor is actively monitoring a patient, the green LED indicates no alarms or alerts are detected.

Audible alarm indicator

Beeps to indicate a patient alarm, and beeps faster for life-threatening arrhythmia alarms (see "Patient alarm and equipment alert specifications" on page 56).

Beeps to indicate when the equipment needs attention. This beep tone is slower than patient alarm tones (see "Patient alarm and equipment alert specifications" on page 56).

Volume can be configured as high, low, or off (configured at Acuity).

Volume can be configured differently for network connection or stand-alone operation (configured at Acuity).

Snapshot key

When connected to Acuity, pressing this key sends a snapshot of the patient's numeric and waveform data to the Acuity Central Monitoring System. Depending on how Acuity is configured, this will cause Acuity to print a 21-second snapshot (14 seconds of history, 7 seconds of data after the button is pressed) to the Acuity central station printer.

Note Snapshot is the default selection of the monitor. However, the connected monitor will inherit the configuration previously defined by Acuity. For example, if Acuity has defined the Snapshot key to respond with a Nurse Call function and a new monitor is introduced to the system, the Snapshot key definition will remain as Nurse Call.

For more information about using the Acuity Central Monitoring System, refer to *Acuity Directions For Use* (810-1605-XX)

Scroll Up key and Reset Patient Alarm Tone key

Scrolls up menus on the display.

Resets a silenced patient alarm tone.

Scroll Down key and Main Menu key

Scrolls down menus on the display.

Displays the Main Menu.

Select key and Silence Patient Alarm/Equipment Alert key

Selects the choice highlighted on the menu.

During patient alarms, silences the tone at the monitor and Acuity (if connected) for 90 seconds. During equipment alerts, silences or acknowledges (dismisses) the alert at the monitor and Acuity.

Battery

Insert the battery to turn on power. Remove the battery to turn off power. (While the battery is removed, the monitor does not perform patient monitoring.)

Note If you do not use END TELE to disconnect from the network as described above, the Acuity Central Station generates a DROPOUT equipment alert at Acuity.

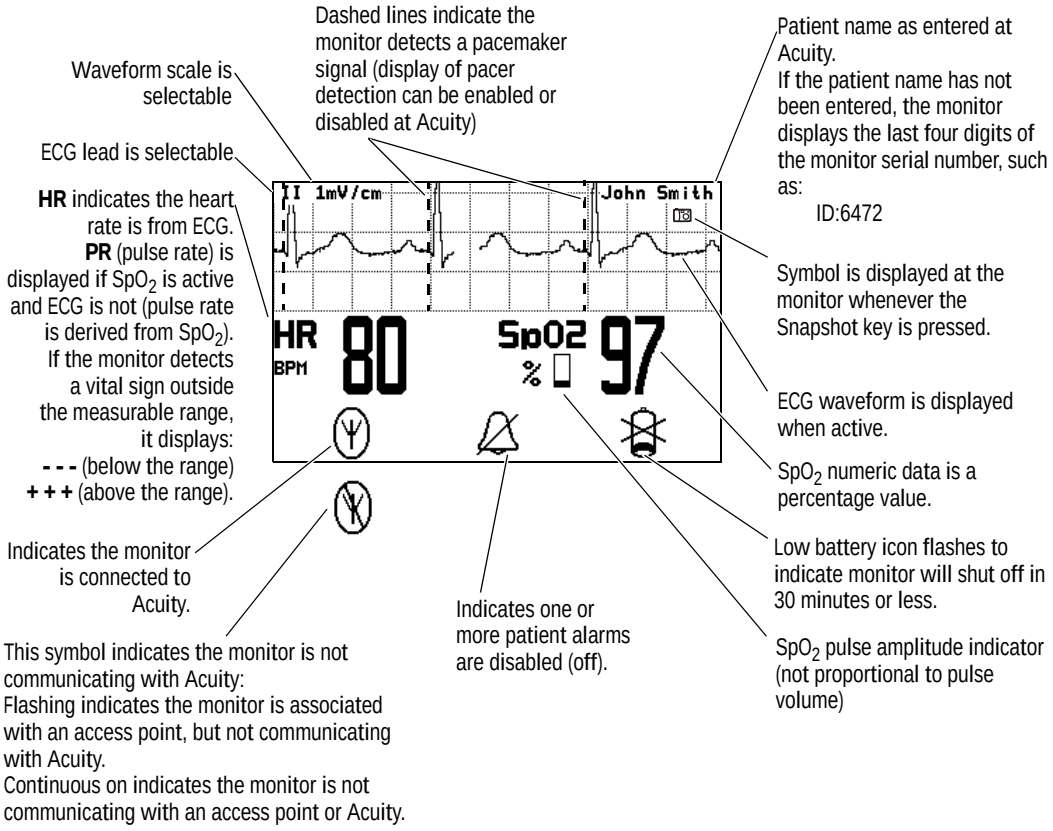
If you want to monitor this same patient at a later time, you will need to reselect the patient name from the monitor or confirm the patient ID at Acuity.

Recharge the battery while it is removed from the monitor. (See "Recharge a battery" on page 43.)

To order a new battery, see "Battery Status and Possible Response" on page 44.

Display

Although the Acuity Central Station is the primary location for viewing patient data, the monitor provides information to support patient care.



Display sleep mode

In order to extend battery life, the display becomes blank after two minutes if no keys are pressed. The display becomes active again if an alarm or alert occurs, a key is pressed, the initial Acuity connection occurs, a cable is inserted, or an electrode is attached.

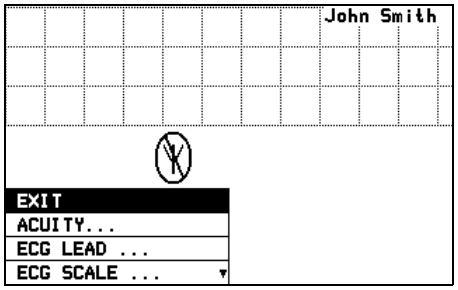
The display will not become blank if a patient alarm is occurring, an Acuity message is displayed, or the monitor is in Demo mode or Service mode.

Main Menu

When you first press ▼, the Main Menu appears:

Press ▼ to move through the menu.

Press ✓ to select or change the highlighted choice.



EXIT	Exit the Main Menu (the menu disappears).
ACUITY...	Access the Acuity Menu with network options. The Acuity Menu is only accessible while connected to Acuity.

EXIT	Exit all menus and return to the monitoring screen.
END TELE	Discontinue monitoring a patient.
NEW ROOM	Reassign a patient to a new room in the same unit.
TRANSFER	Transfer a patient to a new room in a new unit.
NEW PATIENT	Assign the monitor to a new patient.
PATIENT INFO	Display patient information such as ID, name, unit and room.

Whenever the monitor is connected to Acuity and you select ACUITY... from the Main Menu, the monitor displays the message ACUITY CONTACTED to confirm that Acuity has been contacted. The monitor continues to display this message until Acuity responds, or you press ✓ to acknowledge the message and clear the screen. If the monitor detects an alarm or alert, it clears the screen to display the appropriate alarm or alert message. The length of time required for Acuity to respond to your selection at the monitor can vary widely depending on the amount of network traffic and other conditions.

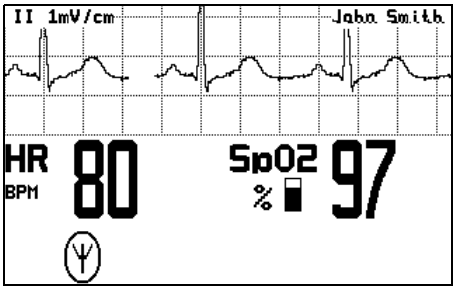
ECG LEAD...	Access a menu to change the ECG 1 or ECG 2 lead selection (I, II, III, aV_R, aV_L, aV_F, or V). Available vectors depend on the connected electrodes.

ECG SCALE...	Change the scale of the ECG waveform. If two waveforms are displayed, both have the same scale.
1 WAVEFORM	There are four possible ECG waveform display selections: 1 WAVEFORM the default selection 2 WAVEFORMS 5 SECONDS FULL SCREEN Pressing ✓ changes to the next selection. This change does not take effect until after you exit the Main Menu. See "Display" on page 12 for descriptions.
LIMITS...	Enter the Alarm Limits Menu ("Customize patient alarm limits at the monitor" on page 37) and change alarm limits.
SYSTEM INFORMATION	Display information about the network connection and SpO_2 module.
SERVICE MENU	Enter Service Mode for a demonstration mode (Demo, see "Demonstration mode" on page 17) or service functions for technicians. Service Mode is not available if any cables are plugged in.

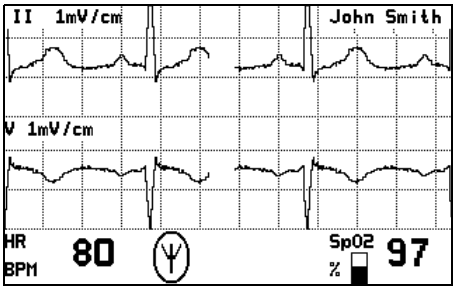
Note To restrict access to the Main Menu, a Menu Lock option can be configured for the monitor at the Acuity Central Station. When the Menu Lock is enabled, the operator must press and hold down ✓ and ▼ for two seconds to gain access to the Main Menu. The Menu Lock is disabled if the monitor loses communication with Acuity.

Waveform options

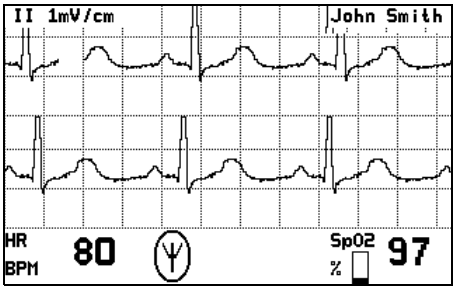
There are four ECG waveform options as shown:



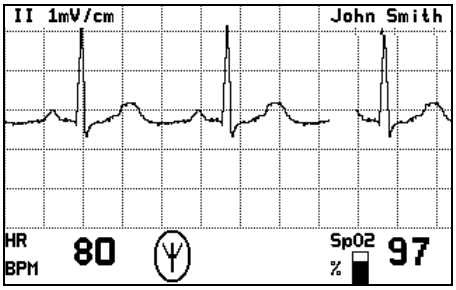
1 Waveform
The single ECG 1 (lead II) waveform is displayed.



2 Waveforms
ECG 1 (lead II) and ECG 2 (lead V) are both displayed.



5 Seconds
ECG 1 (lead II) cascades from one line to the other.



Full Screen
The single ECG 1 (lead II) waveform is allowed to occupy most of the screen.

To change the waveform selection during operation:

1. Press ▼ to display the Main Menu.
2. Press ▼ as needed to highlight the current waveform selection. Then press ✓ as needed to select the desired display.

Messages from Acuity

The monitor displays messages sent from Acuity as needed, including patient alarms and equipment alerts. When Acuity messages are displayed, they temporarily override information displayed on the lower half of the monitor screen.

Accessories

Battery charger (8-battery)	*Micropaq Directions For Use*
Battery	ECG electrodes
3-lead ECG cable (optional)	5-lead ECG cable
ECG extension cable (optional)	Carrying pouch
SpO_2 sensors (Masimo or Nellcor)	SpO_2 cable (Masimo or Nellcor)

WARNING Use only accessories supplied by Welch Allyn or recommended in the Welch Allyn *Products and Accessories* booklet (810-0409-XX). The monitor will only meet the listed specifications when using accessories listed by Welch Allyn. Use accessories according to your facility's standards and the manufacturer's recommendations. Always refer to the manufacturer's Directions for Use.

Operating settings

The following monitor operating settings can be set at the monitor or at the Acuity Central Station:

- Patient alarm limit settings (ECG and SpO_2).
- ECG lead and scale selection
- ECG display format

Many other monitor operating settings (such as patient mode and alarms volume) can only be set at the Acuity Central Station. See "Operating settings" on page 49 for a list of all settings and where they are set.

Default settings

When the monitor connects to Acuity for a new patient, the Acuity Central Station downloads the appropriate default settings stored at Acuity. While the monitor is connected to Acuity, settings can be changed either at the monitor or at the Acuity Central Station.

If the monitor is temporarily disconnected from Acuity and the operator changes settings at the monitor, those settings are transmitted to and stored at Acuity when the monitor reconnects.

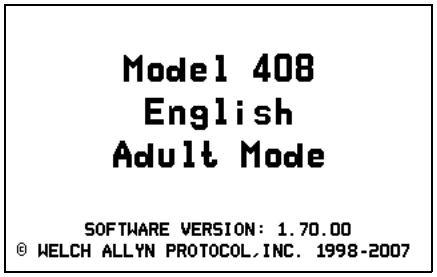
Demonstration mode

You can practice using the monitor with the Demo mode of operation, including connection to Acuity.

The Demo mode cannot be activated while you are monitoring a patient or if any cables have been plugged into the monitor. During the Demo mode, the monitor and Acuity display the message SIMULATION.

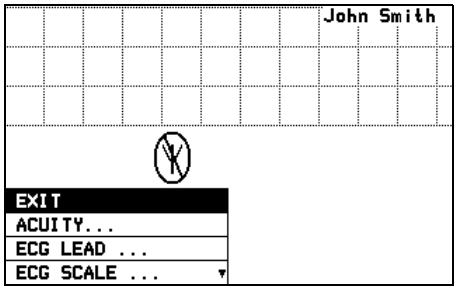
To practice with the monitor in Demo mode:

1. Disconnect all patient cables connected to the monitor.
2. Remove the battery (if installed).
3. Insert the battery and watch for the Power-Up screen.



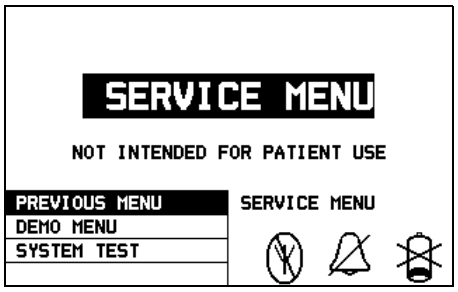
Power-Up Screen

4. After the Power-Up screen disappears, press ▼ to display the Main Menu.



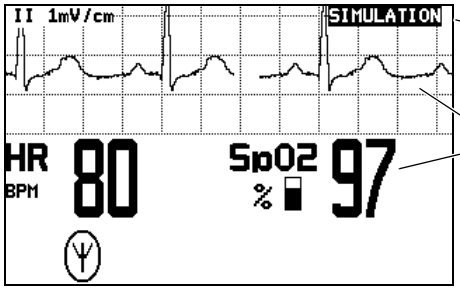
Main Menu

5. Press ▼ to highlight SERVICE MENU, then press ✓ to display the Service Menu.



Service Menu

6. Press ▼ to highlight **DEMO MENU**, then press ✓ to display the Demo Menu.
7. Press ▼ to highlight **DEMO 1** or **DEMO 2**, then press ✓ to start.



Demonstration Mode

Demo Mode Display Values and Alarm Limits			
Display	**Demo 1**	**Demo 2[a]**	**Alarm Limits (On)**
ECG Waveform	Normal sinus rhythm, normal ST	Normal sinus rhythm, normal ST	(not applicable)
ECG Heart Rate SpO_2 Pulse Rate	80	125	Lower 50 Upper 120
SpO_2 Saturation%	97	88	Lower 90 Upper 100

a. Demo 2 will cause patient alarms.

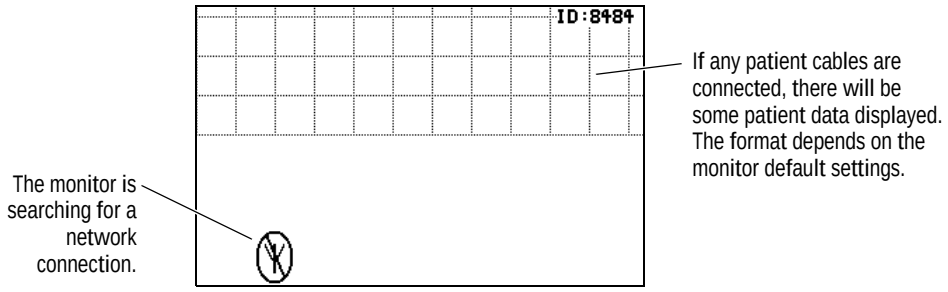
8. While in Demo mode you can practice changing settings such as ECG lead selection and alarm limit adjustment. (These changes only affect the Demo mode and are erased when you exit the Demo mode.)
9. To change to the other Demo selection, press ▼ to display the menu, then scroll down to highlight **TOGGLE DEMO MODE** and press ✓.
10. To exit the Demo mode, either insert a patient cable or remove and insert the battery. The monitor restarts and enters the normal monitoring mode.

2 Monitoring

Connect a new patient

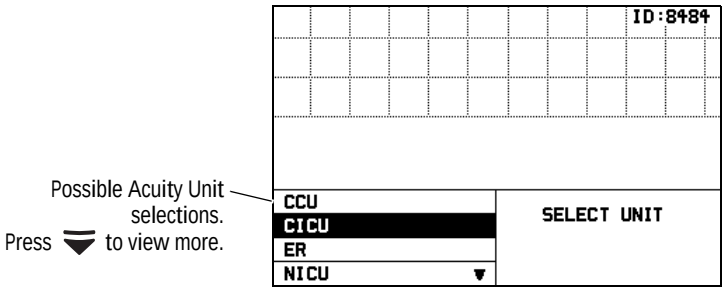
Connect to the network

1. Insert a battery into the monitor to turn it on. After a few seconds the monitor Power-Up Screen is replaced by an initial monitoring screen.



Example of Initial Monitor Screen

2. After the network connection is established, the monitor may prompt you to select an Acuity Unit (if your facility has more than one Acuity unit):



Example of Acuity Unit Selection

3. Press ▼ or ▲ to highlight the desired Acuity unit, then press ✓.

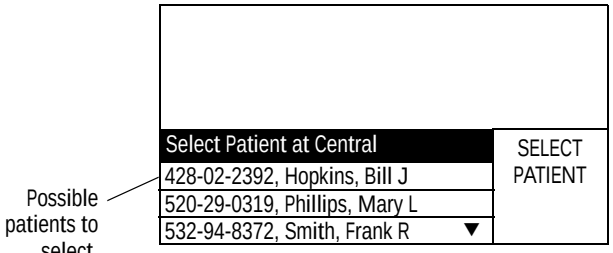
   When you press ▼ or ▲ to highlight the desired Acuity unit and then press ✓, your selection will begin to flash between normal and reverse video to confirm that the monitor is communicating your selection to Acuity. You cannot scroll to another selection during this time. The selection continues to flash until Acuity responds back to the monitor. Then the monitor displays the next appropriate screen (such as a list of possible patients). The length of time required for Acuity to respond to your selection at the monitor can vary widely depending on the amount of network traffic and other conditions.

   Be sure to select an Acuity unit. Even though the monitor is connected to the network (as indicated by the green LED and network connection symbol), the Acuity Central Station may not display any indication of this monitor until after you have selected an Acuity unit.

Network Connection Symbol

4. The monitor displays a list of possible patients.

   If your patient has been pre-admitted to the selected Acuity unit, they will be included in the list.



Example of Patient List

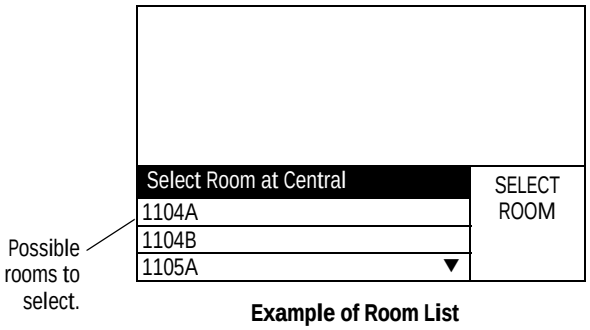
5. Scroll through the patient list to look for your patient's name.

   - If your patient is not in the list, highlight **Select Patient at Central** and press ✓. The patient name will need to be entered later at the Acuity Central Station.

WARNING If you do not select the patient name at the monitor at this time, do not adjust any alarm limits until **after** the patient name and ID are confirmed at Acuity. When the patient name and ID are confirmed at Acuity, Acuity downloads the default settings and patient alarm limits for that Acuity unit to the monitor, thereby overriding any previous settings and alarm limits.

Note At power-up, the monitor retains the most recent patient mode. The patient mode can only be changed at Acuity. If the patient is being monitored when the patient mode is changed, there is a brief interruption in the display and recording of ECG and SpO_2 patient data.

- If your patient is in the list, highlight the name and press ✓. Within a few seconds the monitor displays a list of unassigned rooms.



Example of Room List

- If you want to assign the patient to a room, highlight the room and press ✓.
- If you do not want to assign a room at this time, highlight **Select Room at Central** and press ✓. The patient room will need to be entered later at the monitor (see "Reassign a monitored patient to a new room in the same unit" on page 32) or at Acuity (see "Monitor patient at Acuity" on page 41).

6. If you need to customize alarm limits for your patient, see "Customize patient alarm limits at the monitor" on page 37.

Perform ECG monitoring

WARNING Motion artifact can cause incorrect heart rate readings. Minimize patient motion whenever possible.

WARNING If a disconnected lead is in too close proximity to other electrical devices, it may cause false heart rate readings.

WARNING The monitor does not provide internal arrhythmia analysis. Therefore, arrhythmias may cause the monitor to display inaccurate heart rates.

WARNING The monitor will show + + + for HR numerics between 301 and 350 beats per minute. Above 350 beats per minute, it may display incorrectly low heart rates, due to intermittent picking of R-waves.

WARNING Do not use the monitor in a Magnetic Resonance Imaging (MRI) suite or a hyperbaric chamber. Such use can cause fire or explosion resulting in patient injury and monitor damage.

WARNING Pacemaker signals can differ from one pacemaker to the next. The Association for Advancement of Medical Instrumentation (AAMI) cautions that "in some devices, rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. All pacemaker patients should be kept under close or constant observation." See "ECG specifications" on page 51 for disclosure of the pacemaker pulse rejection capability of this instrument.

WARNING For patients with a pacemaker, position the monitor to maintain a minimum 6-inch distance between the monitor and pacemaker. Immediately turn the monitor off and provide appropriate patient care if you have any reason to suspect that the monitor is interfering with the pacemaker. The Health Industry Manufacturers Association recommends this minimum 6-inch distance between a hand-held wireless radio and a pacemaker, which is consistent with the independent research by, and recommendations of, Wireless Technology Research.

WARNING High-intensity radio frequency (RF) energy from external sources, such as an improperly connected electrosurgical unit, can induce heat into electrodes and cables which can cause burns on the patient. Reading errors and damage to equipment may also result. This hazard can be reduced by (1) avoiding the use of small ECG electrodes, (2) selecting ECG electrode attachment points remote from the surgical site and from the electrosurgical return electrode, (3) using electrosurgical return electrodes with the largest practical contact area, and (4) assuring proper application of the electrosurgical return electrode to the patient.

WARNING Verify patient mode at Acuity. Incorrect patient mode may result in inaccurate heart rates and inappropriate alarm settings.

WARNING To help prevent injury, use the provided garment clips to route the ECG cables away from the patient's head.

WARNING Use of ECG cables with loose or faulty detachable lead wires may cause erratic behavior of the ECG waveform due to intermittent ECG lead wire connections.

WARNING To ensure patient safety, the conductive parts of the ECG electrodes (including associated connectors) and other patient-applied parts should not contact other conductive parts, including earth ground, at any time.

Caution To protect the monitor from damage during defibrillation, for accurate ECG information, and for protection against noise and other interference, use only ECG electrodes and cables specified or supplied by Welch Allyn (these cables have the required current-limiting resistors). Follow recommended application procedures.

Caution Do not use an ECG cable longer than 10 feet (3 meters). If the nominal length of the ECG cable, including extensions, exceeds this length, the monitor is not guaranteed to meet published electromagnetic compatibility (EMC) performance specifications.

- Even though the monitor contains fully isolated patient-connected circuitry, it has not been specially designed for direct application on a patient's heart.
- Use only with accessories provided or recommended in the Welch Allyn *Products and Accessories* booklet (810-0409-XX).
- Severe artifact and interference (such as defibrillation interference) can cause the waveform to move off the display for a few seconds before it is restored.

Perform 5-Lead ECG monitoring

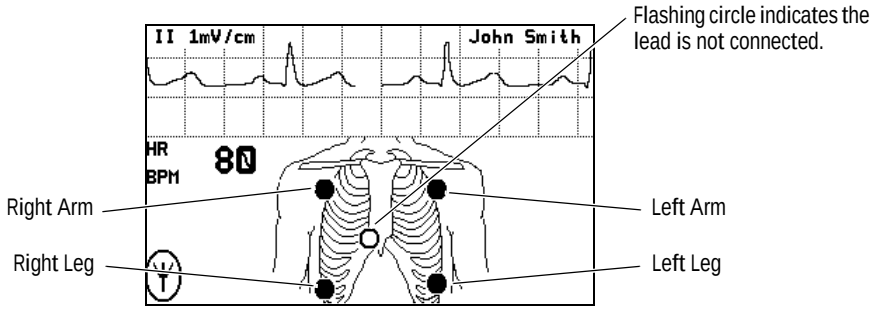
1. Inspect the ECG cable and replace it if it shows any signs of wear, breakage, or fraying. Plug the cable into the monitor.
2. Select electrode sites on the patient.

   Choose flat areas; avoid fatty or bony areas and major muscles.
3. Shave or clip hair from electrode sites, thoroughly clean skin, and lightly rub dry.

   You may use soap and water, isopropyl alcohol or special skin preparation pads. To avoid allergic reactions to electrodes, refer to the electrode manufacturer's directions.
4. If you are using pre-gelled electrodes, make sure the electrode date is not expired and the gel is intact and not dried out. For best results, use only silver/silver chloride electrodes.

   If you are using ungelled electrodes, apply a 1/4- to 1/2-inch mound of gel over the electrode contact area.

   For best product performance and measurement accuracy, do not use stainless steel needle electrodes, squeeze bulb electrodes, or electrodes with dissimilar metals. Due to polarization, such electrodes can generate offsets beyond the monitor's capabilities. Do not use electrodes from more than one manufacturer on the same patient.
5. Attach lead wires to the electrodes before applying them to the patient. Apply the electrodes to the patient in the proper locations.



If the monitor detects that some lead wires are not properly connected, the monitor displays a chest diagram and indicates which leads are disconnected.

The locations of the circles displayed on the monitor for each lead are fixed, and are not affected by the exact placement of the electrodes on the patient. For example, the C lead can be placed on the patient in any one of the V1-V6 locations desired, but will only be displayed on the monitor in the location shown above.

6. After leads are properly connected, confirm that the monitor displays the ECG waveform, heart rate, and other patient data.

   To change the ECG lead selection, press ✓ to display the Main Menu. Then press **Scroll Down** to highlight **ECG LEAD . . .** , then highlight **ECG 1** or **ECG 2** and press ✓ to change the lead.

3-Lead ECG application with the 5-Lead ECG cable

Note Be aware that there are some inherent limitations with this application, especially when compared to 5-lead ECG monitoring. These limitations include the restriction to only one displayed lead, ECG lead II. Because only one displayed lead is available (ECG lead II), factors such as a poor electrode connection at RA, LA, or LL can significantly affect performance. To overcome these limitations, the 5-lead ECG monitoring is preferred.

The monitor's 3-lead ECG monitoring is only available for use with Acuity software versions 6.1 or later.

You can perform 3-lead ECG monitoring in a similar manner as 5-lead ECG monitoring. You may use the 5-lead ECG cable with detachable electrode lead wires, and connect only the lead wires and electrodes for RA, LA, and LL. Refer to the Welch Allyn *Product and Accessories* booklet (810-0409-XX) for part numbers.

Follow these steps:

1. Perform Step 1 through Step 4 on page 23 as described for 5-lead ECG monitoring.
2. Before attaching electrodes to the patient, attach only lead wires for RA, LA, and LL to the 5-lead ECG trunk cable and to the electrodes. Make sure that lead wires for C and RL are DETACHED from the 5-lead ECG trunk cable.
3. Apply the electrodes for RA, LA, and LL to the patient in the proper locations.

   The monitor displays the chest diagram with two circles blinking confirming that the C and RL electrodes are not connected.
4. Observe the monitor and visually confirm that within about 30 seconds, the two circles disappear and the monitor displays the ECG waveform, heart rate, and other patient data.

   Be aware that if you connect the C or RL lead wires to the 5-lead ECG trunk cable and apply the C or RL electrodes to the patient, the monitor defaults to 5-lead ECG monitoring and does not enable 3-lead ECG monitoring. To enable 3-lead ECG monitoring, you must disconnect the ECG cable from the monitor for a few seconds, and then begin this procedure again.

Be aware that only ECG lead II is available for display with the monitor's 3-lead ECG monitoring. No other ECG lead selections are available.

WARNING Do not try to perform this 3-lead ECG monitoring with any 5-lead ECG cable that does not have detachable electrode lead wires as described above. Attempting to perform this procedure with a 5-lead ECG cable which has lead wires cut off or hanging loose and not connected to the patient would present a shock hazard to the patient or clinician.

3-Lead ECG application with the 3-Lead ECG cable

Note Be aware there are some inherent limitations with this application, especially when compared to 5-lead ECG monitoring. These limitations include the restriction to only one displayed lead, ECG II lead. Because only one displayed lead is available (ECG lead II), factors such as poor electrode connection at RA, LA, or LL can significantly affect performance. To overcome these limitations, the 5-lead ECG monitoring is preferred.

The monitor's 3-lead ECG monitoring is only available for use with Acuity software versions 6.1 or later.

Refer to the *Welch Allyn Product and Accessories* booklet (810-0409-XX) for part numbers.

Follow these steps:

1. Perform Step 1 through Step 4 on page 23 as described for 5-lead ECG monitoring.
2. Attach lead wires to the electrodes before applying them to a patient.
3. Apply the electrodes for RA, LA, and LL to the patient at the proper locations. If the monitor detects one of the lead wires is not properly connected, it will display a chest diagram indicating which lead is disconnected.
4. Observe the monitor and visually confirm it displays the ECG waveform, heart rate, and other patient data.

   Be aware that only ECG lead II is available for display with the monitor's 3-lead monitoring. No other ECG lead selections are available. The monitor will not detect the presence of a 3-lead cable until two or more of its leads are connected to the patient.

3-Lead ECG application with the 3-Lead ECG cable and cable extension

This combination functions the same way as the 3-lead ECG application with the 5-lead cable. For electromagnetic compatibility (EMC) reasons, do not use an ECG cable and extension cable length of more than approximately 10 feet total.

Perform SpO_2 monitoring

WARNING Oxygen saturation measurements using pulse oximetry are highly dependent on proper placement of the sensor and patient conditions. Patient conditions such as shivering and smoke inhalation may result in erroneous oxygen saturation readings. If pulse oximetry measurements are suspect, verify the reading using another clinically accepted measurement method, such as arterial blood gas measurements on a co-oximeter.

WARNING Use only accessories as listed in the Welch Allyn *Products and Accessories* booklet (810-0409-XX). Use only Masimo accessories and sensors with the Masimo SpO_2 option. Use only Nellcor accessories and sensors with the Nellcor SpO_2 option. The monitor will only meet the listed specifications when using accessories listed by Welch Allyn.

WARNING Use of Masimo LNOP® sensors/cables will not provide protection in accordance with IEC defibrillation standards when used with this device.

WARNING Tissue damage can be caused by incorrect application or use of a sensor (e.g., wrapping the sensor too tightly, applying supplemental tape, failing to periodically inspect the sensor site, leaving a sensor on too long in one place). Refer to the Directions for Use provided with each sensor for specific instructions on application and use, and for description, warnings, cautions, and specifications.

WARNING Sensors exposed to ambient light while not applied to a patient can exhibit semi-normal saturation readings. Be sure the sensor is securely placed on the patient and check its application often to ensure accurate readings.

WARNING Inaccurate measurements may be caused by venous pulsations.

WARNING The pulse oximeter can be used during defibrillation, but the readings may be inaccurate for a short time.

WARNING The pulse oximeter should NOT be used as an apnea monitor.

WARNING A very sudden and substantial change in pulse rate can result in erroneous pulse rate readings. Be sure to validate the patient data and patient condition before intervention or change in patient care.

WARNING Interfering Substances: Carboxyhemoglobin may erroneously increase readings; the level of increase is approximately equal to the amount of carboxyhemoglobin present. Methemoglobin may also cause erroneous readings. Dyes, or any substances containing dyes, that change usual arterial pigmentation may cause erroneous readings.

1. Attach the SpO_2 sensor to the patient according to the manufacturer's directions for use, observing all warnings and cautions.

   Each SpO_2 sensor is designed for application to a specific site on the patient within a certain size range. To obtain optimal performance, use an appropriate sensor and apply it as described in the sensor's directions for use.

   If excessive ambient light is present, cover the sensor site with opaque material to block the light. Failure to do so may result in inaccurate measurements. Light sources that can affect performance include surgical lights (especially those with a xenon light source), bilirubin lamps, fluorescent lights, infrared heating lamps, and direct sunlight.

   If NIBP will be monitored while using SpO_2, place the NIBP cuff on a different limb than the SpO_2 sensor to help reduce unnecessary SpO_2 alarms. For optimal measurements, avoid placing the SpO_2 sensor on the same limb as an arterial catheter or intravascular line.

   Loss of pulse signal can occur if the sensor is too tight, there is excessive ambient light, an NIBP cuff is inflated on the same limb as the sensor, there is arterial occlusion proximal to the sensor, the patient is in cardiac arrest or shock, or the patient has hypotension, severe vasoconstriction, severe anemia, or hypothermia.

2. Inspect the SpO_2 cable. Replace it if it shows any signs of wear, breakage, or fraying. Plug the cable into the sensor and the monitor.

3. After the cable is connected, confirm that the monitor displays SpO_2 data within a few seconds.

4. If excessive patient movement interferes with measurements, consider the following possible solutions:

   - be sure the sensor is secure and properly applied
   - use a new sensor with fresh adhesive backing
   - select a different type of sensor
   - move the sensor to a less active site

   The SpO_2 system is designed to work satisfactorily during normal patient motion.

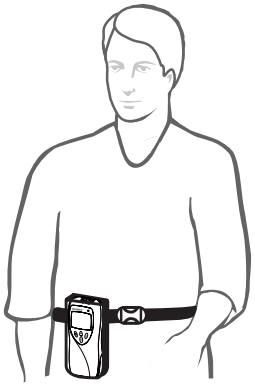
Install the carrying pouch

WARNING As with all medical equipment, carefully route the patient cabling to reduce the possibility of patient entanglement or strangulation. Use the supplied garment clips to secure the cable properly.

WARNING When positioning the monitor pouch on the patient, make sure the straps do not entangle the patient's neck or cause choking. Make sure the straps do not restrict the movement of the patient's limbs or create a hazard when walking or moving.

Adult carrying pouch

The Adult Carrying Pouch is intended for ambulatory adult patients. It is not intended for use while the patient is in bed.

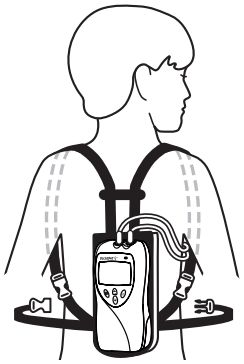


1. Put the carrying pouch on the patient and insert the monitor.
2. Carefully arrange the pouch and monitor on the patient to avoid bruising or other skin injuries.

   To maximize the monitor's wireless transmission range, always make sure that the monitor display is facing out and away from the patient's body.

Pediatric carrying pouch

The Pediatric Carrying Pouch is intended for ambulatory pediatric patients (40 to 80 lbs., 18 to 36 kg.). It is not intended for use while the patient is in bed.



1. Insert the monitor into the pouch.
2. Carefully arrange the pouch and the monitor on the patient to avoid bruising or other skin injuries.

   To maximize the monitor's wireless transmission range, always make sure that the monitor display is facing out and away from the patient's body.

Monitor a patient out of range of Acuity

While out of range of Acuity, the monitor continues to monitor the patient and provide local HR/PR and SpO2 alarms or alerts at the monitor as needed.

When the patient wearing the monitor goes out of range of Acuity, do the following:

1. A DROPOUT equipment alert occurs at the Acuity Central Station. Acknowledge the alert at Acuity.
2. An equipment alert occurs at the monitor with this message:

   ACUITY CONNECTION LOST

   Depending on how the monitor is configured (as controlled by Acuity), this alert can also cause the monitor to emit audible alert tones.

   If tones are enabled, the authorized person should press ✓ on the monitor to acknowledge (dismiss) the alert and silence this instance of the alert tone.

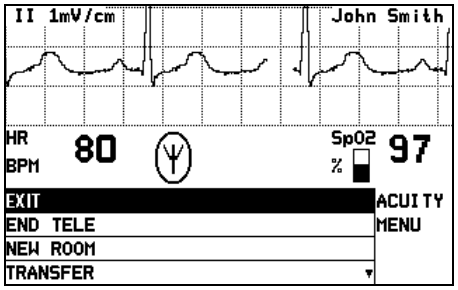
Note The person authorized to press ✓ to acknowledge the alert may vary, depending on the local protocol. Follow the protocol established by your institution.

When the patient returns within range of Acuity, the monitor automatically reconnects to Acuity. No clinician intervention is required.

Stop monitoring a patient

If you want to discontinue monitoring the patient, follow these steps.

1. Press ▼ to display the **Main Menu**.
2. Press ▼ to highlight **ACUITY**, then press ✓.



Acuity Menu

3. Press ▼ to highlight **END TELE**, then press ✓.
4. When the monitor displays the message SAFE TO REMOVE BATTERY, remove the battery.

   If the battery is not removed within 30 seconds, the monitor will automatically try to reconnect to the network.
5. Disconnect the leads and sensors from the patient.

Note If you do not use END TELE to disconnect from the network as described above, the Acuity Central Station generates a DROPOUT equipment alert at Acuity.

If you want to monitor this same patient at a later time, you will need to reselect the patient name from the monitor or confirm the patient ID at Acuity.

Reconnect a recently monitored patient

1. Insert a battery into the monitor to turn on the monitor. Confirm that after a few seconds the monitor Power-Up Screen is replaced by the initial monitoring screen.
2. The monitor will then present a series of menus and messages requesting you to provide information about the connection and patient. The actual screens presented depend on how long the patient has been disconnected. Provide the information as requested. This may include:
   - Select an Acuity unit.
   - Select a patient from the patient list.
   - Select a patient room from the room list.

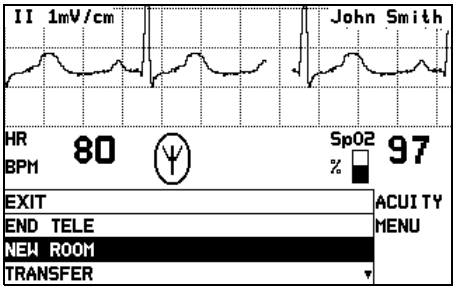
Note If you do not select the patient name or room while connecting the patient, you will need to do that later at the Acuity Central Station. See “Monitor patient at Acuity” on page 41 for more information.

- To perform ECG monitoring, see “Perform ECG monitoring” on page 21.
- To perform SpO_2 monitoring, see “Perform SpO2 monitoring” on page 26.

Reassign a monitored patient to a new room in the same unit

If a patient is being monitored and you want to assign them to a new room in the same unit, follow these steps.

1. Press ▼ to display the Main Menu.
2. Press ▼ again to highlight **ACUITY** and press ✓ to display the Acuity Menu screen.
3. Press ▼ to highlight **NEW ROOM**, then press ✓.



New Room Selection

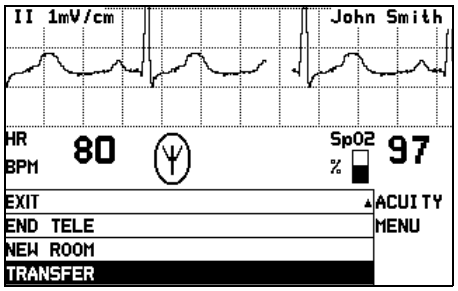
Within a few seconds the monitor displays a list of all available rooms, including the patient's current room.

- If you decide not to change the patient's current room assignment, press ✓ (the patient's current room is the default selection in the list).
- To assign the patient to a new room, highlight the room and press ✓.
- If you want to cancel the patient's current room assignment, but do not want to assign a new room at this time, you can highlight **Select Room at Central** and press ✓. You can then assign the room later from the Acuity Central Station, or you can repeat this procedure and assign a new room from the monitor.

Transfer a monitored patient to a new room in a different unit

If a patient is being monitored and you want to assign them to a new room in a different unit, follow these steps.

1. Press ▼ to display the Main Menu.
2. Press ▼ again to highlight **ACUITY** and press ✓ to display the Acuity Menu screen.
3. Press ▼ to highlight **TRANSFER**, then press ✓.



Transfer a Patient

Within a few seconds the monitor displays a list of units.

4. Press ▼ to highlight the new unit, then press ✓.

   The patient is not monitored at Acuity during the short time required by Acuity to process the transfer to the new unit (typically less than one minute). However, the patient continues to be monitored by the monitor.

   (If the selected unit is currently not available, the monitor displays an appropriate message; press ✓ to acknowledge the message and cancel the transfer.)

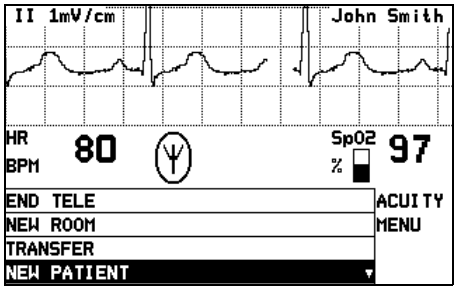
5. After the patient is assigned to the new unit, the monitor displays a list of unassigned rooms. (The patient's previous unit and room assignment is cancelled.)

   - To assign the patient to a new room, highlight the room and press ✓.
   - If you decide not to assign the patient to a new room at this time, you can highlight **Select Room at Central** and press ✓. You can then assign the room later from the Acuity Central Station, or you can assign a new room from the monitor later using the procedure on "Reassign a monitored patient to a new room in the same unit" on page 32.

Reassign the monitor to a new patient

If you want to discontinue monitoring a patient and reconnect the monitor to a new patient, follow these steps.

1. Press ▼ to display the Main Menu.
2. Press ▼ again to highlight **ACUITY** and press ✓ to display the Acuity Menu screen.
3. Press ▼ to highlight **NEW PATIENT**, then press ✓.



Select a New Patient

The monitor then presents a series of menus and messages requesting you to provide information about the connection and patient. The actual screens presented depend on how the Acuity System is configured.

Provide the information as requested. This may include:

- Select an Acuity unit.
- Select a patient from the patient list. (After you select a new patient, all monitor operating settings are reset to the Acuity System default power-up settings.)
- Select a patient room from the room list.

If you do not select the patient name or room while connecting the patient, you will need to do that later at the Acuity Central Station. See "Monitor patient at Acuity" on page 41 for more information.

- To perform ECG monitoring, see "Perform ECG monitoring" on page 21.
- To perform SpO_2 monitoring, see "Perform SpO2 monitoring" on page 26.