IntelliVue MX40

Installation and Service

Release C.01x

PHILIPS

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The 865350 device complies with Part 95 sub-part H of the FCC Rules. Operation of 865350 equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service. This device complies with part 95 of the FCC rules.

The 865351 and 865352 devices comply with Part 15 of the FCC Rules only. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation.

Changes and modifications not expressly approved by Philips Medical Systems can void your authority to operate this equipment under Federal Communications Commission's rules

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It is recommended that customers have policies and procedures for the proper handling of personal or sensitive information, ePHI (electronic protected health information) and PHI (protected health information), which will maintain the confidentiality, integrity, and the availability of these types of data. Any organization using this product should implement the required protective means necessary to safeguard personal information consistent with each applicable country law, code and regulation; and consistent with their developed and maintained internal policies and procedures.

While handling personal information is outside the scope of this document; in general, each organization is responsible for identifying:

- Who has access to personal data and under what conditions an individual has authorization to use that data.
- What security controls are in place to protect personal and sensitive data.

- How the data is stored and the conditions by which it is stored.
- How the data is transmitted and the conditions under which that data is transmitted.

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Compliance

Uses of the system for purposes other than those intended and expressly stated by the manufacturer, as well as incorrect use, incorrect operation, or modifications made to the system without explicit approval from Philips, may relieve the manufacturer (or his agent) from all or some responsibilities for resultant noncompliance, damage, or injury.

Information Center Product Name

As of Release C.02, the IntelliVue Information Center (also known as IIC iX) is called patient Information Center iX, or PIC iX. However, any references to IIC iX are considered equivalent to PIC iX.

Printing History

New editions of this document will incorporate all material updated since the previous edition. Update packages may be issued between editions and contain replacement and additional pages to be merged by a revision date at the bottom of the page. Note that pages which are rearranged due to changes on a previous page are not considered revised.

The documentation printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The document part number changes when extensive technical changes are incorporated.

Second Edition..... May 2022

Document Conventions

In this guide:

Warnings

Warning

A Warning alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.

Cautions

Caution

A Caution alerts you to where special care is necessary for the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury or damage to the product or other property, and possibly in a remote risk of more serious injury.

Notes

A Note contains additional information on the product's usage.

Contents

1. Introduction

The IntelliVue MX40 is a wearable patient monitor. It is designed to support ambulatory patients for continuous ECG and optionally, SpO_2 and impedance respiration. The short-range radio option allows connection to the IntelliVue Cableless Measurements or an IntelliVue patient monitor for additional parameters. The display on the MX40 also provides immediate access to patient information at the point of care.

Network Connectivity

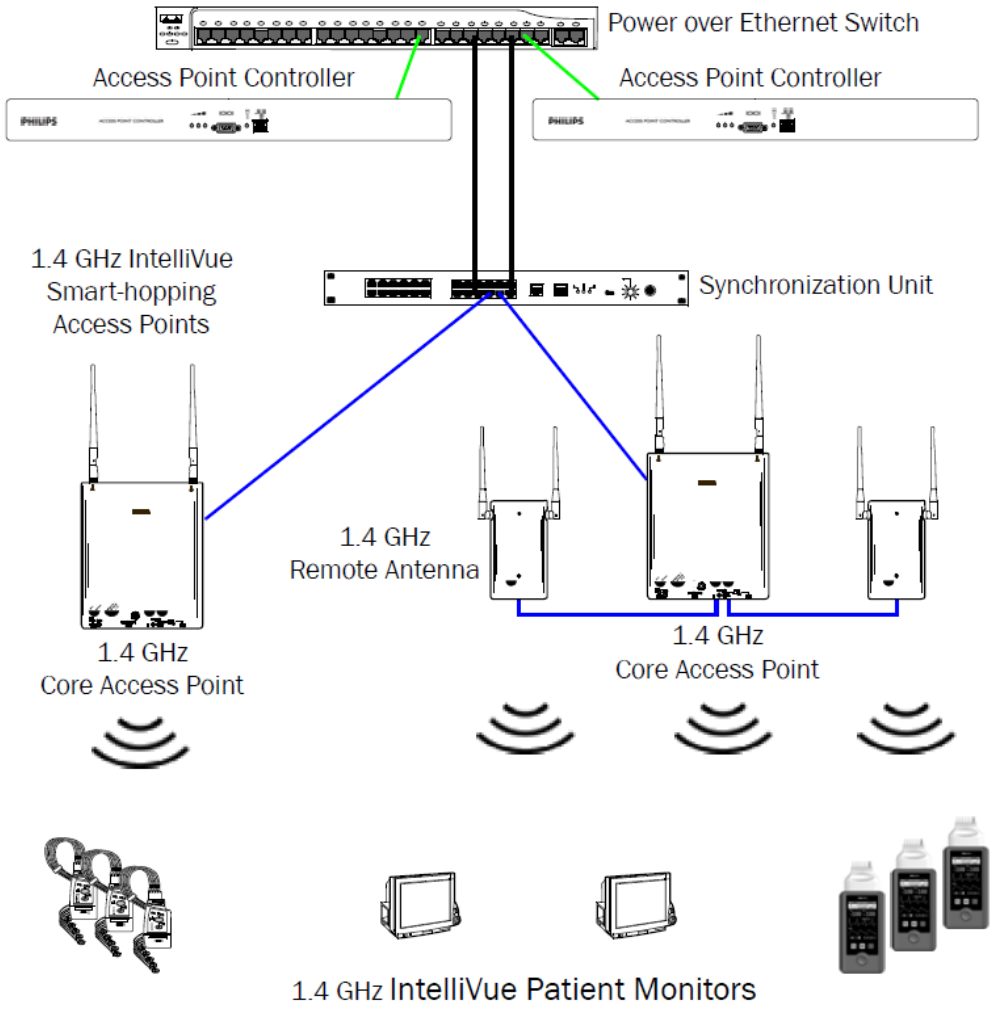
The MX40 provides a choice of network connectivity options – IntelliVue Smart-hopping or 802.11 a/b/g/n. Each device version can only operate on the specified network and maintains operation only on the approved RF frequencies for the device and network. The following table shows the MX40 version and associated network connectivity:

MX40 Version	Supported Network Connectivity
865350	IntelliVue MX40 1.4 GHz Smart-hopping
865351	IntelliVue MX40 2.4 GHz Smart-hopping
865352	IntelliVue MX40 802.11 a/b/g/n 2.4 GHz or 5 GHz bands as part of Philips IntelliVue Clinical Network (ICN) specification.

Note — For information about the WLAN version of the MX40 and its operation on customer supplied network infrastructure, see Chapter 9.

Network Components

The IntelliVue Smart-hopping wireless network is comprised of the following devices and components:



2. Installation

This section provides compatibility and configuration information for reference during MX40 installation. For clinical configuration information, see the MX40 Configuration Guide, p/n 4535 643 44071.

MX40 Release C.01 Compatibility

IntelliVue Information Center

The MX40 (865350/865351) is compatible for use with IntelliVue Information Center Release N/N.01 only. Release L and M are not supported.

The MX40 (865352) is not compatible with IntelliVue Information Center Release N or earlier.

Patient Information Center iX

The MX40 (865350/865351/865352) with ECG only or optional FAST SpO2 remains compatible with IntelliVue Information Center iX Release A.02.08 or latest release.

The MX40 (865350/865351/865352) with optional Masimo SET technology is compatible for use with IntelliVue Information Center iX Release B.02.15 or latest release.

Note— 865350 and 865351 Smart-hopping devices operate on Smart-hopping Network infrastructure only. 865352 WLAN devices operate on 802.11 wireless network infrastructure only.

MX40 Short-range Radio

The MX40 (865350/865351) is compatible for use with IntelliVue Patient Monitors Release G or latest release when wirelessly connected via Short-range radio.

The MX40 (865352) is compatible for use with IntelliVue Patient Monitors Release J or latest release when wirelessly connected via Short-range radio.

The MX40 is compatible for use with IntelliVue Cableless Measurements Release C.0 or latest release.

MX40 and Smart-hopping Infrastructure

The MX40 (865350/865351) is compatible for use with Access Point Controller 862147, Release B.00.19 or latest release and Access Point Controller 865346, Release C.00.04 or latest release.

MX40 Patient Cable

The MX40 Patient Cables are compatible for use with the X2, X3, MMS, and MMX IntelliVue Patient Monitor platforms.

Wireless Network Configuration

MX40 865350 and 865351 (Smart-hopping)

For the Smart-hopping MX40s (865350, 865351), wireless network configuration happens as a part of the equipment label assignment procedure. The MX40s are shipped from the factory with an Equipment Label of "NEW_DEVICE" and an RF Access Code of "0". This allows basic wireless connectivity to any Smart-hopping Access Point. After the MX40 has basic connectivity to the Smart-hopping network, the "Label Assignment" procedure can be performed at the Information Center. The "Label Assignment" procedure configures the RF Access Code and Equipment Label into the MX40 without the need for any additional tools.

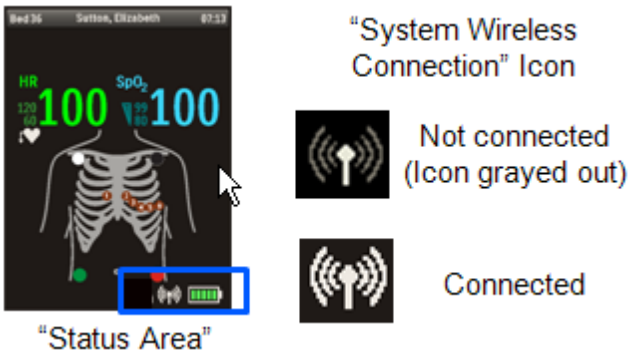
MX40 865352 (802.11 a/b/g/n)

For the 802.11 a/b/g/n MX40s (865352), wireless network configuration must be completed before the equipment label assignment procedure can be performed. The WLAN configuration is done using the IntelliVue Support Tool – Mark2. See Chapter 9 of this document and also the IntelliVue Support Tool Instructions for Use for details.

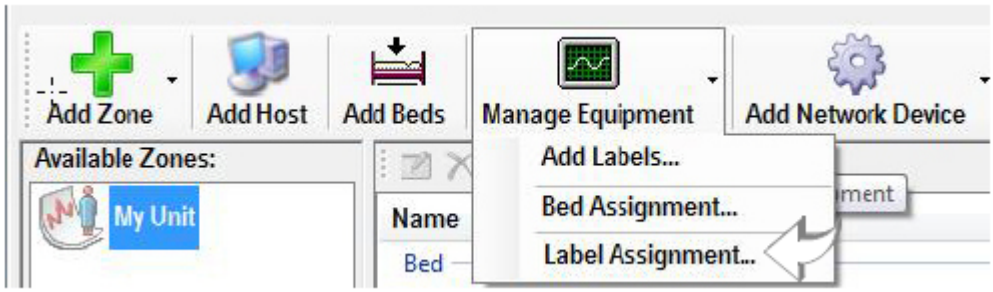
Assigning an Equipment Label - IIC iX

➢ *To assign an equipment label to a device:*

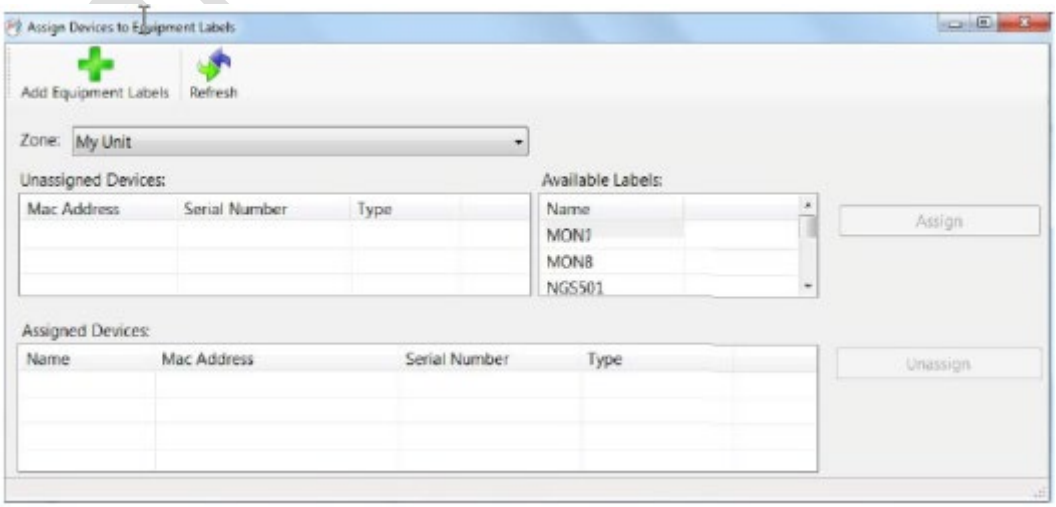
1. Insert battery power into the MX40 and if attached, disconnect the patient cable.
2. Confirm the connection to the wireless network as follows:



3. Go to **Manage Equipment** > **Label Assignment**.



The **Assign Devices to Equipment Labels** dialog window opens.

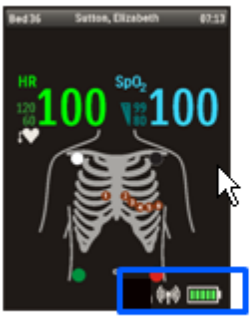


4. Click the desired label in the **Available Labels** list, then click the desired **Unassigned Device**.
5. Click the **Assign** button.
6. When prompted, press **Confirm** on the MX40 to accept the assignment.
7. On the MX40, wait for the New_Device label to change to the selected equipment label.
8. Confirm the label assignment by viewing the waveform in the Patient Sector at the Information Center iX.

Assigning an Equipment Label - IIC

➢ *To assign an equipment label to a device:*

1. Select **All Controls** > **Label Assignment**.
2. Enter password (tele)
3. Insert battery power into the MX40 and if attached, disconnect the patient cable.
4. Select **Refresh**.
5. Confirm the connection to the wireless network as follows:



"System Wireless Connection" Icon

Not connected (Icon grayed out)

Connected

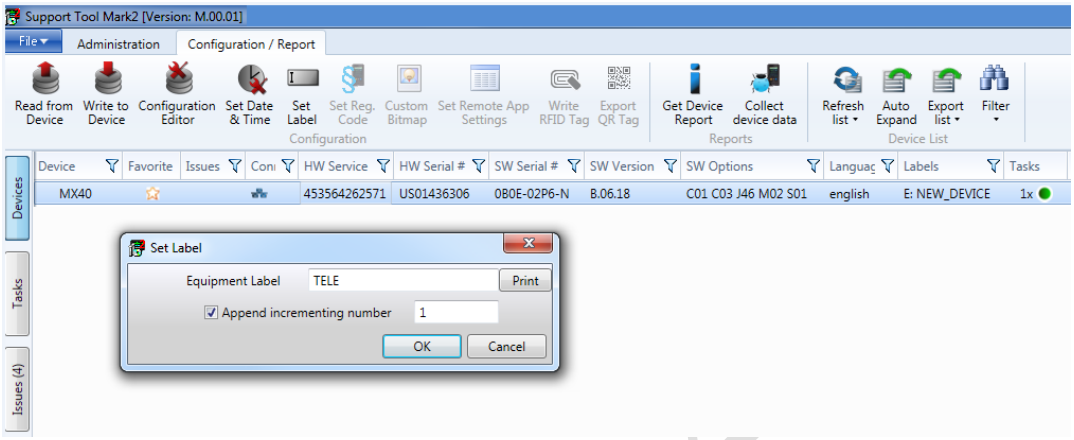
6. Select the MAC address of the device from the **New Devices** list. If the address does not appear, remove battery power and re-insert. Select **Refresh**.

Note — The MAC address appears on the rear label of the MX40.

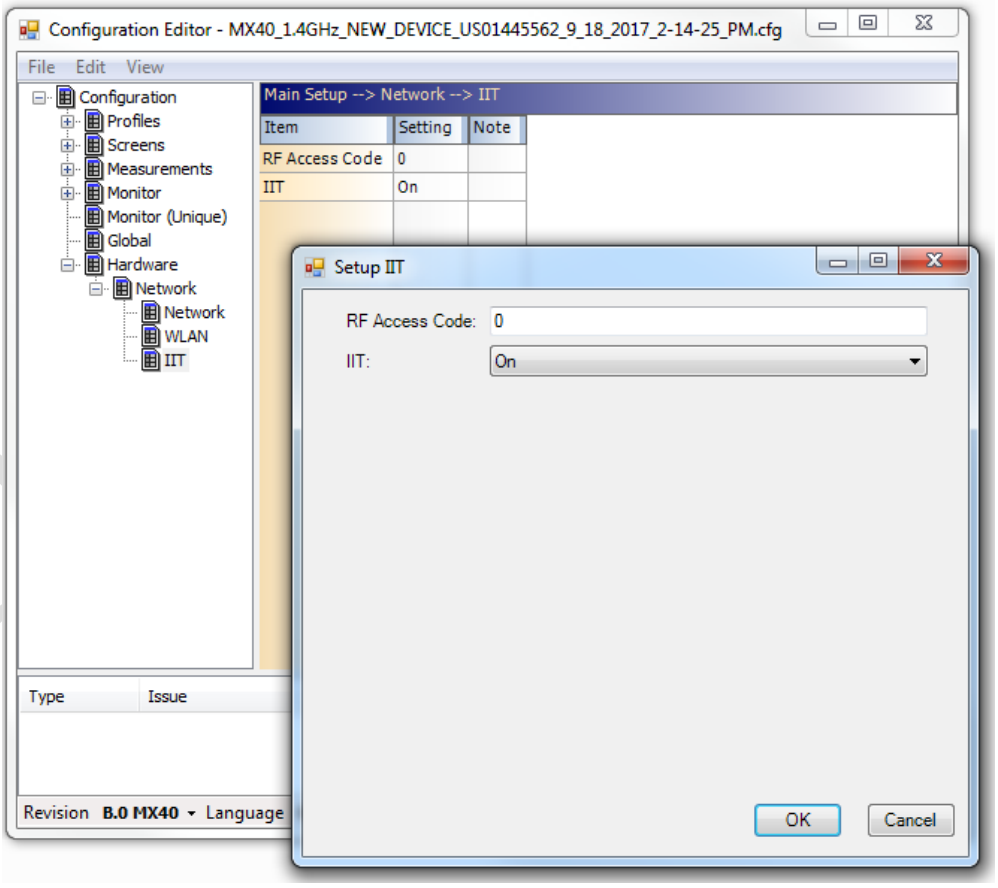
7. Select the desired equipment label from the Equipment Label list.
8. Select Assign Label to initiate programming of the equipment label and RF Access Code into the MX40.
9. When prompted, press Confirm on the MX40 to accept the assignment. The confirmation must occur within 30 seconds of the prompt.
10. On the MX40, wait for the New_Device label to change to the selected equipment label.
11. Confirm the label assignment by viewing the waveform in the Patient Sector at the Information Center.

Assigning an Equipment Label – IntelliVue Support Tool Mark 2

Equipment labels may also be assigned using the IntelliVue Support Tool Mark 2.



For Smart-hopping devices, the RF Access Code may also be configured using the IntelliVue Support Tool Mark 2.



Equipment Label Character Limitations

Equipment labels are limited to a maximum of 10 bytes. If the equipment label exceeds the 10 byte maximum, the label assignment process will fail.

- UTF-8 encoded characters may use 1-4 bytes depending on the language. (http://en.wikipedia.org/wiki/UTF-8)
- The first 128 Unicode characters (which corresponds directly to the ASCII character set) take only 1 byte.
  - Example: Tele1 (English) is 5 bytes long.
- If you use special characters, more bytes are required.

Refer to the table below for character limit information:

Language	Bytes per Character	Special Characters Tested
Chinese(Simplified)	3	说汉语
Chinese(Traditional)	3	???
Czech	2	ťůýžáčďéěíň
Danish	2	åæéø
Dutch	2	éëïóöü
English	1	
Finnish	2	äåö
French	2	äåöùûüÿâçéèêëïôœ
German	2	äöüß
Greek	2	ΑαΒβΓγΔδΕεΖζΗηΘθΙιΚκΛλΜμΝνΞξΟοΠπΡρΣσςΤτΥυΦφΧχΨψΩω
Hungarian	2	áéíöóőúű
Italian	2	àèéòóù
Japanese	3	下かうう
Norwegian	2	åæâéèêøóòô
Polish	2	ąćęłńóśźż
Portuguese	2	úüãáâàçéêíõóô
Romania	2	ăâîşşţţ
Russian	2	ёяшертыуиопющъэасдфгчйкльжзхцвбнм
Spanish	2	áéíñóúü¡
Swedish	2	äåéö

Clinical Configuration

Most of the clinical configuration of the MX40 is done in the Information Center; however, several parameters can only be changed through the user interface at the MX40. These parameters are covered in Chapter 4 – Configuration Mode.

It is also possible to copy the clinical configuration from one MX40 to another one using the IntelliVue Support Tool – Mark2. See the IntelliVue Support Tool Instructions for Use for details.

Frequency Management and Channel Selection

Management of the RF environment in a facility is important to the overall performance of any wireless system. Philips cannot control what wireless devices are used in a hospital, but Philips or an authorized service provider will work with the hospital to select the best frequencies to use in order to avoid interference with other wireless devices used within the hospital.

Frequency Management

Frequency management is the selection of frequencies for wireless devices within a facility to prevent interference between devices.

Frequency Management Responsibility

Frequency management is the responsibility of the hospital. Philips has no control over the RF environment in a hospital. If interference exists at the operating frequencies, system performance will be affected. Careful selection of frequencies for all wireless devices used within a hospital is important to prevent interference between them.

Channel Selection

The MX40 has two radios – a wireless network radio (865350–1.4 GHz Smart-hopping, 865351-2.4 GHz Smart-hopping or 865352–802.11 a/b/g) and a short-range radio (optional).

Channel selection for each product (865350, 865351, 865352) is different, therefore they will be discussed separately.

- A "clear" short range radio channel is defined as having a power level < -80dBm.
- A "clear" Smart-hopping channel is defined as having a power level < -90dBm.

865350 - Channel Selection

WMTS (1.4 GHz) Smart-hopping Channel Selection

The MX40 (865350) operates in the FCC-allocated, protected Wireless Medical Telemetry Service (WMTS) in the 1395-1400 and 1427-1432 MHz bands.

Note — Per U.S. Federal Communications Commission (FCC) rules (Section 95.1111), operation of WMTS equipment requires device registration with an authorized Frequency Coordinator designated by the FCC before the equipment is commissioned. The American Society for Healthcare Engineering (ASHE) is the current designated Frequency Coordinator.

The Smart-hopping channels that can be used, will be determined by this coordination process. A minimum of three Smart-hopping channels is required for proper operation of the system, but using more channels will improve performance. Smart-hopping channels are configured in the Access Point Controller.

Frequency Coordination (USA, WMTS only)

Frequency coordination is a registration and coordination process for wireless medical telemetry devices used in the U.S.A. which operate in the FCC-allocated, protected Wireless Medical Telemetry Service (WMTS) bands (608-614 MHz, 1395-1400 MHz, 1427-1432 MHz).

Registration/Coordination is a two-step process.

Step 1: Registration of Facility: The healthcare facility must first register with ASHE. This is a lifetime, one-time application per facility. Facility registration confirmation must be received before proceeding to the next step, Registration of Devices and Frequency Coordination.

Some helpful links:
For general WMTS information: http://www.ashe.org/wmts/index.shtml

For a WMTS guide with registration instructions:

http://comsearch.com/products/online-tools/wmts-frequency-coordination/

Facility Registration: https://www.wmtssearch.com/wmts/controller and select "Secure a WMTS Account Now"

Step 2: Registration of Devices and Frequency Coordination: After confirmation of registration, frequency coordination can begin. This step involves logging the equipment and frequencies used into the FCC's database, so as to identify any existing potential interference and to help prevent potential future interference. Frequency coordination is accomplished via the ASHE website provided above. The way the frequency coordination process is executed as of today, it will need to be repeated twice; once for 1395-1400 MHz band, and then again for the 1427-1432 MHz band, both of which are used concurrently by the Philips product. There is a separate fee for each coordination request. A certificate for each frequency band is issued.

To fill in the frequency coordination forms, you'll need to know the following:

- The Frequency Range to be used: Two separate coordination submissions are required: For the first one, click on the range of 1395.0 through 1400.0 MHz. completed the registration. Then you will need to go through the process again for the second frequency band. For the second one, click on all the frequency ranges listed in the range of 1427.0 through 1432.0 MHz.
- The name/s of the Clinical Unit/s using the devices (e.g. ICU4, CCU-West, ER1, Step-Down North, etc.)
- Latitude and longitude that represents the center of the area where the transmitting devices will be deployed. Comsearch can help provide this information; www.comsearch.com. Google Earth is an excellent site to use for this information.
- County
- The radius of deployment, expressed in meters. The radius can be determined by drawing an imaginary circle around the center of the clinical unit that encloses/encompasses the unit.
- The number of the highest floor on which a transmitting device will operate.
- The number of transmitting devices will be used, i.e. the total number of MX40 devices, Access Points and Remote Antennas, etc. combined. For example: 12 MX40 and 15 AP – would translate to 27 devices MX40 C/D (selection on Database)
- The Effective Radiating Power: 6.3 mW. (This will be automatically filled in once the device is selected)
- The Equipment Manufacturer: Philips Medical Systems.
- The Equipment Models: MX40, etc. current devices are registered as C/D version (A/B is for the older APs)

After completing the device registration and frequency coordination, a WMTS Coordination Certificate is issued.

Important — Within 30 days, the installation date must be updated in the WMTS registration system. The installation date cannot precede the certificate date.

1.4GHz Smart-hopping Channel Definition

1.4GHz Smart-hopping Channel Definition - Standard

Primary	Low	Center	High
Channel 1:	1395.0977MHz	1395.8977MHz	1396.6977MHz
Channel 2:	1396.6970MHz	1397.4970MHz	1398.2970MHz

Primary	Low	Center	High
Channel 3:	1398.2963MHz	1399.0963MHz	1399.8963MHz
Channel 4:	1427.0979MHz	1427.8979MHz	1428.6979MHz
Secondary	**Low**	**Center**	**High**
*Channel 5:	1428.6972MHz	1429.4972MHz	1430.2972MHz
*Channel 6:	1430.2965MHz	1431.0965MHz	1431.8965MHz

1.4GHz Smart-hopping Channel Definition - Carved-out Areas*

Primary	Low	Center	High
Channel 1:	1395.0977MHz	1395.8977MHz	1396.6977MHz
Channel 2:	1396.6970MHz	1397.4970MHz	1398.2970MHz
Channel 3:	1398.2963MHz	1399.0963MHz	1399.8963MHz
Channel 4a:	1429.4410MHz	1430.2410MHz	1431.0410MHz
Secondary	**Low**	**Center**	**High**
*Channel 4:	1427.0979MHz	1427.8979MHz	1428.6979MHz

*Carved-out areas apply to:

Location	Counties
Pittsburgh, PA	Allegheny, Beaver, Butler, Washington, Westmoreland
Washington, DC	Arlington, Fairfax, Loudoun, Prince William, Montgomery, Charles, Prince George's, and Fauquier counties; cities of Alexandria, Fairfax, Falls Church, Manassas, Manassas Park and the District of Columbia
Richmond - Norfolk, VA	Chesterfield, Goochland, Hanover, Henrico, Powhatan, Charles City, Dinwiddie, Isle of Wight, James City, New Kent, Prince George, Southhampton, Surrey, Sussex, and York counties; cities of Richmond, Norfolk, Newport News, Hampton, Virginia Beach, Chesapeake, Portsmouth, Suffolk, Colonial Heights, Franklin, Hopewell, Petersburg, Poquoson, and Williamsburg
Austin - Georgetown, TX	Williamson and Travis
Battle Creek, MI	Calhoun
Detroit, MI	Oakland, Wayne, Washtenaw, Macomb, Livingston
Spokane, WA	Spokane, WA and Kootenia, ID

865350 - Short-range Radio (SRR) Channel Selection

SRR with Cableless Measurements (Telemetry Use Model) – The SRR channels are configured in the Information Center. Configure 2-4 channels as "High" and the rest "Off". The MX40 will select the best channel to use from those channels configured as "High".

SRR with IntelliVue monitor (Bedside Use Model – WTAAP) – One SRR channel is configured in the bedside monitor. This is the channel the bedside will use to communicate with the MX40 and any Cableless Measurement pods. Select the best channel based on the interference level at the location where the bedside will be used.

Warning

The Short-range radio operates in the 2.4 GHz band. Short-range radio connections are subject to interruption due to interference from other radio sources in the vicinity, including microwaves, Bluetooth devices, and DECT phones. The most likely interference will come from 802.11b, g wireless LANs.

In order to reduce the chances of interference, the Short Range Radio channels should be chosen to operate at frequencies that avoid any 802.11 b/g channels that are in use in the hospital.

In order to assist with this, recommendations for SRR channels based on possible 802.11 b/g WLAN channel deployments in the 2.4 GHz band are given in the table below.

For example, if the hospital has an 802.11 deployment using 802.11 channels 1, 6, and 11, using the table below, short-range radio channels 25, 26, 15, and 20 are recommended. Using the diagram below to illustrate, SRR channel 15 operates between 802.11 channels 1 and 6, SRR channel 20 operates between 802.11 channels 6 and 11 and SRR channels 25 and 26 operate above 802.11 channel 11, thus minimizing interference with the WLAN that is deployed.

The table below also lists some short-range radio channels that may be used if a frequency survey is performed and a power level check is done to ensure that the frequency is "clear" (has a power level < -80dBm).

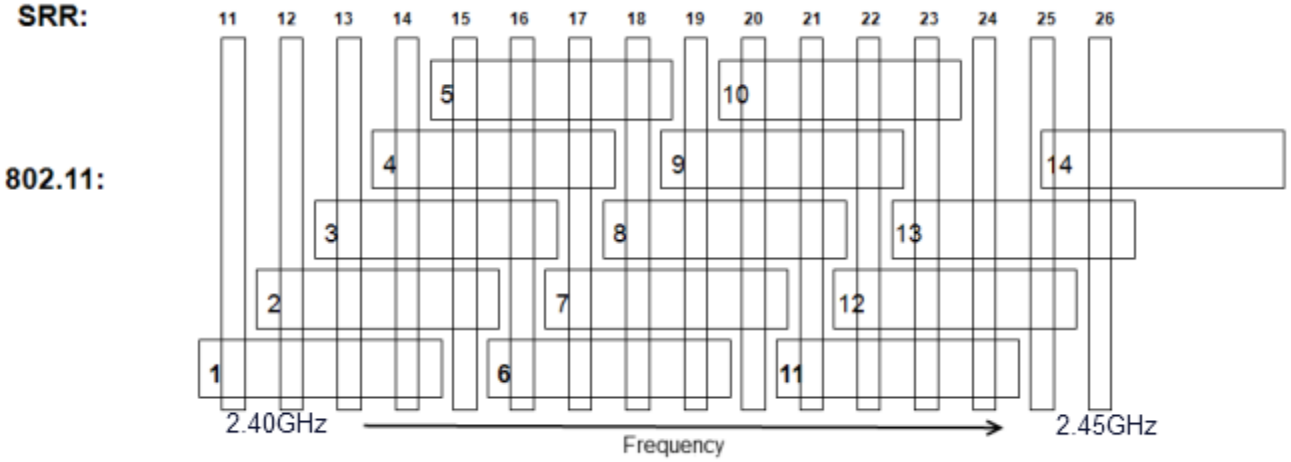
Note — Channel overlap as shown in the diagram below is not totally accurate. There is not sufficient resolution to pick channels solely by using this diagram. Use it in conjunction with the table provided.

SRR Channel Recommendations for 865350 Installations.

802.11 b/g Channel Deployment	Short-range Radio Channel Recommendations
1, 6, 11	25, 26, 15, 20
1, 4, 7, 11	25, 26, 11*, 20*, 21*, 24*
1, 4, 8, 11	25, 26, 11*, 17*, 18*, 24*

**Requires RF frequency survey and RF power level check for clear channels. Clear SRR channels have a power level < -80 dBm.*

Channel Comparison - SRR and 802.11 b,g Channels



865351 Channel Selection

For 2.4 GHz Smart-hopping networks, both the Smart-hopping radio and the short-range radio operate in the 2.4 GHz band, and therefore are subject to interference from other devices that operate in this band like 802.11 b/g wireless LANs, microwave ovens, Bluetooth radios, etc. The most likely interference will come from 802.11 b/g wireless LANs.

In order to reduce the chances of interference, the Smart-hopping and short-range radio channels should be chosen to operate at frequencies that avoid any 802.11 b/g channels that are in use in the hospital.

In addition, if the short-range radio will be used, interference between the Smart-hopping radio and short-range radio must be avoided by separating these channels by a minimum of 5 MHz.

In order to assist with this, recommendations for Smart-hopping channels and SRR channels based on possible 802.11 b/g WLAN channel deployments in the 2.4 GHz band are given in the tables that follow.

2.4 GHz Smart-hopping Channel Selection

A minimum of three Smart-hopping channels is required for operation of the system, but Philips strongly recommends selecting the maximum of six channels in order to improve performance.

For example, if a 2.4GHz Smart-hopping network is being deployed without the short-range radio in a hospital with an 802.11 deployment of channels 1, 6 and 11, the best Smart-hopping channels to use would be the channels listed as "Primary" in the table, "802.11 b/g Channel Deployment 1, 6, 11", under "Option 1". This would be Smart-hopping channels 13, 14, 28, 42, 43, 44, 45, 46, 47. The best six of these Smart-hopping channels across the whole coverage area should be selected. A clear Smart-hopping channel is defined as having a power level of < -90dBm.

Using the diagram below to illustrate, Smart-hopping channels 13 and 14 operate between 802.11 channels 1 and 6, Smart-hopping channel 28 operates between 802.11 channels 6 and 11 and Smart-hopping channels 42, 43, 44, 45, 46 and 47 operate above 802.11 channel 11, thus minimizing interference with the WLAN that is deployed.

865351 - Short-range Radio (SRR) Channel Selection

SRR with Cableless Measurements (Telemetry Use Model) – The SRR channels are configured in the Information Center. Configure 2-4 channels as "High" and the rest "Off". The MX40 will select the best channel to use from those channels configured as "High".

SRR with IntelliVue monitor (Bedside Use Model – WTAAP) – One SRR channel is configured in the bedside monitor. This is the channel the bedside will use to communicate with the MX40 and any Cableless Measurement pods. Select the best channel based on the interference level at the location where the bedside will be used.

Warning

The Smart-hopping and short-range radios operate in the 2.4 GHz band. Radio connections are subject to interruption due to interference from other radio sources in the vicinity, including microwaves, Bluetooth devices, and DECT phones. The most likely interference will come from 802.11 b/g wireless LANs.

Smart-hopping and SRR Channel Selection for 2.4GHz Smart-hopping Networks

If a 2.4 GHz Smart-hopping network is being deployed with the short-range radio in a hospital with an 802.11 deployment of channels 1, 6 and 11, a number of different deployment options are given in the table. The clearest frequencies should be assigned to the short-range radio, and then the Smart-hopping channels can be assigned.

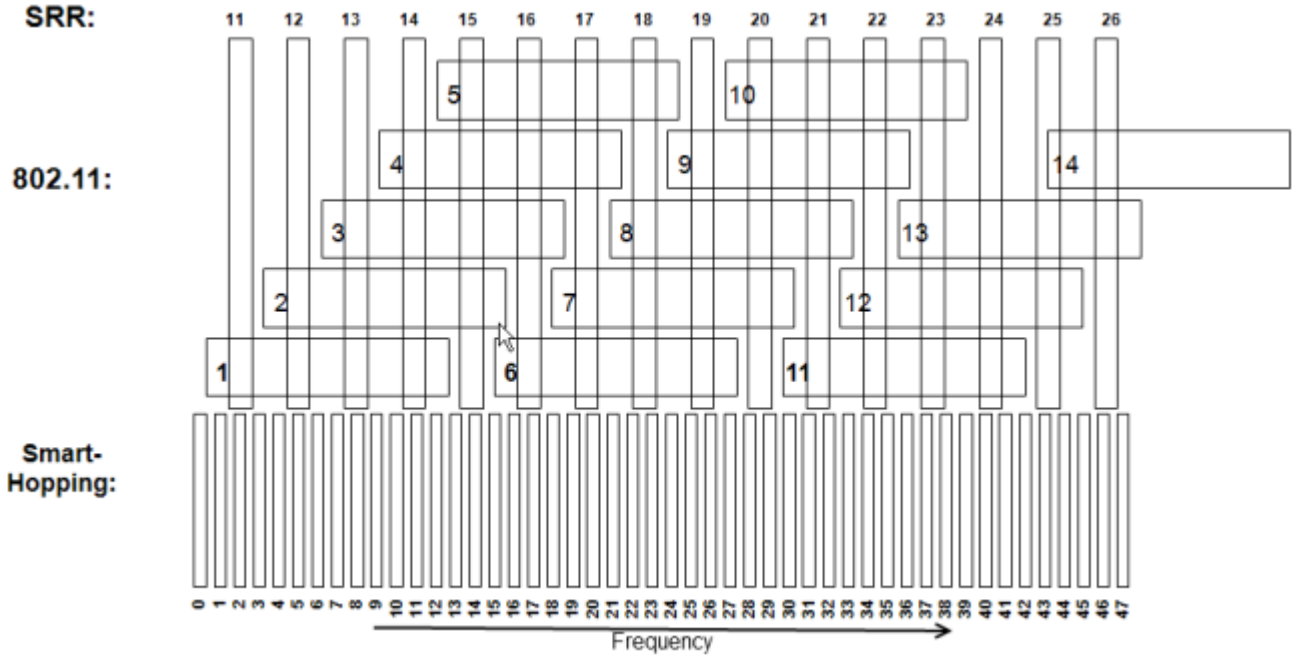
So if short-range radio (SRR) channels 25 and 26 are selected, then the best Smart-hopping channels to use would be the channels listed as "Primary" in the table, "802.11 b/g Channel Deployment 1, 6, 11", under "Option 2". This would be Smart-hopping channels – 13, 14, 28. Channels 42, 43, 44, 45, 46, 47 should not be used because they will interfere with the short-range radio. In addition to these three Smart-hopping channels, the best three channels of the "Secondary" (0 if allowed, 29) and "Tertiary" (12, 15, 27) channels listed should be selected.

Using the diagram again, short-range radio channels 25 and 26 operate above 802.11 channel 11. This leaves the frequencies between 802.11 channels 1 and 6 (Smart-hopping channels 12, 13, 14 and 15) and the frequencies between 802.11 channels 6 and 11 (27, 28 and 29) as possibilities for the Smart-hopping channels.

In these deployments, it is unlikely that all of the channels will be clear throughout the coverage area. A frequency survey is suggested to determine the best channels to use.

- A "clear" short range radio channel is defined as having a power level < -80dBm.
- A "clear" Smart-hopping channel is defined as having a power level < -90dBm.

Channel Comparison - SRR and 802.11 b,g Channels



Note — Channel overlap as shown in the diagram is not totally accurate. There is not sufficient resolution to pick channels solely by using this diagram. Use it in conjunction with the tables provided.

802.11 b/g Channel 1,6,11 Deployment

802.11 b/g Channel Deployment 1, 6, 11					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	None	None	None
	Smart-hopping Channels	Primary	13, 14, 28, 42, 43, 44, 45, 46, 47	13, 14, 28, 42, 43, 44, 45, 46, 47	13, 14, 28, 42, 43, 44, 45, 46
		Secondary*	0, 29	29	29
		Tertiary*	12, 15, 27, 41	12, 15, 27, 41	12, 15, 27, 41
OPTION 2		SRR	25, 26	25, 26	25, 26
	Smart-hopping Channels	Primary	13, 14, 28	13, 14, 28	13, 14, 28
		Secondary*	0, 29	29	29
		Tertiary*	12, 15, 27	12, 15, 27	12, 15, 27
OPTION 3		SRR	25, 26, 24*, 11*	25, 26, 24*, 11*	25, 26, 24*, 11*
	Smart-hopping Channels	Primary	13, 14, 28	13, 14, 28	13, 14, 28
		Secondary*	29	29	29
		Tertiary*	**12, 15, 27**	**12, 15, 27**	**12, 15, 27**
OPTION 4		SRR	15, 20	15, 20	15, 20
	Smart-hopping Channels	Primary	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46
		Secondary*	0	None	None
		Tertiary*	1, 41	1, 41	1, 41

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 1,4,7,11 Deployment

802.11 b/g Channel Deployment 1, 4, 7, 11					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	None	None	None
	Smart-hopping Channels	Primary	0, 42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46
		Secondary*	1, 29, 30, 41	1, 29, 30, 41	1, 29, 30, 41
		Tertiary*	10, 11, 19, 20	10, 11, 19, 20	10, 11, 19, 20
OPTION 2		SRR	20*, 21*	20*, 21*	20*, 21*
	Smart-hopping Channels	Primary	0, 42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46
		Secondary*	1	1	1
		Tertiary*	10, 11, 19, 20	10, 11, 19, 20	10, 11, 19, 20
OPTION 3		SRR	11*, 20*, 21*	11*, 20*, 21*	11*, 20*, 21*
	Smart-hopping Channels	Primary	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46
		Secondary*	10, 11, 19, 20	10, 11, 19, 20	10, 11, 19, 20
		Tertiary*	None	None	None

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 1,4,8,11 Deployment

802.11 b/g Channel Deployment 1, 4, 8, 11					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	None	None	None
	Smart-hopping Channels	Primary	0, 42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
		Secondary*	1, 20, 21, 41	1, 20, 21, 41	1, 20, 21, 41
		Tertiary*	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32
OPTION 2		SRR	17*, 18*	17*, 18*	17*, 18*
	Smart-hopping Channels	Primary	0, 42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
		Secondary*	1, 41	1, 41	1, 41
		Tertiary*	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32
OPTION 3		SRR	11*, 17*, 18*	11*, 17*, 18*	11*, 17*, 18*
	Smart-hopping Channels	Primary	42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
		Secondary*	41	41	41
		Tertiary*	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 1,7,13 Deployment

802.11 b/g Channel Deployment 1, 7, 13					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	Not Applicable	None	None
	Smart-hopping Channels	Primary	Not Applicable	13, 14, 15, 16, 17, 31, 32, 33, 34	13, 14, 15, 16, 17, 31, 32, 33, 34
		Secondary*	Not Applicable	30	30
		Tertiary*	Not Applicable	12, 18, 35, 47	12, 18, 35
OPTION 2		SRR	Not Applicable	15, 16	15, 16
	Smart-hopping Channels	Primary	Not Applicable	31, 32, 33, 34	31, 32, 33, 34
		Secondary*	Not Applicable	30	30
		Tertiary*	Not Applicable	35, 47	35
OPTION 3		SRR	Not Applicable	21, 22	21, 22
	Smart-hopping Channels	Primary	Not Applicable	13, 14, 15, 16, 17	13, 14, 15, 16, 17
		Secondary*	Not Applicable	None	None
		Tertiary*	Not Applicable	12, 18, 47	12, 18

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 1,5,9,13 Deployment

802.11 b/g Channel Deployment 1, 5, 9, 13					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	Not Applicable	None	None
	Smart-hopping Channels	Primary	Not Applicable	None	None
		Secondary*	Not Applicable	12, 24, 35, 47	12, 24, 35
		Tertiary*	Not Applicable	1, 11, 13, 23, 25, 34, 36, 46	1, 11, 13, 23, 25, 34, 36, 46
OPTION 2		SRR	Not Applicable	11*, 26*	11*, 26*
	Smart-hopping Channels	Primary	Not Applicable	None	None
		Secondary*	Not Applicable	12, 24, 35	12, 24, 35
		Tertiary*	Not Applicable	11, 13, 23, 25, 34, 36	11, 13, 23, 25, 34, 36
OPTION 3		SRR	Not Applicable	11*, 14*, 15*, 26*	11*, 14*, 15*, 26*
	Smart-hopping Channels	Primary	Not Applicable	None	None
		Secondary*	Not Applicable	24, 35	24, 35
		Tertiary*	Not Applicable	23, 25, 34, 36	23, 25, 34, 36
OPTION 4		SRR	Not Applicable	11*, 18*, 19*, 26*	11*, 18*, 19*, 26*
	Smart-hopping Channels	Primary	Not Applicable	None	None
		Secondary*	Not Applicable	12, 35	12, 35
		Tertiary*	Not Applicable	11, 13, 34, 36	11, 13, 34, 36
OPTION 3		SRR	Not Applicable	11*, 22*, 23*, 26*	11*, 22*, 23*, 26*
	Smart-hopping Channels	Primary	Not Applicable	None	None
		Secondary*	Not Applicable	12, 24	12, 24
		Tertiary*	Not Applicable	11, 13, 23, 25	11, 13, 23, 25

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 2,7,12 Deployment

802.11 b/g Channel Deployment 2, 7, 12					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	Not Applicable	None	None
	Smart-hopping Channels	Primary	Not Applicable	1, 2, 16, 17, 30, 31, 45, 46, 47	1, 2, 16, 17, 30, 31, 45, 46
		Secondary*	Not Applicable	None	None
		Tertiary*	Not Applicable	None	None
OPTION 2		SRR	Not Applicable	11, 21	11, 21
	Smart-hopping Channels	Primary	Not Applicable	16, 17, 45, 46, 47	16, 17, 45, 46
		Secondary*	Not Applicable	None	None
		Tertiary*	Not Applicable	15, 18, 44	15, 18, 44
OPTION 3		SRR	Not Applicable	11, 12*, 20*, 21, 22*	11, 12*, 20*, 21, 22*
	Smart-hopping Channels	Primary	Not Applicable	16, 17, 45, 46, 47	16, 17, 45, 46
		Secondary*	Not Applicable	None	None
		Tertiary*	Not Applicable	15, 18, 44	15, 18, 44

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 1,6,11,14 Deployment

802.11 b/g Channel Deployment 1, 6, 11, 14					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	Not Applicable	None	Not Applicable
	Smart-hopping Channels	Primary	Not Applicable	13, 14, 28	Not Applicable
		Secondary*	Not Applicable	29	Not Applicable
		Tertiary*	Not Applicable	12, 15, 27, 41, 42	Not Applicable
OPTION 2		SRR	Not Applicable	11*, 20	Not Applicable
	Smart-hopping Channels	Primary	Not Applicable	13, 14	Not Applicable
		Secondary*	Not Applicable	None	Not Applicable
		Tertiary*	Not Applicable	12, 15, 41, 42	Not Applicable
OPTION 3		SRR	Not Applicable	11*, 19*, 20, 21*	Not Applicable
	Smart-hopping Channels	Primary	Not Applicable	13, 14	Not Applicable
		Secondary*	Not Applicable	None	Not Applicable
		Tertiary*	Not Applicable	12, 15, 41, 42	Not Applicable

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

802.11 b/g Channel 3,10,14 Deployment

802.11 b/g Channel Deployment 3, 10, 14					
			FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
			Canada, China, Hong Kong , Singapore, Taiwan, USA	Japan	All other countries
OPTION 1		SRR	Not Applicable	None	Not Applicable
	Smart-hopping Channels	Primary	Not Applicable	1, 2, 3, 4, 5, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41	Not Applicable
		Secondary*	Not Applicable	None	Not Applicable
		Tertiary*	Not Applicable	None	Not Applicable
OPTION 2		SRR	Not Applicable	17, 18, 19	Not Applicable
	Smart-hopping Channels	Primary	Not Applicable	1, 2, 3, 4, 5, 39, 40, 41	Not Applicable
		Secondary*	Not Applicable	None	Not Applicable
		Tertiary*	Not Applicable	None	Not Applicable

**Requires RF Frequency Survey and RF Power Level Check for clear channels. Clear SRR channels have a power level < -80dBm. Clear Smart-hopping channels have a power level < -90dBm.*

865352 - Channel Selection

802.11 Channel Selection

802.11 channel selection is done by the hospital. Due to the limited number of channels in the 2.4 GHz band, lower capacity, and higher number of native interferers, use of the 802.11a band is highly recommended.

865352 Short-range Radio (SRR) Channel Selection

SRR with Cableless Measurements (Telemetry Use Model) – The SRR channels are configured in the Information Center. Configure 2-4 channels as "High" and the rest "Off". The MX40 will select the best channel to use from those channels configured as "High".

SRR with IntelliVue monitor (Bedside Use Model – WTAAP) – One SRR channel is configured in the bedside monitor. This is the channel the bedside will use to communicate with the MX40 and any Cableless Measurement pods. Select the best channel based on the interference level at the location where the bedside will be used.

Warning

The Short-range radio operates in the 2.4 GHz band. Short-range radio connections are subject to interruption due to interference from other radio sources in the vicinity, including microwaves, Bluetooth devices, and DECT phones.

The most likely interference will come from 802.11b, g wireless LANs.

The 802.11 version of the MX40 may only be used with short-range radio when the wireless network radio is operating in the 802.11a (5 GHz) band.

In order to reduce the chances of interference, the Short Range Radio channels should be chosen to operate at frequencies that avoid any 802.11 b/g channels that are in use in the hospital.

In order to assist with this, recommendations for SRR channels based on possible 802.11 b/g WLAN channel deployments in the 2.4 GHz band are given in the table below.

For example, if the hospital has an 802.11 deployment using 802.11 channels 1, 6, and 11, using the table below, short-range radio channels 25, 26, 15, and 20 are recommended. Using the diagram below as illustration, SRR channel 15 operates between 802.11 channels 1 and 6, SRR channel 20 operates between 802.11 channels 6 and 11 and SRR channels 25 and 26 operate above 802.11 channel 11, thus minimizing interference with the WLAN that is deployed.

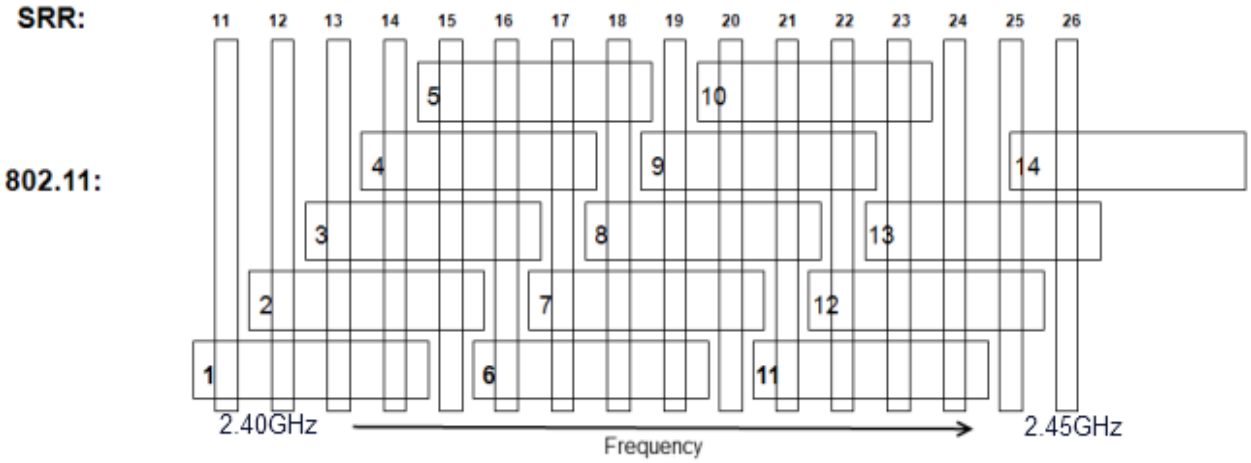
The table below also lists some short-range radio channels that may be used if a frequency survey is performed and a power level check is done to ensure that the frequency is "clear" (has a power level < -80dBm).

SRR Channel Recommendations for 865352 Installations

802.11b/g (2.4 GHz) Channel Deployment	Short-range Radio Channel Recommendations
1,6,11	25, 26, 15, 20
1, 4, 7, 11	25, 26 11*, 20*, 21*, 24*
1, 4, 8, 11	25, 26 11*, 17*, 18*, 24*
1, 7, 13	15, 16, 21, 22
1, 5, 9, 13	12*, 13*, 16*, 17*, 20*, 21*, 24*, 25*
2, 7, 12	11, 16, 21, 26
1, 6, 11, 14	15, 20 25*
3, 10, 14	11, 12, 17, 18, 19, 24

**Requires RF frequency survey and RF power level check for clear channels. Clear SRR channels have a power level < -80 dBm.*

Channel Comparison - SRR and 802.11 b/g Channels

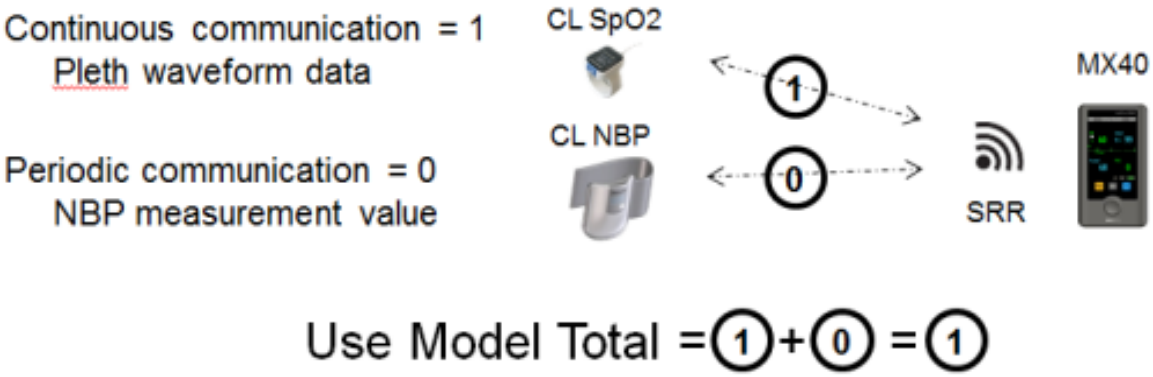


Short-range Radio Density

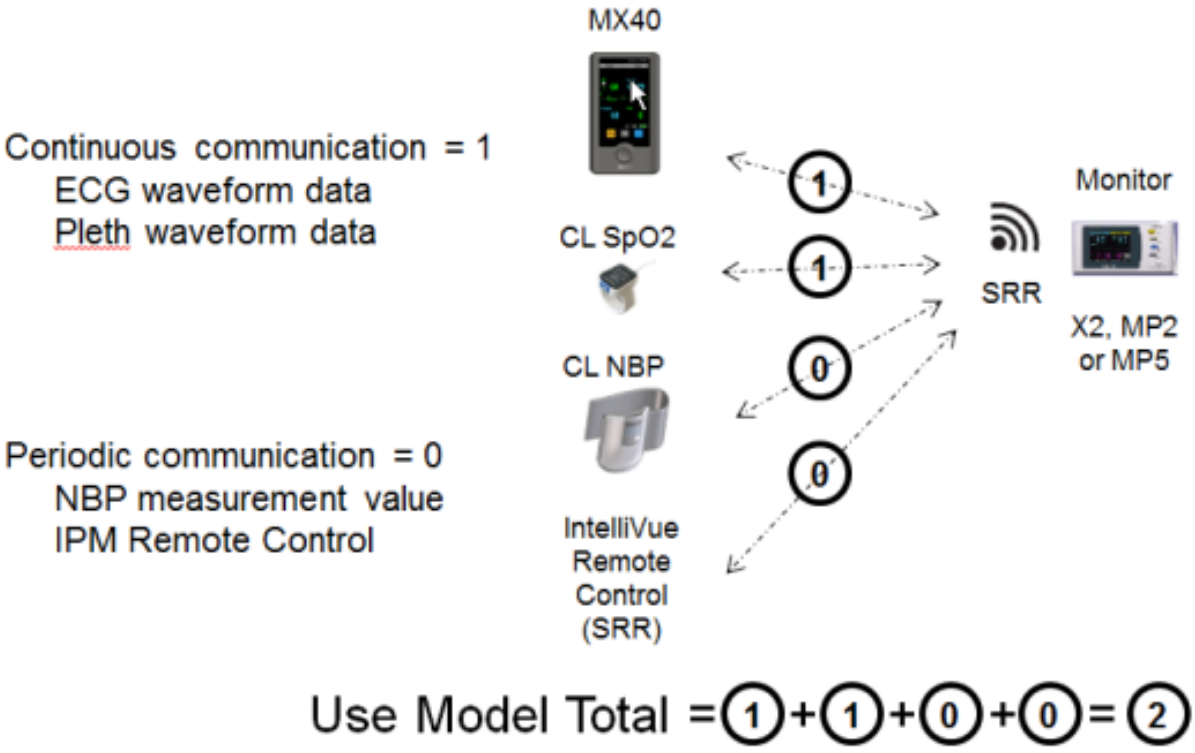
- A Short Range Radio cell is defined as a radius of 15ft (4.6m).
- A "Device Link" is defined by use model.

Device Density per SRR Channel	1.4GHz Smart-hopping Networks	2.4GHz Smart-hopping Networks
Maximum density of SRR Device Links in a single SRR cell	4 Device Links	3 Device Links

SRR with IntelliVue Cableless Measurements (Telemetry Use Model):



SRR with IntelliVue Monitor (Bedside Use Model):



3. Test and Inspection

This section covers Test and Inspection tasks to be performed to ensure the performance of the MX40 after all installation procedures are completed.

MX40 Test & Inspection Matrix

Test Block Name	Test or "Inspection" to Perform	What to Record on Service Record
Visual Test:	Inspect the MX40 (and packing material if applicable) for obvious signs of damage. Also check external leads and accessories. Expected Test Results: The device does not have any obvious signs of damage = Pass	**V:P** or **V:F** where **P**=Pass **F**=Fail
Power On:	Remove patient cable. Insert battery into the MX40. The MX40 will go through its self-test and pass. Make sure that an ECG wave appears on the screen and the battery gauge displays battery status. Check the INOP Area for any equipment malfunctions. The expected test result is pass: the MX40 boots up and displays an ECG wave and the battery gauge displays battery status. The wave will be a flat line if no simulator is attached. Expected Test Results: Expected answer is "yes". If so, Power On test is passed.	**PO:P** or **PO:F** where **P**=Pass **F**=Fail
Performance:	1. Insert battery into the MX40 for the channel being tested. 2. Attach a patient cable to the MX40 and an ECG simulator. 3. At the Information Center assign the MX40 being tested to a Sector. Ensure that the Multi-Function Button is turned "on", and turn on the SpO_2 parameter if the MX40 being tested has the SpO_2 option. Set the mode to Continuous. 4. An ECG waveform should be visible at the Information Center. 5. If the MX40 has the SpO_2 option, connect an SpO_2 sensor and apply the SpO_2 sensor to yourself. Confirm that the MX40 completes a successful measurement. 6 .Set the SpO_2 mode to the customer's desired setting, Continuous or Spot Check/Manual. 7. Place the device in Standby. At the Information Center, resume monitoring. 8. Press the Multi-Function Button on the MX40. The button press should generate one of the following, depending on the configured setting: • Nurse Call & Record - Nurse Call alarm and a recording generated at the Information Center. • Nurse Call Only - Nurse Call alarm at the Information Center. • Record Only - A recording generated at the Information Center. • Disabled - No event at the Information Center.	**P:P** or **P:F** where **P**=Pass **F**=Fail

Test Block Name	Test or "Inspection" to Perform	What to Record on Service Record
	9. If the MX40 has the Short-Range Radio option, establish communication between the MX40 and either the patient monitor or a cableless measurement device, depending on the chosen use model. . If assigned to a patient monitor, an ECG waveform should be visible on the monitor. The display on the MX40 will be:  10. If assigned to a cableless measurement device, initiate a measurement and view it at the Information Center. Expected Test Results: Expected answer to all is "yes". If so, Performance test is passed.	
Revision Check:	Check the revision of the software/firmware in the Device Info. screen. Check the INOP Area for either an "SpO_2 Equip Malf" or "Resp Equip Malf" message which indicates an SpO_2 or Resp upgrade failure. The revision reported should match the revision loaded. You may also check the Status Log at the Information Center. Note: If the device has SpO2 hardware installed (option S02 or S04), after an upgrade if SpO2 is in Manual or Auto measurement mode, the SpO2 revision information will display as ??.??.??. To view the SpO2 revision information go to the SmartKeys and select “Start SpO2”, then return to the Device Info screen. Expected Test Results: Expected answer is "yes". If so, Revision Check test is passed.	**RC:P** or **RC:F** where **P**=Pass **F**=Fail

When to Perform Test Blocks

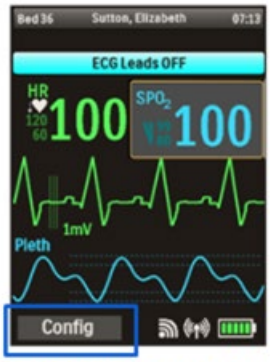
Service personnel should perform Test Blocks as identified in the following table.

Service Event **When performing...**	**Test Block(s) Required** **Complete these tests**
Installation	Visual, Power On, Performance
Repairs/Replacement	Visual, Power On, Performance
Upgrades	Revision Check
Preventive Maintenance	N/A ***Note —*** There are no preventive maintenance tests required.
All other Service Events	Perform all Test Blocks

4. Operating Modes

This section provides operation information about the MX40 when the device is in Monitoring Mode, Service Mode, Configuration Mode and Demo Mode.

Operating Modes
- Monitoring Mode (no password)
- Configuration Mode
  - Same password as IPM
  - Monitoring continues
- Service Mode
  - Same password as IPM
  - No monitoring possible
- Demo Mode
  - Same password as IPM
  - No monitoring possible



Configuration, Service and Demo mode operation indicated in status area, and on IIC

Monitoring Mode

Monitoring Mode is the normal operating mode of the MX40 and a password is not required.

Warning

If the MX40 displays a SW License Required message, remove the device from service. The device must be repaired/replaced.

Caution

Do not use pneumatic tube systems to transport this device or the rechargeable lithium-ion battery. Damage may result.

Telemetry Mode Use

To minimize patient disruption, the MX40 operates in Telemetry Mode when connected to the Information Center. In Telemetry Mode, the local volume is set to zero and the display is off. You can activate the display at any time by touching the Main Screen button for two seconds. All active alarms can be viewed when the display is on, however audible alarm indicators are not annunciated. Regardless of the display status, all measurement data is being sent to the Information Center. Telemetry Mode is only available when connected to the Information Center.

Monitor Mode Use

In Monitor Mode, the display is always on for easy viewing, and should an alarm condition occur, it will be announced locally at the MX40 and at the Information Center if networked connected. Be aware that when the display is on and alarms are audible, battery consumption will increase.

➢ *To use Monitor Mode:*

1. Press the SmartKeys Button.
2. Press the Mode: Telemtry / Mode: Monitor SmartKey and choose Mode: Monitor.

Note — Anytime you are disconnected from the Information Center, the MX40 automatically activates Monitor mode. The MX40 reverts to Telemetry mode when connection to the Information Center is re-established. If the MX40 is not connected to the Information Center, the alarm is only announced locally. For additional information regarding battery status during Monitoring Mode, see Note 3 under the "Battery Charge Status" section starting on page 4-28.

Controls, Indicators and Connectors

This section describes the clinical controls of the IntelliVue MX40. These controls include buttons, display icons, visual and auditory indicators, ports, and safety labeling located on the front and back of the device.

MX40 Controls and Indicators

1. Patient Cable
2. Patient Information Area
3. Active Alarms Area
4. INOP Area
5. Measurement Area 1
6. Measurement Area 2
7. Waveform 1
8. Waveform 2
9. Radio/Network/Battery Status Area
10. Leads Off Status Area
11. Silence/Acknowledge Alarms Button
12. SmartKeys Button
13. Main Screen Button
14. Multi-Function Button

Multi-Function Button

Button	Function
	Depending on configuration at the Information Center: • generates a Nurse Call; • Initiates a Delayed Recording; • Both, or; • None ***Note —*** If appropriate, patients should be informed that the Multi-function button on the MX40 is not the primary method for generating a Nurse Call.

Silence/Acknowledge Alarm Button

Button	Function
	• Initiates a local silence/acknowledgment of all active alarms when enabled (IIC). • Initiates a global silence/acknowledgment of all active alarms (IIC iX). • Silences the "Find Device" sound. ***Note —*** Alarms at the MX40 can be silenced from the Information Center. When silenced from the Information Center, the alarm sound is not silenced at the Information Center until it receives feedback from the MX40. This may take several seconds.

SmartKeys Button

Button	Function
	Displays the SmartKey Menu on the touch screen.

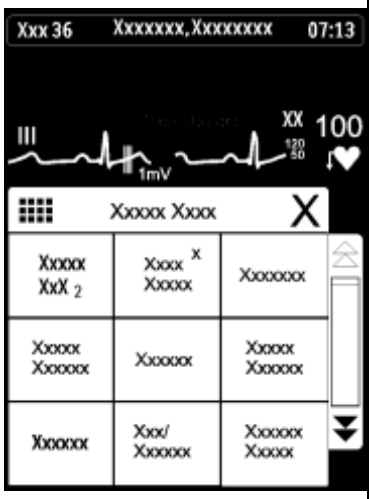
Main Screen Button

Button	Function
	• Activates the display screen if touched for two seconds. • Cycles through the display screens if touched repeatedly. • Resumes from Standby. • When pressed from a sub-menu, returns display to the Main Screen.

SmartKeys

The following table lists the SmartKeys available on the display of the MX40.

Note—gray text on a SmartKey signifies that the item is unavailable.

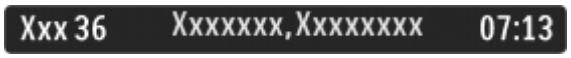
	SmartKey	Function
	Start SpO_2 ***Note —*** This SmartKey is unavailable when SpO_2 mode is continuous.	Starts a manual SpO_2 measurement.
	Delayed Record	Starts a delayed recording at the Information Center.
	Alarms	Alarm Volume setting. Review of up to 50 previous alarm conditions (entries are stored during power cycle). Pause Alarms for configured time period (if enabled at the Information Center).
	Mode: Telemetry / Mode: Monitor	Toggles between modes. In Telemetry Mode, display and audio are off; in Monitor Mode, display and audio are always on.
	Standby	Puts the device into Standby locally and at the Information Center. Displays purchased/enabled product options. To resume from Standby, touch the Main Screen button.
	Add/Remove	Displays available monitors and IntelliVue Cableless Measurements to assign to via the short-range radio.
	Print Reports	Prints the pre-configured report as designated at the Information Center.
	Trends	View up to 24 hours of tabular and graphical trend data (Option C03). One hour tabular trend standard.

	SmartKey	Function
	Setup Screen	Determines time period that the display remains active after user interaction or whether the display is always On or always Off.
	Lock/Unlock	Locks/Unlocks the display.
	Op Modes	Selects either Monitoring, Demo, Config or Service modes.

Alarms Area

- The Alarm Area of the MX40 displays physiological alarms and technical alarms.
- A multiple alarm indicator (down arrow) is displayed when multiple alarm conditions are present and the alarm message rotates every 3 seconds.
- A check mark in front of the alarm text signifies that the alarm has been acknowledged by touching the Silence Alarms button at the MX40 or IIC iX.
- Alarm Indicators display in the Patient Information Area in place of the time clock when alarm/INOP conditions are present but have not been acknowledged.
- Touching the Alarms Area displays a list of all active alarms.
- The alarms paused icon communicates whether the alarm system is on/off. When alarms are paused from the IIC, the display wakes at half brightness to indicate the alarm pause state.
- Local Alarm Audio is off when the alarm volume symbol is present next to the time. The Local Audio Off message is displayed as a reminder that alarms are never annunciated in Telemetry Mode.

Patient Information Area



The Patient Information Area displays the following information:

- Bed Label
- Patient Name (up to 18 characters will display)
- Time

Touching the Patient Information Area displays the **Patient Demogr.** menu which lists the following:

- Patient Name (Last, First, Middle)
- Lifetime ID
- Encounter ID
- Patient Category
- Paced Mode
- Height
- Weight
- Date of Birth
- Gender

Note — If you use an alternative ID, it will display at the Information Center and on printed reports. It will not display at the MX40.

Paced Status

1. Pacing algorithm is on.
2. Pacing algorithm is off.
3. Pacing algorithm is on. Patient's paced status is unknown.

Display Lock

The Lock symbol appears in the lower left of the display when the MX40 is in a locked state after a configured time of non-use (1-30 minutes, default of 1 minute), or if configured to do so during the start-up process. Locking the display provides additional protection against accidental patient access. The display is unlocked using the SmartKeys menu. Additionally, the MX40 can be configured to require a 3-5 digit numeric only password to unlock the device.

Status Area

The status area of the MX40 displays short-range radio connection (optional) and system wireless connection status. You can also view battery strength for the type of battery used in the device, AA or rechargeable Li-on.

Operating and Navigating

The principal method of operating your MX40 is via the Touch Display. Almost every element on the display is interactive. Display elements include measurement numerics, information fields, alarm fields, waveforms, SmartKeys and menus.

Power-On Self Test

Once battery power is supplied, the MX40 performs a power-on self test to check operational status prior to start-up. This process takes approximately 45 seconds. Subsequent connection to the Information Center then occurs within approximately 30 seconds. Should a failure be detected, an INOP tone will sound and if possible, the appropriate INOP message for the failure will be communicated to the Information Center and displayed locally.

For MX40 WLAN devices, a  graphic will display if AA batteries are inserted into the MX40 to remind the user that only the Philips rechargeable lithium-ion battery pack is to be used.

Warnings

If the MX40 enters a continuous "boot-up" cycle or the main screen does not appear or update, ensure that you are using a freshly charged lithium-ion battery or new disposable batteries. If the batteries are fresh and the device reboots or does not update, remove the device from service.

Should the MX40 fail its alarm sound test (no sound played) or the Speaker Malfunct INOP is displayed, remove the device from use.

Ensure that your MX40 connects to the Information Center. You can verify this by confirming the following:

- the bed label appears in the top left corner of the display.
- the No Central Monit. INOP is no longer displayed and has been replaced by Local Audio Off.
- device sounds have ceased, and after one minute (configurable) the display is no longer active.

Check that the above actions occur and that you are connected to the Information Center when in the wireless coverage area. If you are not in range of the Information Center, the device continues to sound and the display remains active.

A successful power-on self test will then transition the MX40 to the start-up screen. Selectable background colors can be configured and display on the screen for assistance with device identification. This can be helpful when devices are in a pooled use setting.

You must visually check that a waveform is present on the display. You can access further status information is by touching the status area on the display.

On a daily basis, the clinician should inspect the MX40 and accessories. Replace any damaged equipment or accessories.

Touch Sensitive Display

The display area of the MX40 is touch sensitive and can be touched with your fingertip or thumb through the Philips Waterproof Carrying Pouch or medical gloves. Do not use a pen or stylus. When touched, the element is highlighted. After removing your fingertip or thumb, a white dot is displayed to guide you by showing the location of your touch. When the display is locked, a red dot is displayed.

Navigating

Touching the Navigation Bar on the right of the display will scroll through additional display items. Solid downward arrows indicate there are additional elements that are not currently displayed. The arrows briefly illuminate when touched. Your selection from the menu also illuminates when touched.

Selecting Display Elements

Touch a display element to get to the actions linked to that element. For example, touch the Patient Information element to call up the Patient Info window, or touch the HR numeric to call up the Setup ECG menu. Touch the ECG waveform to call up the wave selection menu.

Locking the Display

To provide additional protection against accidental patient access to the MX40, the display can be locked using the **Lock SmartKey**. When **Lock** is selected, the **SmartKey** menu automatically changes to the **Main Screen**. When **Unlock** is selected, you must close the **SmartKey** menu to return to the **Main Screen**. To provide additional security to prevent patient access, the MX40 can be configured to require a 3-5 digit numeric only password to unlock the device. To unlock the display, the password must be entered every time the configured time of non-use is exceeded.

Display Auto-Lock

The display automatically locks when there is no interaction for the configured time period (1-30 minutes with a default of 1 minute), or if configured to do so during the start-up process.

Function	Display Locked / Display On	Display Locked / Display Off	Display Unlocked / Display On	Display Unlocked / Display Off
Display Touch	No	No	Yes	No
Main Screen Button	No	Yes	Yes	Yes
SmartKeys Button	Yes	No	Yes	No
Silence Button	No	No	Yes	No

Measurement Area

The measurement area of the MX40 display is optimized to show available parameter numerics, waveforms, and alarm limits. Each element is a touch object and when you select it, further controls and menus become available.

Measurement Area Display Configurations

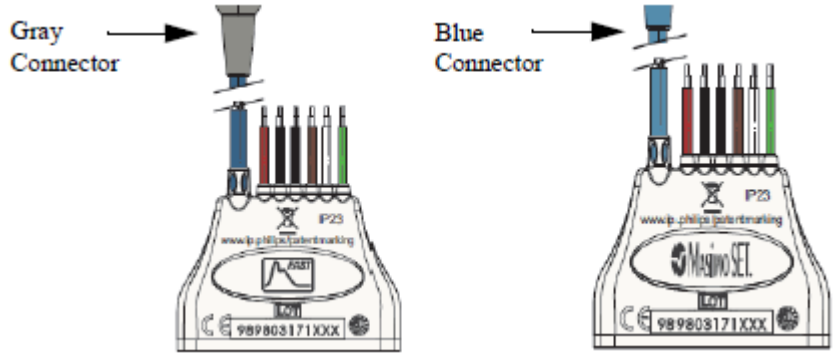
The display of your MX40 is configured/can operate in one of five available orientations:

- Portrait - No Waveforms and six Numerics (IIC iX only)
- Portrait - One Waveform and four Numerics
- Portrait - Two Waveforms and two Numerics (IIC Release N and IIC iX only)
- Landscape - Two Waveforms and three Numerics (IIC Release N and IIC iX only)
- Portrait - Viewable Chest Diagram and two Numerics

Identifying the SpO_2 Patient Cable Type

The patient cable with SpO_2 is available in two versions, Philips FAST and Masimo SET. Each cable contains the markings as shown in the diagram below.

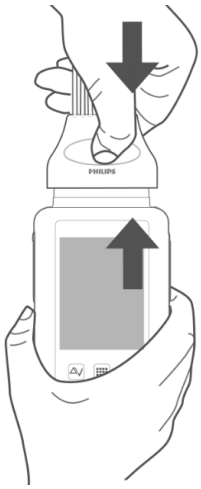
Note — For more information on cable/device identification, see the MX40 SpO_2 Option Quick Card, p/n 4535 648 13471.



Note — The Philips FAST patient cable is not compatible with Masimo SET devices. The Philips Masimo SET patient cable is not compatible with Philips FAST devices. An Invalid Leadset INOP will display, along with instruction to connect the proper patient cable.

Connecting/Disconnecting the Patient Cable

The patient cable is connected to the MX40 as shown in the illustration below.

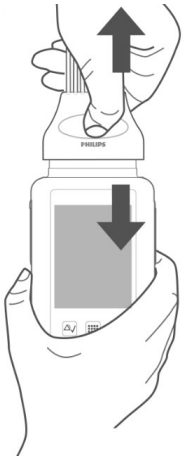


When connecting to the MX40, there is a slight clicking sound that signifies that the cable is securely connected.

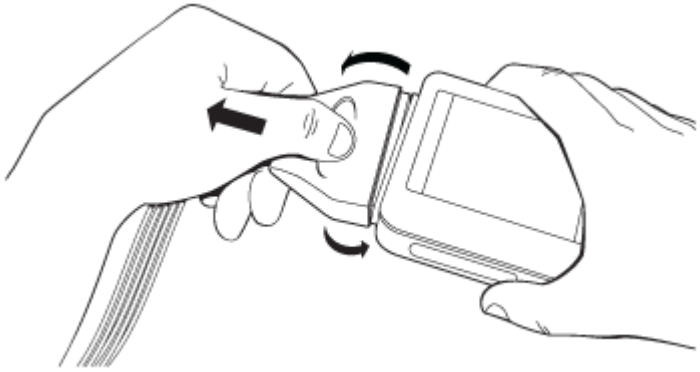
Typically, the patient cable may be disconnected as shown below.

Caution

To avoid dislodging the gasket in the patient cable, use a straight-on approach when attaching. Do not use a pivot motion to attach the patient cable connector to the MX40.



During initial use of the MX40, the secure connection between the patient cable and the device may be difficult to disconnect. Should this occur, use the alternative procedure shown below.



Caution

Never disconnect the patient cable by pulling on the leadwires or the SpO2 adapter, as this may damage wires over time.

Changing Measurement Settings

Each measurement has a setup menu in which you can adjust its settings. You enter the setup menu by selecting the measurement numeric.

You must be aware that, although many settings can be changed during use, permanent changes to settings can only be done in Configuration Mode. All settings are restored to their default setting when the patient is discharged or the MX40 is powered off.

ECG Settings at the MX40

Setting	Description
Alarm Limits	Heart Rate alarm limits can be viewed locally at the MX40. Limits set at the Information Center (Release N or later or iX) are reflected at the MX40 when connected on the network.
Primary (used for arrhythmia analysis only) (Set at IIC Release N or IIC iX. View only.)	I, II, III, aVR, aVL, aVF, V1-V9, MCL, V3R, V4R, V5R. Available waveforms are based on lead set type. Lead II is the default.
Secondary (used for arrhythmia analysis only) (Set at IIC Release N or IIC iX. View only.)	I, II, III, aVR, aVL, aVF, V1-V9, MCL, V3R, V4R, V5R. Available waveforms are based on lead set type. Lead V is the default.

Setting	Description
Paced Mode (Set at IIC Release N or IIC iX. View only.)	On, Off, Unconfirmed (IIC iX only)
Adjust Size	Set ECG gain to x1/2, x1, x2, x4
Arrhythmia	Initiate an Arrhythmia Relearn; View Arrhythmia Alarm Limits; Turn Arrhythmia Annotation On/Off (local control on device only.)
Lead Placement	Set EASI, Standard
ECG	Set ECG On/Off
New Lead Setup	When IntelliVue Patient Monitor lead sets are in use, select 3-wire, or 5-wire.
Va Lead	Shows position of Va, or Ca, electrodes. Choices are V1-V9, v3R, V4R, V5R. Configured at IIC/IIC iX.
Vb Lead	Shows position of Vb, or Cb, electrodes. Choices are V1-V9, v3R, V4R, V5R. Configured at IIC/IIC iX.
Change Numeric	Selects parameter numeric to display in place of current HR numeric.

Note — ECG monitoring is turned off when the SpO2 only adapter accessory is attached to the MX40. When a battery change occurs, ECG monitoring resumes if the SpO2 only adapter accessory is no longer attached.

Waveform Settings at the MX40

Setting	Description
Wave 1	Primary, Secondary, I, II, III, aVR, aVL, aVF, V1-V9, MCL, V3R, V4R, V5R, Pleth (if SpO_2 is available), Resp (if Resp is available). Available waveforms are based on patient cable type. Primary wave is the default. If Primary or Secondary are selected, then the waveform displayed is the waveform configured as primary or secondary for arrhythmia analysis at the Information Center.
Wave 2	Primary, Secondary, I,II, III, aVR, aVL, aVF, V1-V9, MCL, V3R, V4R, V5R, Pleth (if SpO_2 is available), Resp (if Resp is available). Available waveforms are based on patient cable type. Secondary wave is the default. If Primary or Secondary are selected, then the waveform displayed is the waveform configured as primary or secondary for arrhythmia analysis at the Information Center..

Note — Primary or secondary waveform configuration changes made at the Information Center change what is displayed on the MX40. But changes made locally at the MX40 do not affect settings at the Information Center. Selecting Pleth or RESP to display at the Information Center affects ECG wave storage for future review at the Information Center.

Battery Information

Battery Safety Information

Warnings

- The battery compartment door must be closed during defibrillation.
- Use the Philips Rechargeable Lithium-ion Battery or 3 Duracell Alkaline batteries, size AA, MN 1500, 1.5V, to ensure specified performance and correct battery gauge reporting.
- Outdated, mismatched, or poor-quality batteries can give unacceptable performance (e.g., insufficient Battery-Low warning time). If you are using disposable batteries, the use of fresh high-quality alkaline batteries is strongly recommended.
- Certain failure conditions, such as short circuits, can cause a battery to overheat during use. High temperatures can cause burns to the patient and/or user. If the MX40 becomes hot to the touch, remove it from the patient and place it aside until it cools. Then remove the batteries and discard them.
- If you receive a TELE BATTERY LOW, TELE BATT EMPTY, REPLACE TELE BATT, or TELE BATTERY TEMP alarm, the batteries must be promptly replaced. If these conditions are not corrected, they will result in a device shutdown and cessation of monitoring. These INOPS also apply when monitoring with Cableless Measurements.
- Disposable batteries should be removed from the MX40 at the end of the battery's useful life to prevent leakage.
- Use only the Philips manufactured Rechargeable Lithium-ion Battery.
- Do not use other types of rechargeable batteries. Other types of rechargeable batteries will adversely affect:
  - Battery gauge performance
  - Battery low warnings
  - Battery life performance

- Do not store batteries in the MX40 in a reverse polarity position. This can cause leakage and corrode the battery terminal. This corrosion can create a short in the battery adapter which can cause the batteries to overheat.
- If battery leakage should occur, use caution in removing the battery. The leaked substance may cause eye or skin irritation. Avoid contact with skin. Wash hands. Replace the battery tray if exposed to battery leakage. Continued use increases the risk of batteries shorting and overheating, potentially resulting in burns to the user.
- To eliminate the risk of electrical shock or burn, do not carry loose batteries on your person, e.g. in clothing pockets.
- Use of AA Lithium batteries or batteries with terminal voltage >1.6V may cause damage to the device.

Caution

- When monitoring with the WLAN version of the MX40 (Model 865352), the lithium-ion rechargeable battery is the only approved power source. Use of AA disposable batteries is not supported.

Lithium-ion Rechargeable Battery Care

Care of the rechargeable battery begins when you receive a new battery for use and continues throughout the life of the battery. The table below lists battery care activities and when they should be performed.

Activity	When to Perform
Perform a visual inspection.	Before inserting a battery in the MX40.
Charge the battery.	Upon receipt, after use, or if a low battery state is indicated. To optimize performance, a fully (or almost fully) discharged battery should be charged as soon as possible.
Clean the battery	At each patient discharge, or in cases when the battery is exposed to contaminants.
Charge stored batteries to at least 90% of their capacity every six months.	When not in use for an extended period of time.

Activity	When to Perform
Decommission the battery	When any of the following INOPs are displayed on the MX40: **TELE SERVICE BATTERY** **TELE BATTERY TEMP** **TELE REMOVE BATT** Note — When the above INOPs occur, the Tele Batt Low INOP is suppressed.

Rechargeable batteries are charged using the IntelliVue CL Charging Station. For information on charging station use, see Charging Li-ion Rechargeable Batteries p. 5-10 .

Note — The battery capacity of rechargeable batteries degrades over time and number of recharge cycles. Toward the end of its useful life, the battery capacity may be reduced by 30%. If this reduced battery life is unacceptable based on your use model, Philips recommends replacing the rechargeable battery sooner.

Lithium-ion Rechargeable Battery Storage

When storing rechargeable batteries, make sure that the battery terminals do not come into contact with metallic objects or other conductive materials.

If batteries are stored for an extended period of time, they should be stored in a cool, dry place, ideally at 15ºC (60ºF), with a state of charge of 20% to 90%. Storing batteries in a cool place slows the aging process.

The batteries should not be stored at a temperature outside the range of -20ºC (-4ºF) to 50ºC (122ºF).

Stored batteries should be should be charged to at least 90% of their capacity every 6 months. They should be charged to full capacity prior to use.

Note — Storing batteries at temperatures above 38ºC (100ºF) for extended periods of time could significantly reduce the batteries' life expectancy.

Lithium-ion Rechargeable Battery Handling Precautions

Lithium-ion batteries store a large amount of energy in a small package. Use caution when handling the batteries; misuse or abuse could cause bodily injury and/or equipment damage.

- Do not short circuit - take care that the terminals do not contact metal (e.g. coins) or other conductive materials during transport and storage.
- Do not crush, drop or puncture - mechanical abuse can lead to internal damage and internal short circuits that may not be visible externally.
- Do not apply reverse polarity.
- Do not incinerate batteries or expose them to temperatures above 60ºC (140ºF).

If a battery has been dropped or banged against a hard surface, whether damage is visible externally or not:

- discontinue use.
- dispose of the battery in accordance with the disposal instructions.

Inserting/Removing Batteries

Warning

Arrhythmia relearning is initiated whenever the MX40's batteries are removed for one minute or longer. Be sure to check your patient's arrhythmia annotation for accuracy whenever relearn has occurred.

Caution

Remove the batteries before storing the MX40 for an extended period of time.

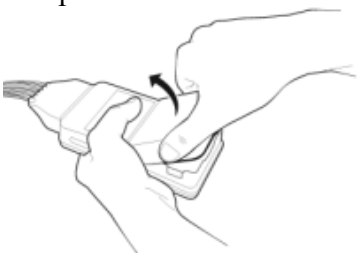
The battery compartment is located on the back of the MX40, accessible by opening the compartment door from the bottom. It accommodates three AA 1.5V alkaline batteries or the Philips Rechargeable Lithium-ion battery. Only these batteries should be used.

Note— Lithium-ion batteries should be fully charged prior to first use.

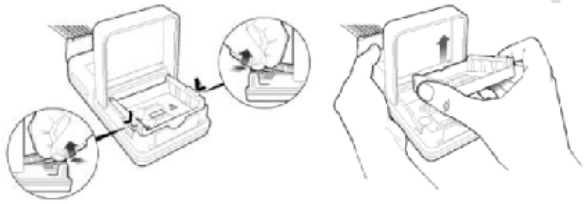
Inserting Batteries

➢ *Insert the rechargeable lithium-ion battery using the following procedure:*

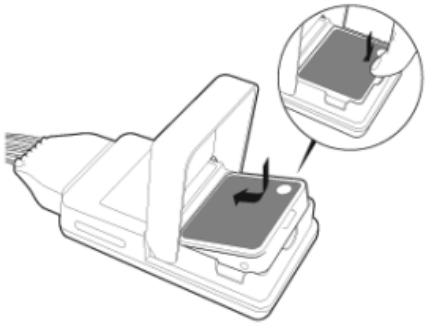
Open the battery compartment by lifting up on both bottom sides of the compartment door.



Remove the AA battery tray if present.



Insert the battery pack so that the raised tab is aligned with the cutout in the base of the battery compartment.



Close the battery compartment door.

Watch for the start-up screen on the front of the MX40 to illuminate briefly.

➢ *Insert AA batteries into the MX40 using the following procedure:*

1. Open the battery compartment by lifting up on both bottom sides of the compartment door.

2. Insert the AA battery tray if not already present.

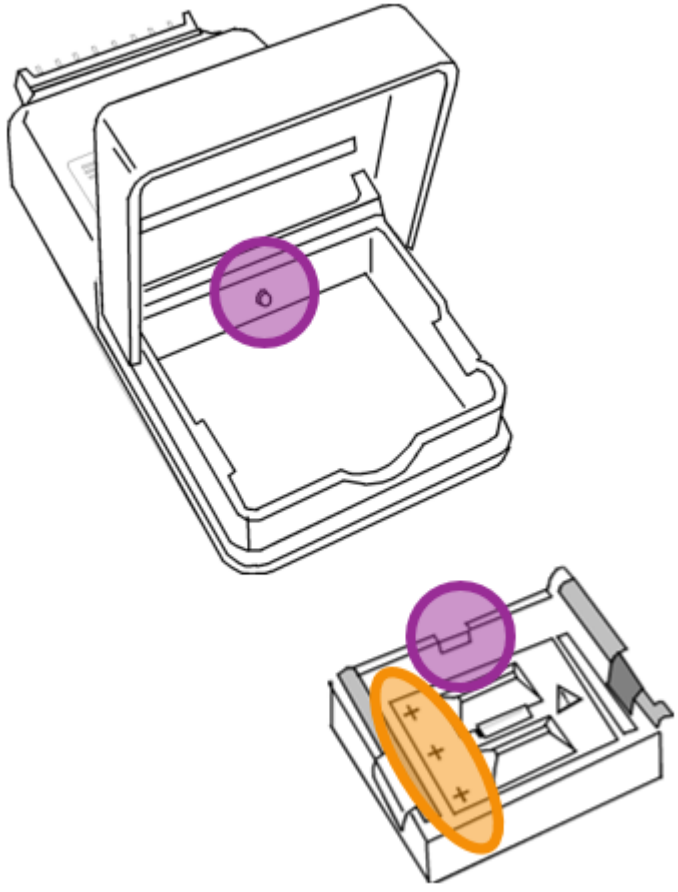
Ensure that the AA battery adapter is inserted into the battery compartment in the correct orientation. If the battery adapter is inserted fully with the orientation reversed, it will be difficult to remove.

Caution

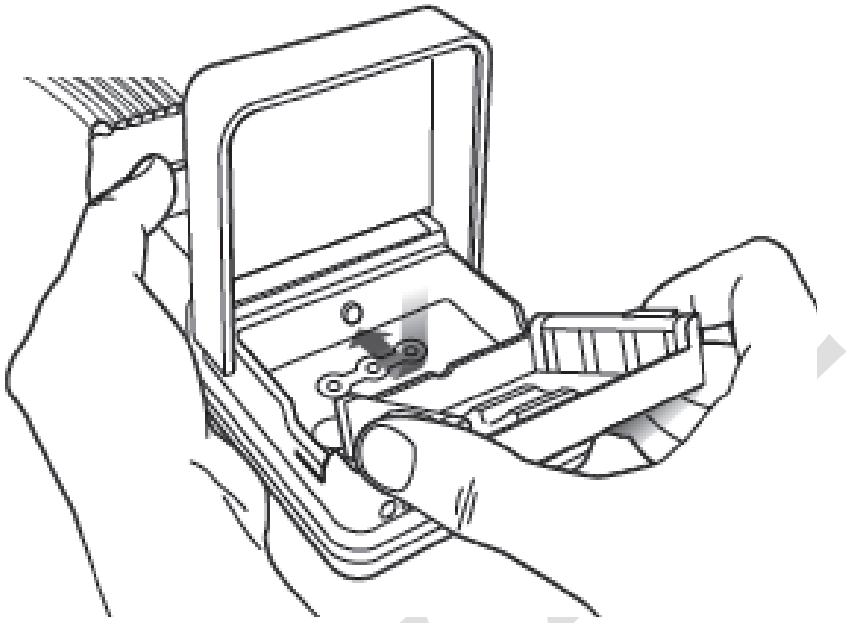
Do not use any tools to pry or pull the battery adapter tray out of the battery compartment as this can result in damage/breakage of the retention tabs that are integral to the MX40/battery compartment.

➢ *AA Battery Adapter Insertion:*

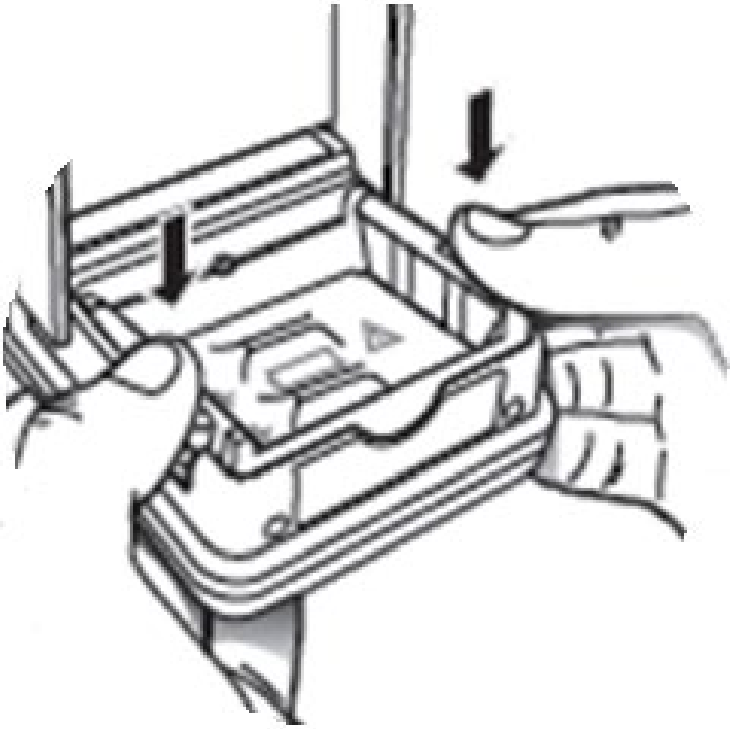
2a - Align the cutout in the back of the adapter with the post on the wall of the MX40 battery compartment. Please note that the "+" symbols for the batteries will be on left side of the adapter when oriented properly as shown in the diagram below:



2b - Slide the adapter under the post as shown below:

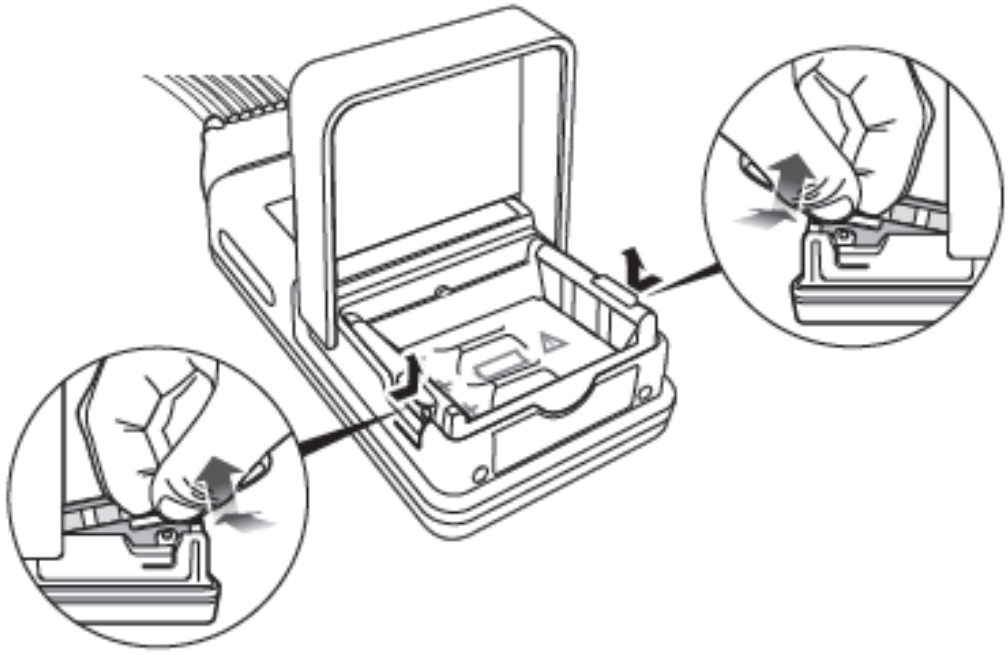


2c - Snap the adapter in by pushing down on it:

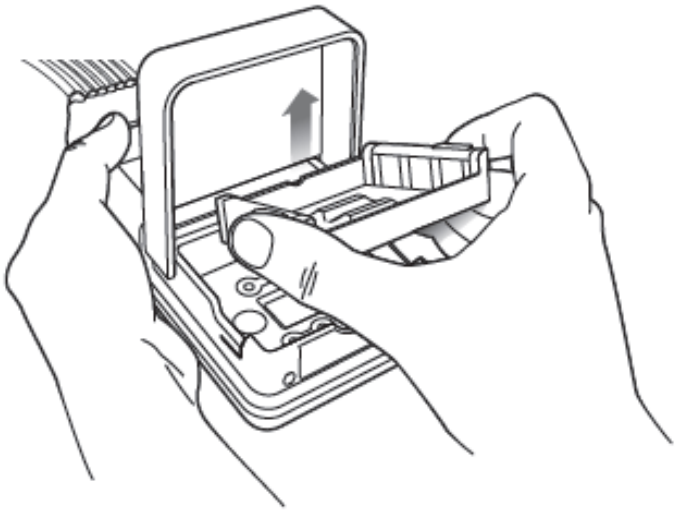


➢ *AA Battery Adapter Removal:*

2d - To remove the AA battery adapter, push inward and then gently pull up on the white tabs on both sides of the adapter to free it from the retention pins on the MX40. A tool is not needed. Use of any tools to pry or pull the battery adapter tray out of the battery compartment can result in damage/breakage of the retention tabs that are integral to the MX40.



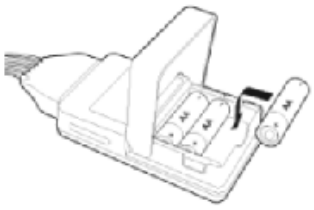
2e - Once the adapter is free of the retention pins, it can be removed completely from the MX40.



Caution

The MX40 Battery Adapter Tray requires routine inspection, and will require replacement when visible signs of wear are present, including corrosion, cracks, bends, crimping, or curling that can prevent disposable batteries from remaining securely in the tray. It is recommended that the MX40 Battery Adapter Tray be replaced every 12 months or when visible wear is recognized. A date code is included on the Battery Adapter Tray to help you identify the 12-month time period with a format of YY/MM, e.g. 15/11 meaning November 2015.

3. Insert three Duracell AA 1.5V Alkaline batteries, matching the polarity with the + indications inside the compartment.



Note—all batteries are inserted with the + polarity in the same direction. Use of AA batteries is not supported with the WLAN MX40 (Model Number 865352). Use only the rechargeable lithium-ion battery.

4. Close the battery compartment door.
5. Watch for the start-up screen on the front of the MX40 to illuminate briefly.

Removing the Batteries

Batteries should be removed when the MX40 is not in use or is being stored.

To remove the batteries, open the battery compartment door and push from the opening at the bottom of the compartment to pop the batteries out. To remove the rechargeable battery, open the battery compartment door and lift up on the raised tab on the battery to release it from the battery compartment. Device settings (patient cable type, SpO_2 mode, volume, etc.) are retained when the batteries are removed.

Important— Do not use AA batteries that have different energy levels remaining. Fresh AA batteries are recommended for each new application.

Caution

Do not "store" disposable AA batteries by leaving them in the incorrect polarity position in the MX40.

Be careful not to short circuit the batteries. Batteries can get hot when shorted. Short circuits are caused when a piece of metal touches both the positive and negative terminals simultaneously. More than a momentary short circuit will generally reduce the battery life. In case of a short circuit, discard the batteries, or just the shorted one if the batteries are new.

Failure to remove the rechargeable battery from the MX40 when the device is not in use may result in damage to the battery, including reduced capacity, inaccurate charge status indicator, failure to charge, and failure to function in the MX40.

Disposal of Batteries

When disposing of batteries, follow local laws for proper disposal. Dispose of batteries in approved containers. If local regulations require you to recycle batteries, recycle batteries in accordance with those regulations.

Battery Charge Status

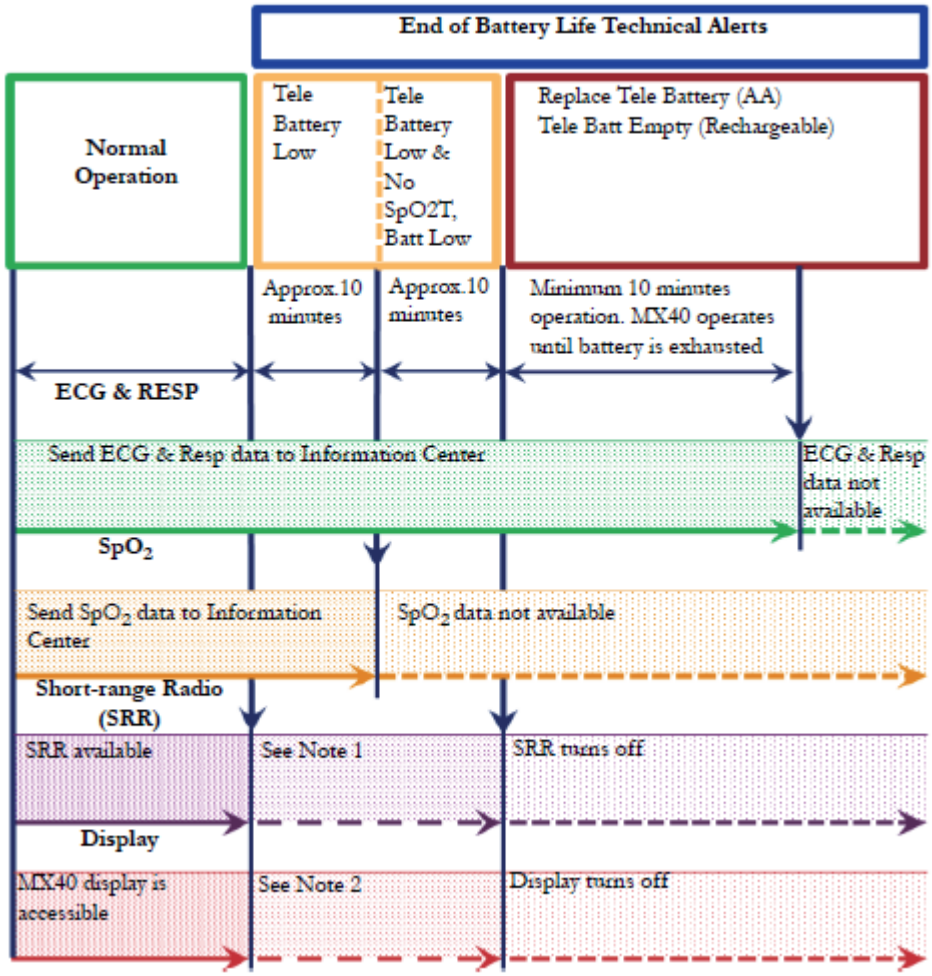
The battery charge indicator displays in the Status Area and communicates the remaining battery charge time when using both AA batteries and the rechargeable lithium-ion battery.

When the MX40 is initially powered-on, it takes approximately 25 seconds for the indicator to populate. During this time, the indicator displays a ? in the battery icon.

In order to guarantee overall device performance, certain functionality is disabled when the battery charge reaches critical levels. See the diagram below for additional information about battery status.

When monitoring SpO2 and the battery reaches a low battery state, the Tele Battery Low INOP is displayed for approximately 10 minutes. After this time period, No SpO2T, Batt Low and Tele Battery Low are displayed for an additional 10 minutes (approximate). If you need to continue to monitor SpO2, replace your batteries during the initial Tele Battery Low period. Once the time period has elapsed, a 3rd INOP is displayed - Tele Replace Batt/Tele Batt Empty. This INOP is displayed for at least 10 minutes, but can also display for several hours depending on your environment. During the Tele Replace Batt/Tele Batt Empty period, the MX40 will continue to send ECG monitoring information to the Information Center for as long as possible. Once battery power is completely depleted, monitoring will stop completely and 2 INOPs are displayed at the Information Center Replace Tele Batt/Tele Replace Batt (or Tele Batt Empty) and No Signal/No Data Tele. Failure to replace battery power in a timely manner will cause monitoring and physiological alarms to cease.

MX40 Performance at End of Battery Life



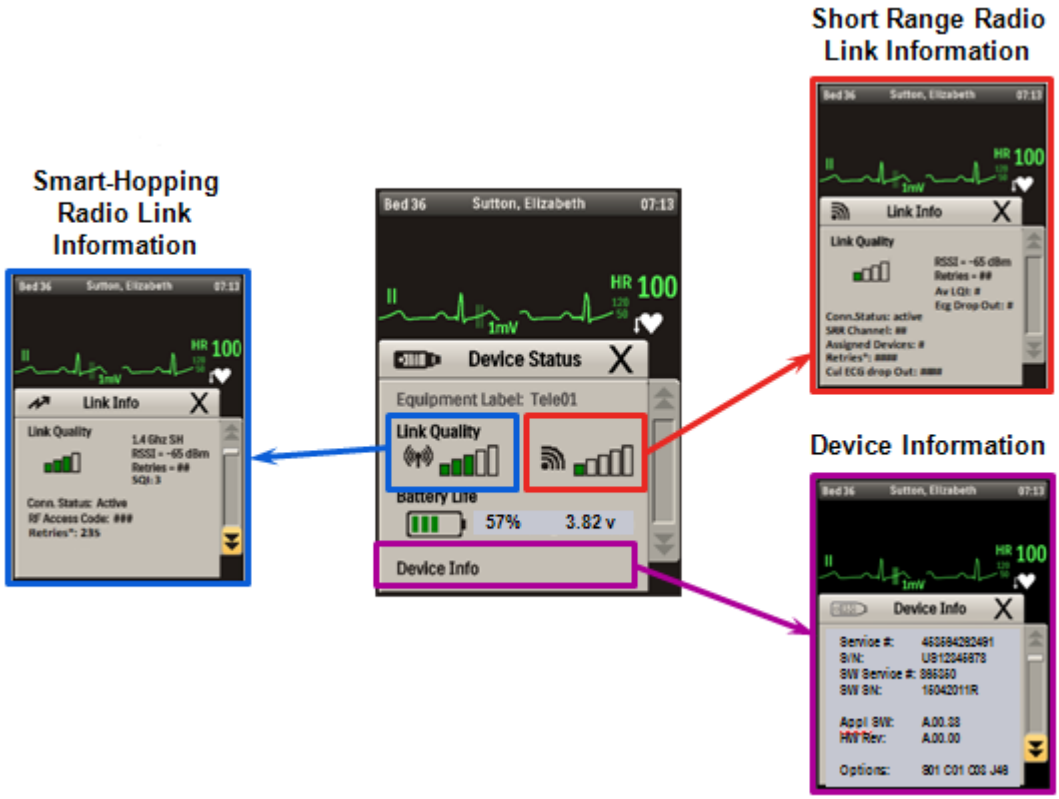
Note 1 – If the SRR is already connected, SRR connectivity continues. In this state, it is not possible to start a new SRR connection.

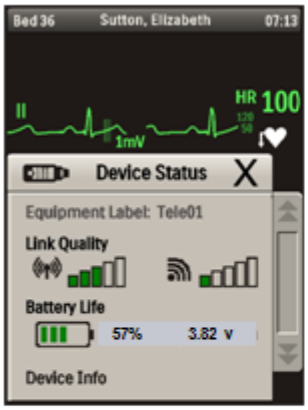
Note 2 – If the display is already turned on, the display will dim, but will continue to function. In this state, it is not possible to turn the display on if it is off.

Note 3—If the Tele Battery Low INOP occurs and then the MX40 disconnects from the network, the behavior and timing described in the diagram above does not apply. The screen activates to show a large red battery icon , and the device plays an escalating double beep sound to indicate that it is disconnected from the network. Alarm and SpO2 monitoring are no longer available locally. The MX40 will attempt to reconnect to the Information Center to transmit the battery INOP condition.

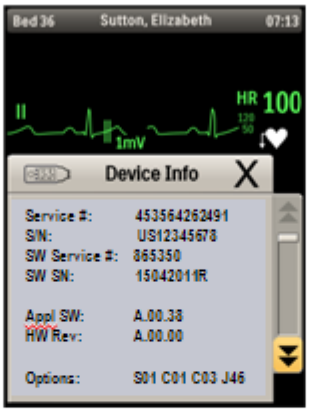
Service Information Available in Monitoring Mode

While the MX40 is operating in Monitoring Mode, important Service information is available by touching the Status Area. You can view radio signal strength and device specific information, such as serial number and software and hardware revisions.





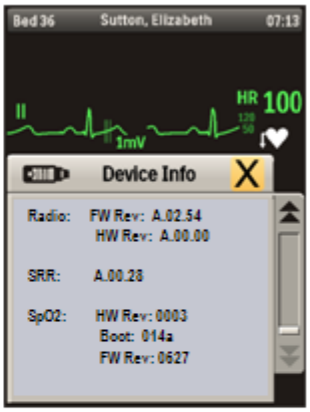
Device Info – Page 1



Hardware Service Number
Hardware Serial Number
Software Service Number
Software Serial Number

Application
Software Revision
and Options

Device Info – Page 2



Detailed Revision
Information

Configuration Mode

For information on configuration settings that are entered at the MX40, see the *IntelliVue MX40 C.01 Configuration Guide* contained on the MX40 Documentation CD, p/n 4535 647 51811. For information on configuration settings that are entered at the Information Center, see the *Patient Information Center iX Clinical Configuration Guide, Release C.03* contained on the MX40 Documentation CD, p/n 4535 647 51811.

Configuration Mode is password protected. The password to enter is "71034". This password may be modified. See Change Password on pg. 4-28.

Clinical Configuration

The table below lists the settings that are configured using the **Configuration** menu:

Setting	Description	MX40 with IIC N	MX40 with IIC L/M	MX40 with IIC iX
Touch Tone Volume:	Audio feedback for button touch events. Mute (0) or allow sound feedback	0 -10 **4**	0-10 **4**	0-10 **4**
Default Screen:	Screen displayed after power on	1 wave - P(ortrait) **2 waves - P(ortrait)** 2 waves - L(andscape) Chest Diagram All numerics	**1 wave - P(ortrait)** Chest Diagram	The default setting at IIC iX overrides the MX40 Default Screen setting. Additional 6 numerics (no waves) screen available, but cannot be configured as Default Screen.
Screen Color:	The color of the Standby screen can be changed. This can be used to distinguish devices between different units, e.g. Blue for CCU, Green for ED	**Blue**, Gray, Green, Pink, Purple, Yellow ***Note* —** Blue, Gray, and Green apply to both Startup and Standby screens. Pink, Purple and Yellow apply to Standby screen only.	**Blue**, Gray, Green, Pink, Purple, Yellow	**≤ B.04** **Blue**, Gray, Green, Pink*, Purple*, Yellow* **≥ B.05** **Blue**, Green, Purple, Orange*, Aqua (* only display in Standby Mode)
ECG Cable Color:	These are the colors that will be displayed on the chest diagram if a patient cable type cannot be determined.	**AAMI**, IEC	**AAMI**, IEC	**AAMI**, IEC

Setting	Description	MX40 with IIC N	MX40 with IIC L/M	MX40 with IIC iX
Alarm Sounds:	Sets MX40 alarm sound type to Traditional (Carenet) or ISO.	**Traditional**, ISO	**Traditional**, ISO	**Traditional**, ISO
Alarms On:	Enable: All MX40/IIC Release N features available. Disable: MX40 operates as if connected to IIC Release L/M.	Disable, **Enable** ***Note —*** This configuration item is not available when operating with IIC iX.	**Disable**	**Enable** (cannot disable - MX40 is the alarm manager)
Lock Time	Sets the default automatic lock time (minutes).	1, 2, **5**, 15, 30	1, 2, 5, 15, 30	1, 2, **5**, 15, 30
Unit Defaults:				

The table below lists the settings that are configured using the **SmartKeys** menu:

Setting	Description	MX40 with IIC N	MX40 with IIC L/M	MX40 with IIC iX
Alarm Volume for Off Network:	Sets the default alarm volume when the device goes off network	10 only	10 only	10 only
Inop Reminder:	Inop reminders on or off	Set at IIC	**On**, Off	Set at IIC iX
Inop Severity: • ECG Leads Off • Replace Battery • Leadset Unplugged • Invalid Leadset	Sets the severity of the "ECG Leads Off", "Replace Battery" and “Leadset Unplugged” INOP conditions	Set at IIC	Red, Yellow, **Cyan**	Set at IIC iX
• Screen On Time	Sets default screen on time (minutes)	**1**, 2, 5, 15, 30	**1**, 2, 5, 15, 30	Set at IIC iX
• Trend Group	Sets default trend group type: Standard (no ST/QT) or Cardiac (includes ST/QT)	Standard (Cardiac not available)	Standard (Cardiac not available)	**Standard**, Cardiac
• Trend Interval	Sets default trend interval time	**1**, 5, 10, 15, 30, 1 hour, 2 hours	**1**, 5, 10, 15, 30, 1 hour, 2 hours	**1**, 5, 10, 15, 30, 1 hour, 2 hours

The table below lists the settings that are configured using the individual parameter **Setup** menus for ECG, SpO_2 and Resp:

Setting	Description	MX40 with IIC N	MX40 with IIC L/M	MX40 with IIC iX
Lead Placement:	Sets the default lead placement to either Standard or EASI ECG. This impacts the leads that are selectable and the location of the electrodes displayed on the Chest Diagram.	**Standard**, EASI	**Standard**, EASI	Set at IIC iX
SpO_2 Mode:	Sets the default SpO_2 mode to either Manual or Continuous.	**Manua**l, Continuous	**Manua**l, Continuous	Set at IIC iX (Auto also available)
Change Wave 1 / 2	The following choices are available if the waveform displayed is:			
	ECG	Primary Lead, Secondary Lead, Pleth	Primary Lead, Secondary Lead, Pleth	Primary Lead, Secondary Lead, Pleth
	Pleth	Any ECG Lead, Any Pleth	Any ECG Lead, Any Pleth	Any ECG Lead, Any Pleth, Any Resp
	Resp	n/a	n/a	
	Note — Wave 1 on MX40 defaults to ECG Wave - Primary Lead. Wave 2 on MX40 defaults to PlethT.			
ECG Wave Adjust Size	Sets default ECG wave size on MX40.	x1/2, **x1**, x2, x4	x1/2, **x1**, x2, x4	x1/2, **x1**, x2, x4
RESP Wave Adjust Size	Sets the default Respiration size (MX40 and IIC iX)	n/a	n/a	x1/2, x1, **x2**, x4

Default Settings = **Bold**.

Note — The IntelliVue Support Tool - Mark 2 can be used to copy the configuration of one MX40 to another MX40. It can also be used to copy passwords from one MX40 to another MX40.

Service Mode

This section describes the menus and settings accessed from the Service Operating Mode. Service Mode is password protected. The password to enter is "1345". This password may be modified. See below.

Change Password

The **Change Password** menu allows you to set new passwords on the MX40 for access to Configuration Mode, Service Mode and Demo Mode. Passwords must have a minimum of three numerical characters and a maximum of five numerical characters.

1. Enter current password.
2. Enter new password.
3. Re-enter new password.

Setup Network

The **Setup Network** menu allows you to set the RF Access Code for the MX40.

Revisions

The **Revisions** menu displays the **Device Info** menu:

- Service #: This is the Service Identification Number located on the back label and used to identify the device.
- S/N: This is the Hardware Serial Number for the device located on the back label and used to identify the device.
- SW Service #: This is the Service Identification Number for the software version on the device. It can be found on the Software License Certificate that shipped with the Device.
- SW SN: This is the Software License Number. It can be found on the Software License Certificate that shipped with the device.

  Note — Customers should save the Software License Certificate for future reference.
- Appl SW: This is the revision of the software installed and running on the MX40.
- HW Rev: This is the Revision Number for the device hardware.

- Options: List of enabled product options on the device.

Enabled Product Option #	Product Option
S01	ECG only
S02	ECG and SpO_2
S03	ECG and SpO_2 Ready (for future upgrade)
S04	ECG and SpO_2 (Masimo)
C01	Enhanced Arrhythmia
C03	24 hours of Vitals Trends
J46	Short-Range Radio
M02	Impedance Respiration

Rechargeable Battery Information

The **Batt Info** menu displays information about the rechargeable battery. Touch the Device Status area and then the battery area to display:

- Rechargeable: The battery type.
- Percent Remaining: Remaining battery capacity.
- Voltage: Current voltage measurement.
- Av. Current: Average current measurement.
- Av. Power: Average current power measurement.
- Temp: Current operating temperature.
- Ch Cycle: The number of charge cycles the battery has undergone.

Demo Mode

The MX40 has a Demo Operating Mode available for assistance in sales and training situations. Demo Mode is password protected. The password to enter is "14432". This password may be modified. See Change Password on pg. 4-28

In Demo Mode, all menus are accessible, and all buttons and SmartKeys are operational. There is a simulated ECG wave on the display, and the alarm system is functional. Data is transmitted to the Information Center and is labeled "Demo" in the patient sector and on the MX40 in the Leads Off Status Area.

5. Maintenance

This section provides procedures for maintaining the MX40 after installation, including equipment label assignment, cleaning and battery care.

Cleaning

The procedure in this section keeps the MX40 and its accompanying patient cable clean and provides protection against infectious agents and bloodborne pathogens. Both the outside and the inside of the MX40 battery compartment and the patient cable must be kept free of dirt, dust, and debris.

Caution

After use, the MX40 and accessories must be cleaned as per the instructions contained herein. Use only the recommended cleaners and disinfectants listed in the table below. Others may cause damage (not covered by warranty), degrade performance, reduce product lifetime, or cause safety hazards.

Note — Sterilization of the MX40 has been qualified using the STERRAD 100NX System. For more information and instruction on sterilizing the MX40, please contact your Steris representative. The alternative Steris V-pro process using hydrogen peroxide vapor is also acceptable.

Note — Single-Patient-Use leadsets are intended to be disposed of when use is complete. They are not to be re-used and are not designed to be cleaned using any of the materials listed below.

Note — The MX40 Battery Adapter Tray requires routine inspection and will require replacement when visible signs of wear are present, including cracks, bends, crimping, or curling that can prevent disposable batteries from remaining securely in the tray. It is recommended that the MX40 Battery Adapter Tray be replaced every 12 months or when visible wear is recognized.

➢ ***Perform the following steps to clean the MX40 and the patient cable of visible surface contamination.***

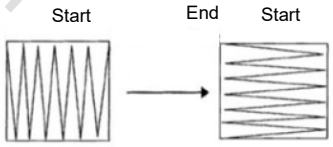
Note — when cleaning, the use of protective gloves is encouraged.

1. Remove the batteries and disconnect the patient cable. Note that disconnecting the patient cable for cleaning is dependent on your hospital's protocol. The connection between the MX40 and the patient cable is rated IPX7 (protected against the effects of temporary immersion in water). Care must be taken to ensure this area of connection is completely dry prior to reconnecting the MX40 with the patient cable. The MX40 and patient cable must be connected correctly and completely in order to maintain the IPX7 rating. The battery compartment of the MX40 has an IPX3 rating (protected against the effects of spraying water).

   If using disposable AA batteries, remove the battery adapter tray and clean separately. Dispose of AA batteries according to hospital policy.

   If using the MX40 rechargeable battery, remove and clean separately.
2. Clean the MX40, rechargeable battery, patient cables, and battery adapter tray before disinfecting.
3. Wipe the MX40, rechargeable battery, and patient cables using a lint-free cloth dampened modestly with one of the approved cleaning or disinfecting agents listed in the table below.

   If using a cotton swab to clean or disinfect, swabbing should be unidirectional at a time. Parallel strokes should be used to cover the entire swab area as shown below.



4. Wipe the exterior surfaces of the patient cable using a lint-free cloth dampened modestly with one of the approved cleaning or disinfection agents listed in the table below. If the interior surfaces of the patient cable connector require disinfection, wipe using a lint-free cloth dampened modestly with isopropyl alcohol only. Wipe between and around the MX40 connector pins to remove chemical residue.
5. Wipe the outside surfaces of the battery adapter tray with one of the approved cleaning or disinfecting agents listed in the table below. Wipe the inside surfaces of the battery adapter tray with a lint free cloth dampened modestly with isopropyl alcohol.
6. Follow the manufacturer's instructions with regard to application duration.

7. Remove cleaner residue by wiping the MX40, exterior surfaces of the patient cables, rechargeable battery, and battery tray with a lint-free cloth modestly dampened with distilled water or isopropyl alcohol.
8. Allow to air-dry, or dry with a non-lint producing cloth.
9. Store the MX40 until ready to re-use. Do not insert rechargeable or disposable batteries until ready for use.

Cautions

Never immerse or soak the MX40, the patient cable, the batter adapter tray, or the rechargeable battery in any liquid solution for cleaning or disinfecting. Damage may result.

Use of cleaning/disinfecting agents other than isopropyl alcohol inside the patient cable connector and battery adapter tray can result in chemical residue build-up and damage to the contacts. Connecting the patient cable to the MX40 while there is still moisture from the cleaning/disinfecting agents other than isopropyl alcohol present, and then inserting the rechargeable battery or battery adapter tray and batteries into the MX40 can result in corrosion of the MX40 pins and patient cable contacts.

Use of brushes with stiff and/or wire bristles on any part or component of the MX40 may cause damage.

Cleaning Materials for the MX40

Cautions

- Use of abrasive cleaning materials, or disinfectants or cleaning agents not listed herein, on any part or component of the MX40 may damage the components.
- Sharp or pointed instruments should not be used to remove soil from recessed areas on the MX40.

Note —The cleaners listed in the following table have been tested and approved by Philips as of the print date of this document.

Note —The listed cleaners are also suitable for cleaning the outside of the patient cable, the rechargeable battery, and the outside surface of the battery adapter tray.

Approved Cleaners

Cleaner	Active Ingredient
Isopropyl Alcohol	Isopropyl Alcohol (≥70%)
Hydrogen Peroxide	Hydrogen Peroxide (3%)
Chlorine Bleach	Sodium Hypochlorite (1:10 concentration, mixed < 24 hours)
Metrex CaviWipes	Isopropyl alcohol (15-18%) Sodium hydroxide (0.1%) 2-butoxyethanol (1-5%)
Viraguard	Isopropanol (70%)
Resert XL HLD	Hydrogen peroxide (1.4-2-3%) 2-Fumic Acid (<2.5%)
Sporox II Sterilizing & Disinfection Solution	Hydrogen peroxide (7.5%) Phosphoric acid (0.85%)
Sanicloth Plus Germicidal Cloths (Red Top)	Isopropyl alcohol (55%) n-Alkyl dimethyl ethyl benzyl ammonium chlorides n-Alkyl dimethyl benzyl ammonium chlorides Quaternary ammonium (0.5%)
WipesPlus Disinfecting Wipes	Phenylphenol (0.28%), Benzyl-p-chlorophenol (0.03%)
TechSpray General Purpose Cleaner	Isopropyl alcohol (70%)
Oxivir Tb Cleaner Disinfectant	Hydrogen peroxide (2.5-3.5%)
Oxivir Tb Wipes	Hydrogen peroxide (3%)
Sanicloth HB	Quaternary ammonium (1%)
Sanicloth Plus (Red Top)	Quaternary ammonium (0.25%) 2-Butoxyethol (1-4%) Isopropyl alcohol (14.85%)
Super Sanicloth (Purple Top)	Quaternary ammonium (<1%) Isopropyl alcohol (55%)
Sanicloth Bleach Germicidal Disposable Wipes (Orange Top)	Sodium Hypochlorite (0.6%)
Balcillol 25	Ethanol 100 mg/g, Propane-2-ol 90 mg/g Propane-1-ol 60 mg/g

Cleaner	Active Ingredient
Bacillol AF	Propane-1-ol (450 mg/g) Propane-2-ol (250 mg/g) Ethanol (47 mg/g)
Hydrogen Peroxide	Hydrogen peroxide (5%)
Meliseptol	Propane-1-ol, (50 g) Glyoxal (0.08 g)
Alkaspray Ultra	Bis (3-aminopropyl) Dodecylamine (0.31 g) Didecyl dimethyl ammonium chloride (0.16 g) Benzalkonium chloride (0.03 g)
Dismozon Plus	Magnesium monoperoxyphthalate hexahydrate (≥90%, ≤100%); Tridecanol, branched, ethoxylated (≥1%, <2.5%); Amines, coco alkyldimethyl, N-oxides(≥1%, <2.5%); (1 packet in 4 liters water, 0.4%)
Biguacid Liquid	ethanol (25 - 30 %) propan-2-ol (35 - 40 %) polyhexamethylene biguanide hydrochloride < 0.1 %
Lysoformin	Formaldehyde (6%) Glutaral (1.8%) (0.75% solution in water)
Descosept pur	Ethanol (45%)
Descogen Liquid	Pentakaliumbis (peroxymonosulfate) bis (sulphate) > 1%

Unsupported Cleaners

The following cleaners have been tested and failed. They should not be used to clean the MX40.

- Caltech-Dispatch 5200
- Cidex OPA
- Gluteraldehyde
- Liquid Soap (antibacterial soap)
- Omnicide
- Sanicloth AF
- Wavicide
- Cidex Formula 7
- Cidex Activated Dialdehyde
- Incidin
- Metricide
- Procide 14
- Virex Tb

Disposing of the MX40

Warning

To avoid contaminating or infecting personnel, the environment or other equipment, make sure you disinfect and decontaminate the MX40 appropriately before disposing of it in accordance with your country's laws for equipment containing electrical and electronic parts. For disposal of parts and accessories where not otherwise specified, follow local regulations regarding disposal of hospital waste.

You will find detailed disposal information on the following web page:

http://www.healthcare.philips.com/main/about/Sustainability/Recycling/pm.wpd

The Recycling Passports located there contain information on the material content of the equipment, including potentially dangerous materials which must be removed before recycling (for example, batteries and parts containing mercury or magnesium).

Do not dispose of waste electrical and electronic equipment as unsorted municipal waste. Collect it separately, so that it can be safely and properly reused, treated, recycled, or recovered.

Label Assignment for Replacement MX40

During installation, an equipment label is assigned to each MX40 in a clinical unit so that the device can be identified during operation within the wireless system. If an MX40 is lost, the Assign Label function at the Information Center enables you to unassign the label from a lost device and re-assign its label to a replacement device. Labels are limited to those available in an individual clinical unit.

Re-assigning an Equipment Label at the IntelliVue Information Center

➢ *To re-assign an equipment label to a replacement device:*

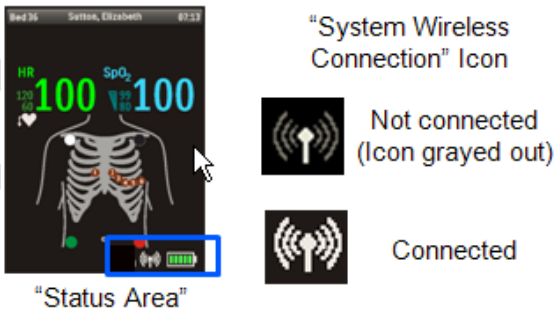
1. At the Information Center, clear the sector that the original equipment label was assigned to (**Patient Window -> Sector Setup -> Clear Sector -> OK**).

Note — Before clearing the sector, ensure that the equipment label of the lost device is not actively assigned to a patient being monitored.

2. Select **All Controls -> Label Assignment**.
3. Enter password (tele).

Note — The remaining screens will be in English only.

4. Insert battery power into the MX40 and if attached, disconnect the patient cable.
5. Select **Refresh**.



6. Select the MAC address of the replacement device from the **New Devices** list. If the address does not appear, remove battery power and re-insert. Select **Refresh**.

Note — The MAC address appears on the rear label of the MX40.

7. Select the equipment label that was assigned to the previous device from the **Equipment Label** list.
8. Select **Assign Label** to initiate programming of the equipment label into the replacement MX40.
9. When prompted, press **Confirm** on the MX40 to accept the assignment. The confirmation must occur within 30 seconds of the prompt.
10. Wait for the new device label to change to the selected equipment label.
11. In **Sector Setup**, select the **Bed Label** and **Equipment Label** and then press **OK**.

Re-assigning an Equipment Label at the IntelliVue Information Center iX

➢ *To re-assign an equipment label to a replacement device:*

1. Enter the **Manage Unit** application (scroll down if necessary).
2. Select **Label Assignment**.
3. Select the entry for both the previously assigned device (on the left) and the entry for the available device (on the right).
4. Select **Replace**.
5. At the MX40, select **Confirm**.
6. At the Information Center iX, select **OK**.
7. Select Refresh to confirm that the device now appears in the **Assigned Devices** column.
8. Confirm that the Equipment Label is now displayed on the MX40.

Charging Lithium-ion Rechargeable Batteries

The li-ion rechargeable battery is recharged using the IntelliVue CL Charging Station. In order to meet the published battery life specifications, the battery should be fully charge before use.

Battery management is very important to ensure that when a fully charged battery is needed, one is available. Recharging a discharged battery can take up to 6.5 hours.

To charge a battery, place it onto a charger slot on the charging station. The battery power indicators will supply information about the charge status.

Warning

- Always use the supplied power cord with the grounded mains plug to connect the charging station to a grounded AC mains socket. Never adapt the mains plug from the power supply to fit an ungrounded AC mains socket.
- Do not use AC mains extension cords or multiple socket outlets. If a multiple portable socket outlet without an approved isolation transformer is used, the interruption of its protective grounding may result in leakage currents equal to the sum of the individual ground leakage currents, so exceeding allowable limits.
- Do not connect any devices that are not supported as part of the system.

Battery Power Indicators

There are various indications which help you keep track of the battery power status.

- LEDs on the charging station slots
- battery status information on both the MX40 and the charging station's display, and at the Information Center
- INOP messages

The indicators always show the remaining capacity in relation to the battery's actual maximum capacity which may lessen as the battery ages.

Charging Station LEDs

The **AC Power / Error LED** is

- cyan during startup or to indicate a general charging station error
- green when the charging station is connected to AC power

The nine **Charger Slot LEDs** show the battery status of the device in their slot and are switched off if a battery is not inserted.

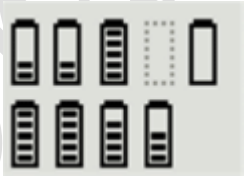
When a battery is put on a charging station slot, confirm that the corresponding LED flashes yellow until the battery's current state has been identified. Then a beep is issued, and the LED reflects the battery status as described in the table below.

Status	LED
no battery on charger slot or battery inserted upside down.	off
battery put on charger slot and recognized	flashing yellow
battery not properly recognized, error	cyan
battery recognized, battery charging	yellow
battery recognized, battery full (≥90%)	green

Note — Wiping of battery contacts with an alcohol solution after cleaning is recommended.

Battery Status on the Charging Station Display

The IntelliVue CL Charging Station display provides a quick overview of all the connected devices and their battery status. The screen is arranged in the same layout as the charger slots.



Note — The display on the charging station is product revision dependent. Newer revisions do not have a display.

Battery Lifetime Management

The lifetime of a li-ion battery depends on the frequency and duration of use. When properly cared for, the useful life is approximately 500 complete charge-discharge cycles.

Battery Disposal

Discharge the battery and insulate the terminals with tape before disposal. Dispose of used batteries promptly and in accordance with local recycling regulations.

6. Part and Option Ordering Information

This section provides specific part number, option number, support part number, and descriptive information associated with the MX40.

MX40 Support Parts

1.4GHz Smart-hopping MX40 – 865350 (USA & Puerto Rico only)

Country	Service # on device label	Option S01: ECG Only S02: ECG+FAST SpO2 Enabled S03: ECG+FAST SpO2 Upgradeable S04: ECG+SET SpO2 Enabled (Masimo)	Description	Order Part Number:
US or PR	453564262491	S01	TELE MX40, 1.4 GHz, ECG only, exchange	453564262491
US or PR	453564262511	S02 or S03	TELE MX40, 1.4 GHz, ECG&Sp02, exchange	453564262511
US or PR	453564758561	S04	TELE MX40, 1.4 Ghz, ECG and SET Sp02, ex	453564758561
All	All	All	ASSY - MX40 AA Battery Adapter	453564132721
All	All	All	PLAST - MX40 Battery Door V2	453564602631
All	All	All	MX 40 Lithium ion battery pkg 1	989803176201
All	All	All	MX40 Lithium-ion battery pkg 3	989803174131
All	All	All	MX40 Service Adapter + Cable (tool for service)	453564270071

2.4GHz Smart-hopping MX40 – 865351

Country	Service # on device label	Option S01: ECG Only S02: ECG+FAST SpO2 Enabled S03: ECG+FAST SpO2 Upgradeable S04: ECG+SET SpO2 Enabled (Masimo)	Description	Order Part Number:
Argentina	453564467721	S01	TELE MX40,2.4 GHz, ECG only, exchange, Argentina	453564467721
Argentina	453564467741	S02 or S03	TELE MX40,2.4 GHz, ECG&Sp02, exchange, Argentina	453564467741
China	453564467841	S01	TELE MX40, 2.4 GHz, ECG only, exchange, CN	453564467841
China	453564467861	S02 or S03	TELE MX40, 2.4 GHz, ECG&Sp02, exchange, CN	453564467861
Japan or Indonesia	453564451791 or 453564262531	S01	TELE MX40, 2.4 GHz , ECG only, exchange, JP,ID	453564451791
Japan or Indonesia	453564451811 or 453564262551	S02 or S03	TELE MX40,2.4 GHz, ECG&Sp02, exchange, JP,ID	453564451811
Japan	453564758581	S04	TELE,MX40,2.4Ghz,ECG&SET Sp02,exch,JP	453564758581
Korea	453564467761 or 453564262531	S01	TELE MX40,2.4 GHz, ECG only, exchange, Korea	453564467761
Korea	453564467781 or 453564262551	S02 or S03	TELE MX40,2.4 GHz, ECG &Sp02, exchange, Korea	453564467781
Mexico	453564467801	S01	TELE MX40, 2.4 GHz, ECG only, exchange, Mexico	453564467801
Mexico	453564467821	S02 or S03	TELE MX40, 2.4 GHz, ECG&Sp02, exchange, Mexico	453564467821
Taiwan	453564615431 or 453564451791 or 453564262531	S01	TELE MX40, 2.4 GHz , ECG only, exchange, TW	453564615431
Taiwan	453564615451 or 453564451811 or 453564262551	S02 or S03	TELE MX40,2.4 GHz, ECG&Sp02, exchange, TW	453564615451
All other countries	453564262531	S01	TELE MX40, 2.4 GHz, ECG only, exchange	453564262531
All other countries	453564262551	S02 or S03	TELE MX40, 2.4 GHz, ECG&Sp02, exchange	453564262551
All other countries	453564758681	S04	TELE MX40, 2.4 Ghz, ECG &SET Sp02, exchange	453564758681
All	All	All	ASSY - MX40 AA Battery Adapter	453564132721

Country	Service # on device label	Option S01: ECG Only S02: ECG+FAST SpO2 Enabled S03: ECG+FAST SpO2 Upgradeable S04: ECG+SET SpO2 Enabled (Masimo)	Description	Order Part Number:
All	All	All	PLAST - MX40 Battery Door V2	453564602631
All	All	All	MX 40 Lithium ion battery pkg 1	989803176201
All	All	All	MX40 Lithium-ion battery pkg 3	989803174131
All	All	All	MX40 Service Adapter + Cable (tool for service)	453564270071

802.11 MX40 - 865352

Country	Service # on device label	Option S01: ECG Only S02: ECG+FAST SpO2 Enabled S03: ECG+FAST SpO2 Upgradeable S04: ECG+SET SpO2 Enabled (Masimo)	Description	Order Part Number:
US	453564262571 or 453564615311	S01	TELE PWM, 802.11a/b/g , ECG only, exchange, US only	453564615311
US	453564262591 or 453564615331	S02 or S03	TELE PWM, 802.11a/b/g, ECG&Sp02, exchange, US only	453564615331
US	453564758701	S04	TELE PWM,802.11a/b/g, ECG&SET Sp02,EX,US only	453564758701
Japan or Indonesia	453564615391	S01	TELE PWM,802.11a/b/g,ECG only,ex,Japan & Indonesia	453564615391
Japan or Indonesia	453564615411	S02 or S03	TELE PWM,802.11a/b/g,ECG & Sp02,ex,Japan & Indonesia	453564615411
Japan	453564887461	S04	TELE PWM,802.11a/b/g, ECG&SET Sp02,ex,Japan	453564887461
All other countries	453564262571 or 453564615351	S01	TELE PWM,802.11a/b/g, ECG only, exchange, non US	453564615351
All other countries	453564262591 or 453564615371	S02 or S03	TELE PWM,802.11a/b/g, ECG&Sp02, exchange, non US	453564615371
All other countries	453564758721	S04	TELE PWM,802.11a/b/g, ECG&SET Sp02,ex,non US	453564758721
All	All	All	PLAST - MX40 Battery Door V2	453564602631
All	All	All	MX 40 Lithium ion battery pkg 1	989803176201
All	All	All	MX40 Lithium-ion battery pkg 3	989803174131
All	All	All	MX40 Service Adapter + Cable (tool for service)	453564270071

Service personnel can find hardware service number, serial number (outlined in yellow below) and MAC address information on the label on the back of the MX40:

7. MX40 Repair Strategy

Repair choices for the Philips IntelliVue MX40 include: (1) Whole Unit Exchange, offered worldwide through Philips part centers and (2) repair through the Philips Lifecycle Support Center (Philips Repair Bench) for the US and Canada. MX40 repairs for both choices are completed by the Philips factory to the Philips production standards and meet all published specifications.

Philips Healthcare has not qualified any third-party service providers to perform repairs on the IntelliVue MX40. Repair parts and certain accessories purchased from other vendors, except as noted in the MX40 Instructions for Use, are not controlled by the Philips Quality System, and may not meet Philips' published specifications.

Note — Philips does not warrant third party hardware including repair hardware component upgrades; third party software including software upgrades; third party operating systems or operating system patches, fixes and updates.

Tools Required

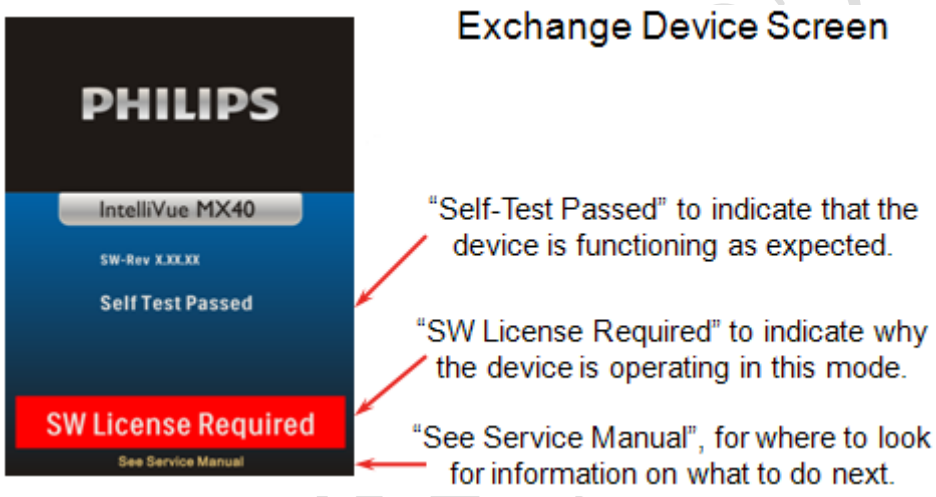
Repair of the MX40 requires the following tools:

- MX40 Service Adapter Cable
- PC running the IntelliVue Support Tool - Mark2
- Internet Connection to the Philips Software License Server

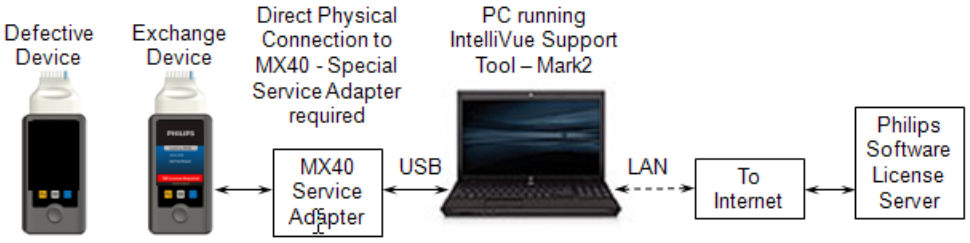
Software License Transfer

The MX40 uses software licensing functionality to track customer information, software revisions, and features enabled. Software Licensing allows Philips personnel to easily determine what products, features, and revisions are installed at a particular customer site.

Exchange devices will arrive without a software license and will display a "SW License Required" message.



The software license from the defective device needs to be transferred to the exchange device using the IntelliVue Support Tool - Mark2. For more information, see the Support Tool Instructions for Use that accompanied the Support Tool software.



Required information from defective device:	Notes on the MX40 Service Adapter and cable:
• Original Ship To Address information (country, city) • SW Serial Number, OR • HW Service Number and HW Serial Number (see Pg. 6-5)	• The service adapter is for service and demo use only. • It is not to be used in the patient vicinity. • It is not to be used to power the device when it is connected to a patient. • The service adapter is installed in the battery compartment. • The MX40 connects to the PC via a USB port, and uses a USB cable – but the MX40 does not operate as a standard USB device. • Maximum cable length = 3 ft (1m)

Note — The MX40 does not support the use of a cable longer than 3 ft. Longer cables may result in an unacceptable drop in voltage.

8. Troubleshooting

This section provides information about the technical alarms generated by the MX40 and associated troubleshooting suggestions. Also provided are troubleshooting suggestions for user interface issues and information regarding the patient cables used with the MX40.

Technical Alarms (INOPs)

Technical Alarms, or INOPs (inoperative conditions), are sourced at the MX40, the ST/AR algorithm running at the Information Center, or the IntelliVue Patient Monitor. They identify inoperative conditions (that is conditions where the system is not operating properly and therefore cannot measure or detect alarm conditions reliably). There are four levels of Technical Alarms:

- **Severe** - Monitoring and alarm generation are disabled. Visual alarm indicator on the MX40. Audible tone at the Information Center. Must be acknowledged by a clinician.
- **Hard** - Monitoring and alarm generation are disabled. Visual alarm indicator on the MX40. Audible tone at the Information Center.
- **Soft** - Monitoring and alarms remain active. Visual alarm indicator on the MX40 and at the Information Center. No audible tones are generated at the Information Center
- **Red/Yellow** - Replace Battery, ECG Leads Off, and Leadset Unplugged INOPs may be configured to display as either Red or Yellow Technical Alarms.
  Note - The ECG Leads Off and Leadset Unplugged INOPs will initially display as a cyan technical alarm until a valid ECG signal is obtained.

Alarm Text	Priority	Condition	What to do
Cannot Analyze ECG **Source - MX40 and Information Center (PIC iX only)**	Hard	Arrhythmia algorithm cannot reliably analyze the ECG data on any monitored leads.	Assess the lead selections, initiate relearn, and validate analyzed rhythm. Check other INOPs for possible source of problem.
Cannot Analyze QT	Soft	The QT Arrhythmia algorithm cannot reliably analyze the QT data on any monitored leads.	• Change electrodes and/or electrode position. • Change Primary lead.
Cannot Analyze ST	Soft	The ST Arrhythmia algorithm cannot reliably analyze the ST data on any monitored leads.	• Change electrodes and/or electrode position. • Change Primary lead.
!! Check Pairing **Source - MX40 and Information Center** **(IIC only)**	Yellow Technical Alarm	• There is a problem with device assignment. • When the MX40 is wirelessly assigned with an X2 patient monitor (no label) docked with a larger networked MP series monitor, the network connection is lost.	• Check that the bedside monitor or cableless measurement device is correctly assigned. • Select the correct device to be assigned.
Chk PulseT Limits **Source - MX40**	Hard	The HR/Pulse alarm limit is set too high/low for the pulse measurement range	Set alarm limit within pulse measurement range. Pulse rate measurement range = > 25bpm - < 240bpm (Masimo SET); > 30bpm - < 300bpm (Philips FAST).
cl NBP Disconnect **Source - Cableless Measurement Device**	Hard	CL NBP Pod is not connected with the MX40.	• Resolve interference condition. • Reduce range between CL NBP Pod and MX40.
cl NBP Batt Empty **Source - Cableless Measurement Device**	Hard	CL NBP Pod empty battery condition. Monitoring is not possible.	• Replace CL NBP Pod. • Recharge depleted CL NBP Pod.

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Alarm Text	Priorit	Condition	What to do
cl SpO2 Batt Empty **Source - Cableless Measurement Device**	Hard	CL SpO_2 Pod empty battery condition. Monitoring is not possible.	• Replace CL SpO_2 Pod. • Recharge depleted SpO_2 Pod.
cl SpO2 Batt Low **Source - Cableless Measurement Device**	Hard	CL SpO_2 Pod weak battery condition.	Charge CL SpO_2 Pod.
cl SpO2 Disconnect **Source - Cableless Measurement Device**	Hard	CL SpO_2 Pod is not connected with the MX40.	• Resolve interference condition. • Reduce range between CL SpO_2 Pod and MX40.
Cuff Not Deflated **Source - Cableless Measurement Device**	Severe	Cuff pressure has exceeded the specified safety limit.	Remove cuff and tubing and expel air.
ECG/Arrh AlarmsOff **Source - MX40**	Soft	ECG is turned off. This is normal behavior if operating in SpO_2 only mode.	• Turn on ECG. • Attach ECG/SpO_2 patient cable.
<ECG Lead>Lead Off **Source - MX40**	Hard	Single lead is off. If primary lead is MCL, lead will be identified as V/C in INOP text.	Re-attach ECG leads to patient.
ECG Leads Off **Note —** This INOP may also be configured to display as a Red or Yellow Technical Alarm. **Source - MX40**	Red or Yellow or Hard Technical Alarm	Multiple leads are off.	Re-attach ECG leads to patient.

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Alarm Text	Priority	Condition	What to do
Invalid Leadset **Source - MX40**	Hard	• FAST SpO2 leadset attached to MX40 with Masimo SET option. • Masimo SET leadset attached to MX40 with FAST SpO2. (MX40 Revision dependent.)	Replace with compatible leadset.
Leadset Life **Source - MX40**	Soft	The single-patient use leadset has exceeded its limit of 25 cycles.	Replace with new leadset.
Leadset Unplugged **Source - MX40** **Note —** If supported by your revision of PIC iX, this INOP may also be configured to display as a Red or Yellow Technical Alarm. **Note —** The message will initially display for up to 3 seconds as “ECG Leads Off” at the MX40 and at the PIC iX.	Red or Yellow or Hard Technical Alarm	• Patient cable has been unplugged from the MX40. • Incompatible leadset attached to patient cable. Masimo leadset attached to MX40 with FAST SpO2. (MX40 Revision dependent.)	• Re-attach the patient cable. • Replace the leadset. • Replace with compatible leadset.
Local Audio Off **Source - MX40** **Note —** This is normal operation in Telemetry Mode.	Soft	There is no alarm audio notification when operating in Telemetry Mode.	Change to Monitor Mode.
NBP Cuff Overpress **Source - Cableless Measurement Device**	Severe	Cuff pressure has increased above overpressure safety limits.	Remove cuff and tubing and expel air.
NBP Equip Malf **Source - Cableless Measurement Device**	Hard	• Tubing may be obstructed or kinked. • Hardware malfunction.	• Check tubing. • If condition persists, contact Service.

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Alarm Text	Priority	Condition	What to do
NBP Interrupted **Source - CablelessMeasurement Device**	Hard	The preset maximum time for the total measurement has been exceeded.	Reduce patient movement and avoid interaction with the cuff and tubing.
NBP Measure Failed **Source - Cableless Measurement Device**	Hard	Measurement values cannot be derived.	• Attach cuff to new location on patient. • Replace cuff.
No Alarm Display **Source - MX40**	Soft	No local alarming at the MX40, networked or non-networked.	• IIC - Configuration specific setting. • PIC iX - Contact Service.
No Central Monit. (appears at MX40 only) **Source - MX40**	Hard	• The MX40 is out of range of the network. • Patient Sector at the Information Center is in Standby.	• Return the MX40 to the coverage area. • Select Resume at the Information Center.
No Host Monitoring **Source - MX40**	Hard	The paired MX40/ bedside monitor is out of short-range radio range or there is excessive radio interference.	• Reduce the distance between the devices. • Identify and remove interference source.
No SpO2T, Batt Low	Hard	Battery power is too low to support SpO_2 measurement.	Insert fresh batteries to continue monitoring SpO_2.
Replace Battery **Source - MX40** **Note —** This INOP may also be configured to display as a Red or Yellow Technical Alarm. This INOP configuration setting also affects the Tele Batt Empty INOP.	Red or Yellow or Hard Technical Alarm, Latched	Disposable battery power is close to depleted. At least 10 minutes of monitoring time remains. Depending on your environment, you may see this message for several hours. Monitoring ceases immediately when batteries are depleted.	To avoid loss of monitoring, replace batteries when this INOP is present.
Resp Equip Malf **Source - MX40**	Hard	• Malfunction in the Resp equipment. • MX40 requires calibration.	Contact Service.

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Alarm Text	Priority	Condition	What to do
Resp Leads Off **Note —** OR leadsets cannot be used to monitor Resp with the MX40. **Source - MX40**	Hard	Resp lead off.	Re-attach lead to patient.
Some ECG AlarmsOff	Soft	Some ECG alarms have been turned off at the Information Center.	For information only.
Speaker Malfunct **Source - MX40**	Soft	The MX40 Power-on Self Test detected a speaker failure.	• Remove the MX40 from use. • Contact Service.
<SpO2 Label> **Erratic** (FAST SpO2 only) **Source - MX40**	Hard	Erratic SpO_2 measurements, often due to a faulty sensor or invalid SpO_2 measurements, or incorrect transducer position	Repeat measurement, reposition sensor on patient, or finally, replace sensor.
<SpO2 Label> **Equip Malf** **Source - MX40**	Hard	Malfunction in the SpO_2 equipment	Contact Service.
<SpO2 Label> **Extd.Update** (FAST SpO2 only) Numeric is displayed with a -?-. **Source - MX40**	Soft	The update period of displayed values is extended due to an NBP measurement on the same limb or an excessively noisy signal.	If NBP is not active, check the sensor placement. Reposition the sensor on patient, or replace sensor.
<SpO2 Label> **Interference** **Source - MX40**	Hard	Level of ambient light or level of electrical interference are so high that the SpO_2 sensor cannot measure SpO_2 and pulse rate.	Reduce ambient light to sensor or electrical noise sources.
<SpO2 Label> **Low Perf** **Source - Monitor**	Soft	Accuracy may be reduced due to low perfusion. Data displayed with ?.	Increase perfusion. Change sensor site. Avoid site distal to BP cuff or intra-arterial line. Warm the site.

Alarm Text	Priority	Condition	What to do
<SpO2 Label> **No Pulse** **Note —** For FAST SpO2 only this INOP may also be configured to display as a Red or Yellow Technical Alarm. **Source - MX40**	Red or Yellow or Hard Technical Alarm	Pulse is too weak or not detectable.	Check connection to patient.
<SpO2 Label> **No Sensor** **Warning** Silencing this technical alarm turns off the SpO_2 measurement on the MX40 and at the Information Center when operating in Manual or Continuous mode. It does not turn the measurement off when operating in Auto mode. **Source - MX40**	Hard	No sensor attached to SpO_2 device.	Attach SpO_2 sensor.
<SpO2 Label> **NoisySignal** **Source - MX40**	Hard	Excessive patient movements or electrical interference are causing irregular pulse patterns	Reduce movement or electrical noise sources.
<SpO2 Label> **Poor Signal** **Source - MX40**	Soft	Although a measurement may be possible, its accuracy may be reduced due to poor signal quality.	• Apply the sensor according to the manufacturer's instructions. • Relocate the sensor to a different site on the patient.
<SpO2 Label> **Pulse?** (FAST SpO2 only) **Source - MX40**	Hard	The detectable pulsations of the SpO2 signal are outside the specified pulse rate range.	• Check connection to patient. • Avoid excessive motion at the measurement site.

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Alarm Text	Priority	Condition	What to do
<SpO2 Label> **ReplcCable** (Masimo SET SpO2 only) **Note —** Depending on PIC iX revision, this may appear there as “Unknown” or “!!Cable life”. Contact Service to upgrade your PIC iX to the compatible revision. The MX40 will display “!! ReplcCable” as expected. **Source - MX40**	Hard Yellow	Hard condition - The connected SpO2 sensor cable is approaching expiration. (95%).	Replace Masimo patient cable.
<SpO2 Label> **ReplcSensor** (Masimo SET SpO2 only) **Note —** Depending on PIC iX revision, this may appear there as “Unknown” or “!!Sensor life”. Contact Service to upgrade your PIC iX to the compatible revision. The MX40 will display “!! ReplcSensor” as expected. **Warning** Failure to replace the sensor when this condition is present will result in loss of SpO2 monitoring. **Source - MX40**	Hard Yellow Technical Alarm	Hard condition - the connected SpO2 sensor or adhesive life is approaching expiration. (95%). Yellow alarm condition - the connected SpO2 sensor or adhesive life has expired.	Replace sensor.
<SpO2 Label>**Searching** **Source - MX40**	Soft	The patient signal is analyzed, but a valid numeric is not available yet.	Wait for the measurement to complete.

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Alarm Text	Priority	Condition	What to do
<SpO2 Label> **Sensor Off** **Note —** The ability of the algorithm to detect this condition depends on the sensor type in use.	Hard	The algorithm has determined that a sensor is connected, but not properly applied to the patient.	• Apply the sensor according to the manufacturer's instructions. • If the condition persists, relocate the sensor to a different site on the patient.
<SpO2 Label> **Sensor Malf** **Source - MX40**	Hard	Malfunction of the SpO_2 sensor/adapter cable	Replace sensor and/or adapter cable.
<SpO2 Label> **Unkn.Sensor** **Source - MX40**	Hard	The connected SpO_2 sensor and/or adapter cable is not supported by the hardware version.	Use specified sensor and/or adapter cable.
<SpO2 Label> **Upgrade** (FAST SpO2 only) **Source - MX40**	Soft	SpO_2 hardware is in upgrade process. SpO_2Monitoring is not possible.	Wait for the upgrade process to complete.
Tele Batt Empty **Note —** This INOP may also be configured to display as a Red or Yellow Technical Alarm. **Source - MX40**	Red or Yellow or Hard Technical Alarm, Latched	Lithium-ion battery power is close to depleted. At least 10 minutes of monitoring time remains. Depending on your environment, you may see this message for several hours. Monitoring ceases immediately when battery is depleted.	To avoid loss of monitoring, insert a charged lithium-ion battery pack when this INOP is present.
Tele Battery Low **Note —** This INOP may also be configured to display as a Red or Yellow Technical Alarm. **Source - MX40**	Hard or Soft based on Tele Batt Empty INOP configuration setting (cyan = soft, red or yellow = hard).	• There is $\leq$ 20 minutes of monitoring time remaining (AA batteries). • Lithium-ion battery level is $\leq$ 10% or has $\leq$ 20 minutes remaining time.	• Replace batteries promptly to avoid shutdown and cessation of monitoring. • Insert a charged lithium-ion battery pack.

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Alarm Text	Priority	Condition	What to do
Tele Battery Temp **Note —** When the above INOP occurs, the Tele Batt Low INOP is suppressed. **Source - MX40**	Hard	The temperature of the lithium-ion battery is above 55^{o} C or below -5^{o} C.	Remove the current battery from patient use, replace the lithium-ion battery.
Tele Malfunction **Source - MX40**	Hard	MX40 internal malfunction or self-test failure.	Contact Service to replace the MX40.
Tele Check Battery **Note —** When the above INOP occurs, the Tele Batt Low INOP is suppressed. **Source - MX40**	Soft	Lithium-ion battery has ≤ 25 charge cycles remaining before reaching the charge cycle maximum limit.	Be aware that the Lithium-ion battery pack will soon need replacement.
Tele No Signal (appears at the Information Center only) **Note —** When operating with PIC iX, the INOP will display as No Data Tele. **Source - Information Center**	Hard, Latched	• The MX40 is outside the coverage area, or • No batteries in the MX40 • The MX40 is receiving a weak signal for > 10 seconds with high data loss from the AP, or • The MX40 has failed.	• Make sure that the MX40 is within the coverage area and has good batteries. • Replace the MX40 if Power On Self Test fails. • Put bed in Standby. Refer to the additional Troubleshooting information that appears beginning on page.
Tele Remove Batt **Note —** When the above INOP occurs all other battery related INOPs are suppressed. **Source - MX40**	Hard, Latched	The temperature of the lithium-ion battery is >60^{o} C and the battery must be removed.	• Remove the current battery from patient use, replace the lithium-ion battery. • Dispose of old battery properly.

Alarm Text	Priority	Condition	What to do
Tele Service Batt **Note —** When the above INOP occurs, the Tele Batt Low INOP is suppressed. **Source - MX40**	Hard	The lithium-ion battery has exceeded the maximum charge cycle limit and reached the end of its useful life.	• Replace the lithium-ion battery. • Dispose of old battery properly.
Tele Weak Signal **Source - MX40**	Soft	• Patient is at out of range of the radio coverage area. • The MX40 is receiving a weak signal for > 6 seconds with high data loss from the AP. • Condition may exist for multiple devices in a specific area	• Return patient to the coverage area. • If patient is in close proximity to AP, replace the MX40. Contact service. • The AP covering the specific area is suspect. Contact Service.
Transmitter Off **Source - MX40**	Hard	RF Auto Shutoff after 10 minutes of all leads off, no SpO_2 sensor connected, and no short-range radio communication.	Reattach ECG leads to patient.
Unsupported LAN **Source - MX40**	Hard	The MX40 (WLAN) is connected to the Access Point but cannot obtain an IP address.	Correct the IP address issue.

Informational Messages

The following table lists the Informational Text messages that may appear in the Status Area of the MX40 display.

Informational Text	Condition	What to do.
Setting synchronized to Central	The MX40 is returned to use and settings are synchronized to reflect any changes that may have occurred at the Information Center.	Cleared after setting synchronization is complete. The message displays for a minimum of 30 seconds, depending on the number of settings changes.
Check Revisions	The revision of the Information Center that the MX40 is trying to connect to is not supported.	Connect only to supported revisions of the Information Center.
DEMO (flashing text)	The MX40 is operating in Demo Mode.	Cleared when the MX40 is changed to a different operating mode. Patient monitoring is not possible in Demo Mode. Measurements cannot be performed, and alarms cannot be communicated. Remove and reinsert the battery to resume patient monitoring.
CONFIG (flashing text)	The MX40 is operating in Configuration Mode.	Cleared when the MX40 is changed to a different operating mode.
Incompatible Option	Masimo SET or FAST SpO2 device configured with wrong option.	Cleared automatically after temporary display.
SERVICE (flashing text)	The MX40 is operating in Service Mode.	Cleared when the MX40 is changed to a different operating mode. Patient monitoring is not possible in Service Mode. Measurements cannot be performed, and alarms cannot be communicated. Remove and reinsert the battery to resume patient monitoring.
SRR Started	Short-range radio is powered on (used with Cableless Measurement Devices and when paired to a patient monitor).	Cleared automatically.
No OR-ECG leadset connected	IntelliVue Patient Monitor leadset adapter is in use. This message is a reminder not to use OR-ECG leadsets with the adapter.	Continues to flash as a reminder while the leadset adapter is in use. Cleared when adapter is removed from MX40.
Resp Avail	User confirms that an OR-ECG leadset is not attached with the adapter.	Cleared automatically after one minute.
Resp not available	The Resp feature is not enabled.	Software option must be installed to enable Resp.
SpO2 not available	SpO2 sensor is connected to MX40 but the device does not have the SpO2 option enabled/available.	Enable MX40 software option/upgrade hardware.
Switch to Masimo SET Leadset	Incorrect leadset is connected to Masimo device.	Cleared automatically after connecting Masimo leadset.

Informational Text	Condition	What to do.
Switch to Philips FAST Leadset	Incorrect leadset is connected to Philips FAST device.	Cleared automatically after connecting Philips FAST leadset.
SRR Network Scan	Short-range radio channel scan in progress.	Cleared automatically when complete.
SRR Channel <chan num>	Short-range radio channel scan is complete and best channel is selected.	Cleared automatically after selection.
SRR Searching Sensor	Short-range radio is attempting to associate with Cableless Measurement Devices.	Cleared automatically.
SRR Stopped	Short-range radio is in power saving mode and no longer searching for Cableless Measurement Device until the Add/Remove SmartKey is touched again	Cleared automatically or when the Add/Remove SmartKey is touched.
cL NBP Assigned	Short-range radio is assigned to an NBP Cableless Measurement Device.	Cleared automatically after one minute.
cL SpO_2 Assigned	Short-range radio is assigned to an SpO_2 Cableless Measurement Device.	Cleared automatically after one minute.
SRR Searching Monitor	Short-range radio is attempting to associate with a patient monitor.	Cleared automatically.
SRR Assoc Monitor	Short-range radio is connected to a patient monitor.	Cleared automatically.
SRR Link Test	Short-range radio link testing is in progress before final association.	Cleared automatically. Icon replaces message.
SRR Unavailable w/ Resp	Respiration monitoring is enabled, therefore the Short-range radio is disabled.	Turn the Resp parameter off at the Information Center.

Additional Hardware Troubleshooting Information

Problem	Condition	What to do.
The following icon is displayed on the MX40: 	865352 802.11 MX40 does not operate, just displays this icon.	• The 865352 MX40 cannot use AA batteries. It will only operate with the Philips MX40 Li-ion battery. Remove the AA batteries and battery adapter and replace with a Philips MX40 Li-ion battery. • There is damage to a battery contact in the MX40 battery compartment, and the MX40 cannot recognize that a Philips MX40 Li-ion battery is installed. The MX40 will require replacement via the Exchange Process, or for USA and Canada only, repair (at the Philips Lifecycle Support Center). • Failure of the Philips Li-ion battery. Replace the battery.

MX40 Reboots Intermittently	Device reboots intermittently, possibly when bumped or tapped. This may be caused by wear, corrosion, or damage to the: **Battery Contacts** **AA Battery Adapter Tray** • Chemical residue buildup on the contacts in the AA battery adapter tray • Corrosion of the contacts in the AA battery adapter tray • Separation of the flex circuit from the AA battery adapter tray plastic body **Battery Compartment Contacts** • Chemical residue buildup on the battery contacts in the battery compartment • Corrosion of the battery contacts in the battery compartment • Separation of the battery contacts from the silicone membrane in the battery compartment • Loss of battery contacts from the silicone membrane in the battery **MX40 Battery Retention Tabs** • damage or breakage of the tabs results in battery or battery adapter movement during operation	• Check the battery. If there is damage and/or corrosion of the battery contacts, replace the battery. • Check the AA battery adapter tray for wear/damage (indentations) in the contacts, and for wear/separation of the flex circuit from the tray and corrosion of the flex circuit contact areas. Replace battery adapter as necessary. • Check battery compartment and contacts for damage/ corrosion. Once corrosion to the battery contacts and/or damage to the bond between the silicone membrane and the battery contacts occurs the MX40 cannot be repaired in the field. The MX40 will require replacement via the Exchange Process, or for USA and Canada only, repair (at the Philips Lifecycle Support Center). CAUSES: Improper cleaning/disinfection of the MX40 and AA battery adapter tray, and/or use of unapproved cleaning and disinfecting agents can cause the above noted issues, specifically: • Failure to remove the battery adapter tray from the battery compartment for cleaning/disinfecting allows chemical to collect and dry under the battery adapter tray, which results in residue build up, contact corrosion, and damage to the bond between the silicone membrane and the battery contacts, especially when bleach is used • Use of unapproved cleaning and disinfecting agents (can damage the silicone membrane, causing failure of the bond to the battery contacts and corrosion to the battery contacts) • Improper application of cleaning and disinfecting agents like soaking the battery adapter tray and battery compartment (can lead to corrosion of the contacts in the AA battery adapter tray and separation of the flex circuit from the AA battery adapter tray plastic body) • Failure to wipe the MX40 and battery adapter tray with a cloth dampened with either distilled water or Isopropyl Alcohol to remove chemical residue following disinfection (causes

Problem	Condition	What to do.
		chemical residue build-up, corrosion, and separation over time) • The MX40 will require replacement via the Exchange Process, or for USA and Canada only, repair (at the Philips Lifecycle Support Center).

Problem	Condition	What to do.
Visible corrosion of patient cable connector pins either on the MX40 or on the patient cable	• Visible corrosion (black and/or green) • Visible loss of gold plating from the pin(s) • Visible chemical residue buildup on the pins • Inability of the MX40 to communicate with the patient cable (“Leadset Unplugged” technical INOP) • Inability of the MX40 to acquire ECG and/or SpO2 signals (“ECG Leads Off”, and/or “SpO2T No Sensor” technical INOPs)	• Once corrosion of the pins on the MX40 has occurred, it cannot be effectively removed or corrected. The device will require replacement via the Exchange Process, or for USA and Canada only, bench repair (at the Philips Lifecycle Support Center). • Once corrosion of the contacts on the patient cable connector has occurred, the patient cable will need to be replaced. CAUSES: Improper cleaning/disinfection of the patient cable and/or the MX40, and/or use of unapproved cleaning and disinfecting agents can cause the noted issues, specifically: • Application of disinfecting products other than Isopropyl Alcohol inside the connector on the patient cable can result in corrosion and/or chemical residue build-up • Application of product other than Isopropyl Alcohol inside the connector on the patient cable, followed by connection to the MX40 while there is still fluid inside the patient cable connector, and then insertion of batteries into the device, will cause a reaction between the base metals of the contacts. This then results in corrosion to both the MX40 connector pins and patient cable connector contacts • Application of bleach inside the connector on the patient cable results in corrosion and residue build-up on the contacts.

Problem	Condition	What to do.
Shorter run time than specified in the IFU.	• AA batteries • Philips rechargeable Lithium-ion battery The clinical use model will impact the battery life. Confirm the use model. Use models that can significantly impact battery run time include the following: • Use model: ECG only operation with an ECG+SpO2 device • Use model: ECG+SpO2 Continuous • Use of the short-range radio • Use of the display • Use of Monitor Mode • Operating the device off network (display turns on automatically).	• Use fresh / high quality AA batteries. NOTE: The battery life specifications are based on the use of three fresh Duracell MN 1500 batteries. Battery life for other brands may differ. • Ensure that the battery is fully charged before being put into the device. • The battery capacity of rechargeable batteries degrades over time and number of recharge cycles. Toward the end of its useful life, the battery capacity may be reduced by 25-30%. Check the charge cycles of the battery in Service Mode. Check the age by looking at the date code on the battery itself. • When operating an ECG+SpO2 device in ECG only mode, ensure that the SpO2 Mode is set to “Manual”. Even if the SpO2 parameter is not displayed on the device or Information Center, if the Mode is set to “Continuous”, the SpO2 PCA is operational, and will draw a significant amount of energy resulting in a shorter than expected run time. • When operating in SpO2 Continuous mode, SpO2 monitoring will stop, but ECG monitoring will continue after the MX40 initiates a “No SpO2T, Batt Low” INOP message. When ECG monitoring is no longer possible, a “No Signal” INOP message will appear at the Information Center. Specifications are provided for both states, and are significantly different. • Use of the short-range radio can reduce battery life by 25%. • Use of the display consumes a significant amount of power. • Display is being turned on frequently (by user or patient) • Change the MX40 to Telemetry Mode. • Device is going off network frequently, which also turns display on. Extend the coverage of the wireless network or restrict the patients to the covered area.

Problem	Condition	What to do.
Cyan LED at charging station slot	• Rechargeable battery cannot establish communication with charger	• Leave the battery on the charging station for up to 30 hours to allow the battery to begin to communicate with the charging station. If communication has been established, the LED will be either Yellow indicating that the battery is charging, or Green, indicating that charging is complete. • If after 30 hours, the charging slot LED is still Cyan, replace the battery. Causes: • Battery is in an over-discharged state as a result of being left in the MX40 device after power down • Battery was in storage and was not properly maintained during the storage period. • Battery has failed.

Possible User Interface Issues

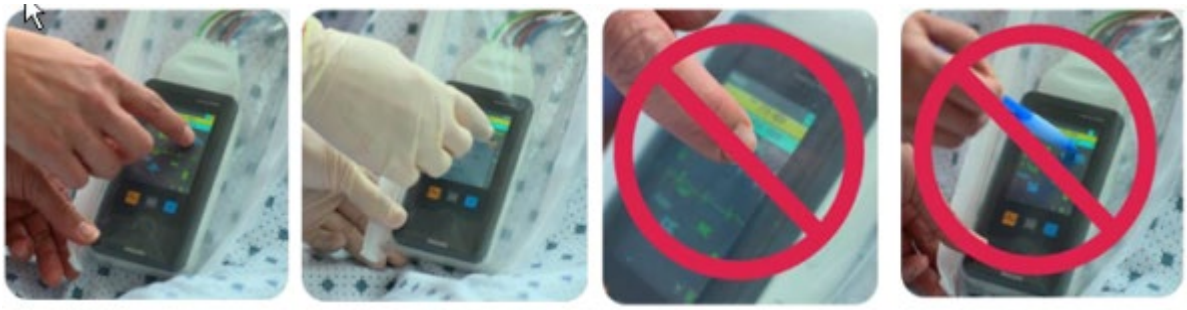
- The MX40 display does not turn on.
  - The AA Battery Tray may be inserted backwards.
  - The user may not understand that they need to touch the blue Main Screen button for two seconds.

Main Screen Button

- The MX40 display is on but does not react to touch.
  - The screen is locked and needs to be unlocked using the Unlock SmartKey.

a. Select the Smartkey button.
b. Scroll to the second page.
c. Select the Lock/Unlock Smartkey.

- The user is not using their finger to touch the screen. The MX40 does not react to touches by a fingernail, pen, etc.



Fingertip | Fingertip through pouch and 2 pairs of gloves (this will work) | Finger nail | Pen, etc.

- The MX40 does not recognize the patient cable type.
  - The IntelliVue style leadset adapter cable is being used, therefore, detection of the cable type is not possible. Configure the MX40 for the desired settings:
  - ECG Cable Color, using the **Configuration** Menu in Configuration Mode.
  - Lead Placement, using the **HR** Menu in Configuration Mode.
  - If using a 3-wire IntelliVue leadset, it must be selected using the **Setup ECG** menu and then selecting the **New Lead Setup** entry. This will remove the INOP message.

Coverage Assessment

For MX40 devices, use the following procedure to confirm that the RF coverage of the wireless network meets the requirements of the MX40 for the performance level for clinically safe operation.

Measurements are focused in patient care areas where patients spend the majority of their time (patient room, patient bathroom). Additional measurements are suggested for traditionally difficult coverage locations where monitored patients will be (in procedure areas, patient transport corridors (frequent roaming) and elevators, etc.).

During the procedure, the MX40 is worn on the body to more closely simulate the normal use model. The RF signal strength will be impacted by the body. If the test criteria are not met, remediation is required.

Signal strength remediation may include:

- moving access points
- adding access points

Interference remediation may include:

- removing the source of the interference
- changing the frequency of operation

Assessment Mode

Using Assessment Mode, you can determine coverage levels of typical locations within the hospital, e.g. patient rooms and hallways.

1. Turn the MX40 on.
2. Press the SmartKeys button.
3. Select the Op Modes SmartKey.
4. From the Operating Modes menu, select Service and enter the password.
5. Use the scroll bar to navigate to the second page of the Service menu.
6. Select clear CAV data and confirm.
7. Scroll to the second page again and select Assessment Mode.
8. From the Assess Coverage Menu, select the Room button to choose Room, Hallway, or Other.

9. Use the numbered keypad to enter location identification.
10. Select the location from within the room, e.g. Bed, to begin the assessment.
11. While the assessment is measuring the RSSI Value Field will display alternating dashes.
12. Once complete, the RSSI Value and Link Quality Indicator fields will populate.
13. To end the assessment at any time, press the blue Main Screen button.

    If there is more than one bed in a room, select the "**+**" key to make additional measurements associated with the selected room.

    When all measurements are complete, use the arrow keys to advance to the next room.

Link Quality Assessment Indicator Values

Link Quality – Smart-hopping

LQI Indicator Color	Link Quality Average Retries / 25 Seconds	Average RSSI / 25 Seconds (body blocked)	Coverage Status
LQI=4	Avg. Retries ≤ 50	≥ -67 dBm (1.4GHz) ≥ -68 dBm (2.4GHz)	Good
LQI=3	Avg. Retries > 50 to 125	> -70 dBm to > Weak Signal Threshold	Marginal
	Avg. Retries > 125	≤ Weak Signal Threshold	Insufficient

Note—The measurement criteria listed above is for MX40 Hardware Rev. B.01.01 or greater.

Note—The Link button on the **Assess Coverage** menu is for future use and not presently active.

Link Quality - WLAN

5GHz WLAN Link Quality Assessment Indicator color	Link Quality (LQI) in 5 sec moving average view or 25 sec in coverage tool	Average Rssi level (5GHz band)	Coverage Status	SQI color	Signal Quality (SQI)
Green	4	≥ -68dBm (5G band)	Good Coverage	Green (4)	≥ -68dBm (5G)
Yellow	3	-69dBm to > -80dBm (Weak Signal Threshold)	Marginal Coverage	Yellow (3)	-69dBm to > -80dBm
Red	2, 1	≤ 80dBm (Weak Signal Threshold)	Insufficient Coverage	Red (1, 2)	≤ -80dBm

2.4GHz WLAN Link Quality Assessment Indicator color	Link Quality (LQI) in 5 sec moving average view or 25 sec in coverage tool	Average Rssi level (2.4GHz band)	Coverage Status	SQI color	Signal Quality (SQI)
Green	4	≥ -62dBm (2.4G band)	Good Coverage	Green (4)	≥ -62dBm (2.4G)
Yellow	3	-63dBm to > -80dBm (Weak Signal Threshold)	Marginal Coverage	Yellow (3)	-63dBm to > -80dBm
Red	2, 1	≤ 80dBm (Weak Signal Threshold)	Insufficient Coverage	Red (1, 2)	≤ -80dBm

Note—WLAN Link Quality & Rssi assessment with B.05 or greater with HW rev.C.01.01 or greater.

Note—For deployment in the 5GHz band, only use the A-865350-90304-5GHz-WLAN CAV template.

Note—The Link button on the **Assess Coverage** menu is for future use and not presently active.

Coverage Assessment Data

Coverage Assessment data can be exported from the MX40 using the IntelliVue Support Tool – Mark 2. A zip file is created containing a coverage.txt file. Renaming the file to coverage.csv allows it to be imported into a comma delimited spreadsheet. Spreadsheet template files can be found on InCenter (A-865350-90222-1G4CAV – 1.4GHz, A-865350-90223-2G4CAV – 2.4GHz, A-865350-90304–WLAN, and A-865350-90306-WLAN).

- Stored coverage data survives power cycling. Stored coverage data is viewable in **Assessment Mode**. Stored data is not affected by changes in Operating Mode.

- Stored coverage data is deleted in **Service Mode**. Select **Clear CAV Data**. When confirmed, the stored coverage data is erased from flash memory.
- The total FMID is 12 bits. (The last 10 bits of the IP address and 2 bits to define remote antennas and Core AP.)

➢ *To export Coverage Assessment data:*

1. Select the appropriate device.
2. Select the **Configuration/Report Tab**.
3. Select **Collect Device Data**.
4. Deselect the **Collect Full Data** checkbox.
5. Save the file to the desired directory location.

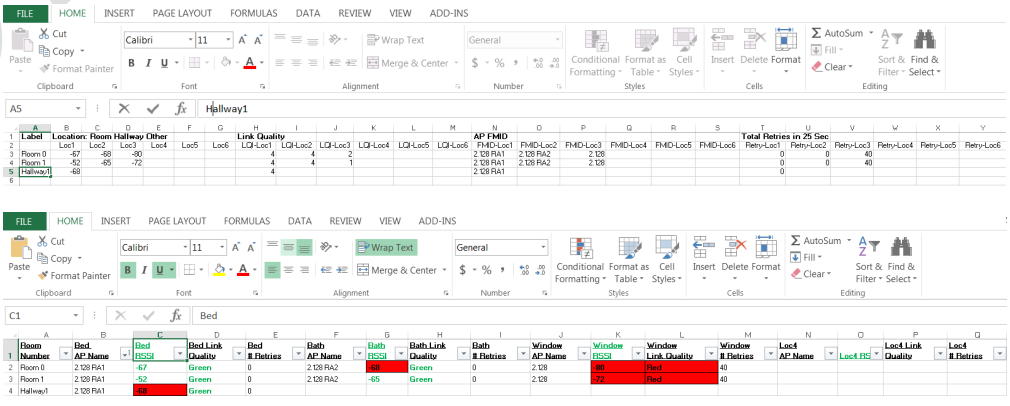
Data Format – Smart-hopping Radio

Room Number Location, RSSI 1... RSSI 6, LQI 1... LQI 6, FMID 1... FMID 6, Retry 1…Retry 6 (LQI is 0 to 4 and FMID is decimal), Room Number Location (room#, hallway#, other#). For WLAN devices, the AP MAC address is provided.

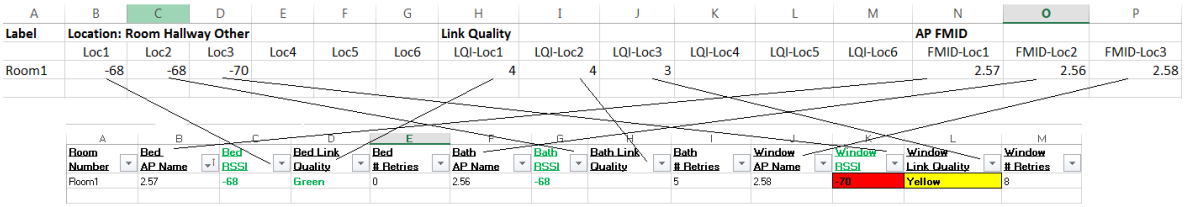
Example 1: 0,0,-59,-59,-58, , , ,4,4,4, , , ,3.164,3.164,3.164 RA1, , ,5,0,2, , , (‘, ,’ is blank data)

Example 2: 0,0,-59,-59,-58,-45,-47,-50,4,4,4,4,4,4,3.164,3.140,3,142, 3.142,3,142,10,0,5,5,0,0

The graphics below are examples of an Excel spreadsheet and summary for coverage assessment data with a 1.4GHz Smart-hopping radio.



Information from the data tab maps to the summary tab as shown below.



Optionally, coverage area verification measurements can be performed using the MX40 along with the AirSpy tool.

Status Parameters

The tables below lists the WLAN Status Parameters and their associated definitions/settings. Access is through Service Mode or by touching the wireless icon in the Status Area while in Monitoring mode. The Status Parameters can then be viewed by touching the Link Quality area on the Device Status menu. Use the Status Parameter information to determine connection quality.

Note — Interference is indicated by a poor Link Quality Indicator reading and an excessive number of Retries while RSSI is at an adequate value.

Smart-hopping Link Information	Definition/Setting
RSSI	Received Signal Strength Indicator (moving average over 5 seconds). Reported in dBm (decibel-milliwatts). See Signal Strength table below
	Link Quality Indicator Radio link quality relates to RSSI and Retries
Retries	This retry number represents the number of retries over the last second.
SQI	Signal Quality Indicator (SQI) = 0-4
FMID	This field reports the last 10 bits of the IP address of the Access Point the MX40 was previously/currently connected to.

Smart-hopping Link Information	Definition/Setting
Conn. Status	Current wireless network connection status Seeking: MX40 has Smart-hopping radio on and is looking for an Access Point Locked: MX40 has located an Access Point Active: MX40 has an active connection to an Access Point Inactive: MX40 has Smart-hopping radio turned off
RF Access Code	The RF Access Code of the MX40, which must match the RF Access Code of the system it is intended to connect to.
Retries*	Retries since last reboot.
MAC Info	The MAC address of the MX40 Smart-hopping radio.
Network Info	IP Address, Subnet Mask, Default Gateway, Server IP

WLAN Link Information	Definition/Setting
RSSI	Received Signal Strength Indicator (moving average over 3 seconds)
Rate	Currently selected transmit rate (adapts dynamically based on wireless signal propagation behavior)
	Radio link quality relates to RSSI and Retries
Retries	Retries over last 3 seconds.
SQI	Signal Quality Indicator (SQI) = 0-4
Wireless LAN	On, Off
Conn. Status	Current wireless LAN connection status (None, Scanning, Authenticating, Associating, Connected, Link Problem)
Retries*	Retries since last reboot.
Active Channel	Current radio channel
Mode	802.11ah, 802.11bg, 802.11g
WMM Mode	Wireless Multi-Media – On, Off - support Quality of Signal (QoS) over WLAN
SSID	The Service Set Identifier in use - Network Name
Security Mode	Display selected security mode
MAC AP WLAN	The MAC address of the access point to which a connection has been established

WLAN Link Information	Definition/Setting
802.11n	On, Off
MAC Address	The MAC address of the MX40 WLAN radio
Network Info	IP Address, Subnet Mask, Default Gateway, Server IP (Server IP - IP address of the PC server. If not entered (0.0.0.0) the address of the DHCP server, if any, is substituted)
Multicast	Multicast address being used for the CI (Connect Indication) message.
Regulatory Domain	Country definition as determined by system configuration.

General Troubleshooting

Normal Start-up Process

1. MX40 performs self-test.

12. MX40 begins local monitoring.
13. MX40 establishes connection to Smart-hopping network.
14. MX40 establishes connection with IntelliVue Information Center.

Status Checks

1. Check status at the Information Center.

   - Ensure MX40 equipment is assigned to a sector.

   - Check for INOP messages in the sector.

15. Check status of MX40.

   - Check for INOP messages.

   - Check Device Status area icons for basic status.

   - Navigate to **Link Info** screen for more detailed information if necessary.

WLAN Troubleshooting

Problem	Possible Cause	Solution
MX40 fails to connect to Surveillance PIIC iX. MX40 display inop "**No Central Monitor**" and Connection Status is in state "**None**".	Status indicates that the MX40 does not have a network connection, or a radio "association" to the Access Point. There are several possible causes for this including: AP not turned on, or not connected to customer-supplied infrastructure properly.	Verify the AP is powered on and connected to the customer-supplied infrastructure properly.
	MX40 is not configured for the correct 802.11 radio modality for the SSID setup (802.11a, 802.11bg, 802.11abg).	Check the configuration of the MX40 and verify modality is configured. After the MX40 settings have been set via the IntelliVue Support Tool, make sure settings are confirmed to ensure the settings are retained.
	MX40 not configured for the correct SSID. It must be the same as configured on the WLAN Controller.	Check the configuration of the MX40 and verify that the correct, case-sensitive SSID is configured. Also check the configuration of the SSID on the WLAN Controller. After the MX40 settings have been set via the Support Tool, make sure settings are confirmed to ensure the settings are retained.
	MX40 not configured for the correct WPA/WPA2 pre-shared key. It must be the same as configured on the WLAN Controller.	Check the configuration of the MX40 and verify that the correct WPA or WPA2 pre-shared key is configured. Check the configuration of the WPA/WPA2 key on the WLAN Controller. The default pre-shared key must not be used.
	MX40 is not seeing strong enough signals.	Deploy additional Aps or adjust AP power levels to accommodate the required signal strength.

	MX40 was cloned and wireless settings were lost.	Configure the MX40 with the correct settings: SSID, WPA key, radio modality.
	MX40 not configured for the correct country code.	Do not change the MX40 country code from its default setting (1000). The default setting causes the MX40 to use the country code provided by the AP to which it associates.
	Defective MX40.	If MX40 self-test fails: • Verify issue persists with other MX40s. If so, verify CSCN WLAN settings. • If all settings are correct, replace MX40.
MX40 fails to connect to Surveillance PIIC iX.	MX40 has a radio connection to the wireless infrastructure but has not been recognized by the Surveillance PIIC iX. Possible causes include:	
	MX40 not assigned to Surveillance PIIC iX. No Monitor Label assigned to MX40 from Surveillance PIIC iX.	Assign MX40 to the Surveillance PIIC iX from the Surveillance PIIC iX.
	Configuration problem using WEP, WPA (PSK), WPA (PSK), or 802.1x Authentication.	Verify the Mode, SSID, Country and Security settings in the MX40 match your installation.
	Configuration problem using WPA Enterprise or WPA2 Enterprise including 802.1x Authentication	Check the connection status. (Status message…Conn.Status). I the state only shows “Scanning”, make sure that the Mode, SSID, Country, and Security settings in the MX40 Status screen are accurate. If not, correct the configuration using the IntelliVue Support Tool.

		Check the connection status. If the MX40 shows the state “Authenticating”, the SSID, Mode, Country and Security settings are correct. If a WLAN connection to the Access Point is established, but the MX40 fails to authenticate, check the authentication server and WLAN controller error logs.
		As an investigation step, disable the CertificateCheck via the IntelliVue Support Tool (Configuration ->Hardware>Network->WLAN). If authentication is now possible, proceed with the step below. Otherwise, verify the authentication server configuration, WLAN controller configuration and the user credentials (User Name, Password, Anonymous Identity). If the previously used credential settings were incorrect, the MX40 may be on the exclude list of the WLAN Controller. Resolve the issue on the WLAN Controller. Note: Remember to re-enable the certificate check.
		Check the installed CA certificate using the IntelliVue Support Tool (Task->Clone from Medical Device) Open the cloned file using Configuration->Configuration Editor. In Configuration Editor check Configuration->Hardware ->Network->WLAN->Certificate 1 for validity (Valid from, Valid until)
		Make sure that the installed CA certificate is the root certificate of the authentication server certificate chain.

9. MX40 WLAN (P/N 865352)

This section provides information specific to the operation of the WLAN version of the MX40.

Important — MX40 WLAN (865352) requires compliance with Phillips Customer-supplied Clinical Network Specifications.

The 865352 – IntelliVue MX40 802.11 a/b/g/n is a Wi-Fi CERTIFIED ™ product (Certification ID: WFA63551). For additional information, visit https://www.wi-fi.org/product-finder-results?sort_by=certified&sort_order=desc&keywords=MX40&companies=21

Short-range Radio and WLAN

Because at least 20 MHz separation is needed between the SRR channels and 802.11b/g/n (2.4 GHz ISM band) channels in order to source real-time waves over the SRR link, the MX40 WLAN device should only be used with Short-range radio when operating on the 802.11a (5 GHz) band. See Smart-hopping and SRR Channel Selection for 2.4GHz Smart-hopping Networks p. 2-17.

WLAN Configuration Parameters

The MX40 WLAN configuration is loaded into the MX40 using the IntelliVue Support Tool - Mark2 (IVST Mark2). The parameter values are changed using the IntelliVue Support Tool Configuration Editor which is accessed from the IVST Mark2 "Configuration/Report" tab. The WLAN parameters can be found under:

Hardware > **Network**
Hardware > **Wireless** > **Wireless**
Hardware > **Wireless** > **WLAN**

Hardware > **Network**

Parameter	Available Selections	Comments
WLAN IP Config		
Enabled	On, Off	Must be “On” for WLAN connection to function.
Mode	DHCP, Manual	The MX40 only supports “DHCP”.
CI Config 1		
CI Mode	Broadcast, Unicast, Multicast, Off	Standard operation is Multicast, Broadcast and Unicast are not recommended.
CI Address	X.X.X.X	224.0.23.63 or224.0.23.173 for Multicast
IP Address Configuration		
QoS State	On, Off	To enable QoS, this must be configured “On”, and WMM Mode on the WLAN page must be set to “Enabled”.
QoS Level	0-7	A level of 6 is recommended.

Hardware > **Wireless** > **Wireless**

Parameter	Available Selections	Comments
Wireless Network	Off, On	Must be “On” for WLAN connection to function
Wireless Adapter	WLAN, IIT	Must be “WLAN” for WLAN connection to function.

Hardware Wireless WLAN

Parameter	Applicable to MX40	Available Selections	Comments
General			
WMM Mode	Yes	Disabled, Enabled	To enable QoS, this must be set to "Enabled", and QoS State on the Network menu page must be set to "On".
Security Mode	Yes	WEP, WPA (PSK), WPA2 (PSK), WPAEnterpr, WPA2Enterpr	WPA2-Enterprise is not recommended due to increased handover times.
Mode	Yes	Auto, 802.11ah, 802.11bg, 802.11g	802.11 ah is recommended.
SSID	Yes	****	1-32 characters
WEP			
WEP Key Index	Yes	1, 2, 3, 4	This selects which WEP Key will be used.
WEP Key Size 1	Yes	104 Bit, 40 Bit	
WEP Key 1	Yes	****	10 or 26 hex characters based on Key Size 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
WEP Key Size 2	Yes	104 Bit, 40 Bit	
WEP Key 2	Yes	****	10 or 26 hex characters based on Key Size 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
WEP Key Size 3	Yes	104 Bit, 40 Bit	
WEP Key 3	Yes	****	10 or 26 hex characters based on Key Size 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
WEP Key Size 4	Yes	104 Bit, 40 Bit	
WEP Key 4	Yes	****	10 or 26 hex characters based on Key Size 1,2,3,4,5,6,7,8,9,A,B,C,D,E,F
WPA (PSK) / WPA2 (PSK)			
WPA Password	Yes	****	8-63 characters
WPA Enterprise / WPA2 Enterprise			
Authentication	Yes	NotConfigrd, PEAP, TTLS	If WPA / WPA2 Enterprise is selected, must select PEAP or TTLS.

Parameter	Applicable to MX40	Available Selections	Comments
Inner Authentication	Yes	NotConfigrd, PAP, CHAP, MSCHAP, MSCHAPv2	The MX40 only supports MSCHAPv2.
PEAP Version	Yes	Default, Version 0, Version 1	
PEAP Label	Yes	Default, EAP, PEAP	
Certificate Check	Yes	Disabled, Enabled	Should be "Enabled" is using a certificate. "Disabled" is provided for troubleshooting purposes.
User Name	Yes	****	0-63 characters
Password	Yes	****	0-63 characters
Anonymous Identity	Yes	****	0-63 characters
Certificate 1			
Friendly Name	Yes	****	0-32 characters
CA Certificate	Yes	Add, Delete	
File Size	Yes		Not modifiable, reflects file chosen
Valid from	Yes		Not modifiable, reflects file chosen
Valid until	Yes		Not modifiable, reflects file chosen

WLAN Configuration Parameter Definitions

Hardware > Network Parameter Definitions

These definitions are for the parameters that apply to the MX40.

WLAN IP Config – these are parameters that apply specifically to the wireless network adapter.

- "Enabled" under the WLAN IP Config section refers to the wireless network adapter in the MX40. When "Enabled" is configured "on" the wireless network adapter is on and active. When configured "Off", the wireless network adapter is in a low power sleep state.
- "Mode" under the WLAN IP Config section refers to the network configuration protocol the device uses when communicating over the 802.11 link. Although other selections may be available on the IntelliVue Support Tool Configuration Editor, the only network configuration protocol that the MX40 supports is DHCP.

CI Config 1 – these parameters apply to the MX40 once the data reaches the wired network.

- CI Mode - Standard operation is Multicast. Broadcast and Unicast are not recommended
- CI Address - 224.0.23.63 or 224.0.23.173 for Multicast

IP Address Configuration – these parameters apply to the MX40 once the data reaches the wired network

- QoS State: In order to enable Quality of Service for the MX40 data once it reaches the wired network, the "QoS State" parameter must be configured "On", and the "QoS Level" must be configured for a value greater than "0". Note: "WMM Mode" on the "WLAN" page must be configured for "Enabled" otherwise this setting will be ignored by the MX40.
- QoS Level: "QoS Level" sets the network QoS priority that the MX40 will use to tag packets. The QoS Level is used for both the wired and the wireless link. "0" is the lowest priority, "7" is the highest priority. A QoS Level of "6" is recommended for the MX40.

Hardware > Wireless > Wireless Parameter Definitions

These definitions are for the parameters that apply to the MX40.

- Wireless Network – Must be "On" for WLAN connection to function.
- Wireless Adapter – Must be "On" for WLAN connection to function.

Hardware > Wireless > WLAN Parameter Definitions

General

- **WMM Mode**

  This parameter enables or disables WMM (Wireless Multimedia Mode). Used for basic wireless quality of service. Note: "QoS State" on the "Network" page must be configured "On" and the "QoS Level" must be configured for a value greater than "0" otherwise this setting will be ignored by the MX40.
- **Security Mode**

  WEP, WPA(PSK) or WPA2(PSK), WPA-Enterprise and WPA2-Enterprise with either Protected EAP (PEAP) or Tunneled TLS (TTLS) as authentication methods.
  - WPA2 (PSK) is recommended.
  - WPA2-Enterprise is not recommended due to increased handover times (roaming).
  - WEP is not recommended due to general security issues.

- **SSID**

  Service Set Identifier: Logical WLAN Network Name.

WEP

- **WEP Key Index**

  Defines the transmit WEP Key Index. This entry must match the WEP Key Index configured at the infrastructure device, i.e. on a WLAN Access Point, and ranges from 1 to 4.

- **WEP Key Size**

  The WEP Key Size 40 bit or 104 bit

- **WEP Key**

  The number of hex characters for the WEP key depends on the WEP key size chosen. For a 40 bit WEP key size the WEP key must be 10 hexadecimal characters long, for a 104 bit key the WEP key must be 26 hexadecimal characters long.

WPA

- **WPA Password**

  In WPA(PSK) or WPA2(PSK) mode this entry defines the Pre-Shared-Secret or Password with 8 to 63 alpha-numeric characters.

WPA Enterprise / WPA2 Enterprise

In WPA-Enterprise or WPA2-Enterprise mode the following parameters are used:

- **Authentication**

  The authentication method can be either Protected EAP (PEAP) or Tunneled TLS (TTLS).

- **Inner Authentication**

  For the MX40, PEAP and TTLS can only be used with MSCHAPv2 as the Inner Authentication method.

- **PEAP Version**

  This setting describes the PEAP protocol version to be used while authenticating against the authentication server. Valid values are Default, Version 0 and Version 1. If set to Default the decision is up to the wireless adapter. Version 0 or 1 forces the wireless adapter to use the protocol version required for a certain authentication server. This setting is intended for experts only.

- **PEAP Label**

The PEAP label setting defines the string to be used to signal EAP-PEAP encryption to the authentication server. Valid values are Default, EAP or PEAP. Default leaves the decision up to wireless adapter. Both EAP and PEAP force the wireless adapter to use this setting. This setting is intended for experts only.

- **Certificate Check**

  As long the Certificate Check is set to Enabled, the CA Certificate is used to verify the authenticity of the certificate chain delivered by the authentication server. The verification involves also the system time to check the validity period of every certificate in the chain. This item can only be set to Enabled, if a CA Certificate has been installed. Valid values are Disabled or Enabled.

- **Username**

  The username used in the encrypted tunnel with 1-63 alpha-numeric characters. It is also used as outer identity as long as the Anonymous Identity is not set.

- **Password**

  The password used in the encrypted tunnel with 8-63 alpha-numeric characters. Will be shown as four stars "****" after the user entered the password.

- **Anonymous Identity**

  The identity used for the outer PEAP or TTLS authentication, which may be "unprotected". Thus, the identity should be different to the Username for enhanced security. The Anonymous Identity contains 1-63 characters. It can be set to NotConfigured by clearing it.

Certificate 1

- **Friendly Name**

  A certificate can be installed on the MX40, and when doing so, a "Friendly Name" of up to 32 characters can be assigned to it.

MX40 WLAN Device Specific Performance Characteristics

In addition to the network requirements covered in the IntelliVue Clinical Network Specification, the MX40 has the following device specific performance characteristics:

DTIM

In order to preserve battery life, the MX40's 802.11 Listen Interval is hardcoded to three beacon intervals or roughly 300ms (based on a typical access point beacon period of 100 TUs). This means that the MX40 will wake up approximately every 300ms to receive beacons and data. The access point (AP) honors the MX40's Listen Interval, buffering unicast traffic destined for the MX40 for the time period specified by the Listen Interval.

Please note: The Listen Interval configuration does not affect when data is transmitted by the MX40 to the Information Center. It only affects when the MX40 will come out of power-save mode to receive messages.

The AP beacon contains the DTIM (Delivery Traffic Indication Map) period. The DTIM indicates how often an AP will send broadcast and multicast messages to all clients on a WLAN. For example, a DTIM Period of 1, indicates broadcast and multicast messages are sent after every beacon. A DTIM Period of 2 indicates broadcast and multicast messages are sent after every second beacon.

The MX40 does not follow the DTIM (Delivery Traffic Indication Map) period announced in the AP beacon frames.

If broadcast or multicast messages (e.g. ARP) are being sent to the MX40s every beacon period (DTIM = 1, every 100ms or so), but the MX40 only comes out of power-save mode every 300ms (approximate), then the MX40 will miss some of these broadcast / multicast messages. This can lead to sluggish response to ARP or other broadcast / multicast protocols.

There are several approaches to deal with problems resulting in the MX40 failing to respond to ARP messages in a timely fashion:

- Make static ARP entries for the MX40s on the router, so that their ARP entry does not expire.
- Eliminate the need for routing by mapping the Philips SSID to the same subnet as the Information Center.

10. Safety Standards & Specifications

This section describes the regulatory standards that the IntelliVue MX40 complies with, along with product and measurement specifications.

Regulatory Information

Software Hazard Prevention

Potential hazards arising from errors in the software program have been identified. Mitigations applied to reduce the associated risk of such hazards are included as part of the Risk Management, Clinical Evaluation, and Verification and Validation phases of the product's development.

AC Power Source

The system is not intended for connection to the public mains as defined in CISPR-11.

Industrie Canada Compliance (Canada)

This Class B ISM device complies with Canadian ICES-001.

Cet ISM de la classe B est conforme à la norme NMB-001 du Canada.

Safety Standards

The device complies with the following safety requirements for medical electrical equipment:

- EN 60601-1:2006 +A1: 2013, Medical electrical equipment - Part 1: General requirements for basic safety and essential performance

  IEC 60601-1:2005 + A1: 2012
- EN 60601-1:1990 + A1:1993 + A2:1995 + A13:1996, Medical electrical equipment -- Part 1: General requirements for basic safety and essential performance

  IEC 60601-1:1988 + A1:1991 + A2:1995
- EN ISO80601-2-49:2018 Medical electrical equipment – Part 2: Particular requirements for Safety
- CAN/CSA C22.2 601.1-M90: Medical Electrical Equipment part 1: General requirements for Safety
- UL 60601-1 Medical Electrical Equipment - General Safety
- EN 60601-1-1:2001 Medical electrical equipment - Part 1-1: General requirements for safety - Collateral standard: Safety requirements for medical electrical systems

  IEC 60601-1-1:2000

- EN 60601-1-2:2007, Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests

  IEC 60601-1-2:2007
- EN 60601-1-2:2001+ A1:2006, Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral standard: Electromagnetic compatibility - Requirements and tests

  IEC 60601-1-2:2001 +A1:2004
- EN 60601-1-2:2015 Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests
  IEC 60601-1-2:2014
- ISO 80601-2-61:2017 Pulse Oximeters, requirements for SpO2
- EN 80601-2-61:2019 Pulse Oximeters, requirements for SpO2
- EN 60601-1-4: 1996 + A1:1999 Medical electrical equipment - Part 1-4: General requirements for safety - Collateral standard: Programmable electrical medical systems

  IEC 60601-1-4:1996 + A1:1999
- EN 60601-1-6:2007, Medical electrical equipment - Part 1-6: General requirements for basic safety and essential performance - Collateral standard: Usability

  IEC 60601-1-6:2004
- EN 60601-1-8: 2004 +A1: 2006, Medical electrical equipment. General requirements for basic safety and essential performance. Collateral Standard: General requirements, tests and guidance for alarm systems in medical electrical equipment and medical electrical systems

  IEC 60601-1-8: 2003 + A1: 2006
- EN 60601-1-8: 2007

  IEC 60601-1-8: 2006
- EN 60601-2-27: 2006, Medical electrical equipment - Part 2-27: Particular requirements for the safety, including essential performance, of electrocardiographic monitoring equipment

  IEC 60601-2-27: 2005
- EN 60601-2-27: 2011 Medical electrical equipment - Part 2-27: Particular requirements for the safety, including essential performance, of electrocardiographic monitoring equipment

  IEC 60602-2-27: 2011

- EN 60601-2-49: 2001, Medical electrical equipment - Part 2-49: Particular requirements for the safety of multifunction patient monitoring equipment

  IEC 60601-2-49: 2001
- EN 60601-2-49: 2011 Medical electrical equipment - Part 2-49: Particular requirements for the safety of multifunction patient monitoring equipment

  IEC 60602-2-49: 2011
- EN ISO 10993-1:2009 (for leadwires and pouch), Biological evaluation of medical devices - Part 1: Evaluation and testing within a risk management process
- EN 62304:2006, Medical device software - Software life-cycle processes

  IEC 62304:2006
- EN 62366:2008, Medical devices - Application of usability engineering to medical devices

  IEC 62366:2007

Intended Use Statement

Intended for monitoring and recording of and to generate alarms for, multiple physiological parameters of adults and pediatrics in a hospital environment and during patient transport inside hospitals. Not intended for home use. Intended for use by health care professionals.

Indications for Use

Indicated for use by health care professionals whenever there is a need for monitoring the physiological parameters of patients. Intended for monitoring and recording of, and to generate alarms for, multiple physiological parameters of adults and pediatrics in hospital environments and during transport inside hospitals.

Intended Uses of MX40

The MX40 is to be used primarily as a traditional telemetry medical device. It connects to the IntelliVue Information Center by way of a wireless network. When the MX40 is connected the IntelliVue Information Center the IntelliVue Information Center provides the primary patient monitoring and alarming function. The MX40 does not automatically provide local monitoring or alarming when connected to the Information Center.

The MX40 can provide time-limited local monitoring when it is not connected to the wireless network.

Unlike a traditional bedside monitor which operates on AC power, the MX40 is powered by battery and cannot provide continuous monitoring.

Authorized EU Representative

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Hewlett-Packard-Strasse 2
D 71034, Boeblingen
Germany

Authorized Australia Sponsor

Philips Electronics Australia
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Patient Population

This device is not for use with infant or neonatal patients.

Clinical judgment must be used to determine when the MX40 should be used on a specific pediatric patient, as it is not possible to assign a precise weight or age to ECG performance.

Use of the device is restricted to one patient at a time.

The components/accessories which come into contact with the patient's skin are in compliance with the relevant requirements of EN ISO 10993-1 for Biocompatibility. The device is not designed for direct contact with the patient's skin. The accompanying pouch is the appropriate means for holding the device.

Rx

Federal Law restricts this device to sale by or on the order of a physician.

Contraindications

A Contraindication describes a situation, such as patient population, medical reason, or clinical condition, in which a device may not be used because the risk of use clearly outweighs any possible benefit.

There are no contraindications for use of the MX40.

Essential Performance

The IntelliVue MX40 provides Essential Performance (EP) under normal operating conditions (includes EMC exposure) only as a complete Medical Electrical System, consisting of the MX40, MPx companion monitor (Optional), IntelliVue CL SpO_2 and NBP Cableless Measurement devices(Optional), IntelliVue Telemetry Network Infrastructure, and the Information Center.

The System achieves its Essential Performance exclusively through alarm generation at the IntelliVue Information Center and locally at the MX40, based on configuration.

The IntelliVue MX40 protects the patient from unacceptable immediate clinical risk by generating specific Physiological Alarms when appropriate. If the system cannot generate Physiological Alarms, then relevant Severe or Hard-Level Technical Alarms (Inops) are created.

Risk Management Considerations

Warning

The MX40 operates exclusively via a wireless network connection, therefore, it should not be used for primary monitoring in applications where momentary loss of the ECG is unacceptable at the Information Center. It sends ECG and optionally pulse oximetry and respiration data to the Information Center, where the Information Center displays real-time patient data, provides alarm annunciation, data storage and review applications. The ECG waveform data, alarms and optionally SpO_2 and Resp can always be viewed on the MX40 regardless of the connection to the Information Center.

Smart Hopping technology alleviates most of the problems associated with legacy telemetry technologies. Reception problems are less frequent, because Smart Hopping avoids interference and moves to a different access point if the signal strength is too low. The level of radio frequency activity is always fluctuating in the environment. If the level becomes high enough to significantly interfere with transceiver operation, the system responds by moving to another "cleaner" area where there is less activity.

Dropouts

Because the MX40 operates exclusively via a wireless network connection, under certain frequency conditions dropouts can occur. Dropouts result from a weak signal or RF interference, and appear on the waveform when the signal is interrupted. If dropouts are frequent enough to affect the heart rate count, the "Cannot Analyze ECG" or "Cannot Analyze ST" technical alarm occurs. If there are enough dropouts to cause disassociation/reassociation with the Information Center, events in the Clinical Review application can reflect loss of data for up to 1 minute in the worst case.

Monitoring Considerations

- Patient should be restricted to the designated coverage area. Monitoring performance will degrade if patients go outside the radius of coverage of the receiving wireless network.
- A patient location strategy is critical to a telemetry system. If a life-threatening event occurs, the clinician must be able to locate the patient quickly. The importance of this increases as the coverage area increases.
- Frequency management is the responsibility of the hospital. Philips Healthcare has no control over the RF environment in the hospital. If interference exists at the operating frequencies of the telemetry equipment, telemetry performance will be affected. Careful selection of frequencies for all wireless devices used within a facility (transceivers, other wireless medical devices, etc.) is important to prevent interference between them.

Caution

IEC/ANSI/AAMI 80001-1:2010

Philips recognizes the importance of a safe and effective network that meets both the business needs of a healthcare facility, IT networking requirements, and the clinical functionality. Philips supports the IEC 80001-1 standard in regards to working as a partner with a healthcare organization in the design, implementation, and management of the Medical IT-Network to properly provision and support not only Philips devices, but all the devices using the network. Applying the principles of risk management to hospital frameworks is highly encouraged.

When operating the MX40 on a Customer Supplied Clinical Network, Philips strongly encourages our customers to perform risk management of their Medical IT-Network infrastructure in accordance with IEC 80001. Changes may include changes in network configuration, connection of additional items, disconnection of items, update of equipment, or upgrade of equipment.

If the MX40 experiences loss of network connectivity, technical alerts at the Information Center ("No Signal" or "No Data Tele") and at the MX40 ("No Central Monitor") will occur. The MX40 will also automatically revert to local monitor mode which activates display of patient data on the MX40 – however, when in this state, battery life will be shortened.

Electromagnetic Compatibility

Medical electrical equipment can either generate or receive electromagnetic interference. This product has been evaluated for electromagnetic compatibility (EMC) with the appropriate accessories according to IEC 60601-1-2, the international standard for EMC for medical electrical equipment. This IEC standard has been adopted in the European Union as the European Norm, EN 60601-1-2.

Radio frequency (RF) interference from nearby transmitting devices can degrade performance of the product. Electromagnetic compatibility with surrounding devices should be assessed prior to using the product.

Fixed, portable, and mobile radio frequency communications equipment can also affect the performance of medical equipment. See your service provider for assistance with the minimum recommended separation distance between RF communications equipment and the product.

The cables, sensors/transducers, and other accessories for which compliance is claimed are listed in the Service and User documentation accompanying the product.

Warnings

- The use of accessories, transducers and cables other than those specified in the product service and user documentation can result in increased electromagnetic emissions or decreased immunity of the product.
- Short-range radio connections are subject to interruption due to interference from other radio sources in the vicinity, including microwaves, bluetooth devices, and DECT phones. Outside the frequency band and 5% above and below, i.e. the exclusion band according to IEC 60601-1-2, the short-range radio connection is immune up to 3V/m in the frequency range from 80MHz to 2.5 GHz. Depending on the strength and duration of the interference, the interruption may occur for an extended period. Any interruption of the signal due to interference, moving out of range, or for other reasons is indicated with a Tele Disconnected INOP message.
- The product should not be used next to or stacked with other equipment. If you must stack the product, you must check that normal operation is possible in the necessary configuration before the product is used on patients.

Note — For cellphone frequencies 810-930 MHz at 28 V/m, increased ECG waveform noise is observed that impacts ST performance. The MX40 can tolerate RF interference power to 7 V/m and maintain ECG noise in compliance with IEC 60601-2-27 and AAMI EC13, and a typical cellphone RF power is expected to be less than 5 V/m. A technical alarm for ST or Invalid Parameter is presented with excessive ECG noise. Field strength is measured at 3 meter distance per standard.

Reducing Electromagnetic Interference

The MX40 and associated accessories can be susceptible to interference from other RF energy sources and continuous, repetitive, power line bursts. Examples of other sources of RF interference are other medical electrical devices, cellular products, information technology equipment, and radio/television transmission. If interference is encountered, as demonstrated by artifact on the ECG or dramatic variations in physiological parameter measurement values, attempt to locate the source. Assess the following:

- Is the interference due to misplaced or poorly applied electrodes or sensors? If so, re-apply electrodes and sensors correctly according to directions in Chapter 6.
- Is the interference intermittent or constant?
- Does the interference occur only in certain locations?
- Does the interference occur only when in close proximity to certain medical electrical equipment?

Once the source is located, attempt to attenuate the interference by distancing the MX40 from the source as much as possible. If assistance is needed, contact your local service representative.

Restrictions for Use

Artifact on ECG and other physiological waveforms caused by electromagnetic interference should be evaluated by a physician or physician authorized personnel to determine if it will negatively impact patient diagnosis or treatment.

Electromagnetic Compatibility (EMC) Specifications

Take special precautions regarding electromagnetic compatibility (EMC) when using medical electrical equipment. You must operate your monitoring equipment according to the EMC information provided in this book. Portable and mobile radiofrequency (RF) communications equipment can affect medical electrical equipment.

Accessories Compliant with EMC Standards

All accessories listed in the accessories section comply, in combination with the MX40, with the requirements of IEC 60601-1-2.

Warning

Using accessories other than those specified may result in increased electromagnetic emission or decreased electromagnetic immunity of the monitoring equipment.

Electromagnetic Emissions

Emissions Test	Compliance	Avoiding Electromagnetic Interference
Radio Frequency (RF) emissions	Group 1	TheMX40 uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The MX40 is suitable for use in all establishments.
Harmonized emissions	Not Applicable	Device is battery powered only
Voltage fluctuations/Flicker emissions IEC 61000-3-3	Not Applicable	

Electromagnetic Immunity

The MX40 is suitable for use in the specified electromagnetic environment. The user must ensure that it is used in the appropriate environment as described below.

Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air **4th Edition:** +8 kV contact +15 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m **4th Edition**: 30 A/m	3 A/m	Power frequency magnetic fields should be a t levels characteristic of a typical location in a typical commercial and/or hospital environment

Recommended Separation Distance

Warning

The MX40, equipped with a wireless network interface, intentionally receives RF electromagnetic energy for the purpose of its operation. Therefore, other equipment may cause interference, even if that other equipment complies with CISPR emission requirements.

In the following table, P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).

Portable and mobile RF communications equipment should be used no closer to any part of the MX40, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter.

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than the compliance level in each frequency range.

Interference may occur in the vicinity of equipment marked with this symbol:

Immunity Test	IEC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz 6 Vrms in ISM bands	3 VRMS	Recommended separation distance: $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.7 GHz	3 V/m See Note under "Electromagnetic Compatibility" on page 10-10.	Recommended separation distance: 80 MHz to 800 MHz $d = 1.2\sqrt{P}$ 800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$

Field strengths from fixed transmitters, such as base stations for radio (cellular, cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the monitor is used exceeds the applicable RF compliance level above, the MX40 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the monitor.

These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

The MX40 is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of the monitor can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment and the monitor as recommended below, according to the maximum output power of the communications equipment.

In the following table, P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).

Frequency of Transmitter	150 kHz to 80 MHz	80 MHz to 800 MHz	800 MHz to 2.5 GHz
Equation	d = 1.2√P	d = 1.2√P	d = 2.3√P
Rated max. output power of transmitter	Separation distance	Separation distance	Separation distance
0.01 W	0.1 m	0.1 m	0.2 m
0.1 W	0.4 m	0.4 m	0.7 m
1 W	1.2 m	1.3 m	2.3 m
10 W	3.8 m	3.8 m	7.3 m
100 W	12.0 m	12.0 m	23.0 m

Electrosurgery Interference/Defibrillation/Electrostatic Discharge

The equipment returns to the previous operating mode within 10 seconds without loss of any stored data. Measurement accuracy may be temporarily decreased while performing defibrillation. This does not affect patient or equipment safety. Do not expose the equipment to x-ray or strong magnetic fields (MRI). The MX40 is not for use during electrosurgery.

Restart Time

After power interruption, an ECG wave will be shown on the display after 30 seconds maximum.

Battery Specifications

Battery Life

Note —Battery life specifications are stated with a 95% confidence level that the average run time will be at least this long assuming a random sample of the population with a student-t distribution.

The battery life specifications listed below are based on the use of three Duracell MN 1500 batteries. Battery life for other brands may differ.

Telemetry Mode Networked (Display Off)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)
ECG Only	37.0 hours	33.0 hours
ECG/SpO_2 FAST Continuous (ECG operation available.)	22.0 hours (time to No Signal INOP)	20.0 hours (time to No Signal INOP)
ECG/SpO_2 FAST Continuous (Continuous SpO2 operation available.)	10.0 hours (time to No SpO2T, Batt Low INOP)	10.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO_2 Masimo Continuous (ECG operation available.)	20.0 hours (time to No Signal INOP)	18.0 hours (time to No Signal INOP)
ECG/SpO_2 Masimo Continuous (Continuous SpO2 operation available.)	9.0 hours (time to No SpO2T, Batt Low INOP)	8.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO2 FAST Auto (5 min.) (ECG operation available.)	35.0 hours (time to No Signal INOP)	30.0 hours (time to No Signal INOP)
ECG/SpO2 FAST Auto (5 min.) (SpO2 operation available)	18.0 hours (time to No SpO2T, Batt Low INOP)	16.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO2 Masimo Auto (5 min.) (ECG operation available.)	30.0 hours (time to No Signal INOP)	28.0 hours (time to No Signal INOP)
ECG/SpO2 Masimo Auto (5 min.) (SpO2 operation available)	15.0 hours (time to No SpO2T, Batt Low INOP)	14.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO_2 Manual (FAST and Masimo)	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.	

Monitor Mode Networked (Display On)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)
ECG Only	10.5 hours	9.5 hours
ECG/SpO_2 FAST Continuous	5.3 hours	2.5 hours
ECG/SpO_2 Masimo Continuous	4.3 hours	3.5 hours
ECG/SpO_2 Manual (FAST and Masimo)	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.	

Monitor Mode Non-networked (Display On)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)
ECG Only	6.8 hours	6.0 hours
ECG/SpO_2 FAST Continuous	4.7 hours	4.0 hours
ECG/SpO_2 Masimo Continuous	4.0 hours	3.0 hours
ECG/SpO_2 Manual (Fast and Masimo)	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.	

The battery life specifications listed below are based on the use of the Philips Rechargeable Lithium-ion battery.

Telemetry Mode Networked (Display Off)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)	Battery Life (WLAN p/n 865352)
ECG Only	30.0 hours	28.0 hours	28.0 hours
ECG/SpO_2 FAST Continuous (ECG Operation available)	15.6 hours (time to No Signal INOP)	14.0 hours (time to No Signal INOP)	15.0 hours (time to No Signal INOP)
ECG/SpO_2 FAST Continuous (Continuous SpO2 Operation available)	12.0 hours (time to No SpO2T, Batt Low INOP)	11.0 hours (time to No SpO2T, Batt Low INOP P)	12.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO_2 Masimo Continuous (ECG Operation available)	12.5 hours (time to No Signal INOP)	11.0 hours (time to No Signal INOP)	12.5 hours (time to No Signal INOP)
ECG/SpO_2 Masimo Continuous (Continuous SpO2 Operation available)	10.0 hours (time to No SpO2T, Batt Low INOP)	9.0 hours (time to No SpO2T, Batt Low INOP P)	10.0 hours (time to No SpO2T, Batt Low INOP)

Telemetry Mode Networked (Display Off)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)	Battery Life (WLAN p/n 865352)
ECG/SpO2 FAST Auto (5 min.) (ECG operation available)	28.0 hours (time to No Signal INOP)	26.0 hours (time to No Signal INOP)	27 hours (time to No Signal INOP)
ECG/SpO2 FAST Auto (5 min.) (SpO2 operation available)	15.0 hours (time to No SpO2T, Batt Low INOP)	14.0 hours (time to No SpO2T, Batt Low INOP)	15.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO2 Masimo Auto (5 min.) (ECG operation available)	24.0 hours (time to No Signal INOP)	22.0 hours (time to No Signal INOP)	24 hours (time to No Signal INOP)
ECG/SpO2 Masimo Auto (5 min.) (SpO2 operation available)	13.0 hours (time to No SpO2T, Batt Low INOP)	12.0 hours (time to No SpO2T, Batt Low INOP)	13.0 hours (time to No SpO2T, Batt Low INOP)
ECG/SpO_2 Manual (FAST and Masimo)	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.		

Monitor Mode Networked (Display On)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)	Battery Life (WLAN p/n 865352)
ECG Only	10.0 hours	9.0 hours	10.0 hours
ECG/SpO_2 FAST Continuous	8.0 hours	7.0 hours	8.0 hours
ECG/SpO_2 Masimo Continuous	7.0 hours	6.0 hours	7.0 hours
ECG/SpO_2 Manual (FAST and Masimo)	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.		

Monitor Mode Non-networked (Display On)	Battery Life (1.4GHz p/n 865350)	Battery Life (2.4GHz p/n 865351)	Battery Life (WLAN p/n 865352)
ECG	9.0 hours	8.0 hours	9.0 hours
ECG/SpO_2 FAST Continuous	8.0 hours	7.0 hours	8.0 hours
ECG/SpO_2 Masimo Continuous	7.0 hours	6.0 hours	7.0 hours
ECG/SpO_2 Manual	In this mode battery life is dependent on the usage rate and will range between the ECG Only battery life and the ECG/SpO_2 Continuous battery life.		

Note — Use of the short-range radio can reduce battery life by 35%.

Note — The battery capacity of re-chargeable batteries degrades over time and number of recharge cycles. Toward the end of its useful life, the battery capacity may be reduced by 30%. If this reduced battery life is unacceptable based on your use model, Philips recommends replacing the rechargeable battery sooner.

Nominal Current

Operating Mode	Nominal Current (p/n 865350)	Nominal Current (p/n 865351)	Nominal Current (p/n 865352)
ECG Only FAST (Display inactive)	51.5 mA @ 3.6V	51.0 mA @ 3.6V	51.5 mA @ 4.1V
ECG/SpO_2 FAST Continuous (Display inactive)	120 mA @ 3.6V	116 mA @ 3.6V	120 mA @ 4.1V
ECG Only Masimo (Display inactive)	51.5 mA @ 3.6V	51.0 mA @ 3.6V	51.5 mA @ 4.1V
ECG/SpO_2 Masimo Continuous (Display inactive)	122 mA @ 3.6V	118 mA @ 3.6V	123 mA @ 4.1V

Lithium-ion Battery Charge Time

Definition	Charging Method	Charge Time
Battery pack charge time from 90% depletion state	The Lithium-ion Battery Pack is charged on a separate external charging station. It must be removed from the MX40 to charge.	6.5 hours

Physical Specifications

Parameter	Specification
Height	126.8 mm (4.99 in)
Width	69.9 mm (2.75 in)
Depth	31.5 mm (1.24 in)
Weight • Without batteries, includes SpO_2 • With 3 AA batteries, includes SpO_2 and all hardware options • With lithium-ion battery, includes SpO_2 and all hardware options	 1.4 GHz - 223 g (7.8 oz) 2.4 GHz - 223 g (7.8 oz) WLAN - 206 g (7.3 oz) 1.4 GHz - 298 g (10.5 oz) 2.4 GHz - 298 g (10.5 oz) 1.4 GHz - 289 g (10.2 oz) 2.4 GHz - 289 g (10.2 oz) 2.4 GHz/5.6 GHz WLAN - 274 g (9.7 oz)
Display • Type • View Area • Resolution • Backlight • ECG Display Sector Size (height) • ECG or Pleth Display Sweep Speed • • • • Resp Display Sweep Speed	 • 2.8" QVGA Color LCD • 43.2mm x 57.6 mm (1.70" x 2.26") • 240 x 320 • White LED • 13.5mm (portrait), 9.9mm (landscape) • 10mm/s with 4.32 sec of viewable ECG or pleth data (portrait), 10mm/s with 5.76 sec of viewable ECG or pleth data (landscape) or 25mm/s with 1.73 sec of viewable ECG or pleth data (portrait), 25mm/s with 2.30 sec of viewable ECG or pleth data (landscape). • 2.5mm/s with 17.28 sec of viewable RESP data (portrait) 2.5mm/s with 23.04 sec of viewable resp data (landscape).
Alarm Signal Sound Pressure Level	40dB(A) - 70dB(A)

MX40 1.4 GHz Smart-Hopping Radio

Parameter	Specification
Frequency Ranges	Bands: 1395-1400 MHz and 1427-1432 MHz Channel Spacing: 1.6 MHz
RF Output Power	12.5 dBm +/- 1.5 dB (12.6 mW to 25 mW, nominal 17.8mW) into antenna load. Calibrated into 50 Ohms
Radio Frequency Accuracy during normal operation	<+60/-100 KHz relative to channel frequency, includes temperature compensation and aging effects
Modulation Type	GFSK (1M40Q7D)
Out of Band Spurious Emission Levels: <= 1394 MHz, >= 1401 MHz <= 1428 MHz, >= 1433 MHz	<-41 dBm in 1 MHz bandwidth for FCC limit
Occupied bandwidth as defined by power in 99% BW	< +/- 800 KHz

1.4GHz WMTS (US only)

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference. Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.

MX40 2.4 GHz Smart-Hopping Radio

Parameter	Specification
Frequency Range	ISM Band: 2400 - 2483.5 MHz
Channel Assignment	48 radio channels assigned from 2401.056 MHz - 2482.272 MHz Channel Spacing: 1.728 MHz
RF Output Power	FCC: Channels 0-46 -17 dBm +/- 1 dB (40 mW to 63 mW, nominal 50 mW), into antenna load. Channel 47 only - 15 dBm +/- 1 dB. ETSI: 12 dBm +/- 1 dB (13 mW to 20 mW, nominal 16 mW), into antenna load ARIB: 13.5 dBm +/- 1 dB (18 mW to 28 mW, nominal 22 mW), into antenna load
Radio Frequency Accuracy during normal operation	<+ 60 /- 100 KHz relative to channel frequency, includes temperature compensation and aging effects
Modulation Type	GFSK, Gaussian Frequency Shift keying (1M40Q7D)
Modulation Bandwidth	Typically 1.4 MHz (20 dB Bandwidth) Typically 980 KHz (6 dB Bandwidth)
Out of Band Spurious Emission Levels	Meets ETSI, RSS-210, FCC, ARIB standards

2.4 GHz ISM

See page 10-24 for **FCC Radio Compliance** and page 10-24 for **Industry Canada Radio Compliance**.

MX40 Short-Range Radio

Parameter	Specification
Frequency Ranges	ISM Band: 2400-2483.5MHz
Radio Channel assignment	16 Radio Channel assigned, Fc= 2405 +5*(k-11) MHz, k=11,12,…,26
Frequency Control	Configured via the bedside monitor or the Information Center depending on use model.
RF Output Power	-1.5 to -4.5 dBm +2/-3dB (0.7 mW to 0.3 mW), into Antenna load.
MX40 Frequency Accuracy during normal operation	<+/-40ppm, includes temperature compensation & aging effects
Modulation Type	Direct Sequence Spread Spectrum (DSSS), O-QPSK with half sine pulse shaping modulation (1M40Q7D)
Modulation Bandwidth	>500KHz, typically +/-950KHz (6dB Bandwidth), typically +/-1.4MHz (20dB Bandwidth)

MX40 2.4 GHz WLAN Radio

The MX40 2.4GHz/5.6GHz WLAN Radio conforms to the 802.11 a/b/g/n standard operating in the 2.4GHz and 5.6GHz ISM bands.

Note — For the MX40 WLAN device, Part Number 865352, use of the MX40's short-range Radio is only supported when operating with 802.11a (5.6GHz band).

The Radio characteristics are defined below.

WLAN Radio RF Specs	Specification
802.11b	
Technology	IEEE 802.11 b
Frequency Range	2.4 to 2.4835GHz
Transmitter Power	10 to 15 dBm into antenna load (RMS power)
Modulation	CCK (Complementary Code Keying)
Occupied Bandwidth, 99%	<-22 MHz
802.11g, 802.11ng	
Technology	IEEE 802.11 g, 802.11 ng
Frequency Range	2.4 to 2.4835GHz
Transmitter Power	9.5 to 15 dBm into antenna load (RMS power)
Occupied Bandwidth, 99%	<-22 MHz
Modulation Type	OFDM (Orthogonal Frequency Division Multiplex)
Frequency Bands (802.11 b/g)	FCC, RSS-210, ETSI Japan{ARIB},China, AS/NZS: 2.400 – 2.4835GHz
Out of Band Emissions (802.11 b/g)	Meets ETSI, RSS-210, FCC, ARIB, AS/NZS standards
802.11a, 802.11na	
Technology	IEEE 802.11a, 802.11na
Frequency Power	5.15 to 5.825GHz
Transmitter Power	7 to 15 dBm into Antenna load (RMS power)
Occupied Bandwidth	≤ 19 MHz (802.11a, 802.11na) ≤ 37 MHz (802.11na bonded channel)
Modulation	DSSS : OFDM (Orthogonal Frequency Division Multiplex)
Frequency Bands (802.11a, 802.11na)	FCC, RSS-210: 5.15 ~ 5.25Ghz, 5.25 ~ 5.35Ghz, 5.42 ~ 5.725Ghz, 5.725 ~ 5.825Ghz (excluding 5.6 ~5.65GH ETSI, AS/NZS: 5.15~ 5.35Ghz, 5.47 ~ 5.725Ghz Japan, ARIB: 5.150 – 5.250GHz, 5.25 – 5.35GHz, 5.470 – 5.725GHz, China: 5.725 ~5.825Ghz

WLAN Radio RF Specs	Specification
Out of Band Emissions (802.11a, 802.11na)	Meets ETSI, RSS-210, FCC, ARIB, AS/NZS standards

FCC Radio Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference.
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications to this equipment not expressly approved by Philips Healthcare may cause harmful radio frequency interference and void your authority to operate this equipment.

The device for band 5150-5250 MHz is only for indoor usage to reduce potential for harmful interference to co-channel mobile satellite systems.

Industry Canada Radio Compliance

The 865351 and 865352 devices contain license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

The 865350 device complies with RSS-210 of Industry Canada. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference
(2) this device must accept any interference received, including interference that may cause undesired operation.

Any changes or modifications to this equipment not expressly approved by Philips Healthcare may cause harmful radio frequency interference and void your authority to operate this equipment.

- The maximum antenna gain permitted (for devices in the 5250-5350 MHz and 5470-5725 MHz bands) complies with the e.i.r.p. limits as stated in RSS-210.

- The maximum antenna gain permitted (for devices in the 5725-5825 MHz bands) complies with the e.i.r.p. limits specified for point-to-point operation as stated in RSS-210.

Caution

High power radars are allocated as primary users of 5250-5350 MHz and 5650-5850 MHz. These radars could cause interference and/or damage to LE-LAN devices.

Conformité aux exigences de la norme Industrie Canada en matière de radiofréquences

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1) L'appareil ne doit pas produire de brouillage
2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Ce dispositif est conforme à la norme RSS-210 d'Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne doit pas générer d'interférences perturbatrices et (2) ce dispositif doit accepter toute interférence reçue, y compris celles susceptibles de provoquer un fonctionnement indésirable. Tout changement ou modification apporté à cet équipement sans l'approbation expresse de Philips Healthcare peut générer des interférences radio nuisibles et entraîner l'annulation de votre habilitation à utiliser cet équipement.

- Le gain d'antenne maximum autorisé (pour les dispositifs fonctionnant sur les bandes 5 250-5 350 MHz et 5 470-5 725 MHz) est conforme aux limites PIRE (puissance isotrope rayonnée équivalente) spécifiées par la norme RSS-210.

- Le gain d'antenne maximum autorisé (pour les dispositifs fonctionnant sur les bandes 5 725-5 825 MHz) est conforme aux limites PIRE (puissance isotrope rayonnée équivalente) relatives au fonctionnement point à point spécifiées par la norme RSS-210.

Attention

Les radars de grande puissance sont attribués en priorité aux bandes 5 250-5 350 MHz et 5 650-5 850 MHz. Ces radars peuvent occasionner des interférences et/ou des dommages aux dispositifs LE-LAN.

Environmental Specifications

Parameter	Specification
Temperature	
Operating	0 to 37° C (32 to 99° F)
Storage and Transportation	-30° C to 50° C (-22° F to 122° F) without batteries 12° C to 35° C (53.6° F to 95°F) with Single-Patient-Use leadsets
Humidity	
Operating	< 95% RH at 37° C (98.6° F) non-condensing ≥ 15% RH low limit
Storage and Transportation	< 90% RH at 50° C (122° F) without batteries ≥ 15% RH low limit
Altitude	
Operating & Non-operating (includes Transportation)	3,000 m (9,842 ft)
Barometric Pressure	72kPa (537 mmHg)
Water Resistance	MX40 Battery Compartment - IPX3 (protected against spraying water) MX40 Electronics Compartment - IPX7 (protected against immersion, up to 1m depth) MX40 Patient Cable when not attached to the MX40 (all connections) - IPX3 (protected against spraying water) MX40 to MX40 Patient Cable Connection (when patient cable is securely attached) - IPX7 (protected against immersion, up to 1m depth)

Measurement Specifications

ECG

Parameter	Specification
ECG channel transmitted Leads	
3 electrodes	Channel #1 = I, II, or III
5 electrodes	Channel #1 = II Channel #2 = III Channel #3 = MCL
5 electrodes, EASI	Channel #1 = Va-i Channel #2 = Va-s Channel #3 = Ve-s
6 electrodes	Channel #1= II Channel #2 = III Channel #3 = MCLa Channel #4 = MCLb
Resolution	5 μV
ECG Input	Differential, defibrillator protected against 360 joules discharge into a 100 ohm load
Input Impedance	> 5 megohms (@ 10 Hz
Input Dynamic Range	+/- 9 mV
DC Offset Range	+/- 320 mV
CMRR	≥ 90 dB @ 50, 60 Hz (Active RL-drive is used for best CMRR performance.)
Bandwidth +/- 3 dB	0.05 to 40 Hz
Gain Accuracy	+/- 5% at 25 °C (77 °F)
Noise Referred to ECG Input (Peak-to-Peak)	AAMI: 30 μV (as per AAMI EC 13)
Lead Wires	3, 5 or 6-wire patient cable compatible with IntelliVue Patient Monitor, AAMI/IEC color codes
Time to baseline recovery from Defibrillator	AAMI: 5 s max (until ECG wave is on display but not yet centered, monitoring bandwidth)

Parameter	Specification
Pacer Rejection Performance (Pace pulses with no tails).	Positive pacers[1] Amplitude Width +2 to +700 mV 0.1, 0.2, 0.5 and 1.0 ms +2 to +500 mV 1.5 ms +2 to +400 mV 2 ms Negative pacers[1] Amplitude Width -2 to -700 mV 0.1, 0.2, 0.5 and 1.0 ms -2 to -500 mV 1.5 ms -2 to -400 mV 2 ms [1] Philips does not claim, verify, or validate support for all available pacemakers.
Heart Rate Numeric (range, resolution and accuracy)	Range: 15 bpm to 300 bpm (Adult, Pedi) Resolution: 1bpm, accuracy +/- 1% of the range Beat Detection Sensitivity: > 200 mV peak Meets AAMI EC-13
Heart Rate Meter Response Time to Change in Heart Rate	For a rate increase, the average time to reach the specified heart rate (40 bpm to 80 bpm) using test waveforms as indicated in ANSI/AAMI EC13 Sec. 4.1.2.1(f) is 10 seconds. For a rate drop of 80 bpm to 40 bpm, the average time is 7 seconds.
Heart Rate Meter Response Time to Irregular Rhythm	Provides correct heart rates (60, 80, 90, 120 bpm) using test waveforms as indicated in ANSI/AAMI EC13 Sec. 4.1.2.1(e). All QRS are counted with test waveforms within HR accuracy defined above.
EMC Performance Limits, radiated immunity	Meets Essential Performance.
ECG Patient Cable Disconnection Safety	All ECG connections are patient safe within 750 msec of patient cable removal, with patient leakage current <10 μA. Exception: Leadset detection pins are protected mechanically to prevent patient contact.

ECG Performance Disclosure/Specifications

For complete ECG Performance Disclosure information and specifications, see the IntelliVue MX40 Instructions for Use, Chapter 14.

Distributed Alarm System Delay Specifications

For complete Distributed Alarm System Delay information and specifications, see the Patient Information Center iX Instructions for Use.

Respiration

Parameter	Specification
Leads Used for Measurement	RA, LL (standard) or I, A (EASI)
Range	Adult/Pedi: 0 to 120 rpm
Bandwidth	0.3Hz to 2.5Hz (-6dB)
Noise	Less than 25 mOhm (rms) referred to the input
Calibration Signal	Signal: 1 Ohm p-p; Accuracy: ±20%
Respiration Rate Resolution	1 rpm
Respiration Accuracy	±1 rpm for 0-120 rmp
Auxiliary Current, Respiration Excitation Signal	< 470 uA rms @48KHz, sinusoidal waveform

Respiration Alarm

Alarm	Range	Delay
High	Adult/Pediatric: 10 to 100 rpm	≤ 15 seconds
Low	Adult/Pediatric: 0 to 95 rpm	for limits from 0 to 20 rpm: max. 4 seconds for limits above 20 rpm: max. 15 seconds
Apnea Alarm	10 to 40 seconds	Incremental delay 5 seconds max.

FAST SpO_2

Parameter	Specification
SpO_2 Measurement Range (Calibration and Display)	0 to 100%
SpO_2 Accuracy	See “Performance Specification Details for Philips FAST Sensors” MX40 C.01 Instructions for Use, Chapters 9 and 15..

Parameter	Specification
SpO_2 Resolution	1%
SpO_2 Numerics - Averaging	5 - 20 seconds (default = 10 seconds) The effect of SpO_2 pulse oximetry on data averaging is internally controllable by the patient worn monitorMX40, with no user controls.
SpO_2 & Pulse Numerics - Update Rate	Transmitted once per second. ***Note—***The update rate for the SpO_2 pulse oximetry value and pulse rate is typically 1 second. This can be extended to a max. 60 s when NBP is measured on the same limb, with a corresponding INOP message after a max. of 30 s, indicating that the displayed values are not current values.
Pleth Wave- Sampling Rate	125 sps
Technical Alarms (INOPs)	Triggered if the sensor is disconnected, if a pulse is not detected, if the signal is noisy, if light interference is detected, if the sensor is defective, if the measurement is erratic, or if the module is malfunctioning
Wavelength Range	500 to 1000 nm ***Note—***Information about wavelength range can be especially useful to clinicians (e.g., clinicians performing photodynamic therapy).
Pulse Rate Measurement (available only with Continuous SpO_2)	Range: 30 to 300 bpm Accuracy: ±2% Resolution: 1 bpm
Display of SpO_2 numerics	SpO_2 values are displayed as xxx % SpO_2 to meet ISO 9919.
Emitted Light Energy	$\leq$ 15 mW

Masimo SET SpO_2

Parameter	Specification
SpO_2 Measurement Range (Calibration and Display)	0 to 100%
SpO_2 Accuracy	See “Performance Specification Details for Masimo SET Sensors” MX40 C.01 Instructions for Use, Chapters 9 and 15..
SpO_2 Resolution	1%
SpO_2 Numerics - Averaging	5 - 20 seconds (default = 10 seconds)
SpO_2 & Pulse Numerics - Update Rate	Typical numeric update rate is once per second..
Pleth Wave- Sampling Rate	125 sps
Technical Alarms (INOPs)	Triggered if the sensor is disconnected, if a pulse is not detected, if the signal is noisy, if light interference is detected, if the sensor is defective, if the measurement is erratic, or if the module is malfunctioning
Wavelength Range	500 to 1000 nm ***Note***—Information about wavelength range can be especially useful to clinicians (e.g., clinicians performing photodynamic therapy).
Pulse Rate Measurement	Range: 25 to 240 bpm Accuracy with no motion: 3 bpm Accuracy with motion: 5 bpm Resolution: 1 bpm
Display of SpO_2 Numerics	SpO_2 values are displayed as xxx % SpO_2 to meet ISO 80601-2-61
Emitted Light Energy	$\leq$ 15 mW

SpO_2 Accuracy Specifications

For complete SpO_2 Accuracy Specification information, see the IntelliVue MX40 C.01 Instructions for Use, Chapters 9 and 15.

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