IntelliVue MX40

Installation and Service

PHILIPS

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This device complies with Part 15 and/or Part 95 of the FCC Rules. 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

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.

First Edition June 2011

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.

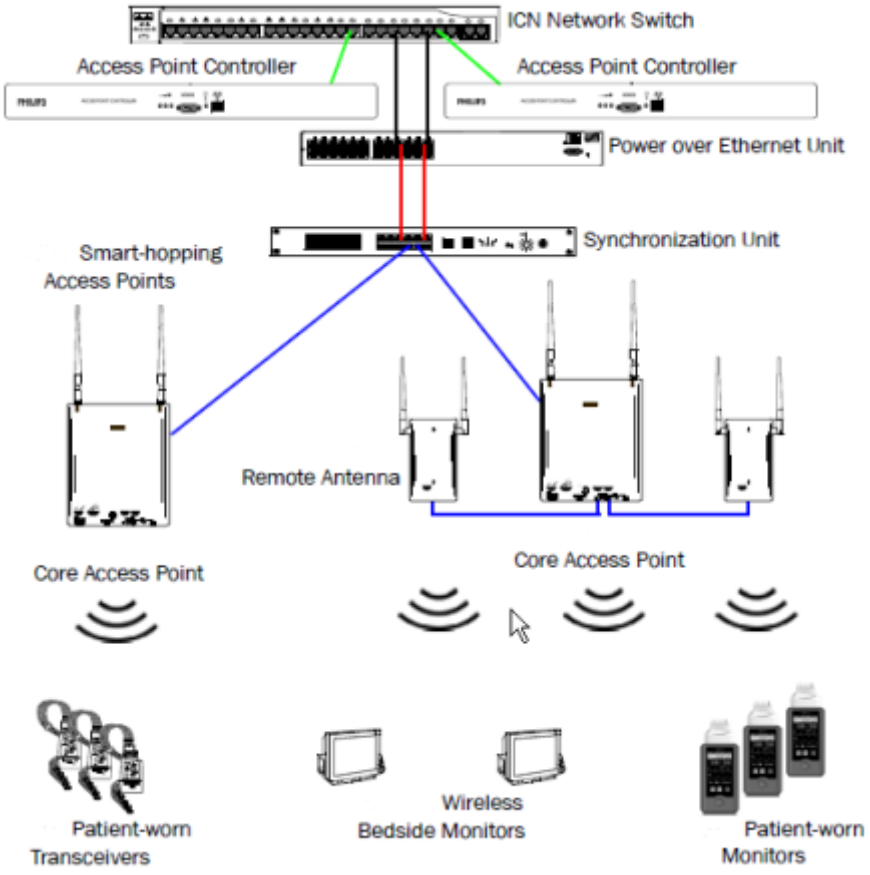
Contents

1. Introduction

The MX40 is compatible with the Philips Smart-hopping wireless network which is designed for use in ambulatory care areas of hospitals, rehabilitation facilities, and cardiac care centers.

The Smart-hopping wireless network provides ambulatory and bedside monitoring of ECG, SpO_2 and NBP. The network encompasses a number of individual units which connect to form a complete method of transporting patient data to a central repository for subsequent distribution to clinical staff.

The 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.

MX40 Compatibility

The MX40 is compatible for use with IntelliVue Information Center Release N. Limited compatibility is offered when used with IntelliVue Information Center Release L or M. See the "Operating with Release L or M" chapter for more information.

The MX40 is compatible for use with IntelliVue Patient Monitors Release G or later when wirelessly connected.

The MX40 is compatible for use with IntelliVue Cableless Measurements Release A.1.

The MX40 is compatible for use with Access Point Controller 862147, Release B.00.19 and Access Point Controller 865346, Release C.00.XX.

The MX40 Patient Cable is compatible for use with IntelliVue Patient Monitor platforms MP2/X2, MP5/MP5T/MP5SC, MP20/30 with MMS or X2, MP40/50 with MMS or X2, MP60/70 with MMS or X2, MP80/90 with MMS or X2, and MX800/700/600 with MMS or X2.

Label Assignment for MX40

When the MX40 is shipped from the factory, it is shipped with an Equipment Label of "NEW_DEVICE" and an RF Access Code of "0". This allows connection to any Smart-hopping Access Point.

After the MX40 has connected to the wireless network, the device gets the RF Access Code and Equipment Label configuration through the "Label Assignment" function at the Information Center. The Label Assignment function is password protected. The password is "tele".

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

Assigning an Equipment Label

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

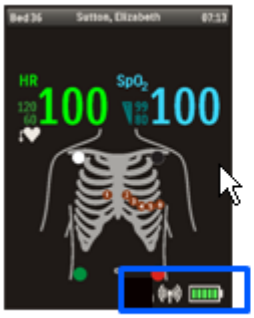
1 Select **All Controls -> Label Assignment**.

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 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 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.

Frequency Management and Channel Selection

Management of the RF environment in a facility is important to the overall performance of any wireless system. Philips Medical Systems cannot control what wireless devices are used in a healthcare facility, but we will work with you 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 Medical Systems 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 facility is important to prevent interference between them.

Channel Selection

The MX40 has two radios – the Smart-hopping radio and the Short Range Radio (optional). Channel selection for the two radios is different for a 1.4 GHz Smart-hopping system versus a 2.4 GHz Smart-hopping system. Therefore they will be discussed separately.

Channel Selection for 1.4 GHz Smart-hopping Systems

The 1.4 GHz MX40 operates in the FCC-allocated, protected Wireless Medical Telemetry Service (WMTS) in the 1395-1400 and 1427-1432 MHz bands. Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.

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 (WMTS only)

Operation of this equipment requires the prior coordination with a frequency coordinator designated by the FCC for the Wireless Medical Telemetry Service.

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). The MX40 operates in the 1395-1400 and 1427-1432 MHz bands.

Under U.S. Federal Communications Commission (FCC) rules, authorized healthcare providers must register their WMTS devices with an authorized Frequency Coordinator designated by the FCC. The American Society for Healthcare Engineering (ASHE) is the current designated Frequency Coordinator.

Registration/Coordination is a two-step process.

Step 1: Registration: The healthcare facility must register with ASHE. This is done on-line, from the ASHE website (www.ashe.org - search on keyword "WMTS"). Click on the link for Wireless Medical Telemetry Service and you will come to the registration page. Fill out the details, and pay the associated fee as per the instructions provided. You will receive confirmation of this registration. Confirmation must be received before proceeding to the next step.

Step 2: Frequency Coordination: Along with confirmation of registration, you will receive access information necessary to perform the second step, frequency coordination. 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. Like registration, coordination is accomplished via the ASHE website. Click on the links for Wireless Medical Telemetry Service and then Frequency Coordination. The way the coordination process is executed as of today, it will need to be repeated twice for the ITS4840A system; 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. Coordination is executed by a company named Comsearch, on behalf of ASHE.

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

- The county.
- 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 provides contact information.
- The name/s of the Clinical Unit/s using the devices (e.g. ICU4, CCU-West, ER1, Step-Down North, etc)

- The radius of deployment, expressed in meters. Imagine drawing a circle around the center of the clinical unit, that encloses/encompasses the unit. What is its radius?
- The number of the highest floor on which a transmitting device will operate.
- How many transmitting devices will be used, i.e. the total number of MX40 devices, Access Points, Core Access Points, and Remote Antennas combined.
- The Effective Radiating Power: 6.3 mW.
- The Equipment Manufacturer: Philips Medical Systems.
- The Equipment Models: MX40, etc.
- The Frequency Range to be used: Two separate coordinations are required: For the first one, click on the range of 1395.0 through 1400.0 MHz. For the second one, click on all the frequency ranges listed in the range of 1427.0 through 1432.0 MHz.

When both Registration and Frequency Coordination have been successfully completed, the MX40 can be activated. Note that this process is the responsibility of the customer, as the final "operator" of the transmitting equipment.

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
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

Short-Range Radio Channel Selection for 1.4GHz Smart-hopping Systems

When the MX40 is to be connected to an IntelliVue Cableless Measurement device, the Short-range radio channel assignment is handled at the MX40. When the MX40 is to be connected to an IntelliVue Patient Monitor, the Short-range radio channel assignment is handled at the patient monitor.

The Short Range Radio operates in the 2.4 GHz band, and is therefore subject to interference from other devices that operate in this band like 802.11b, g wireless LANs, microwave ovens, Bluetooth radios, etc.. The most likely interference will come from 802.11b, g wireless LANs.

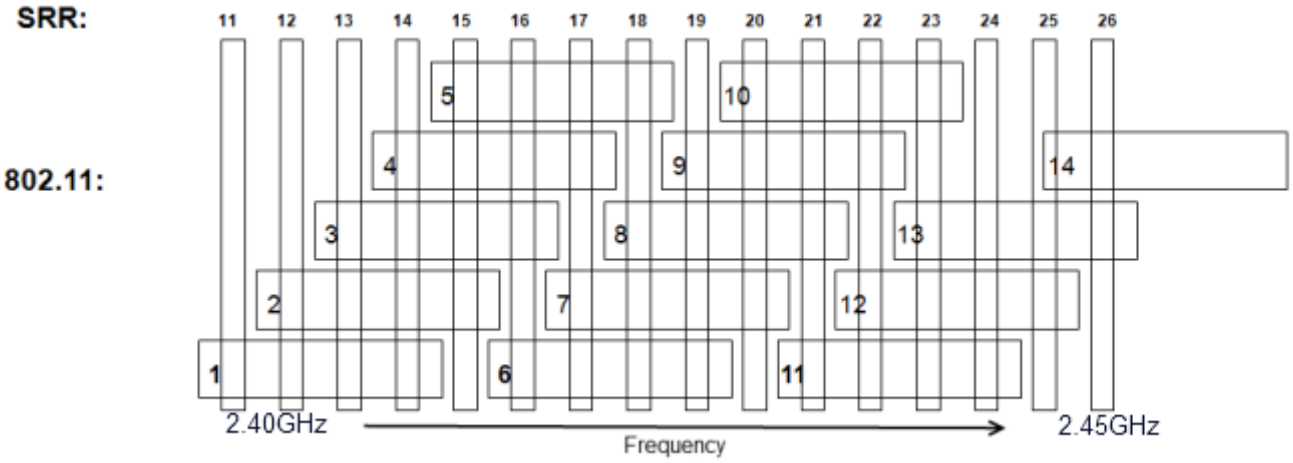
In order to avoid interference, the Short Range Radio channels should be chosen to operate at different frequencies as illustrated in the diagram below, and as captured in the table below.

For example, if the hospital has an 802.11 deployment using 802.11 channels 1, 6, and 11, Short Range Radio channels that operate at frequencies in between and above these channels would be SRR channel 15 (between 802.11 channels 1 and 6), SRR channel 20 (between 802.11 channels 6 and 11) and SRR channels 25 and 26 (above 802.11 channel 11).

The table 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).

Channel Comparison - Short-Range Radio and 802.11b,g Channels

The diagram below is for use in 1.4GHz Smart-hopping installations when trying to select the best available Short-range radio channels.



Note — Channel overlap as shown in this 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.

SRR Channel Selection for 1.4GHz Installations

802.11 Channel Deployment	Short Range Radio Channel Recommendations	
	Telemetry Use Model – Configure 2-4 channels as "High" in Config Wizard	**Bedside Use Model - Select best channel based on local interference levels**
1, 6, 11	25, 26, 15, 20	25, 26, 15, 20
1, 4, 7, 11	25, 26	25, 26
	11*, 20*, 21*, 24*	11*, 20*, 21*, 24*
1, 4, 8, 11	25, 26	25, 26
	11*, 17*, 18*, 24*	11*, 17*, 18*, 24*

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

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

For 2.4 GHz Smart-hopping systems, 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 802.11b, g wireless LANs, microwave ovens, Bluetooth radios, etc.. The most likely interference will come from 802.11b, g wireless LANs. 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 avoid interference, the Smart-hopping and Short-Range Radio channels should be chosen to operate at different frequencies as captured in the tables that follow.

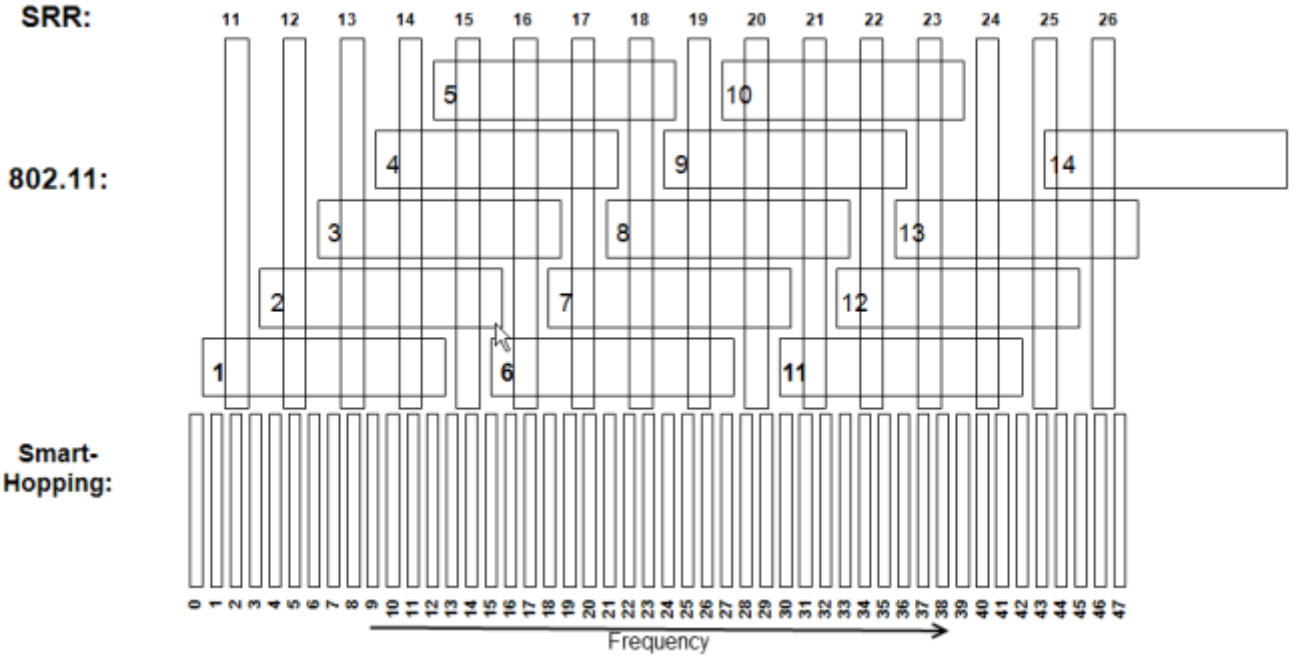
A minimum of three Smart-hopping channels is required for operation of the system, but we strongly recommend selecting the maximum of six channels in order to improve performance.

For example, if a 2.4GHz Smart-hopping system is being deployed without the Short Range Radio in a hospital with an 802.11 deployment of channels 1, 6 and 11, the best channels to use would be the channels listed as "Primary" in the table, "802.11 Channel 1,611 Deployment", – 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.

If a 2.4GHz Smart-hopping system 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 tables. The clearest frequencies should be assigned to the Short Range Radio, and then the Smart-hopping channels can be assigned. So if 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 Channel 1,611 Deployment", – 13, 14, 28, (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, best three channels of the "Secondary" (0, 29) and "Tertiary" (12, 15, 27) channels listed should be selected.

Channel Comparison - Short-Range Radio and 802.11b

The diagram below is for use in 2.4GHz Smart-hopping installations when trying to select the best available Short-range radio channels.



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

802.11 Channel 1,6,11 Deployment

802.11 Channel Deployment 1, 6, 11	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong , Singapore, Taiwan	Japan	All other countries
SRR	None	None	None	None
Smart-Hopping - 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	13, 14, 28, 42, 43, 44, 45, 46
SH Secondary*	0, 29	0, 29	29	29
SH Tertiary*	12, 15, 27, 41	12, 15, 27, 41	12, 15, 27, 41	12, 15, 27, 41
SRR	25, 26	25, 26	25, 26	25, 26
Smart-Hopping - Primary	13, 14, 28	13, 14, 28	13, 14, 28	13, 14, 28
SH Secondary*	0, 29	0, 29	29	29
SH Tertiary*	12, 15, 27	12, 15, 27	12, 15, 27	12, 15, 27
SRR	25, 26, 24*, 11*	25, 26, 24*, 11*	25, 26, 24*, 11*	25, 26, 24*, 11*
SH Primary	13, 14, 28	13, 14, 28	13, 14, 28	13, 14, 28
SH Secondary*	29	29	29	29
SH Tertiary*	12, 15, 27	12, 15, 27	12, 15, 27	12, 15, 27
SRR	15, 20	15, 20	15, 20	15, 20
SH Primary	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46, 47	42, 43, 44, 45, 46
SH Secondary*	0	0	None	None
SH Tertiary*	1, 41	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 < -80dB. Clear Smart-hopping channels have a power level < -90dBm.

802.11 Channel 1,4,7,11 Deployment

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

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

802.11 Channel 1,4,8,11 Deployment

802.11 Channel Deployment 1, 4, 8, 11	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong , Singapore, Taiwan	Japan	All other countries
SRR	None	None	None	None
Smart-Hopping - Primary	0, 42, 43, 44, 45 46, 47	0, 42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
SH Secondary*	1, 20, 21, 41	1, 20, 21, 41	1, 20, 21, 41	1, 20, 21, 41
SH Tertiary*	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32
SRR	17*, 18*	17*, 18*	17*, 18*	17*, 18*
Smart-Hopping - Primary	0, 42, 43, 44, 45 46, 47	0, 42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
SH Secondary*	1, 41	1, 41	1, 41	1, 41
SH Tertiary*	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32	10, 11, 30, 31, 32
SRR	11*, 17*, 18*	11*, 17*, 18*	11*, 17*, 18*	11*, 17*, 18*
Smart-Hopping - Primary	42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46, 47	42, 43, 44, 45 46
SH Secondary*	41	41	41	41
SH Tertiary*	10, 11, 30, 31, 32	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 < -80dB. Clear Smart-hopping channels have a power level < -90dBm.

802.11 Channel 1,7,13 Deployment

802.11 Channel Deployment 1, 7, 13	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong , Singapore, Taiwan	Japan	All other countries
SRR	None		None	None
Smart-Hopping Primary	13, 14, 15, 16, 17, 31, 32, 33, 34		13, 14, 15, 16, 17, 31, 32, 33, 34	13, 14, 15, 16, 17, 31, 32, 33, 34
SH Secondary*	0, 30		30	30
SH Tertiary*	12, 18, 35, 47		12, 18, 35, 47	12, 18, 35
SRR	15, 16		15, 16	15, 16
SH Primary	31, 32, 33, 34		31, 32, 33, 34	31, 32, 33, 34
SH Secondary*	0, 30		30	30
SH Tertiary*	35, 47		35, 47	35
SRR	21, 22		21, 22	21, 22
SH Primary	13, 14, 15, 16, 17		13, 14, 15, 16, 17	13, 14, 15, 16, 17
SH Secondary*	0		None	None
SH Tertiary*	12, 18, 47		12, 18, 47	12, 18

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

802.11 Channel 1,5,9,13 Deployment

802.11 Channel Deployment 1, 7, 13	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong, Singapore, Taiwan	Japan	All other countries
SRR	None		None	None
SH Primary	0		None	None
SH Secondary*	12, 24, 35, 47		12, 24, 35, 47	12, 24, 35
SH Tertiary*	1, 11, 13, 23, 25, 34, 36, 46		1, 11, 13, 23, 25, 34, 36, 46	1, 11, 13, 23, 25, 34, 36, 46
SRR	11*, 26*		11*, 26*	11*, 26*
SH Primary	None		None	None
SH Secondary*	12, 24, 35		12, 24, 35	12, 24, 35
SH Tertiary*	11, 13, 23, 25, 34, 36		11, 13, 23, 25, 34, 36	11, 13, 23, 25, 34, 36
SRR	11*, 14*, 15*, 26*		11*, 14*, 15*, 26*	11*, 14*, 15*, 26*
SH Primary	None		None	None
SH Secondary*	24, 35		24, 35	24, 35
SH Tertiary*	23, 25, 34, 36		23, 25, 34, 36	23, 25, 34, 36
SRR	11*, 18*, 19*, 26*		11*, 18*, 19*, 26*	11*, 18*, 19*, 26*
SH Primary	None		None	None
SH Secondary*	12, 35		12, 35	12, 35
SH Tertiary*	11, 13, 34, 36		11, 13, 34, 36	11, 13, 34, 36
SRR	11*, 22*, 23*, 26*		11*, 22*, 23*, 26*	11*, 22*, 23*, 26*
SH Primary	None		None	None
SH Secondary*	12, 24		12, 24	12, 24
SH Tertiary*	11, 13, 23, 25		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 < -80dB. Clear Smart-hopping channels have a power level < -90dBm.

802.11 Channel 2,7,12 Deployment

802.11 Channel Deployment 2, 7, 12	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong , Singapore, Taiwan	Japan	All other countries
SRR	None		None	None
Smart-Hopping - Primary	0, 1, 2, 16, 17, 30, 31, 45, 46, 47		1, 2, 16, 17, 30, 31, 45, 46, 47	1, 2, 16, 17, 30, 31, 45, 46
SH Secondary*				
SH Tertiary*				
SRR	11, 21		11, 21	11, 21
SH Primary	16, 17, 45, 46, 47		16, 17, 45, 46, 47	16, 17, 45, 46
SH Secondary*	None		None	None
SH Tertiary*	15, 18, 44		15, 18, 44	15, 18, 44
SRR	11, 12*, 20*, 21, 22*		11, 12*, 20*, 21, 22*	11, 12*, 20*, 21, 22*
SH Primary	16, 17, 45, 46, 47		16, 17, 45, 46, 47	16, 17, 45, 46
SH Secondary*	None		None	None
SH Tertiary*	15, 18, 44		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 < -80dB. Clear Smart-hopping channels have a power level < -90dBm.

802.11 Channel 1,6,11,14 Deployment

802.11 Channel Deployment 1, 6, 11, 14	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong, Singapore, Taiwan	Japan	All other countries
SRR	None		None	
Smart-Hopping - Primary	13, 14, 28		13, 14, 28	
SH Secondary*	0, 29		29	
SH Tertiary*	12, 15, 27, 41, 42		12, 15, 27, 41, 42	
SRR	11*, 20		11*, 20	
SH Primary	13, 14		13, 14	
SH Secondary*	None		None	
SH Tertiary*	12, 15, 41, 42		12, 15, 41, 42	
SRR	11*, 19*, 20, 21*		11*, 19*, 20, 21*	
SH Primary	13, 14		13, 14	
SH Secondary*	None		None	
SH Tertiary*	12, 15, 41, 42		12, 15, 41, 42	

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

802.11 Channel 3,10,14 Deployment

802.11 Channel Deployment 3, 10, 14	Available Radio Channels	FCC, RSS-210 Rules	ARIB Rules	ETSI, AUS/AZ Rules
		Canada, China, Hong Kong, Singapore, Taiwan	Japan	All other countries
SRR	None		None	
Smart-Hopping - Primary	0, 1, 2, 3, 4, 5, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41		1, 2, 3, 4, 5, 19, 20, 21, 22, 23, 24, 25, 26, 39, 40, 41	
SH Secondary*				
SH Tertiary*				
SRR	17, 18, 19		17, 18, 19	
SH Primary	0, 1, 2, 3, 4, 5, 39, 40, 41		1, 2, 3, 4, 5, 39, 40, 41	
SH Secondary*				
SH Tertiary*				

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

Short-Range Radio Density

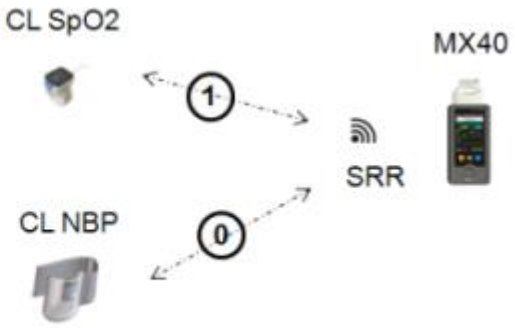
Device Density per SRR Channel	1.4GHz Smart-hopping Systems	2.4GHz Smart-hopping Systems
Maximum density of SRR Device Links in a single SRR cell	4 Device Links	3 Device Links

- A Short Range Radio cell is defined as a radius of 20ft (6.1m).
- A "Device Link" is defined by use model.

MX40 is coordinating SRR communication with the Cableless Measurements:

Continuous communication = 1
Pleth waveform data

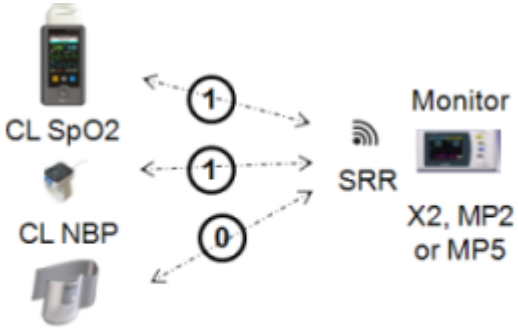
Periodic communication = 0
NBP measurement value



Patient Monitor is coordinating SRR communication with the MX40 and Cableless Measurements:

Continuous communication = 1
ECG waveform data
Pleth waveform data

Periodic communication = 0
NBP measurement value



Use Model Total = 1 + 1 + 0 = 2

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 system (and packing material if applicable) for obvious signs of damage. Also check external leads and accessories. Expected Test Results: The system does not have any obvious signs of damage = Pass	**V:P** or **V:F** where **P**=Pass **F**=Fail
Power On:	Remove leadset. 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 an ECG leadset 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. 7. Place the device in Standby. At the Information Center, resume monitoring.	**P:P** or **P:F** where **P**=Pass **F**=Fail

Test Block Name	Test or "Inspection" to Perform	What to Record on Service Record
	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. 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 an "SpO_2 Equip Malf" message which indicates an SpO_2 upgrade failure.The revision reported should match the revision loaded. You may also check the Status Log at the Information Center. Expected Test Results: Expected answer is "yes". If so, Revision Check test is passed.	**RC:P** or **RC:F** where **P**=Pass **F**=Fail

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 (71034)
  - Monitoring continues
- Service Mode
  - Same password as IPM (1345)
  - No monitoring possible
- Demo Mode
  - Same password as IPM (14432)
  - 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 th MX40 and a password is not required.

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 Alarms Button
12. SmartKeys Button
13. Main Screen Button
14. Multi-Function Button

Silence Alarm Button

Button	Function
	• Initiates a local silence/acknowledgment of all active alarms when enabled. • Silences the "Find Device" sound. ***Note —*** Alarms at the MX40 can be silenced from the Information Center.

SmartKeys Button

Button	Function
	Displays the SmartKey Menu on the touch screen.

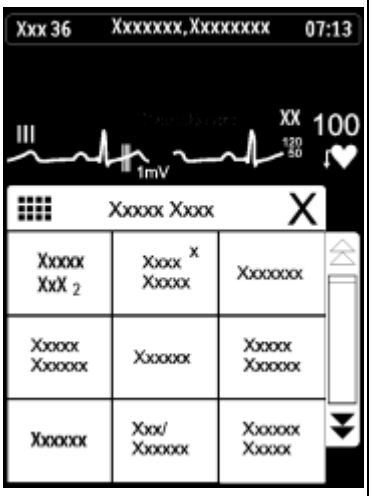
Main Screen Button

Button	Function
	• Activates the Touch Display if touched for two seconds. • Cycles through the display screens if touched repeatedly. • Resumes from Standby.

SmartKeys

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

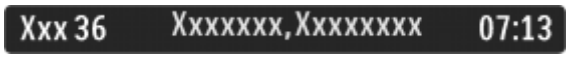
Note—gray text on a SmartKey signifies that the item is unavailable.

	SmartKey	Function
	Start SpO_2 ***Note —*** This SmartKey is unavailable when SpO_2 mode is continuous.	Starts a manual SpO_2 measurement.
	Delay Record	Starts a delayed recording at the Information Center.
	Alarms	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.
	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.
	Vitals Trends (Optional)	View up to 24 hours of tabular trend data.
	Screen Setup	Determines time period that the display remains active after user interaction.
	Lock/Unlock	Locks/Unlocks the display.
	Op Mode	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.
- A check mark in front of the alarm text signifies that the alarm has been acknowledged by touching the Silence Alarms button.
- 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.
- Local Alarm Audio is off when the alarm volume symbol is present.

Patient Information Area



The Patient Information Area displays the following information:

- Bed Label
- Patient Name (up to 15 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.

Display Lock

	The Lock symbol appears in the lower left of the display when the MX40 is in a locked state after five minutes of non-use. Locking the display provides additional protection against accidental patient access. The display is unlocked using the SmartKeys menu.

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.

Multi-Function Button

Button	Function
	Depending on configuration at the Information Center: • generates a Nurse Call; • Initiates a Delayed Recording; • Both, or; • None ***Note —*** the Multi-Function Button does not operate when paired with an IntelliVue Patient Monitor via the short-range radio connection.

Operating and Navigating

The principle 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. 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.

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.

If the MX40 enters a continuous "boot-up" cycle or the main display 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.

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.

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**.

The display automatically locks when there is no interaction for five minutes.

Function	Display Locked/Active	Display Locked/Inactive	Display Unlocked/Active	Display Unlocked/Inactive
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.

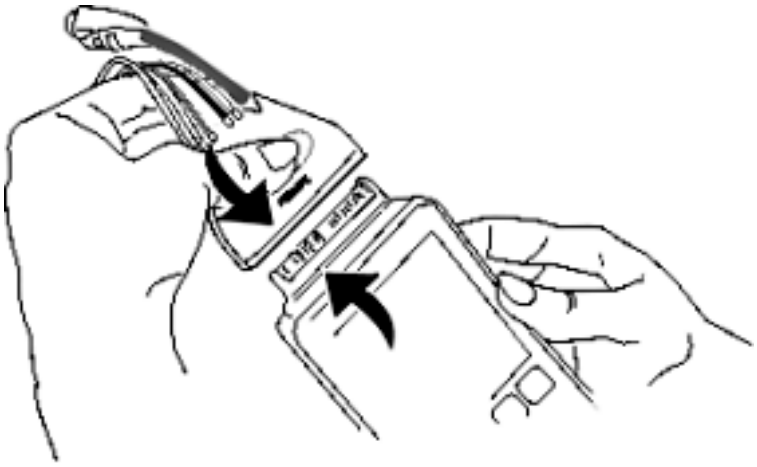
Measurement Area Display Configurations

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

- Portrait - One Waveform and four Numerics
- Portrait - Two Waveforms and two Numerics (IIC Release N only)
- Landscape - Two Waveforms and three Numerics (IIC Release N only)
- Portrait - Viewable Chest Diagram and two Numerics

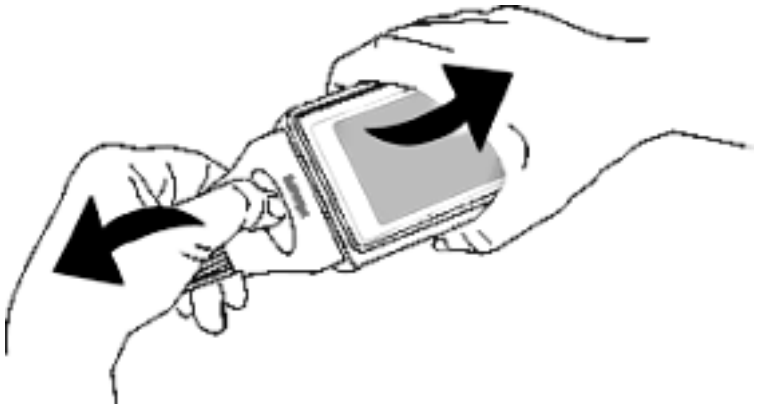
Connecting/Disconnecting the Patient Cable

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.

Disconnect the patient cable as shown below.



Caution

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

Understanding Settings

Each aspect of how the MX40 works and looks is defined by a setting. There are a number of different categories of settings, including:

- Screen Settings - to define the selection and appearance of elements on each individual display screen.
- Measurement Settings - to define setting unique to each measurement, e.g. high and low alarm limits.
- Monitor Settings -including settings that affect more than one measurement or display screen, for example alarm volume and alarm pause time.

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.

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.

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) are reflected at the MX40 when connected on the network.
Primary (used for arrhythmia analysis 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)	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.
Paced Mode	Yes, No
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.
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 C1, electrodes. Choices are V1-V9, v3R, V4R, V5R.
Vb Lead	Shows position of Vb,or C2, electrodes. Choices are V1-V9, v3R, V4R, V5R.
Change Numeric	Selects parameter numeric to display in place of current HR numeric.

Waveform Settings at the MX40

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

Primary or secondary waveform configuration changes made at the Information Center change the MX40.

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. Have the MX40 checked by your service provider to identify the cause of overheating.
- If you receive a TELE BATTERY LOW, TELE BATTERY EMPTY, REPLACE BATTERY T, 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.

- Disposable batteries should be removed from the MX40 at the end of the battery's useful life to prevent leakage.

  If battery leakage should occur, use caution in removing the battery. The leaked substance may cause eye or skin irritation. Avoid contact with skin. Clean the battery compartment according to the instructions in the Maintenance section. Wash hands.

- To eliminate the risk of electrical shock or burn, do not carry loose batteries on your person, e.g. in clothing pockets.

Caution

Use of AA Lithium batteries or batteries with terminal voltage >1.6V may cause damage to the device.

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 40% of their capacity every six months.	When not in use for an extended period of time.
Decommission the battery	When any of the following INOPs are displayed on the MX40: **TELE SERVICE BATTERY** **TELE BATTERY TEMP**

Rechargeable batteries are charged using the IntelliVue CL Charging Station. For information on charging station use, see ***Charging Li-ion Rechargeable Batteries*** p. 5-7 .

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 25-30%. 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 15°C (60°F), with a state of charge of 20% to 40%. Storing batteries in a cool place slows the aging process.

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

Stored batteries should be should be charged to at least 40% of their capacity every 6 months.". They should be charged to full capacity prior to use.

Note — Storing batteries at temperatures above 38°C (100°F) 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 60°C (140°F).

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 is powered down 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.

Important— Do not use other rechargeable batteries. Use of this type of battery will adversely affect:

- Battery gauge performance
- Battery low warnings
- Battery life performance

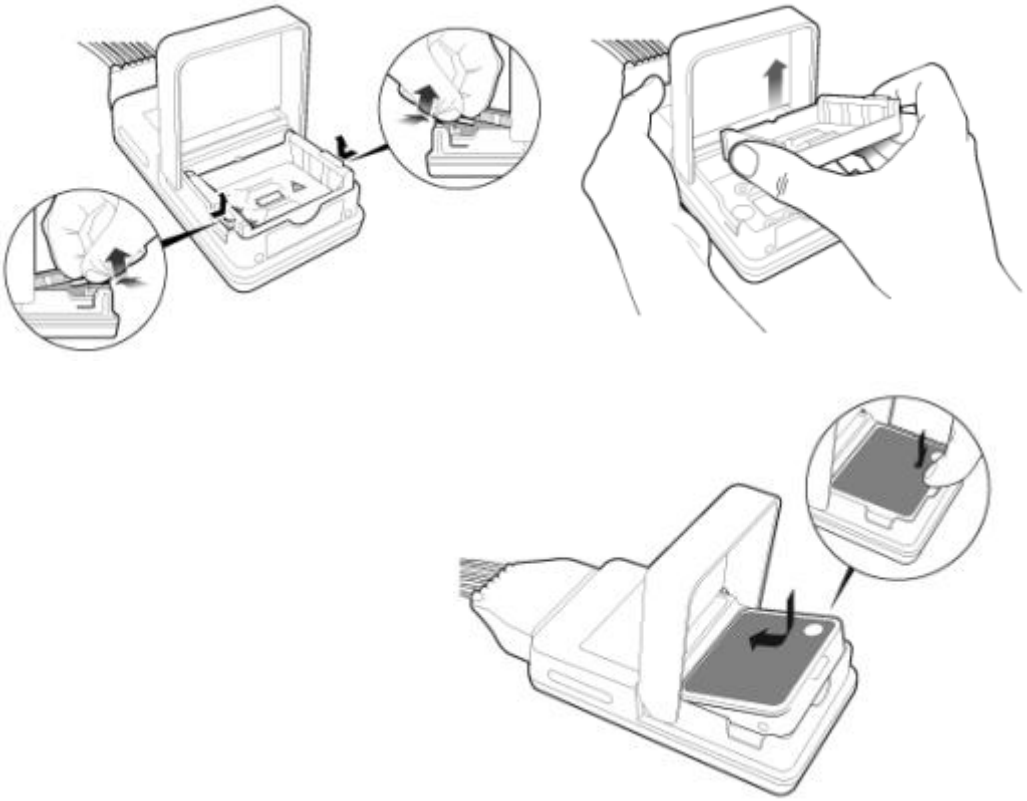
Inserting Batteries

➢ ***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.

1 Remove the AA battery tray if present.

2 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.



3 Close the battery compartment door.

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

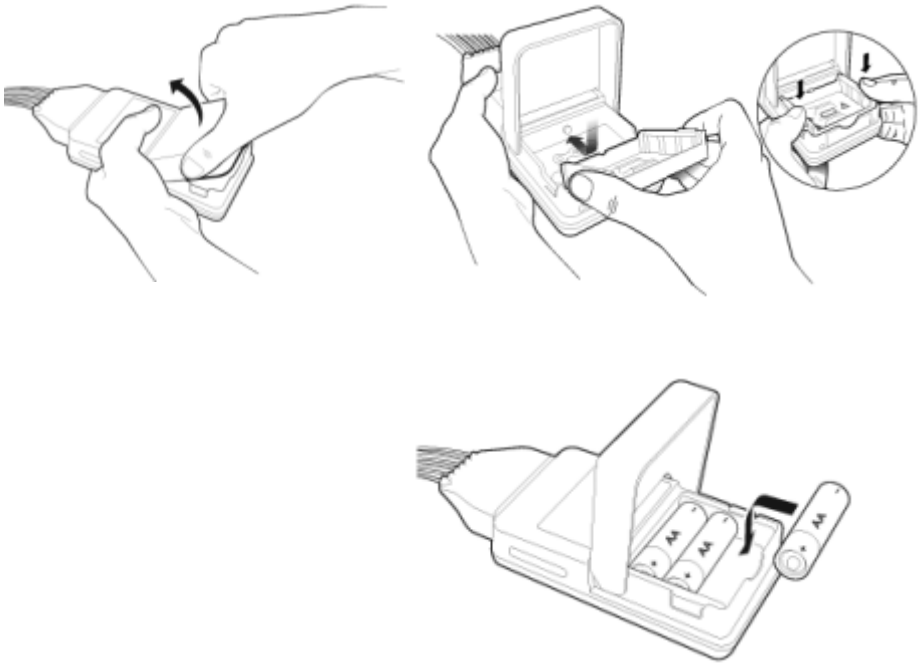
➢ *Insert AA batteries into the MX40 using the following procedure:*

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.

3 Insert three 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.



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. Device settings (patient cable type, SpO_2 mode, volume, etc.) are retained when the batteries are removed.

If you remove good AA batteries to turn off the MX40, keep them together as a set for later re-use so that all batteries will have the same level of power remaining.

Important— 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.

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 or 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 tables below for additional information about battery status.

AA Battery Charge Status

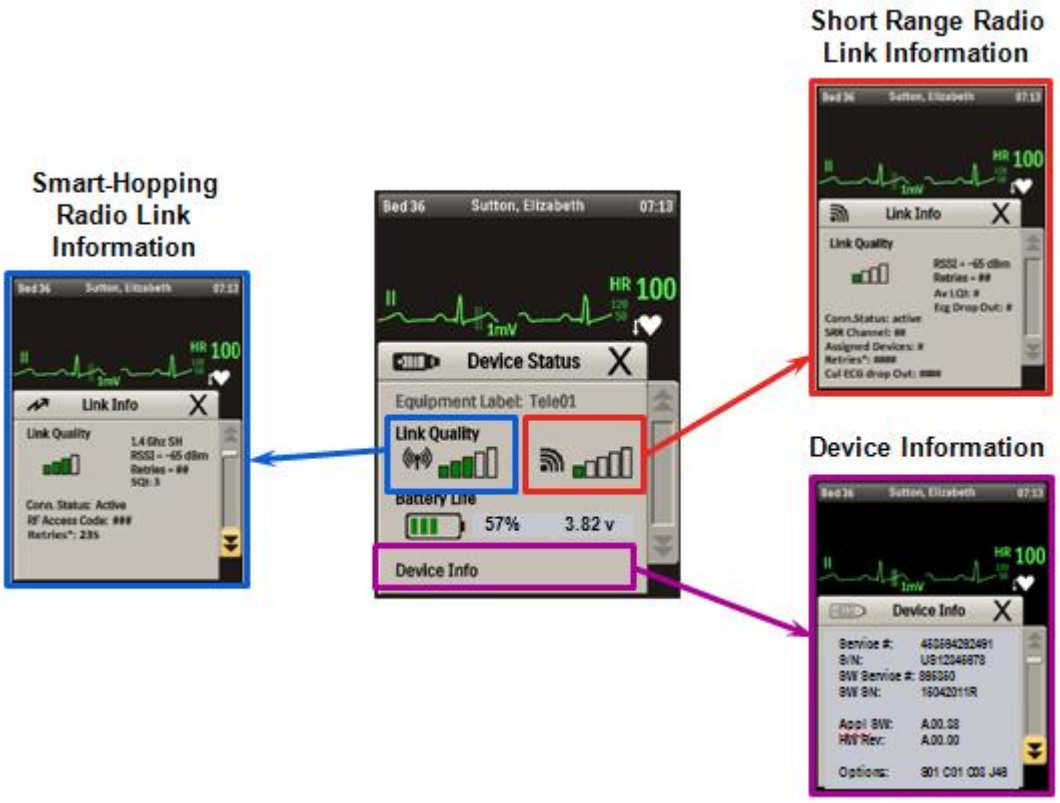
Approximate Battery Life Remaining	Approximate Time Remaining (ECG only)	Approximate Time Remaining (ECG & Spo_2 Continuous)	Functionality Disabled	Battery Indicator LCD Segments
100%	~ 24 hours	~ 9 hours	None	5 Green
75%	< 18 hours	< 7 hours	None	4 Green
50%	< 12 hours	< 5 hours	None	3 Green
25%	< 6 hours	< 2 hours	None	2 Green
10%	< 2 hours	< 1 hours	None	1 Green
Low battery level to replace/charge battery level	< 30 minutes	< 30 minutes	SpO_2 and short-range radio are disabled. Display is at half brightness.	1 Red Red Battery Icon Audio
Replace/charge battery level	< 10 minutes	< 10 minutes	Device shutdown	1 Red Red Battery Icon

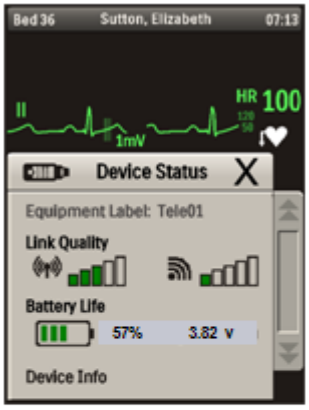
Lithium-ion Rechargeable Battery Charge Status

Approximate Battery Life Remaining	Approximate Time Remaining (ECG only)	Approximate Time Remaining (ECG & Spo_2 Continuous)	Functionality Disabled	Battery Indicator LCD Segments
100%	~ 25 hours	~ 14 hours	None	5 Green
75%	< 19 hours	< 10.5 hours	None	4 Green
50%	< 13 hours	< 7 hours	None	3 Green
25%	< 6 hours	< 3.5 hours	None	2 Green
10%	< 3 hours	< 1.5 hours	None	1 Green
Low battery level to replace/charge battery level	< 30 minutes	< 30 minutes	SpO_2 and short-range radio are disabled. Display is at half brightness	1 Red Red Battery Icon Audio
Replace/charge battery level	< 10 minutes	< 10 minutes	Device shutdown	1 Red Red Battery Icon

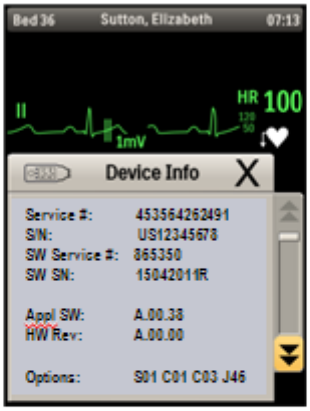
Service Information Availabe in Monitoring Mode

While the MX40is 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.





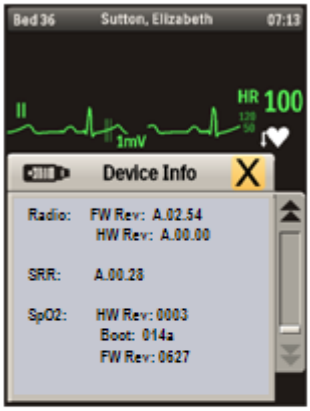
Device Info – Page 1



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

This section describes settings that are configured using the user interface on the MX40. For information on configuration settings that are entered at the Information Center, see the *IntelliVue Information Center Configuration Guide* contained on the MX40 Documentation CD, p/n 453564255041.

Configuration Mode is password protected. The password to enter is "71034".

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
Touch Tone Volume:	Audio feedback for button touch events. Mute (0) or allow sound feedback	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	**1 wave - P(ortrait)** Chest Diagram
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
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
Alarm Sounds	Sets MX40 alarm sound type to Traditional (Carenet) or ISO.	**Traditional**, ISO	**Traditional**, ISO

Setting	Description	MX40 with IIC N	MX40 with IIC L/M
Alarms On:	Enable: All MX40/IIC Release N features available. Disable: MX40 operates as if connected to IIC Release L/M.	Disable, **Enable**	**Disable**
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
Alarm Volume for Off Network:	Sets the default alarm volume when the device goes off network	10 only	10 only
Inop Reminder:	Inop reminders on or of	Set at IIC	**On**, Off
Inop Severity: • ECG Leads Off • Replace Battery	Sets the severity of the "ECG Leads Off" and/or "Replace Battery" INOP conditions	Set at IIC	Red, Yellow, **Cyan**

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

Setting	Description	MX40 with IIC N	MX40 with IIC L/M
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
SpO_2 Mode:	Sets the default SpO_2 mode to either Manual or Continuous.	**Manua**l, Continuous	**Manua**l, Continuous

Default Settings = **Bold**.

Note — The IntelliVue Support Tool - Mark 2 can be used to copy the configuration of 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".

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)
C01	Enhanced Arrhythmia
C03	24 hours of Trends
J46	Short-Range Radio

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".

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.

Important — After exposure, the MX40 and the patient cable must be cleaned as per the instructions contained herein. Sterilization of the MX40 has been qualified using the STERRAD 100NX System. For more information and instruction on sterilizing the MX40, refer to the instuctions provided by the manufacturer. The alternative Steris V-pro process using hydrogen peroxide vapor is also acceptable.

➢ *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.
2. If using disposable AA batteries, remove the battery tray and clean separately.
3. Wipe the MX40 and the patient cable clean by using a cloth dampened modestly with one of the approved cleaning agents listed in the table below.
4. Follow the manufacturer's instructions with regard to application duration.
5. Wipe the M40 and inside the patient cable housing with distilled water or alcohol to prevent residue build-up.
6. Allow to air-dry, or dry with a non-lint producing cloth.

Cleaning Materials for the MX40

Caution

- 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.
- The Gore-tex patch in the battery compartment of the MX40 can be damaged by the use of glutaraldehyde and anti-bacterial soap.

- Sharp or pointed instruments should not be used to remove soil from recessed areas on the MX40.

Approved Cleaners

Cleaner	Active Ingredient
Isopropyl Alcohol based	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	Isopropyl alcohol (55%) 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	Quaternary ammonium (0.25%) 2-Butoxyethol (1-4%) Isopropyl alcohol (14.85%)
Super Sanicloth	Quaternary ammonium (<1%) Isopropyl alcohol (55%)

Note —The cleaners listed above are also suitable for cleaning the patient cable and the lithium-ion battery.

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. The Label Assignment function requires a password for access, and its controls are available in English only.

Re-assigning an Equipment Label

➢ *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.

   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**.

Charging Lithium-ion Rechargeable Batteries

The li-ion rechargeable battery is recharged using the IntelliVue CL Charging Station.

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
- 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 nine charger slot LEDs show the battery status of the device in their slot and are switched off if no battery is inserted.

If a battery is put on a charging station slot, the corresponding LED will flash 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	off
battery put on charger slot	flashing yellow
battery not properly recognized, error	cyan
battery recognized, battery charging	yellow
battery recognized, battery full (≥90%)	green

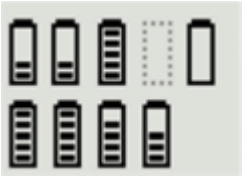
The **AC Power / Error LED** is

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

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.



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 4 years or 500 complete charge-discharge cycles, whichever comes first. In addition, experience indicates that the incidence of failure may increase with battery service life due to the accumulated stresses of daily use. We therefore strongly recommend that li-ion batteries be replaced after 2 years or 500 complete charge-discharge cycles.

The age of a li-ion battery begins at the date of manufacture. The date of manufacture is listed on the side of the battery.

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 Product Structure

The table below provides MX40 part and option information.

√ Standard ● Optional			MX40 865350	MX40 865351
		WMTS 1.4 GHz Smart-hopping network	√	
		2.4 GHz Smart-hopping network		√
		Rechargeable battery	●	●
		AA batteries	√	√
	Required additional purchases[1]			
	S01	**ECG only**	●	●
	S02	**ECG + Fast SpO_2 enabled**[2]	●	●
	S03	**Fast SpO_2 ready**[3]	●	●
	Add-on options			
		Clinical applications		
	C01	**Enhanced Arrhythmia**[4]	●	●
	C03	**Vitals Trend**	●	●
		Documentation		
	D01	**Paper instructions for use**[5]	●	●
		Interfaces		
	J46	**Short range radio**	●	●
	865349	**Intellivue MX40 accessories**		
		Device accessories		
	E24	**MX40 Lith-ion battery, pkg of 3**	●	●
	E28	**AA battery, 8 pieces**[6]	●	●
	E29	**Carry pouch, pkg of 50**	●	●
		Patient accessories		
	K03	**ECG 3-lead grabber, AAMI MX40**	●	●

√ ●	Standard Optional			MX40 865350	MX40 865351
		K05	ECG 5-lead grabber, AAMI MX40	●	●
		K06	ECG 6-lead grabber, AAMI MX40	●	●
		K07	ECG 3-lead grabber, AAMI + SpO_2 MX40	●	●
		K08	ECG 5-lead grabber, AAMI + SpO_2 MX40	●	●
		K09	ECG 6-lead grabber, AAMI + SpO_2 MX40	●	●
		K13	ECG 3-lead grabber, IEC MX40	●	●
		K15	ECG 5-lead grabber, IEC MX40	●	●
		K16	ECG 6-lead grabber, IEC MX40	●	●
		K17	ECG 3-lead grabber, IEC + SpO_2 MX40	●	●
		K18	ECG 5-lead grabber, IEC + SpO_2 MX40	●	●
		K19	ECG 6-lead grabber, IEC + SpO_2 MX40	●	●
		K23	MX40 extender cable	●	●
		K24	Adapter cable bedside/MX40 ECG + SpO_2	●	●
			Additional accessories		
		989803172221	ECG trunk cable AAMI/IEC	●	●
		989803171821	ECG 5-lead snap AAMI	●	●
		989803171841	ECG 5-lead snap AAMI+SpO_2	●	●
		865220	Battery charging station[7]	●	●

1 Only one of this category must be chosen.

2 Requires purchase of pulse oximetry accessories. May require adapter cable.

3 Requires purchase of 865348/S02 to enable feature.

4 Not applicable for IntelliVue Information Center release L or M.

5 Applicable for the United States only.

6 Support for disposable batteries is standard. Must purchase AA batteries separately.

7 Requires purchase of 865349/E24.

√ Standard ● Optional		MX40 865350	MX40 865351
865348	**IntelliVue MX40 upgrade options**		
	Base Functionality		
S02	**Enable Fast SpO_2 to S03 device**	●	
	Clinical applications		
C01	**Add Enhanced Arrhythmia**	●	
C03	**Add Vitals Trend**	●	
	Interfaces		
J46	**Add short range radio**	●	

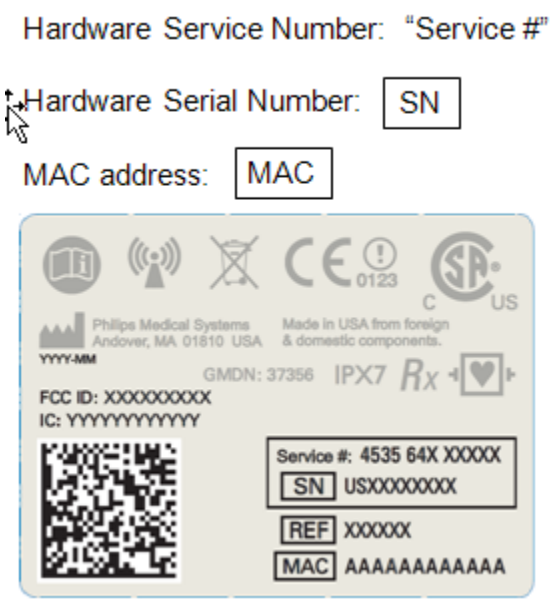
MX40 Support Parts

Description	Part Number	86530	86531
TELE PWM, 1.4 GHz, ECG Only, Exchange	453564262491	S01	n/a
TELE PWM, 1.4 GHz, ECG and Sp02, Exchange	453564262511	S02 or S03	n/a
TELE PWM, 2.4 GHz, ECG only, Exchange	453564262531	n/a	S01
TELE PWM, 2.4 GHz, ECG &Sp02, Exchange	453564262551	n/a	S02 or S03
ASSY - AA Battery Adapter, Tele PWM	453564132721	All	All
PLAST - Battery Door w/Gasket	453564205271	All	All
MX40 Rechargeable Battery, Pkg 1	989803176201	All	All
MX40 Service Adapter + Cable (tool for service)	453564270071	All	All

Note — The software license transfer process expects the same hardware number as original device.For example:

- A SW license for S01 can only be transferred to 453564262491 or 453564262531.
- A SW license for S02 or S03 can only be transferred to 453564262511 or 453564262551.

Service personnel can find the following information on the label on the back of the MX40:



7. MX40 Repair Strategy

The MX40 Repair Strategy is Unit Exchange worldwide through Philips part centers.

Tools Required

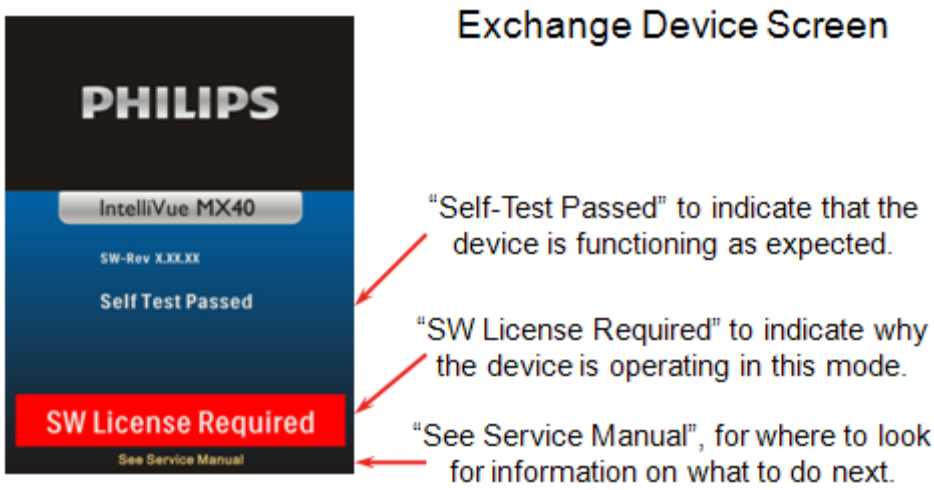
Repair of the MX40 requires the following tools:

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

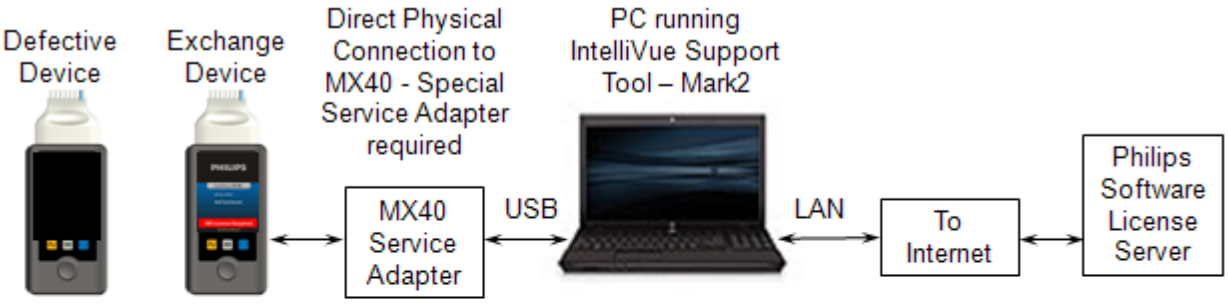
Software License Transfer

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

Exchange devices will arrive without a software license.



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, p/n 453564296161.



Required information from defective device:

- SW Serial Number
  OR
- HW Service Number and HW Serial Number

Notes on the MX40 Service Adapter and cable:

- 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 = 3ft (1m)

Note — The MX40 connects to a PC via a USB port and uses a USB cable, but the MX40 does not operate as a standard USB device. 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 suggetions 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. If the hard INOP is "latched", the sound will be silenced, but the message will remain on the display until resolution of the offending condition.
- **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 and ECG Leads Off INOPs may be configured to display as either Red or Yellow Technical Alarms. ***Note -*** The ECG Leads Off INOP will initially display as a cyan technical alarm until a valid ECG signal is obtained.

In the following table, technical alarms are listed alphabetically.

Alarm Text	Priority	Condition	What to do
BATTERY LOW T **Source - MX40**	Soft	• There is less than 15 minutes of monitoring time remaining (AA batteries). • Lithium-ion battery level is ≤ 10% or has ≤30 minutes remaining time.	• Replace batteries promptly to avoid shutdown and cessation of monitoring. • Insert a charged lithium-ion battery pack.
CANNOT ANALYZE ECG **Source - MX40 and Information Center**	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.

Alarm Text	Priority	Condition	What to do
CHECK PAIRING **Source - MX40**	Yellow Technical Alarm	• There is a problem with device pairing. • When the MX40 is wirelessly paired with an X2 patient monitor (no label) docked with a larger networked MP series monitor, and the network connection is lost.	• Check that the bedside monitor is correctly paired. • Select the correct device to be paired.
cl NBP Batt Low **Source - Cableless Measurement Device**	Hard	CL NBP Pod weak battery condition.	Charge CL NBP Pod.
cl NBP Batt Empty **Source - Cableless Measurement Device**	Severe	CL NBP Pod empty battery condition. Monitoring is not possible.	• Replace CL NBP Pod. • Recharge depleted CL NBP Pod.
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 SpO_2 Batt Low **Source - Cableless Measurement Device**	Hard	CL SpO_2 Pod weak battery condition.	Charge CL SpO_2 Pod.
cl SpO_2 Batt Empty **Source - Cableless Measurement Device**	Severe	CL SpO_2 Pod empty battery condition. Monitoring is not possible.	• Replace CL SpO_2 Pod. • Recharge depleted SpO_2 Pod.
cl SpO_2 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.

Alarm Text	Priority	Condition	What to do
!!!/!! CUFF OVERPRESS **Source - Cableless Measurement Device**	Severe	Cuff pressure has increased above overpressure safety limits.	Remove cuff and tubing and expel air.
ECG/ARRH ALARM OFF **Source - MX40**	Soft	ECG is turned off.	Turn on ECG.
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..
<electrode> 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.
LEADSET UNPLUGGED **Source - MX40**	Hard	• Patient cable has been unplugged from the MX40. • Incompatible leadset attached to patient cable.	• Re-attach the patient cable. • Replace the 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 INTERRUPTED **Source - Cableless Measurement 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.

Alarm Text	Priority	Condition	What to do
NBP EQUIP MALF **Source - Cableless Measurement Device**	Hard	• Tubing may be obstructed or kinked. • Hardware malfunction.	• Check tubing. • If condition persists, contact Service.
NO ALARM DISPLAY **Source - MX40**	Soft	When operating with Information Center Release L Or M, there is no local alarming at the MX40, networked or non-networked.	Condition is not present when operating with Information Center Release N or later (unless specifically configured to operate in this way).
NO CENTRAL MONITOR (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 SIGNAL (appears at the Information Center only) **Source - Information Center**	Hard, Latched	• The MX40 is outside the coverage area, or • No batteries in the MX40, 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. • Contact Service
REPLACE BATTERY T **Source - MX40** ***Note —*** This INOP may also be configured to display as a Red or Yellow Technical Alarm.	Red or Yellow or Hard Technical Alarm, Latched	• Dead battery. No monitoring is occurring. • When operating wirelessly, the patient monitor is no longer providing power to the MX40, and battery capacity is now depleted.	Replace batteries.

Alarm Text	Priority	Condition	What to do
SpO_2T EQUIP MALF **Source - MX40**	Hard	Malfunction in the SpO_2 equipment	Contact Service.
SpO_2T ERRATIC **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.
SpO_2T EXTD UPDATE Numeric is replaced by 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.
SpO_2T 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.
SpO_2T 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.
SpO_2T NO SENSOR ***Note —*** Silencing this technical alarm turns off the SpO_2 measurement on the MX40 only (not at the Information Center). **Source - MX40**	Hard	No sensor attached to SpO_2 device.	Attach SpO_2 sensor.
%SpO_2T NOISY SIGN **Source - MX40**	Hard	Excessive patient movements or electrical interference are causing irregular pulse patterns	Reduce movement or electrical noise sources.

Alarm Text	Priority	Condition	What to do
SpO_2T NO PULSE **Source - MX40** ***Note —*** When paired directly with an IntelliVue MP5 Patient Monitor, the INOP will display as SpO_2T SENSOR OFF.	Hard	• Pulse is too weak or not detectable • Sensor has fallen off at patient.	• Check connection to patient. • Change sensor site. Avoid site distal to BP cuff or intra-arterial line.
SpO_2 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.
SpO_2T SEARCHING **Source - MX40**	Soft	The patient signal is analyzed, but a valid numeric is not available yet.	Wait for the measurement to complete.
SpO_2T 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.
SpO_2T SENSOR MALF **Source - MX40**	Hard	Malfunction of the SpO_2 sensor/adapter cable	Replace sensor.
SpO_2 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.
SpO_2T UPGRADE **Source - MX40**	Soft	SpO_2 hardware is in upgrade process. Monitoring is not possible.	Wait for the upgrade process to complete.
TELE BATTERY LOW **Source - MX40**	Soft	Lithium-ion battery level is $\leq$ 20% or has $\leq$30 remaining time.	Insert a charged lithium-ion battery pack.

Alarm Text	Priority	Condition	What to do
TELE BATT EMPTY ***Note* —** This INOP may also be configured to display as a Red or Yellow Technical Alarm. **Source - MX40** ***Note* —** For Information Center Release L or M, this INOP will appear as "REPLACE BATTERY T".	Hard, Latched	Lithium-ion battery level is critically low. A 10-minute countdown begins. The MX40 will shut down if the condition is not cleared.	Insert a charged lithium-ion battery pack.
TELE BATTERY TEMP **Source - MX40** ***Note* —** For Information Center Release L or M, this INOP will appear as "REPLACE BATTERY T"	Hard	The temperature of the lithium-ion battery is above 55° C or below -5° C.	Replace the lithium-ion battery.
TELE CHECK BATT **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 MALFUNCTION **Source - MX40**	Hard	MX40 malfunction or self-test failure.	Contact Service to replace the MX40.
TRANSMITTER OFF **Source - MX40**	Hard	RF Auto Shutoff after 10 minutes of all leads off and no SpO_2 sensor connected.	• Reattach ECG leads to patient. • Reattach SpO_2 sensor.
TELE REMOVE BATT **Source - MX40** ***Note* —** For Information Center Release L or M, this INOP will appear as "REPLACE BATTERY T".	Hard, Latched	The temperature of the lithium-ion battery is >60° C and the battery must be removed.	• Replace the lithium-ion battery. • Dispose of old battery properly.
TELE SERVICE BATT **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.

Alarm Text	Priority	Condition	What to do
TELE WEAK SIGNAL **Source - MX40**	Soft	• Patient is at outer range of the radio coverage area. • The MX40 is receiving a weak signal with high data loss from the AP. • Condition exists 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

Possible User Interface Issues

- The MX40 display does not turn on.

  The AA Battery Tray may be inserted backwards.

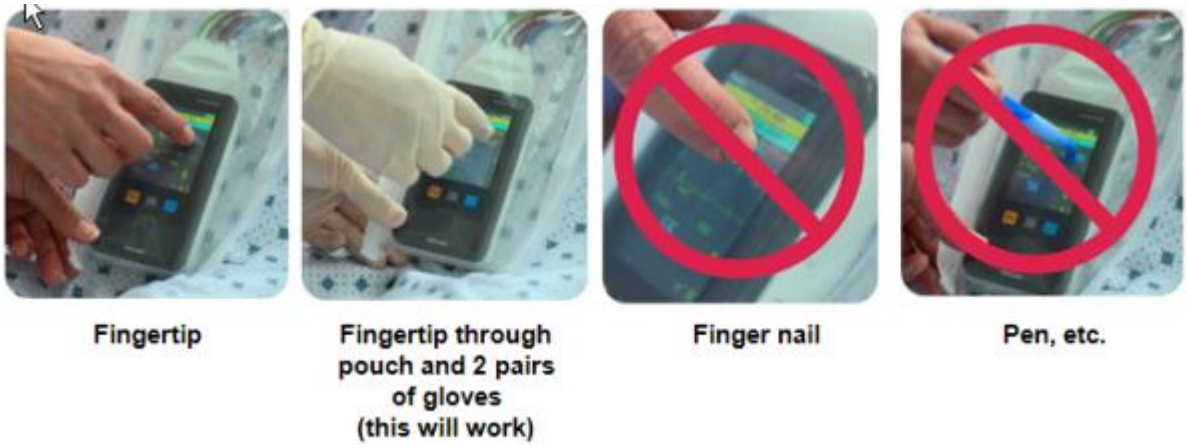
  The user may not understand that they need to touch the blue Main Screen button for two seconds.

Main Screen Button

- The MX40 display does not react to touch.

  The screen is locked and needs to be unlocked using the 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.



- The MX40 does not 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.

9. 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 60601-1:1990 + A1:1993 + A2:1995 +A11:1993 +A12:1993 + A13:1996 General Requirements for Safety (with worldwide deviations, including U.S. deviations)
- CSA C22.2 #601.1:1992 Medical Electrical Equipment - General Safety
- UL 60601-1 Medical Electrical Equipment - General Safety
- UL 2054 Standards for Household and Commercial Batteries
- EN 60601-1-1:2006 System Requirements
- EN 60601-1-4:2000 Safety Requirements for Programmable Electronic Medical Systems
- EN 50371:2005 Low Power Electronic and Electronic Apparatus Electromagnetic Exposure
- EN ISO 9919:2005 Requirements for SpO_2 Pulse Oximeters
- EN ISO 10993-1:2003 Biocompatibility
- EN ISO 10993-1:2003 Biocompatibility (for leadwires and pouch)

- EN ISO 9919:2005 Pulse Oximeters
- IEC 60601-1-2:2001 Electromagnetic Compliance
- IEC 60601-1-4:1999 +A1 Requirements for Programmable Electrical Medical Systems
- IEC 60601-1-6:2006 General requirements for basic safety and essential performance - Collateral standard: Usability
-
- IEC 60601-1-8:2006 General Requirements for Safety for Alarm Systems
- IEC 60601-2-49:2001 Particular Requirements for Safety for Patient Monitoring Equipment
- IEC 60601-2-27:2005 Particular Requirements for Safety for Electrocardiograph Monitoring Equipment
- IEC 62133:2002 Safety Requirements for Portable Sealed Secondary Cells (alkaline, lithium-ion)
- AAMI EC 13:2007 Performance Standard, Cardiac Monitors
- AAMI EC 53:1995 (R) 2001 ECG Cables/Leadwires (excluding 4.2.1)

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

Philips Medizin Systeme Deutschland
Hewlett-Packard-Strasse 2
D 71034, Boeblingen
Germany

Patient Population

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

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.

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 M3290 Information Center Software.

The System achieves its Essential Performance exclusively through alarm generation at the M3140-55 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.

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 60601-1-2:2001, the international standard for EMC for medical electrical equipment. This IEC standard has been adopted in the European Union as the European Norm, EN 60601-1-2:2001.

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.

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 60601-1-2:2001 + A1:2004.

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	±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	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	3 VRMS	Recommended separation distance: $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	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	$d = 1.2\sqrt{P}$	$d = 1.2\sqrt{P}$	$d = 2.3\sqrt{P}$
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

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	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	24.9 hours	24.7 hours
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	11.2 hours	8.9 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.	

Monitor Mode Networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	11 hours	7.7 hours
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	5.3 hours	2.9 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.	

Monitor Mode Non-networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	6.8 hours	7.3 hours
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	4.7 hours	4.6 hours

Monitor Mode Non-networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
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.	

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

Telemetry Mode Networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	26.1 hours	25.1
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	15.6 hours	14.1
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.	

Monitor Mode Networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	13 hours	10.4 hours
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	8.8 hours	7.8 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.	

Monitor Mode Non-networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
ECG Only (only one radio active)	10.8 hours	8.6 hours
ECG/SpO_2 Continuous (using legacy SpO_2 cable/sensors. Only one radio active.)	8.6 hours	7.0 hours

Monitor Mode Non-networked	Battery Life (1.4GHz)	Battery Life (2.4GHz)
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 25%.

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 25-30%. 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
ECG Only (Display inactive)	67 mA @ 3.6V
ECG/SpO_2 Continuous (Display inactive)	136 mA @ 3.6V

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 and Short-range radio • With 3 AA batteries, includes SpO_2 and Short-range radio • With lithium-ion battery, includes SpO_2 and Short -range radio	 • 1.4 GHz - 240 g (8.5 oz) • 2.4 GHz - 215 g (7.6 oz) • 1.4 GHz - 324 g (10.5 oz) • 2.4 GHz - 298 g (11.4 oz) • 1.4 GHz - 289 g (10.3 oz) • 2.4 GHz - 314 g (11.1 oz)
Display • Type • View Area • Resolution • Backlight • ECG Display Sector Size (height) • ECG 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 data (portrait), 10mm/s with 5.76 sec of viewable ecg data (landscape)

MX40 1.4 GHz Radio

Parameter	Specification
Frequency Ranges	Bands: 1395-1400 MHz and 1427-1432 MHz Channel Spacing: 1.6 MHz
RF Output Power (existing systems)	8 dBm +2/-1.5 dB (4.5 mW to 10 mW), into antenna load
Radio Frequency Accuracy during normal operation	<+60/-100 KHz relative to channel frequency, includes temperature compensation and aging effects
Antenna Gain	-3 dBi
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 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 - 14.5 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, RS210, FCC, ARIB standards

2.4 GHz ISM

FCC and Industry Canada Radio Compliance: This device complies with Part 15 of the FCC Rules and RSS-210 of Industry Canada. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications to this equipment not expressly approved by Philips Medical Systems may cause harmful radio frequency interference and void your authority to operate this equipment.

The radio device used in this product is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC (Radio Equipment and Telecommunications Terminal Equipment Directive). Class 2 radio equipment. Member states may apply restrictions on putting this device into service or placing it on the market. This product is intended to be connected to the Publicly Available Interfaces (PAI) and used throughout the EEA.

This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada.

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)

Environmental Specifications

Parameter	Specification
Temperature	
Operating	0 to 37°C (32 to 99°F)
Storage	-30°C to 50°C (-22°F to 122°F) without batteries
Humidity	
Operating	< 95% RH at 37°C (98.6°F) non-condensing
Storage	< 90% RH at 50°C (122°F) without batteries
Altitude	
Operating & Non-operating	3,000 m (9,842 ft)
Barometric Pressure	72kPa (537 mmHg)
Alarm Signal Sound Pressure	40dB(A) - 70dB(A)

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
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.
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

Characteristic	Performance Disclosure/Specification (in italics)
Heart Rate Averaging Method	Two different methods are used: • Normally, heart rate is computed by averaging the 12 most recent RR intervals. • If each of 3 consecutive RR intervals are greater than 1200 milliseconds (i.e. rate less than 50 b/min) for adult and pediatric patients, then the 4 most recent RR intervals are averaged to compute the HR.
Heart Rate Meter Accuracy and Response to Irregular Rhythm	Provides correct heart rates (80, 60, 120, 90 b/min) using test waveforms as indicated in ANSI/AAMI EC13 Sec. 3. 1. 2. 1 (5).

Characteristic	Performance Disclosure/Specification (in italics)
Response Time of Heart Rate Meter to Change in Heart Rate	For a rate increase, the average time to reach the specified heart rate using test waveforms as indicated in ANSI/AAMI EC13 Sec. 3. 1. 2. 1 (6) is 8.6 seconds. For a rate drop, the average time is 8.2 seconds.
Time to Alarm for Tachycardia	The ranges of time to alarm using test waveforms as indicated in ANSI/AAMI EC13 Sec. 3. 1. 2. 1 (7) are 6.4 to 9.3 seconds.
Pacemaker Pulse Rejection Capability	Rejects pace pulses using test waveforms as indicated in ANSI/AAMI EC13 Sec. 3. 1. 4 (with amplitude from +/- 2 to +/- 700 mV, width from 0.1 to 2.0 ms).
Range and Accuracy of Heart Rate Meter	Meets the ANSI/AAMI EC13 Section 3.2.7 recommended minimum range and accuracy. Heart rate range is 15 - 300 b/min with accuracy of ± 1% of the range for Adult and Pediatric patients. (Note: for rates equal to or less than 15, the displayed heart rate is 0).
Alarm Limit Range	Meets the ANSI/AAMI EC13 Section 3.2.8.1 standard. Lower alarm limit is 15 -295. Upper alarm limit is 20 - 300.
Resolution of Alarm Limit Settings	Meets the ANSI/AAMI EC13 Section 3.2.8.2 standard. The resolution is ± 5 b/min.
Alarm Limit Accuracy	Meets the ANSI/AAMI EC13 Section 3.2.8.3 standard. Error less than ± 10% or ± 5b/min
Time to Alarm for Cardiac Standstill	Meets the ANSI/AAMI EC13 Section 3.2.8.4 standard: maximum alarm time <10 seconds, using the test waveforms as indicated.
Time to Alarm for Low Heart Rate	Meets the ANSI/AAMI EC13 Section 3.2.8.5 standard: maximum alarm time <10 seconds, using the test waveforms as indicated.
Time to Alarm for High Heart Rate	Meets the ANSI/AAMI EC13 Section 3.2.8.6 standard: maximum alarm time <10 seconds, using the test waveforms as indicated.
Alarm Silencing	The time required for reactivation of a latched, silenced alarm is 3 minutes
ECG Waveform Display Time Base Accuracy	0.8%. *Meets the ANSI/AAMI EC13 Section 3.2.9.6 standard: maximum error = +/-10%.*
Channel Width	40 mm. *Meets the ANSI/AAMI EC13 Section 3.2.9.7(a) standard: minimum = 30mm.*
Trace Width	0.3 mm. *Meets the ANSI/AAMI EC13 Section 3.2.9.7(b) standard: maximum = 1.0mm.*

Characteristic	Performance Disclosure/Specification (in italics)
Aspect Ratio	0.4s/mV. *Meets the ANSI/AAMI EC13 Section 3.2.9.7(f) standard: 0.4s/mV.*
Input Signal Reproduction Accuracy: Overall Error	-2.9%. *Meets the ANSI/AAMI EC13 Section 3.2.9.8(a) standard: maximum = +/- 20%.*
Frequency Response: Sinusoidal	0.67 to 40 Hz (3 db down). *Meets the ANSI/AAMI EC13 Section 3.2.9.8(b) standard: 0.67 to 40 Hz (3 db down).*
Frequency Response: Triangular	0 to 25% reduction. *Meets the ANSI/AAMI EC13 Section 3.2.9.8(b) standard: 0 to 25% reduction.*
Impulse Response: (for waves marked with ST bandwidth)	Displacement = 0.08 mV, slope = 0.11 mV/s. *Meets the ANSI/AAMI EC13 Section 3.2.9.8(c) standard: displacement maximum = 0.1 mV; slope maximum = 0.30 mV/s.*
Pacemaker Pulse Display Capability	Minimum = 0.2 mV RTI. *Meets the ANSI/AAMI EC13 Section 3.2.9. 12 standard: minimum = 0.2 mV RTI.*
Tall T-Wave Rejection Capability	Meets AAMI standard: 0.5 – 40 BW: HR of 80bpm at all T-wave amplitudes 0.05 – 40 BW: HR of 80bpm at all T-wave amplitudes

FAST SpO_2

Parameter	Specification
SpO_2 Measurement Range (Calibration and Display)	0 to 100%
SpO_2 Accuracy	See table following.
SpO_2 Resolution	1%

Parameter	Specification
SpO_2 Numerics - Averaging	5 - 20 seconds (default = 10 seconds) ***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. 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

SpO_2 Sensor Accuracy

Type	Description	Model Number	Accuracy % [A]rms (70-100% Range)
Reusable Sensors			
	Adult Finger, 2m cable	M1191B	2.0
	Adult Finger, 3m cable	M1191BL	2.0
	Adult Finger, 0.45m cable	M1191T	3.0
	Pediatric, Small Adult Finger, 1.5m cable	M1192A	2.0
	Pediatric, Small Adult Finger, 0.45m cable	M1192T	3.0
	Adult &Pediatric Ear Clip, 1.5m cable	M1194A	3.0
	Adult Finger Clip, 3m cable	M1196A	3.0
	Adult Finger Clip, 2m cable	M1196S	3.0
	Adult Finger Clip, 0.9m cable	M1196T	3.0
	LNCS Adult Reusable Sensor	Masimo LNCS DC-I	2.0
	LNCS Pediatric Reusable Sensor	Masimo LNCS DC-IP	2.0
	LNCS Tip-Clip Ear Reusable Sensor	Masimo LNCS TC-I	3.5
	LNOP Adult Reusable Sensor	Masimo LNOP-DC-I	2.0
	LNOP Pediatric Reusable Sensor	Masimo LNOP DC-IP	2.0
	LNOP Tip-Clip Reusable Sensor	Masimo LNOP TC-I	3.5

Type	Description	Model Number	Accuracy % [A]rms (70-100% Range)
Single Patient Use Sensors			
	Adult Finger, > 40kg	M1901B	3.0
	Pediatric 3-20kg	M1902B	3.0
	Pediatric Finger, 10-50kg	M1903B	3.0
	Adult Finger, >30kg	M1904B	3.0
	Adult, Pediatric > 20kg	M1131A	3.0
	Adult Finger, > 30kg	Nellcor OxiMax Max-A	3.0
	Adult Finger, > 30kg	Nellcor OxiMax Max-AL	3.0
	Adult Finger > 40kg	Nellcor OxiMax Max-N	3.0
	Pediatric	Nellcor OxiMax Max-P	3.0
	Pediatric	Nellcor OxiMax Max-I	3.0
	Adult Finger > 30kg	Nellcor Oxisensor II D-25	3.0
	Adult Finger > 40kg	Nellcor Oxisensor II N-25	3.0
	Pediatric Finger 10-50kg	Nellcor Oxisensor II D-20	3.0
	Adult Finger	Nellcor OxiCliq A	3.0
	Pediatric Finger	Nellcor OxiCliq P	3.0
	Pediatric	Nellcor OxiCliq I	3.0
	Adult Finger > 40kg	Nellcor OxiCliq N	3.0
	Pediatric Adhesive	Masimo LNOP PDT	2.0
	Pediatric Adhesive	Masimo LNOP PDTx	2.0
	Adult Adhesive	Masimo LNOP ADT	2.0

Type	Description	Model Number	Accuracy % [A]rms (70-100% Range)
	Adult Adhesive	Masimo LNOP ADTx	2.0
	Adult Adhesive	Masimo LNCS ADTx	2.0
	Pediatric Adhesive	Masimo LNCS PDTx	2.0
	Adult Adhesive	Masimo LNCS Neo-3	2.0

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