

TEST RESULT SUMMARY

FCC PART 15 SUBPART C

Section 15.209

MANUFACTURER'S NAME	Medtronic Inc.
NAME OF EQUIPMENT	Personal Therapy Manager
MODEL NUMBER	8832
MANUFACTURER'S ADDRESS	710 Medtronic Parkway Minneapolis, MN 55432
TEST REPORT NUMBER	NC203909.1
TEST DATE	26 July 2002

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15.

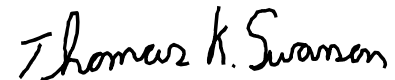
It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15.

Date: 12 August 2002



R. M. Johnson
Tested By



T. K. Swanson
EMC Technical Writer

Location: Taylors Falls MN
USA

Not Transferable

EMC EMISSION - TEST REPORT

Test Report File No. : **NC203909.1** Date of issue: 12 August 2002Model No. : **8832**Product Type : **Personal Therapy Manager**Applicant : **Medtronic Inc.**Manufacturer : **Medtronic Inc.**License holder : **Medtronic Inc.**Address : **710 Medtronic Parkway**: **Minneapolis, MN 55432**Test Result : **Positive** **Negative**Test Project Number
Reference(s) : **NC203909.1**Total pages including
Appendices : **21**

TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.

TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.

This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.

TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI

D I R E C T O R Y - E M I S S I O N S

		Page(s)
A) Documentation		
Test report		<u>1 – 11</u>
Directory		<u>2</u>
Test Regulations		<u>3</u>
Deviation from standard / Summary		<u>9</u>
Test-setups (Photos)		<u>10 – 11</u>
B) Test data		
Conducted emissions	10/150 kHz - 30 MHz	<u>5</u>
Radiated emissions	10 kHz - 30 MHz	<u>6</u>
Radiated emissions	30 MHz - 1000 MHz	<u>7</u>
C) Appendix A		
Constructional Data Form		<u>A2 – A8</u>
Product Information Form(s)		<u>N/A</u>
D) Appendix B		
Measurement Protocol		<u>B1 – B2</u>

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

- | | | |
|--|---|------------------------------------|
| <input type="checkbox"/> - EN 50081-1 / 1991 | <input type="checkbox"/> - Group 1 | <input type="checkbox"/> - Group 2 |
| <input type="checkbox"/> - EN 55011 / 1991 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55013 / 1990 | <input type="checkbox"/> - Household appliances and similar | |
| <input type="checkbox"/> - EN 55014 / 1987 | <input type="checkbox"/> - Portable tools | |
| | <input type="checkbox"/> - Semiconductor devices | |
| <input type="checkbox"/> - EN 55014 / A2:1990 | <input type="checkbox"/> - Household appliances and similar | |
| <input type="checkbox"/> - EN 55014 / 1993 | <input type="checkbox"/> - Portable tools | |
| | <input type="checkbox"/> - Semiconductor devices | |
| <input type="checkbox"/> - EN 55015 / 1987 | | |
| <input type="checkbox"/> - EN 55015 / A1:1990 | | |
| <input type="checkbox"/> - EN 55015 / 1993 | | |
| <input type="checkbox"/> - EN 55022 / 1987 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55022 / 1994 | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - BS | | |
| <input type="checkbox"/> - VCCI | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input checked="" type="checkbox"/> - FCC Part 15 Subpart C Section 15.209 | | |
| <input type="checkbox"/> - FCC Part 15 Subpart B | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 11 (1990) | <input type="checkbox"/> - Group 1 | <input type="checkbox"/> - Group 2 |
| | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - CISPR 22 (1993) | <input type="checkbox"/> - Class A | <input type="checkbox"/> - Class B |

Environmental conditions in the lab:

	<u>Actual</u>
Temperature	: 22 °C
Relative Humidity	: 57 %
Atmospheric pressure	: 99 kPa
Power supply system	: 3 VDC - Battery

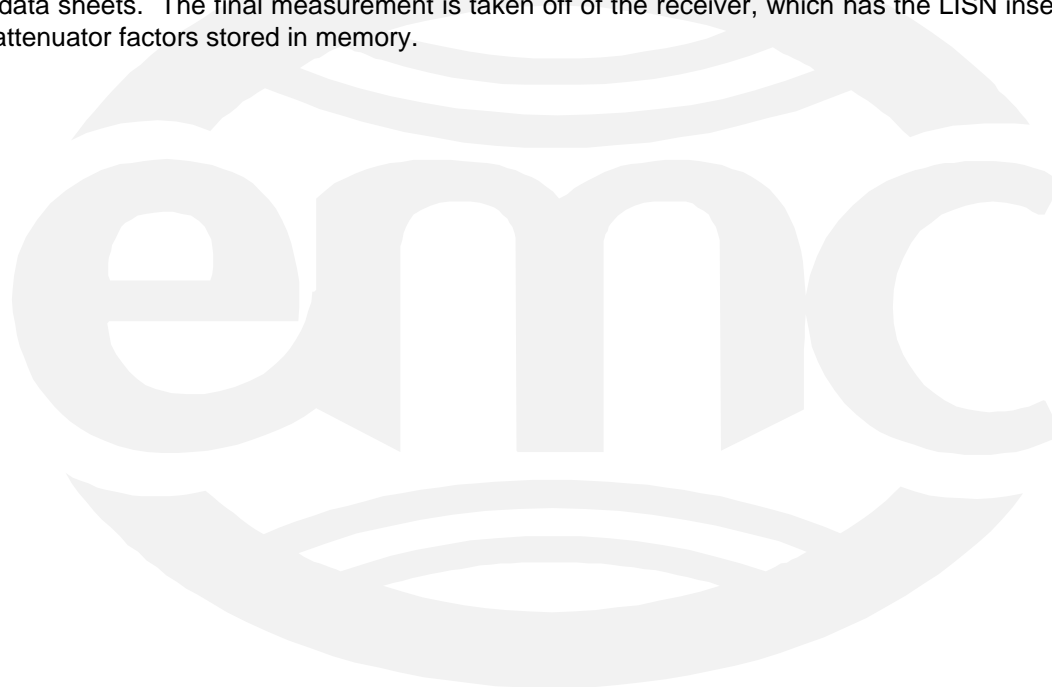
Sign Explanations:

- not applicable
- applicable



CONDUCTED EMISSIONS (15.207)**Conducted emissions 450 kHz - 30 MHz****■ - Test not applicable**

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets. The final measurement is taken off of the receiver, which has the LISN insertion loss, cable loss, and 10 dB attenuator factors stored in memory.



RADIATED EMISSIONS (15.209 - 10 kHz to 30 MHz)

The **RADIATED EMISSIONS (10 kHz TO 30 MHz)** measurements were performed at the following test location:

- - Wild River Lab Large Test Site (Open Area Test Site)

at a test distance of :

- - .3 meters
- - 1 meters
- - 3 meters

Radiated emissions 10 kHz - 30 MHz

The requirements are

■ - MET

□ - NOT MET

Minimum limit margin for fundamental 60 dB at 175.0 kHz

Minimum limit margin for harmonics/spurious 62 dB at 1.225 MHz

With the exception of the reading at 175.0 kHz, no signals could be detected from the eut at a 3 meter antenna distance. Measurements were made at 0.3 and 1 meters in order to establish the falloff rate of the measured signals, and this rate was used to extrapolate the measured values out to 30 or 300 meters, as appropriate.

	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dBuV/m	margin
MHz	0.3 m	1 m	3 m	10 m	30 m	30 m Limit	300 m	300 m Limit	dB
0.009								48.5193746	48.51937
0.175	115	72	50	28	6	N/A	-38	22.7434639	60.74346
0.49						53.8003			
0.49						33.8003			
0.525	90	57	26	-5	-36	33.20104	N/A	N/A	69.20104
0.7	59	35	11	-13	-37	30.70226	N/A	N/A	67.70226
0.875	80	50	20	-10	-40	28.76406	N/A	N/A	68.76406
1.225	67	41	15	-11	-37	25.8415	N/A	N/A	62.8415
1.575	62	33	4	-25	-54	23.65861	N/A	N/A	77.65861
1.705						22.96974			
1.705						29.54243			
1.925	57	32	7	-18	-43	29.54243	N/A	N/A	72.54243
2.275	50	28	6	-16	-38	29.54243	N/A	N/A	67.54243
30						29.54243			

Test equipment used :

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	2534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	8-22-02
■ -	2517	HFH2-Z2	Polarad	Loop Antenna	879285/036	2-11-03

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

In the frequency range of 10 kHz to 30 MHz, a shielded loop antenna is positioned with its plane vertical at 0.3 and 1 meters from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The loop antenna is also positioned horizontally. The center of the loop antenna is 1 meter above the ground plane. Since the measurements were well within the requirements, the unit was not remeasured off of the ground plane. Measurements between 9 kHz and 30 MHz are made with 9 kHz/6 dB bandwidth and quasi-peak detection with a receiver except for the emissions in the frequency bands 9-90kHz, 110-490 kHz and above 1000 MHz which are made with average detection.

File No. NC203909.1, Page 6 of 11

Emissions Test Conditions: RADIATED EMISSIONS (30-1000 MHz)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location:

- - Wild River Lab Large Test Site (Open Area Test Site) – NSA measurements made 7-02, due 7-03.

at a test distance of :

- - 3 meters – no signals detected from the transmitter within 10 dB of the limit.

Test equipment used :

	TUV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
■ -	3202	EM-6917B	Electro-Metrics	Biconicalog Periodic	102	9-24-02
■ -	2665	ZHL-1042J	Mini-Circuits	Preamplifier	32296	9-12-02
■ -	2690	8566B	Hewlett-Packard	Spectrum Analyzer (Unit F)	2430A00930	11-19-02
■ -	2678	85662A	Hewlett-Packard	Analyzer Display (Unit F)	2403A08134	11-19-02
■ -	2684	85650A	Hewlett-Packard	Quasi-Peak Adapter (Unit F)	2521A01006	11-19-02

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V) and adding the antenna correction factor and cable loss factor, and subtracting the preamplifier gain, to it.

Example:

FREQ (MHz)	LEVEL (dB μ V)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dB μ V/m)	POL/HGT/AZ (m) (deg)	DELTA1
79.06	40.7Qp +	1.9 + 6.6 - 28.3 =	20.9	V 1.0 0.0	-9.1

Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

- Standby
- Test program (H - Pattern)
- Test program (color bar)
- Test program (customer specific)
- Practice operation
- Normal Operating Mode
- Reference Medtronic document 8832-70043 Rev 1.0 for operating modes to be testing.

Configuration of the device under test:

- See Constructional Data Form in Appendix B - Page B2
- See Product Information Form in Appendix B - beginning on Page B3

The following peripheral devices and interface cables were connected during the measurement:

- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- _____ Type : _____
- unshielded power cable
- unshielded cables
- shielded cables MPS.No.: _____
- customer specific cables
- _____
- _____

DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

- met

- **not** met.

The device under test does

- fulfill the general approval requirements mentioned on page 3.

- **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 26 July 2002

Testing End Date: 26 July 2002

- TÜV PRODUCT SERVICE INC -

Thomas K. Swanson

Russ M. Johnson

T. K. Swanson
EMC Technical Writer

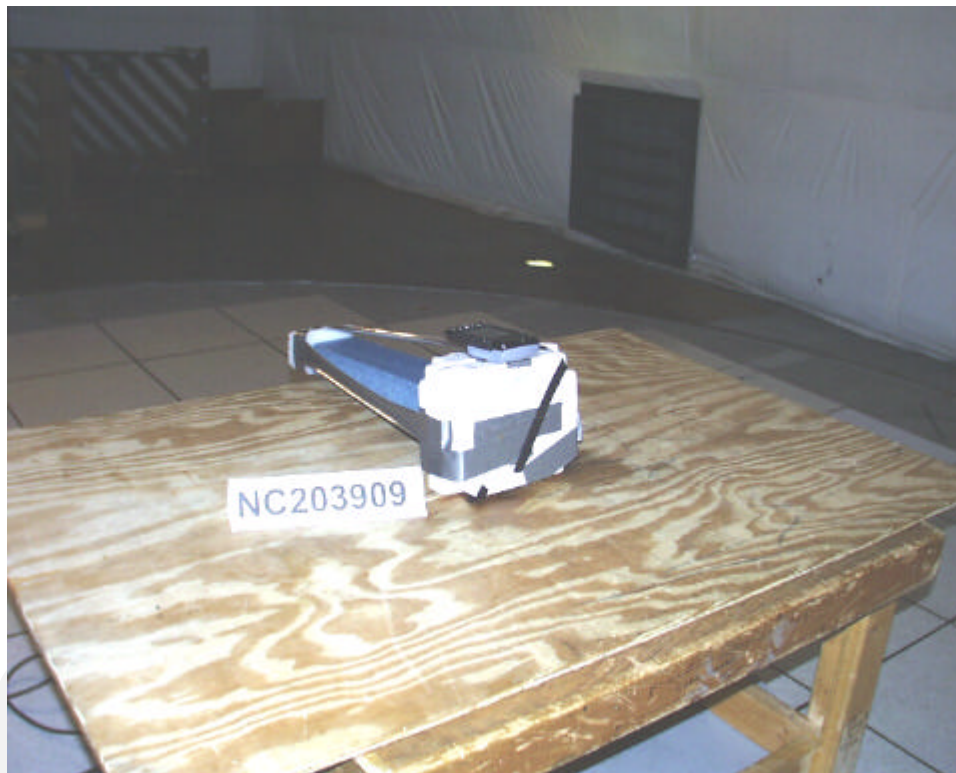
Tested By:
R. M. Johnson

Test-setup photo(s):
Conducted emission 10/150 kHz - 30 MHz

Not Applicable



Test-setup photo(s):
Radiated emission 10 kHz - 1000 MHz



Appendix A

Constructional Data Form



EMC Test Plan and Constructional Data Form



PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- NOTE: This information will be input into your test report as shown below.
Press the F1 key at any time to get HELP for the current field selected.

Company: Medtronic Inc.
 Address: 710 Medtronic Parkway
Minneapolis, MN 55432
 Contact: Duane Bourget Position: Principle Design Engineer
 Phone: 763-505-0346 Fax: 763-505-0482
 E-mail Address: duane.bourget@medtronic.com

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description Personal Therapy Manager
 EUT Name N/A
 Model No.: 8832 Serial No.: as noted on EUT
 Product Options: N/A
 Configurations to be tested: refer to Medtronic document 8832-70043 for details

Test Objective

- EMC Directive 89/336/EEC (EMC) FCC: Class A B Part 15
 Std: VCCI: Class A B
- Machinery Directive 89/392/EEC (EMC) BSMI: Class A B
 Std: Canada: Class A B
- Medical Device Directive 93/42/EEC (EMC) Australia: Class A B
 Std: Other: AIMD Directive 90/385/EEC, R&TTE Directive 1999/5/EC
- Vehicle Directive 72/245/EEC (EMC)
 Std: _____
- FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

EMC Test Plan and Constructional Data Form

TÜV Product Service Certification Requested

- | | |
|---|---|
| <input type="checkbox"/> Attestation of Conformity (AoC) | <input type="checkbox"/> EMC Certification (used with Octagon Mark) |
| <input checked="" type="checkbox"/> Certificate of Conformity (CoC) | <input checked="" type="checkbox"/> Compliance Document |
| Protection Class (N/A for vehicles) | <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III |
- (Press **F1** when field is selected to show additional information on Protection Class.)

Attendance

Test will be: Attended by the customer Unattended by the customer

Failure - Complete this section if testing will not be attended by the customer.

- If a failure occurs, TÜV Product Service should:
- Call contact listed above, if not available then stop testing. (After hrs phone): _____
 - Continue testing to complete test series.
 - Continue testing to define corrective action.
 - Stop testing.

EUT Specifications and Requirements

Length: 15.5 cm Width: 8.0 cm Height: 3.5 cm Weight: 0.2 Kg

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 3.0 Vdc (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: _____

Current (Amps/phase(max)): _____ Current (Amps/phase(nominal)): _____

Other _____

Other Special Requirements

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Hospital / Doctor's office / residential

EUT Power Cable

- | | | | |
|--|----|-------------------------------------|---------------------------|
| <input type="checkbox"/> Permanent | OR | <input type="checkbox"/> Removable | Length (in meters): _____ |
| <input type="checkbox"/> Shielded | OR | <input type="checkbox"/> Unshielded | |
| <input checked="" type="checkbox"/> Not Applicable | | | |

EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables												
Interface			Shielding									
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable	Permanent
EXAMPLE: RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
N/A	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>

EMC Test Plan and Constructional Data Form



EUT Software.

Revision Level: 0.30

Description: Firmware; ~200K bytes

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Reference Medtronic document 8832-70043 Rev 1.0 for operating modes to be testing.
- 2.
- 3.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
Personal Therapy Manager	8832	as noted on EUT	LF58832

EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)			
<i>Description</i>	<i>Model #</i>	<i>Serial #</i>	<i>FCC ID #</i>
drug pump	SynchroMed II	as noted on pump	

Oscillator Frequencies			
<i>Frequency</i>	<i>Derived Frequency</i>	<i>Component # / Location</i>	<i>Description of Use</i>
33 MHz		internal	PDA's main oscillator
9.83 MHz		internal	telemetry head's main oscillator
3.6864 MHz		internal	UART's oscillator

Power Supply			
<i>Manufacturer</i>	<i>Model #</i>	<i>Serial #</i>	<i>Type</i>
N/A			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

Power Line Filters		
<i>Manufacturer</i>	<i>Model #</i>	<i>Location in EUT</i>
N/A		

Form

EMC Test Plan and Constructional Data Form



Critical EMI Components (Capacitors, ferrites, etc.)				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
N/A				

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

Utilized ground and power planes, twisted pair cables, and shielding.

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures

Customer authorization to perform tests according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

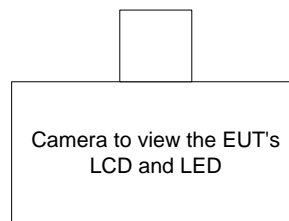
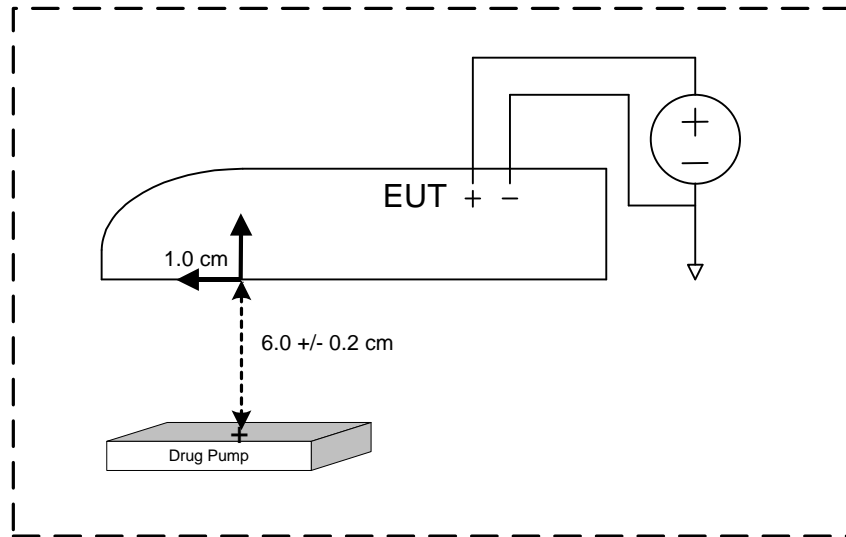
Date

Reviewed by TÜV Product Service Associate

Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.



Authorization Signatures

Customer authorization to perform tests according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Date

Reviewed by TÜV Product Service Associate

Date

Appendix B

MEASUREMENT PROTOCOL FOR FCC

GENERAL INFORMATION

Test Methodology

Conducted and radiated emission testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22 (1993), European Standard EN 55022 and Australian Standard AS 3548 (which are based on CISPR 22).

The Japanese standard, "Voluntary Control Council for Interference (VCCI) by Data Processing Equipment and Electronic Office Machines, Technical Requirements" is technically equivalent to CISPR 22 (1993). For official compliance, a conformance report must be sent to and accepted by the VCCI.

In compliance with FCC Docket 92-152, "Harmonization of Rules for Digital Devices Incorporate International Standards", testing for FCC compliance may be done following the ANSI C63.4-1992 procedures and using the CISPR 22 Limits.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ± 4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

CONDUCTED EMISSIONS

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

RADIATED EMISSIONS

The final level, expressed in dB μ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB μ V), adding the antenna correction factor and cable loss factor to it, then subtracting the preamplifier gain.

Example:

FREQ (MHz)	LEVEL (dBuV)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL (dBuV/m)	POL/HGT/AZ (m) (deg)	DELTA1
79.06	40.7Qp +	1.9 + 6.6 - 28.3 =	20.9	V 1.0 0.0	-9.1

DETAILS OF TEST PROCEDURES

General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

In the frequency range of 10 kHz to 30 MHz, a shielded loop antenna is positioned with its plane vertical at 0.3 and 1 meters from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The loop antenna is also positioned horizontally. The center of the loop antenna is 1 meter above the ground plane. Since the measurements were well within the requirements, the unit was not remeasured off of the ground plane. Measurements between 9 kHz and 30 MHz are made with 9 kHz/6 dB bandwidth and quasi-peak detection with a receiver.