

# TEST RESULT SUMMARY

## FCC PART 15 SUBPART C, Section 15.209 Radiated Emissions

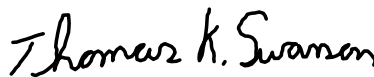
|                        |                                                       |
|------------------------|-------------------------------------------------------|
| MANUFACTURER'S NAME    | Medtronic, Inc.                                       |
| NAME OF EQUIPMENT      | N'VISION Hand Held Clinical Programmer                |
| MODEL NUMBER           | <b>8840</b>                                           |
| MANUFACTURER'S ADDRESS | 710 Medtronic Parkway NE<br>Minneapolis MN 55432-5604 |
| TEST REPORT NUMBER     | NC104316.3                                            |
| TEST DATE              | 17 May 2001                                           |

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 electromagnetic compatibility requirements of FCC Part 15

Date: 13 September 2001



Location: Taylors Falls MN  
USA

T. K. Swanson  
Test Technician

J. C. Sausen  
Test Engineer

Not Transferable

# EMC EMISSION - TEST REPORT

Test Report File No. : **NC104316.3** Date of issue: 13 September 2001

Model / Serial No. : **8840 / NHF000050, NHF000055**

Product Type : **N'VISION Hand Held Clinical Programmer**

Applicant : **Medtronic, Inc.**

Manufacturer : **Medtronic, Inc.**

License holder : **Medtronic, Inc.**

Address : **710 Medtronic Parkway NE**  
: **Minneapolis MN 55432-5604**

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number :  
Reference(s) : **NC104316.3**

Total pages including  
Appendices : **23**

*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

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## 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"/> - ETS 300 683 / 1997, Emission Requirements                  |                                                             |                                    |
| <input type="checkbox"/> - EN 300 330 / 1999, Sections 7.2, 7.3, 7.4, 8.1 Class 1     |                                                             |                                    |
| <input type="checkbox"/> - EN 55022 / 1987                                            | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 55022 / 1994, Amendment A1: 1995 & Amendment A2: 1997   | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - EN 60601-1-2 / 1993, Emission Requirements                 |                                                             |                                    |
| <input type="checkbox"/> - VCCI                                                       | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input type="checkbox"/> - FCC                                                        | <input type="checkbox"/> - Class A                          | <input type="checkbox"/> - Class B |
| <input checked="" type="checkbox"/> - FCC Part 15 Subpart C Section 15.209 - Radiated |                                                             |                                    |
| <input type="checkbox"/> - AS 3548 (1992)                                             | <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          | : 24 °C           |
| Relative Humidity    | : 35 %            |
| Atmospheric pressure | : 97.9 kPa        |
| Power supply system  | : 6.0 VDC Battery |

## Sign Explanations:

- ☐ - not applicable
- ☒ - applicable



### FCC Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

☒ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☐ - New Brighton Lab Shielded Room

### FCC Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

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 :

☒ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site) – NSA measurements made 7-00, due 7-01
- ☐ - Wild River Lab Small Test Site (Open Area Test Site) – NSA measurements made 7-00, due 7-01
- ☐ - Oakwood Lab (Open Area Test Site)

### FCC Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 100 GHz were performed in a horizontal and vertical polarization at the following test location :

☒ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room

## FCC Emissions Test Conditions: RADIATED EMISSIONS

The **RADIATED EMISSIONS** measurements were performed in the frequency range 9 kHz - 30 MHz at the following test location:

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☒ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)

at a test distance of :

- ☒ - 3 meters
- ☒ - 10 meters

☐ - Test not applicable

### Test equipment used :

| Test equipment used: |              |         |                 |              |               |         |
|----------------------|--------------|---------|-----------------|--------------|---------------|---------|
|                      | Model Number |         | Manufacturer    | Description  | Serial Number | Cal Due |
| ■ -                  | 2420         | ESH-3   | Rhode & Schwarz | EMI Receiver | 892473/004    | 1-24-02 |
| ■ -                  | 2517         | HFH2-Z2 | Polorad         | Loop Antenna | 879285/036    | 2-01-02 |

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

## INTERFERENCE POWER

The **INTERFERENCE POWER** measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :

☒ - Test not applicable

- ☐ - Wild River Lab Large Test Site (Open Area Test Site)
- ☐ - Wild River Lab Small Test Site (Open Area Test Site)
- ☐ - Oakwood Lab (Open Area Test Site)
- ☐ - Wild River Lab Screen Room
- ☐ - New Brighton Lab Shielded Room

## 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
- ☒ - See page B5.

### 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:

- |                                                         |                |
|---------------------------------------------------------|----------------|
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - _____                        | Type : _____   |
| <input type="checkbox"/> - unshielded power cable       |                |
| <input checked="" type="checkbox"/> - unshielded cables |                |
| <input type="checkbox"/> - shielded cables              | MPS.No.: _____ |
| <input type="checkbox"/> - customer specific cables     |                |
| <input type="checkbox"/> - _____                        |                |
| <input type="checkbox"/> - _____                        |                |



## Emission Test Results:

### FCC Conducted emissions 10/150 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

### FCC 15.209 Radiated emissions 10 kHz - 30 MHz

The requirements are ☒ - MET ☐ - NOT MET

Minimum limit margin for fundamental \_\_\_\_\_ 21 dB at \_\_\_\_\_ 175.0 kHz

Minimum limit margin for spurious/harmonics \_\_\_\_\_ 24 dB at \_\_\_\_\_ 530.0 kHz

Remarks: The fundamental was measured to be 91 dBuV/m in quasi-peak mode at 3 meters, 61 dBuV/m (1122 microvolts/meter) at 10 meters. The 10 meter limit is extrapolated using the square of an inverse linear distance extrapolation factor (40 dB/decade) to be 82 dBuV/m (12589 microvolts/meter). The third harmonic was measured to be 49 dBuV/m in quasi-peak mode (281 microvolts/meter) at 3 meters. The 3 meter limit is extrapolated using the square of an inverse linear distance extrapolation factor (40 dB/decade) to be 73 dBuV/m (4466 microvolts/meter).

### Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Minimum limit margin for spurious \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

### Interference Power at the mains and interface cables 30 MHz - 300 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

### Equivalent Radiated emissions 1 GHz - 4.2 GHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum margin of compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Maximum margin of non-compliance \_\_\_\_\_ dB at \_\_\_\_\_ MHz

Remarks: \_\_\_\_\_

**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: 17 May 2001

Testing End Date: 17 May 2001

- TÜV PRODUCT SERVICE INC -

*Thomas K. Swanson*

T. K. Swanson  
Test Technician

*J. C. Sausen*

Tested By:  
J. C. Sausen

Test-setup photo(s):  
Conducted emission 9 kHz - 30 MHz

**Not Applicable**

Test-setup photo(s):  
Radiated Emission 9 kHz - 30 MHz

**See Test-Setup Exhibit**

Test-setup photo(s):  
Radiated emission 30 MHz - 1000 MHz

**Not Applicable**



## Appendix A

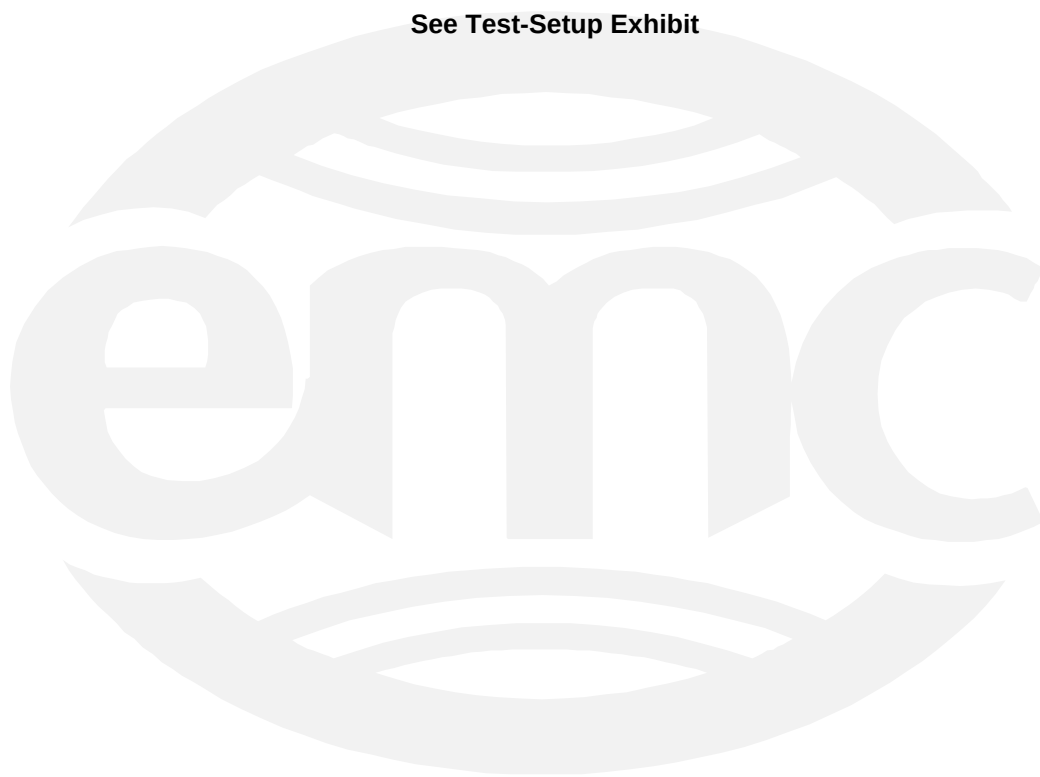
Test Data Sheets  
and  
Test Setup Drawing(s)



**TEST SETUP FOR EMISSIONS TESTING**

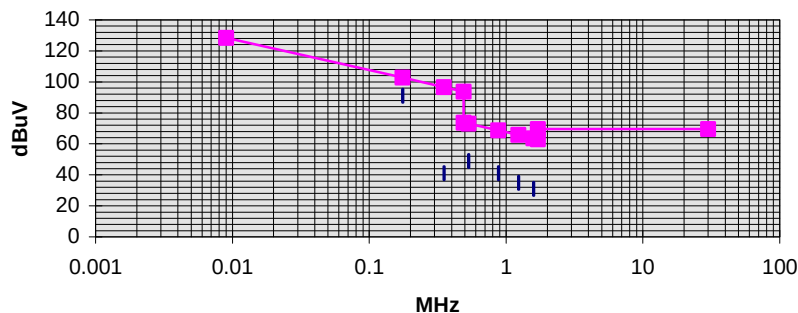
WILD RIVER LAB  
Small Test Site (STS)

**See Test-Setup Exhibit**

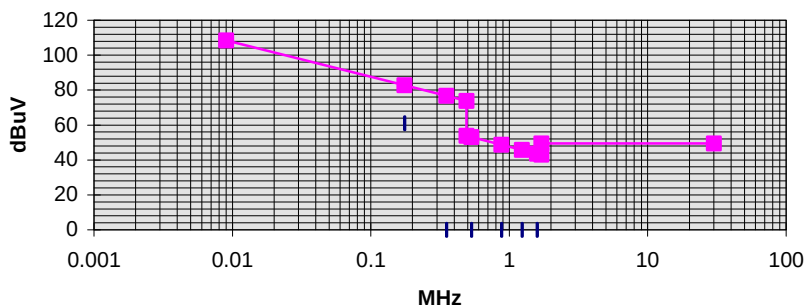


| Radiated Emissions on Medtronic - Model 8840 Programmer |           |            |                  |           |            |           |
|---------------------------------------------------------|-----------|------------|------------------|-----------|------------|-----------|
| Test Report #NC104316.3                                 |           |            | Date 17 May 2001 |           |            |           |
|                                                         | dBuV/m    | spec limit | margin-dB        | dBuV/m    | spec limit | margin-dB |
| MHz                                                     | 3 meters  | 15.209     | 3 meters         | 10 meters | 15.209     | 10 meters |
| 0.009                                                   |           | 128.5194   |                  |           | 108.5194   |           |
| 0.175                                                   | <b>91</b> | 102.7435   | 11.74346         | <b>61</b> | 82.74346   | 21.74346  |
| 0.35                                                    | <b>41</b> | 96.72286   | 55.72286         | Noise FI  | 76.72286   |           |
| 0.49                                                    |           | 93.8003    |                  |           | 73.8003    |           |
| 0.49                                                    |           | 73.8003    |                  |           | 53.8003    |           |
| 0.53                                                    | <b>49</b> | 73.11871   | 24.11871         | Noise FI  | 53.11871   |           |
| 0.876                                                   | <b>41</b> | 68.75414   | 27.75414         | Noise FI  | 48.75414   |           |
| 1.23                                                    | <b>35</b> | 65.80612   | 30.80612         | Noise FI  | 45.80612   |           |
| 1.58                                                    | <b>31</b> | 63.63108   | 32.63108         | Noise FI  | 43.63108   |           |
| 1.705                                                   |           | 62.96974   |                  |           | 42.96974   |           |
| 1.705                                                   |           | 69.54243   |                  |           | 49.54243   |           |
| 30                                                      |           | 69.54243   |                  |           | 49.54243   |           |
| Tested By: J. C. Sausen Quasi-Peak Levels               |           |            |                  |           |            |           |

FCC Pt 15.209 Radiated Emissions at 3 Meters



FCC Pt. 15.209 Radiated Emissions at 10 Meters



## Appendix B

### 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 NE  
Minneapolis, MN 55432-5604

Contact: Roger Berg Position: Principal Reliability Engineer

Phone: 763-514-5052 Fax: 763-514-7285

E-mail Address: roger.berg@medtronic.com

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

EUT Description Hand held clinical programmer

EUT Name N' VISION Clinical Programmer

Model No.: 8840 Serial No.: NHF000050, NHF000055

Product Options: \_\_\_\_\_

Configurations to be tested: \_\_\_\_\_

**Test Objective**

- |                                                                                                            |                                                                                                                                |
|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> EMC Directive 89/336/EEC (EMC)<br>Std: _____                           | <input checked="" type="checkbox"/> FCC: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B Part <u>15</u> |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)<br>Std: _____                                | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B                                     |
| <input checked="" type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)<br>Std: <u>EN45502 (AIMD)</u> | <input type="checkbox"/> BCIQ: Class <input type="checkbox"/> A <input type="checkbox"/> B                                     |
|                                                                                                            | <input type="checkbox"/> Canada: Class <input type="checkbox"/> A <input type="checkbox"/> B                                   |
|                                                                                                            | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B                                |
|                                                                                                            | <input type="checkbox"/> Other: <u>R&amp;TTE Directive EN300,330, ETS300.683</u>                                               |
| <input type="checkbox"/> Vehicle Directive 72/245/EEC (EMC)<br>Std: _____                                  |                                                                                                                                |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket<br>Notification Submissions (EMC)            |                                                                                                                                |

**TÜV Product Service Certification Requested**

- |                                                          |                                                                                                       |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Attestation of Conformity (AoC) | <input type="checkbox"/> International EMC Mark (IEM)                                                 |
| <input 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.)

## EMC Test Plan and Constructional Data Form

**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, TUV Product Service should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): 763-478-3027
- ☐ Continue testing to complete test series.
- ☐ Continue testing to define corrective action.
- ☐ Stop testing.

**EUT Specifications and Requirements**Length: 8.75" Width: 3.75" Height: 1.6" Weight: 24 oz.**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: 6 VDC (If battery powered, make sure battery life is sufficient to complete testing.)# of Phases: N/ACurrent (Amps/phase(max)): N/A Current (Amps/phase(nominal)): N/AOther N/A**Other Special Requirements**N/A**Typical Installation and/or Operating Environment**

(ie. Hospital, Small Business, Industrial/Factory, etc.)

The Model 8840 Clinical Programmer is intended to be used by a health care professional in a hospital or clinical environment.

**EUT Power Cable**

- ☐ Permanent OR ☐ Removable Length (in meters): \_\_\_\_\_
- ☐ Shielded OR ☐ Unshielded
- ☒ 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                           |
| <b>EXAMPLE:</b><br>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"/>            |
| Base module - telemetry module interface cable | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | N/A             | Soldered directly to PCBs                        | N/A                       | N/A                      | 1                  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Application module port                        | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 1         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | N/A             | Connector soldered directly to PCB               | 50 pin Compact Flash Port | N/A                      | 0                  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| IR communication port                          | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | 1         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | N/A             | IR interface components soldered directly to PCB | N/A                       | N/A                      | 0                  | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Expansion port                                 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 1         | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | N/A             | Connector soldered directly to PCB               | 10 pin                    | N/A                      | 0                  | <input type="checkbox"/>            | <input checked="" 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

**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> |
|-------------------------|----------------|-----------------|-----------------|
| Itrel 3 Neurostimulator | Model 7425     | CJB9GE          | N/A             |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |
|                         |                |                 |                 |

**Oscillator Frequencies**

| <i>Frequency</i> | <i>Derived Frequency</i> | <i>Component # / Location</i> | <i>Description of Use</i> |
|------------------|--------------------------|-------------------------------|---------------------------|
| 11.059 MHz       |                          | U1/Y1 Base Module             | Main time base            |
| 9.830 MHz        |                          | U1/Y1 Telemetry Module        | Main time base            |
| 32.768 KHz       |                          | Y2 Base Module                | Real Time Clock           |
|                  |                          |                               |                           |
|                  |                          |                               |                           |
|                  |                          |                               |                           |
|                  |                          |                               |                           |
|                  |                          |                               |                           |

**Power Supply**

| <i>Manufacturer</i> | <i>Model #</i> | <i>Serial #</i> | <i>Type</i>                                                                                                                                         |
|---------------------|----------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| N/A                 | N/A            | N/A             | <input type="checkbox"/> Switched-mode: (Frequency) _____<br><input type="checkbox"/> Linear <input type="checkbox"/> Other: <u>Battery powered</u> |
| N/A                 | N/A            | N/A             | <input type="checkbox"/> Switched-mode: (Frequency) _____<br><input type="checkbox"/> Linear <input type="checkbox"/> Other: _____                  |

**Power Line Filters**

| <i>Manufacturer</i> | <i>Model #</i> | <i>Location in EUT</i> |
|---------------------|----------------|------------------------|
| N/A                 | N/A            | N/A                    |
| N/A                 | N/A            | N/A                    |

## 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> |
|--------------------|---------------------|------------------------|------------|-------------------------------|
| Capacitors         | AVX                 | 100pF                  | 41         | Various #'s / I/O lines       |
| Ferrites           | Murata              | BLM21A102S             | 25         | Various #'s / I/O lines       |
|                    |                     |                        |            |                               |
|                    |                     |                        |            |                               |

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

Full ground plane and power plane

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

**Authorization Signatures**

Roger Berg

May 17, 2001

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 C

# MEASUREMENT PROTOCOL

## GENERAL INFORMATION

### Test Methodology

Testing is performed according to the procedures in EN 300 330, ETS 300 683, International Special Committee on Radio Interference (CISPR) Publication 11 (1991), European Standard EN 55011

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 11 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  $\pm 4.5$  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 $\mu$ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the CISPR limit.

To convert between dB $\mu$ V and  $\mu$ 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 $\mu$ V/m, is arrived at by taking the reading from the spectrum analyzer (Level dB $\mu$ V) and adding the antenna correction factor and cable loss factor, and subtracting the preamplifier gain, to it. This result then has the duty cycle correction factor subtracted from it to provide the final average reading.

Example:

| FREQ<br>(MHz) | LEVEL<br>(dB $\mu$ V) | CABLE/ANT/PREAMP<br>(dB) (dB/m) (dB) | FINAL<br>(dB $\mu$ V/m) | POL/HGT/AZ<br>(m) (deg) | DELTA1<br>EN55022 B |
|---------------|-----------------------|--------------------------------------|-------------------------|-------------------------|---------------------|
| 79.06         | 40.7Qp +              | 1.9 + 6.6 - 28.3 =                   | 20.9                    | V 1.0 0.0               | -9.1                |

For ERP measurements, this measured level is matched by replacing the EUT with a tuned dipole antenna and applying an RF signal to the dipole. The signal generator level is adjusted until the field strength level measured from the EUT is matched.

Radiated emission levels below 30 MHz are taken directly off of the receiver and include the antenna factor and cable loss.

## DETAILS OF TEST PROCEDURES

### Conducted Emissions

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 9 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  $\Omega$ /50  $\mu$ 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 9kHz 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, 10 or 30 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.

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.