TEST RESULT SUMMARY

FCC PART 15 Subpart C
Section 15.231

MANUFACTURER'S NAME	SIMS Deltec Inc
NAME OF EQUIPMENT	Transmitter
MODEL NUMBER	**21-6330-51**
MANUFACTURER'S ADDRESS	1265 Grey Fox Road St Paul MN 55112 USA
TEST REPORT NUMBER	W9498
TEST DATE	11 October 1999

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 Subpart C Section 15.231.

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 Subpart C Section 15.231.

Date: 28 October 1999

Location: Taylors Falls MN USA

G. S. Jakubowski
Test Engineer

J. T. Schneider
Lead Engineer

Not Transferable

EMC EMISSION - T E S T R E P O R T

Test Report File No.	:	**WC1G949801**	Date of issue:	28 October 1999

Model / Serial No.	:	**21-6330-51 / s/n**
Product Type	:	Transmitter
Applicant	:	SIMS Deltec Inc
Manufacturer	:	SIMS Deltec Inc
License holder	:	SIMS Deltec Inc
Address	:	1265 Grey Fox Road
	:	St Paul MN 55112 USA
Test Result	:	■ **Positive** ☐ **Negative**
Test Project Number Reference(s)	:	**W9498**
Total pages including Appendices		30

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

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

D I R E C T O R Y - EMISSIONS

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

☐ - EN 50081-1 / 1991

☐ - EN 55011 / 1991 ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - EN 55013 / 1990

☐ - EN 55014 / 1987 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55014 / A2:1990

☐ - EN 55014 / 1993 ☐ - Household appliances and similar
☐ - Portable tools
☐ - Semiconductor devices

☐ - EN 55015 / 1987

☐ - EN 55015 / A1:1990

☐ - EN 55015 / 1993

☐ - EN 55022 / 1987 ☐ - Class A ☐ - Class B

☐ - EN 55022 / 1994 ☐ - Class A ☐ - Class B

☐ - BS

☐ - VCCI ☐ - Class A ☐ - Class B

■ - FCC Part 15 Subpart C Section 15.231

☐ - AS 3548 (1992) ☐ - Class A ☐ - Class B

☐ - CISPR 11 (1990) ☐ - Group 1 ☐ - Group 2
☐ - Class A ☐ - Class B

☐ - CISPR 22 (1993) ☐ - Class A ☐ - Class B

■ - RSS-210 Issue 2 Rev. 1 Section 6.1.1

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Environmental conditions in the lab:

	Actual
Temperature	: 24 °C
Relative Humidity	: 35 %
Atmospheric pressure	: 98.7 kPa
Power supply system	: 3.3 volts

Sign Explanations:

☐ - not applicable
■ - applicable

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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

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD*) measurements were performed 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
☐ - 30 meters

■ - Test not applicable

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

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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)
☐ - 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
☐ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number	Cal Date
■ -	3146	Electro-Mechanics (EMCO)	Log Periodic Antenna	9103-3075	11-98
■ -	3108	Electro-Mechanics (EMCO)	Biconical Antenna	2118	11-98
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	4-99
■ -	85662A	Hewlett-Packard	Analyzer Display	2152A03640	4-99
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	4-99
■ -	ZHL-1042J	Mini-Circuits	Preamplifier	H072294-11	3-99

Use of the calibrated equipment on this list ensures traceability to national and international standards.

Emissions Test Conditions: 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

Test equipment used :

Model Number	Manufacturer	Description	Serial Number	Cal Date

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Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 4.2 GHz were performed in a horizontal and vertical polarization 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)
☐ - Wild River Lab Screen Room

at a test distance of:

☐ - 1 meters
■ - 3 meters
☐ - 10 meters

☐ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number	Cal Date
■ -	3115	Electro-Mechanics (EMCO)	Horn Antenna	9001-3275	9-98
■ -	8566B	Hewlett-Packard	Spectrum Analyzer	2221A01596	4-99
■ -	85662A	Hewlett-Packard	Analyzer Display	2152A03640	4-99
■ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2811A01127	4-99
■ -	ZHL-1042J	Mini-Circuits	Preamplifier	H072294-11	3-99

Use of the calibrated equipment on this list ensures traceability to national and international standards.

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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

■ - Reception of serial messages from the pump and transmission of said messages via an RF signal.

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

☐ - _____

☐ - _____

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Emission Test Results:

Conducted emissions 10/150 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (magnetic field) 10 kHz - 30 MHz

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated emissions (electric field) 30 MHz - 1000 MHz

The requirements are ■ - MET ☐ - NOT MET

Minimum limit margin for fundamental 3 dB at 418.0 MHz

Minimum limit margin for spurious 15 dB at 836.1 MHz

Remarks: The fundamental was measured to be 74.9 dBuV/m in peak mode, minus 6 dB duty cycle correction factor to give an average reading of 68.9 dBuV/m (2786 uV/m) compared to an average limit of 72.3 dBuV/m (4133 uV/m) per Section 6.1.1(e). The 836.1 MHz signal was measured to be 43.5 dBuV/m in peak mode, minus 6 dB duty cycle correction factor to give an average reading of 37.5 dBuV/m (74 uV/m) compared to an average limit of 52.3 dBuV/m (413 uV/m). The duty cycle correction factor is calculated by 20 log (50/100 msec), with 20 dB being the maximum allowable.

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

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Equivalent Radiated emissions 1 GHz - 4.2 GHz

The requirements are ■ - MET ☐ - NOT MET

Minimum limit margin 5 dB at 2926.6 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: At 2926.6 MHz, peak analyzer reading of 54.5 dBuV/m, minus 6 dB duty cycle correction factor to give an average reading of 48.5 dBuV/m (266 uV/m), compared to an average limit of 54 dBuV/m (500 uV/m).

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DEVIATIONS FROM STANDARD:

None.

GENERAL REMARKS:

The bandwidth of the fundamental must be less than 0.25% of the center frequency, or 1.045 MHz. Page A7 of A7 shows the bandwidth to be less than 40 kHz.

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: 11 October 1999

Testing End Date: 11 October 1999

- TÜV PRODUCT SERVICE INC -

J. T. Schneider
Lead Engineer

Tested By:
G. S. Jakubowski

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

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

Not Applicable

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Test-setup photo(s):
Radiated emission 30 MHz - 4.2 GHz

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Appendix A

Test Data Sheets

and

Test Setup Drawing(s)

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.

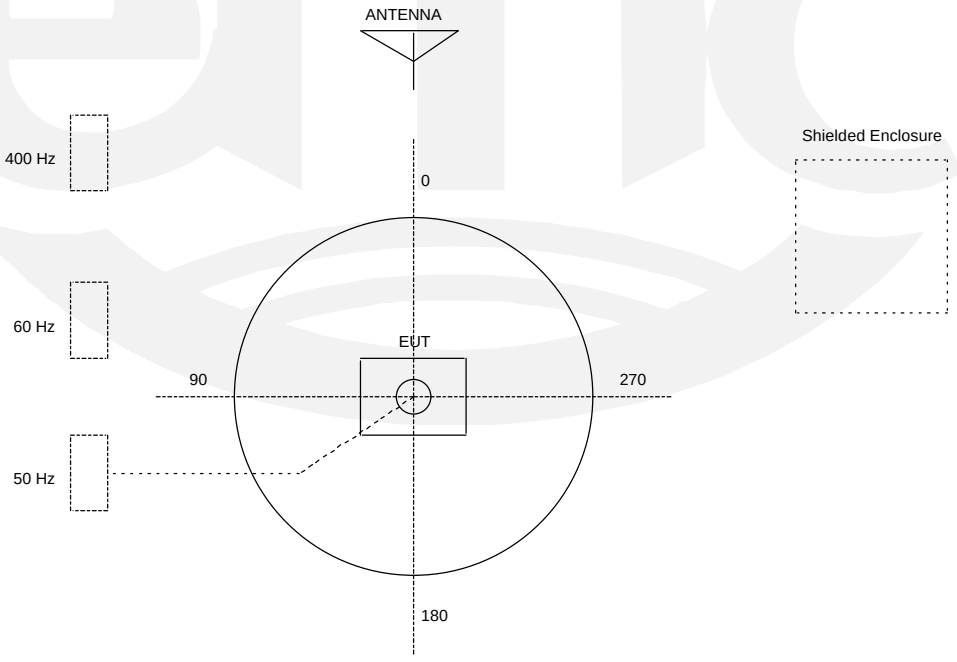
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.

3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.

4. The circle is a 6.7 meter diameter turntable.

5. A ground plane is in the plane of this sheet.

6. The test sample is shown in the azimuthal position representing zero degrees.



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T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site — Report W9498 Run 1
3 Meter Antenna Distance — Date 10-11-99 Page 1
Equipment Under Test: — Engineer _____
SIMS DELTEC — Tech: GSJ_____
WIRELESS TRANSMITTER P/N 21-6330-01 — Requester_____
Notes: REV. A OF PRINTED CIRCUIT BOARD

Frequency MHz	Level dBuV	Factor dB	Cable dB	Peak dBuV/m	Ave dBuV/m	Polar\ Height		15.231(E) Limit dBuV/m
CHANGED INDUCTOR L1 TO 220 NH								
MAXED AT 318 DEG, HORIZ, 1 M								
(6 DB PEAK-AVERAGE DUTY CYCLE CORRECTION)								
418.00	56.12	16.8	1.9	74.9	68.9	H	--	72.3
MAXED AT 320 DEG, HORIZ, 1 M								
836.10	17.9	22.8	2.8	43.5	37.5	H	--	52.3
FUNDAMENTAL RE-MEASURED W/O PREAMP TO VERIFY THAT THE PREAMP WAS NOT SATURATED								
MAXED AT 90 DEG, VERT, 1 M								
1254.2	13.94	25.6	3.6	43.1	37.1	V	--	54
MAXED AT 180 DEG, VERT, 1 M								
1672.3	14.92	27.6	4.2	46.8	40.8	V	--	54
MAXED AT 245 DEG, VERT, 1 M								
2090.4	16.3	29.5	4.8	50.6	44.6	V	--	54
MAXED AT 240 DEG, VERT, 1 M								
2508.5	12.98	30.1	5.3	48.4	42.4	V	--	54
MAXED AT 350 DEG, VERT, 1 M								
2926.6	17.66	31	5.8	54.5	48.5	V	--	54
MAXED AT 190 DEG, VERT, 1 M								
3344.6	14.44	33	6.2	53.7	47.7	V	--	54
MAXED AT 70 DEG, HORZ, 1 M								
3762.7	8.88	33.9	6.7	49.4	43.4	H	--	54
MAXED AT 270 DEG, HORZ, 1 M								
4180.8	13.48	33.7	7.1	54.3	48.3	H	--	54
END SCAN								

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T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site Figure____ Report W9498 Run 1
3 Meter Antenna Distance Date 10-11-99 Page 2
Equipment Under Test: Engineer _____
SIMS DELTEC Tech: GSJ_____
WIRELESS TRANSMITTER P/N 21-6330-01 Requester_____
Notes: REV. A OF PRINTED CIRCUIT BOARD

Measurement Summary

Frequency MHz	Final dBuV/m	Final uV/m	Azimuth deg	Polar\ Height		Delta 15.231(E)	Delta
418.01	68.9	2786.1	--	H	--	-3.4	
836.10	37.5	74.989	--	H	--	-14.8	
1254.2	37.1	71.614	--	V	--	-16.9	
1672.3	40.8	109.64	--	V	--	-13.2	
2090.4	44.6	169.82	--	V	--	-9.4	
2508.5	42.4	131.82	--	V	--	-11.6	
2926.6	48.5	266.07	--	V	--	-5.5	
3344.6	47.7	242.66	--	V	--	-6.3	
3762.7	43.4	147.91	--	H	--	-10.6	
4180.8	48.3	260.01	--	H	--	-5.7	

File W9498 Run 1

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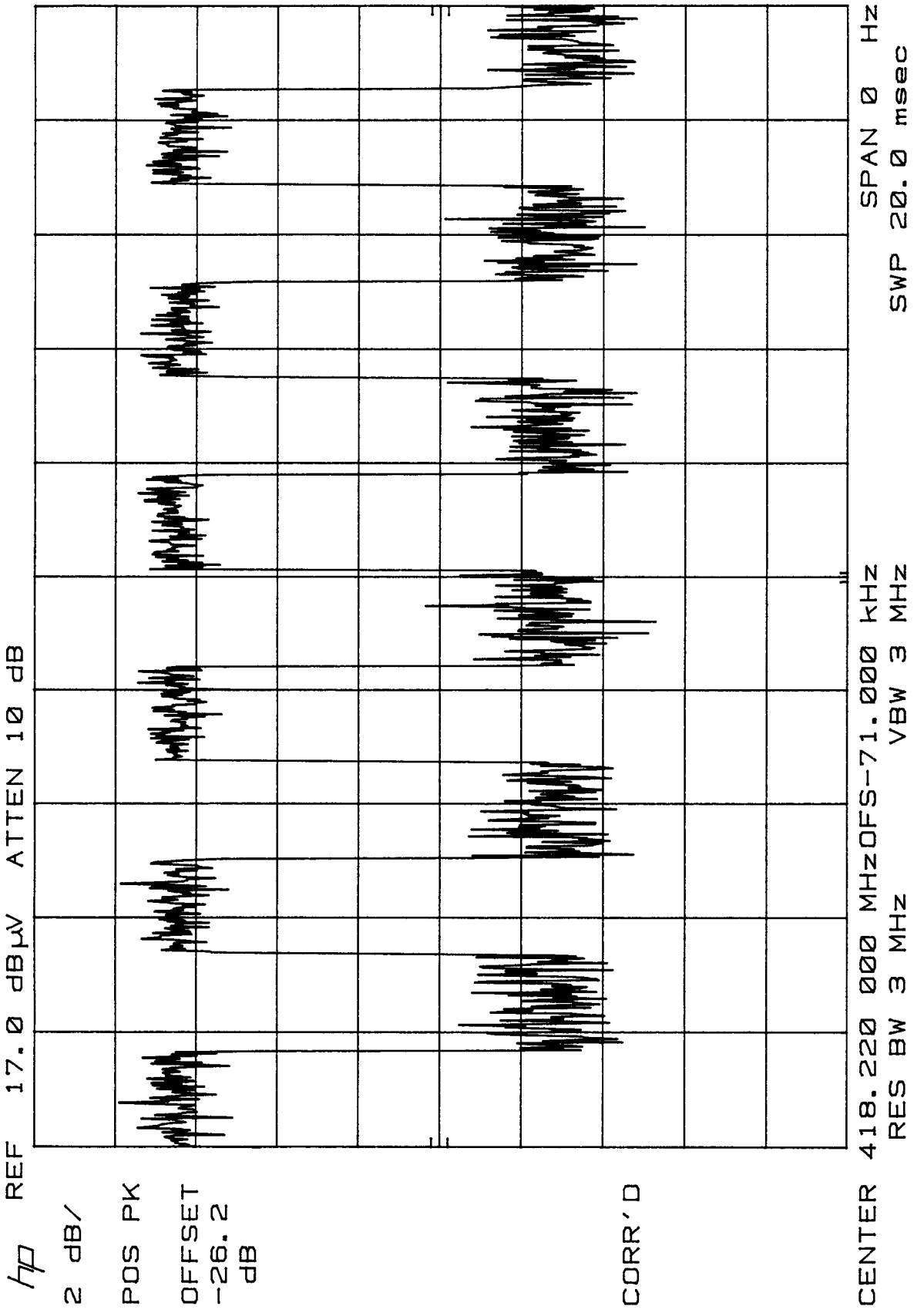

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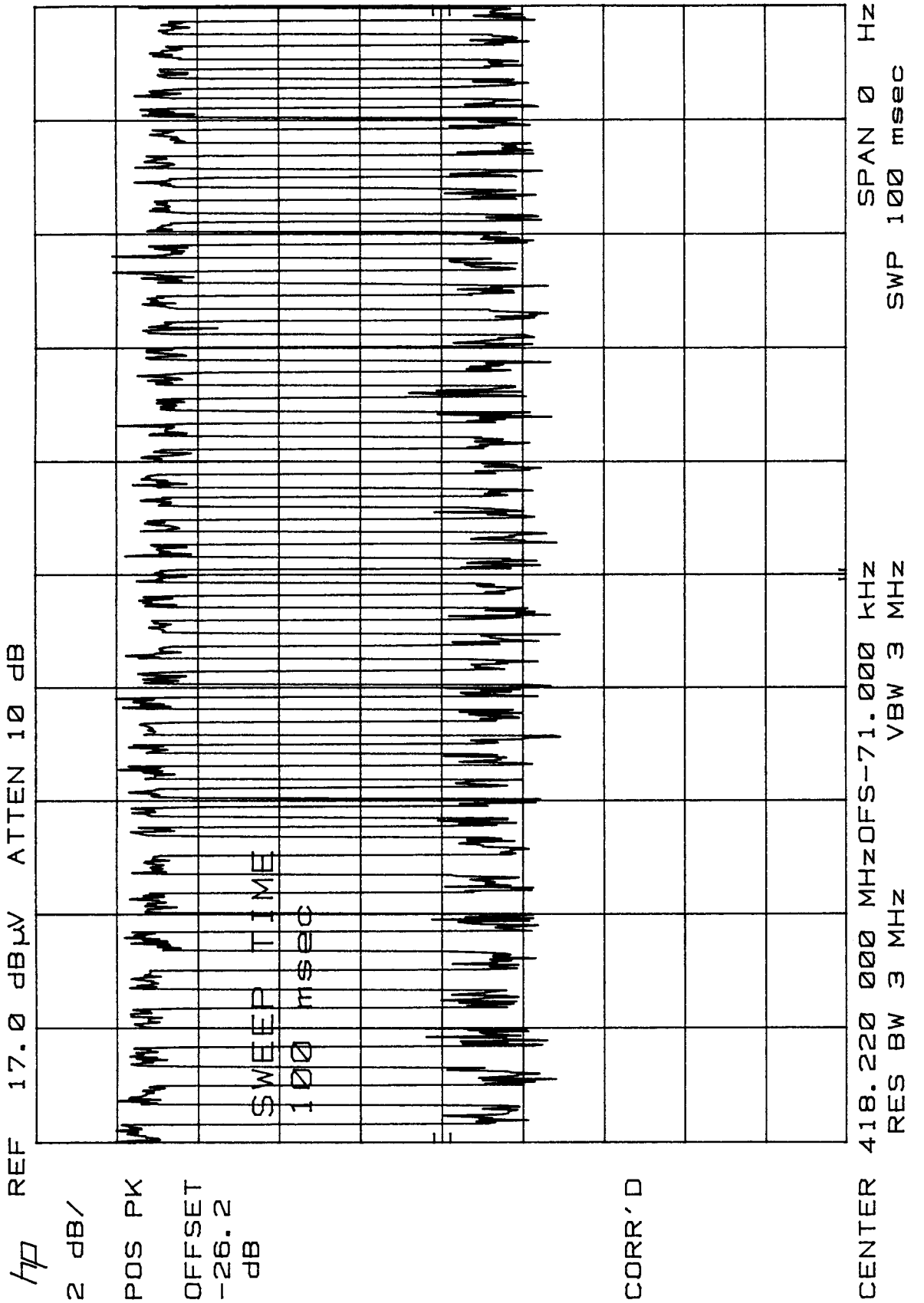

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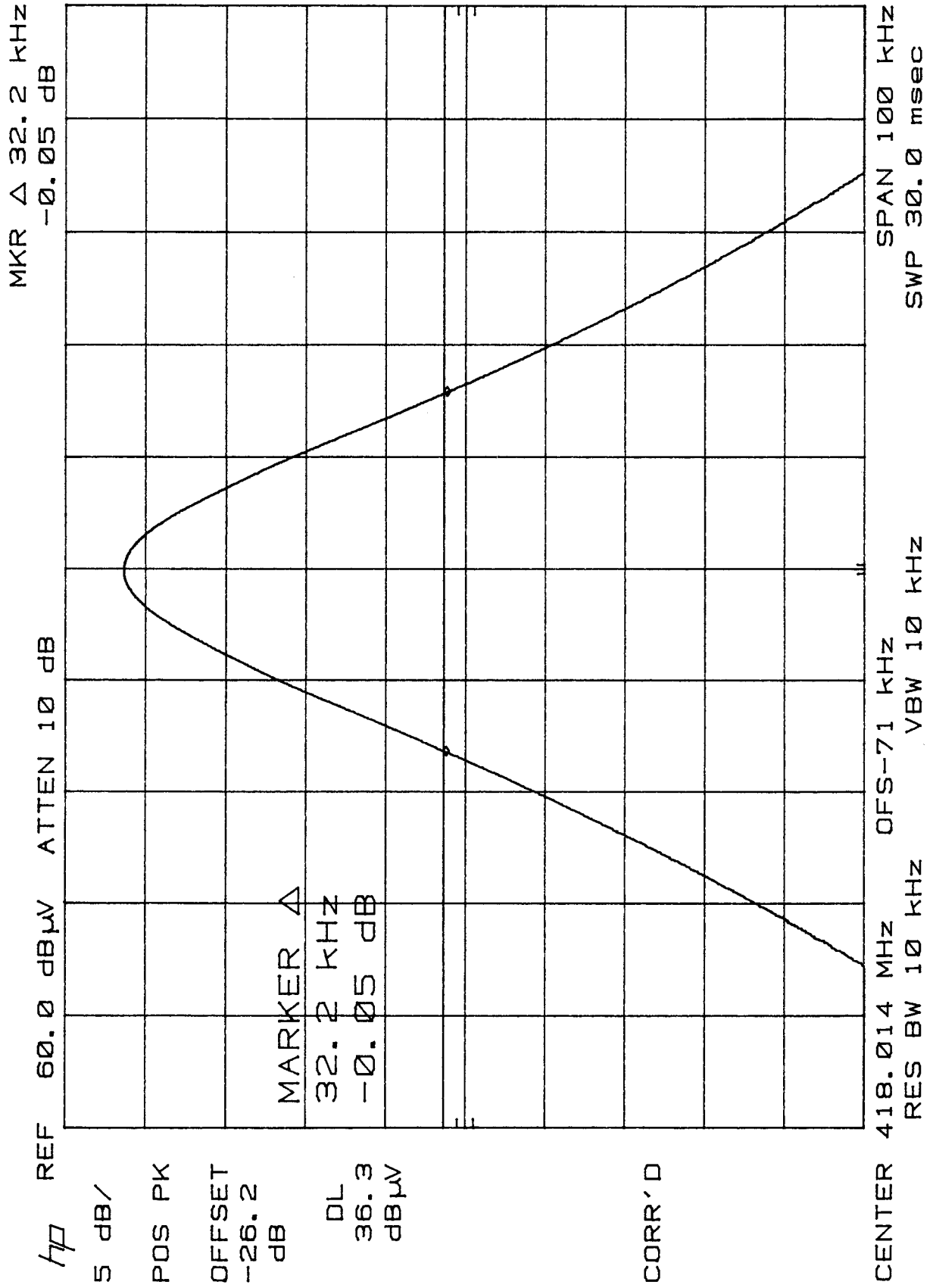

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Appendix B

Constructional Data Form

and

Product Information Form(s)

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

A completed form helps ensure that product testing will go smoothly. Add attachments as necessary for additional documentation. For additional help, please contact your TÜV Product Service Representative.

Applicant -- Enter company information pertaining to the location where the product is manufactured and for the manufacturer's contact soliciting the testing.

Company: SIMS Deltec, Inc.

Address: 1265 Grey Fox Rd

St Paul, MN 55112

Phone: 651 628-7064 Fax: 651 628-7406

Contact: Ron Dohmen Position: Engineer

General Equipment Description -- Indicate which attachments you are providing with this document. It is recommended that you provide those listed.

Type of Equipment: Transmitter Model No.: 21-6330-51

Serial No.: FCC ID No.:

General description: Wireless Remote Monitoring System (WRMS) Transmitter for transmission

Of messages to 21-6335-01 receiver.

Product Variant/Options:

Attachments: (only required for certification)

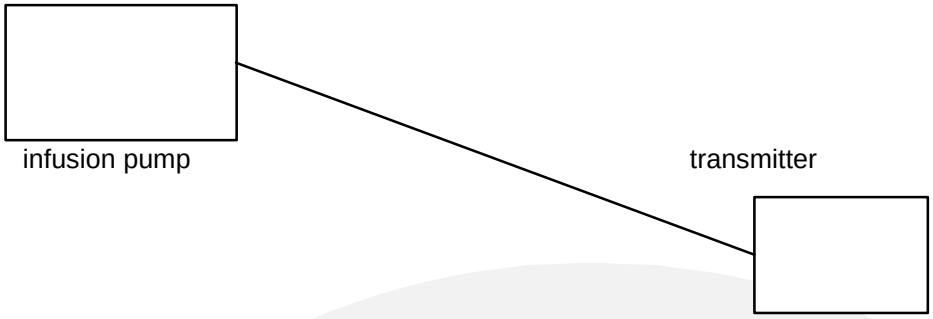
External Photographs Product Literature High Level Bill of Materials

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: 10-15-99 **Signature of Applicant:**

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

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.



Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Installation and Environmental Conditions (describe) -- Describe the intended installation. Include details such as power connection and system grounding approaches. Describe the intended operating environment, include details such as humidity, cooling, heating and hazardous environments. Attaching a copy of an Installation manual is recommended for proper documentation of your system. Please indicate.

Attached manual has description of installation.
Attached specification has description of operating environment.

Installation manual/instructions (attached, only required for certification)

Power Requirements -- Indicate your system power requirements for the equipment to be tested.

Rated Voltage 3.3 Volts Rated Input Power 66 milliwatts maximum

Protection Class -- Indicate your product's protection class. Contact your TÜV Product Service representative and is only required for certification.

Type: _____ Class: _____

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

I/O Ports and Cables

Indicate all interface cables which can be attached to the equipment even if they are not sold as part of your system. Describe the port (e.g., Parallel, Serial, SCSI), list its type (e.g., AC, DC, Signal, Control) and number of ports/cables of type. Indicate if the I/O port is to be exercised during testing. List the type of transmission and if the cable is an EUT assembly-to-assembly interconnection cable (PC to printer, to modem). Indicate whether the cable is shielded or not, type of shield (e.g. Braid, Foil) and how terminated (e.g. 360 degree to conductive shell, pigtail) at both ends of the cable. If a cable can have a typical length of ≥ 3.0 meters, then it is required to test with a cable of at least 3.0 meters.

I/O Ports and Cables

Description: Legacy Pump Interface

Type of Port: 3.3 Volt Unipolar bi-directional logic # of ports/cables of type _____1____

Exercised during testing?	■	Yes		No
Assembly ↔ Assembly Interconnect		Yes		No
Cable shielded:	■	Yes		No
Shield Type (describe)	cable shield			
Termination: (describe)				
Transmission Type:		Analog	■	Digital
Length of cable: 5”	Maximum:	Tested:		

I/O Ports and Cables

Description: _____

Type of Port: _____ # of ports/cables of type _____

Exercised during testing?		Yes	☐	No
Assembly ↔ Assembly Interconnect		Yes		No
Cable shielded:		Yes		No
Shield Type (describe)				
Termination: (describe)				
Transmission Type:		Analog		Digital
Length of cable:	Maximum:	Tested:		

I/O Ports and Cables

Description: _____

Type of Port: _____ # of ports/cables of type _____

Exercised during testing?		Yes		No
Assembly ↔ Assembly Interconnect		Yes		No
Cable shielded:		Yes		No
Shield Type (describe)				
Termination: (describe)				
Transmission Type:		Analog		Digital
Length of cable:	Maximum:	Tested:		

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

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EUT configurations -- Provide a technical description of all possible EUT configurations. Specify if more than one configuration is to be tested.

The only configuration possible for the WRMS Transmitter is connected to a Deltec CADD-Legacy pump. The transmitter receives messages from the pump and passes them to WRMS receiver(s) via an RF link.

EUT Software and Operation 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. Consult with your TÜV Product Service Representative when typical operating modes are not practical. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. This pattern must be sent to the parallel port device, serial port device, and must be write/read/verified to each storage device. Monitors must display the H pattern, typically in white letters on a black background. 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.

General Description: (describe)	The WRMS Transmitter receives serial messages from the CADD-Legacy pump and transmits them as an RF signal which may be received by a WRMS receiver.
Software Revision Level: (list and describe)	97-0327-01 ver. 0.2 (WRMS receiver software) and 97-0328-01 ver. 2.0 (WRMS transmitter software)
Operating modes to be tested: (list and describe)	Reception of serial messages from the pump and transmission of said messages via an RF signal.

Operation manual/instructions (attached)

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

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System, Subsystem, Major Subassemblies or Internal Peripherals -- List and describe all system, subsystem, major subassemblies and all internal peripherals. This should include such things as an external monitor, parallel interface peripheral, serial interface peripheral, internal disk drives or internal circuit boards. It is recommended that circuit diagrams, assembly and subassembly drawings be attached. Please indicate.

Description	*Model #*	*Serial #*	*FCC ID #*

Technical Drawings attached

Interfacing Equipment and/or Simulators (which are not part of the EUT) -- List and Describe all equipment or peripherals that will be connected to the EUT. For FCC testing a minimum configuration is required. If you have questions about this minimum configuration contact your TÜV Product Service representative.

Description	*Model #*	*Serial #*	*FCC ID #*
Legacy Pump	CADD-Legacy		

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

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EMC System Details -- List all frequencies and sub-harmonics which are 10kHz or above for such things as oscillators, horizontal line rate of monitors, and clock rates of incorporated OEM assemblies. List all power supplies. Indicate switching frequencies. List power line filters and indicate the manufacturer, model and location on EUT. Indicate all components used for high frequency noise reduction. (e.g., ceramic capacitor, 0.01µF, 1 ea. at C12 - C20).

Oscillator Frequencies

Frequency	*Sub-harmonics*	*EUT Location*	*Description of Use*
3.579545 MHz		**On PWA**	

Power Supply

Frequency	*Manufacturer*	*Model #*	*Serial #*	*Type (list frequency)*

Power Line Filters

Manufacturer	*Model #*	*Qty*	*Location on EUT*

Critical EMI Components (Capacitors, ferrites, etc.)

Description	*Manufacturer*	*Part # or Value*	*Qty*	*Location on EUT*

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

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Other EMI Critical Construction Detail -- Indicate any other measures taken to reduce high frequency noise, (e.g., grounding the circuit board on the right rear corner with 0.25" braid, 3 inches long to the chassis).

TVS devices across both active pins on interface cable.

Description of Enclosure -- Describe the principle materials of the enclosure (e.g., plastic, plastic with shielding material, metal, metal with specific shielding contact points, metal with paint on all surfaces).

Impact resistant polycarbonate, UL94-5V.
No shielding - internal antenna.

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: **Signature of Applicant:**

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MEASUREMENT PROTOCOL

GENERAL INFORMATION

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 dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

Frequency (MHz)	Level (dBµV)	+	Factor & Cable (dB)	=	Final (dBµV/m)	-	FCC Limit (dBµV/m)	=	Delta FCC (dB)
32.21	13.9	+	16.3	=	30.2	-	40.0	=	-9.8

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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 μH (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.

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