TEST REPORT ON
TP 75 RF

UHF Digital FSK Transmitter
433.920 MHz
FCC Procedures
Part 15

TEST REPORT NUMBER
CTMS 2000/1655a
February 2001

Prepared for:

Danfoss Randall Ltd.
Ampthill Road,
Bedford,
MK42 9ER,
England.

This results in this report refer to the tested unit only

CAMBRIDGE
TEST & MEASUREMENT SERVICES

Certificate of Application

Cambridge Test and Measurement Services Ltd., certifies that the product tested was fully compliant with the requirements of Parts 15 of the FCC Code of Regulations 47CFR, the results of which are contained in this test report No: CTMS 2000/1655a

I certify that the application was prepared under my supervision and that to the best of my knowledge and belief, the facts set forth in this application and technical data, are true and correct.

Signature :

Date :

Name : David Fisher

Title : Radio Technical Manager

General Test Information

Date Test Sample Received	:	8/01/2001
Date Testing Started	:	15/01/2001
Date Testing Finished	:	29/01/2001
Equipment Serial Number	:	N.A.
CTMS Project Number	:	2000/1655a
Test Engineer	:	M. Billis

Report Copy No 1

Contents list and Information

2.1033 **Application for Certification**

For use in accordance with FCC Rules and Regulations 47 CFR parts 2 and parts 15.

2.1033 (b) (1)	Name of applicant	:	Danfoss Randall Ltd.
	Address of applicant	:	Ampthill Road, Bedford, MK42 9ER, England.
Contact :Mr. P.Lewis,			
2.1033 (b) (2)	FCC Identifier	:	xxxxxxxxxxx
	Model Type Number	:	TP 75 RF
2.1033 (b) (3)	Installation and operating instructions	:	User Guide, see exhibit A
2.1033 (b) (4)	Brief description of circuit function	:	see exhibit B
2.1033 (b) (5) 2.1034	Block diagram showing frequency of oscillators	:	see exhibit C
2.1033 (b) (6)	Report of measurements		
15	Subpart A General		
15.31	Measurement standards (OATS)	:	Page 5
15.33	Frequency range of radiated measurements	:	Page 6
15.35	Measurement detector and bandwidths	:	Page 6
15	Subpart C Intentional Radiators		
15.231	Radiated emission limits (fundamental)	:	Page 7
15.209	Radiated emission limits (spurious)	:	Page 10
2.1033 (7)	Photographs of equipment and identification plate / label	:	Pages 12

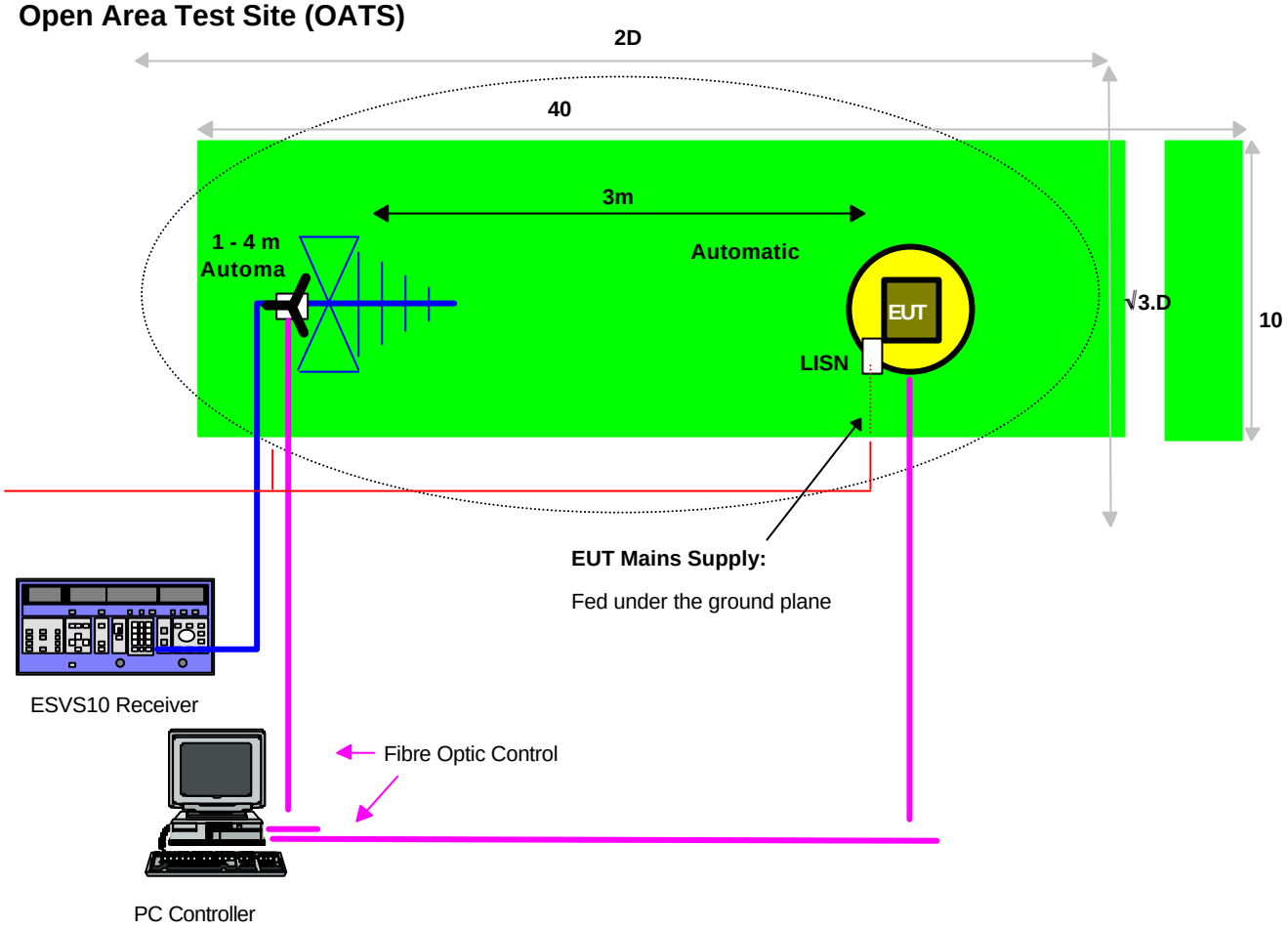
General Information and Attachments :

	Company Accreditations & Credentials	:	Page 18

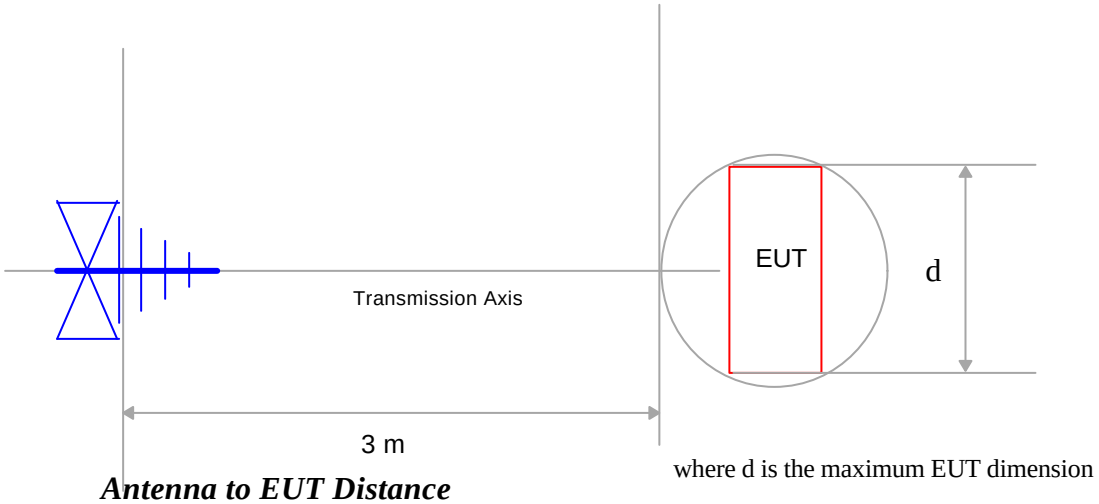
15.31 Measurement standards

The measurement facilities at Cambridge Test and Measurement Services LTD, are in accordance with ANCI C63.4 and lodged with the FCC under rule 2.948, a letter from the FCC recognising compliance with the requirements was dated March 02,1999 with the registration number 93385.

Open Area Test Site (OATS)



Equipment Test Set Up



Antenna to EUT Distance

Frequency spectrum to be investigated - 47 CFR 15.33

The range of frequency search was from 9 kHz to the 10th Harmonic of the highest fundamental carrier frequency (4.3392 GHz)

Measurement detector and bandwidths 47 CFR 15.35

Measurements below 1000 MHz are taken using a quasi-peak detector which has been calibrated to the requirements of CISPR 16-1.

For frequencies above 1000MHz a minimum resolution bandwidth of 1MHz was employed.

General Test Conditions

Laboratory environment .

Ambient Temperature : 21 °C

Relative Humidity : 48 %

Open Area test Site : 4 °C

Test Instruments used

Receiver:	Rohde & Schwarz type ESHS 10
Receiver:	Rohde & Schwarz type ESVS 10
Spectrum Analyser:	Anritsu type MS2602A
Antenna:	Schaffner Chase bi-log type CBL6141A
Antenna:	Emco active loop type 6502
Antenna:	Rohde & Schwarz type HA/226/582/50

Transmitter emission limits- 47 CFR 15.231 and 15.209

The Transmitter (the EUT) fitted with a new battery. Set to 100 % continuous transmit and was placed on a wooden table at a distance of 3m from the receiving antenna. The radiated field for each spurious emission was detected and measured on a calibrated receiver.

The antenna was orientated in the horizontal and vertical planes and was raised and lowered between a height of 1 and 4 metres so as to ensure the maximum level of any spurious emission was detected.

The EUT was rotated through 360° at each orthogonal axis, the emission levels for each spurious were observed on the receiver and recorded.

For each of the emissions detected the EUT was switched off to determine the emission was that of the EUT.

To search for emissions below 30 MHz a Calibrated loop antenna was used. For emissions above 1GHz measurements were carried out by the same method as above, except that a spectrum analyser employing an average detector, and a double-ridged guide horn were used, the measurement distance was reduced to 1m and the results converted to 3m equivalents, the test site used was an absorber lined room which is accepted in ANSI C63.4 in this frequency range.

Results in accordance with Part 15.231 Emission Limits

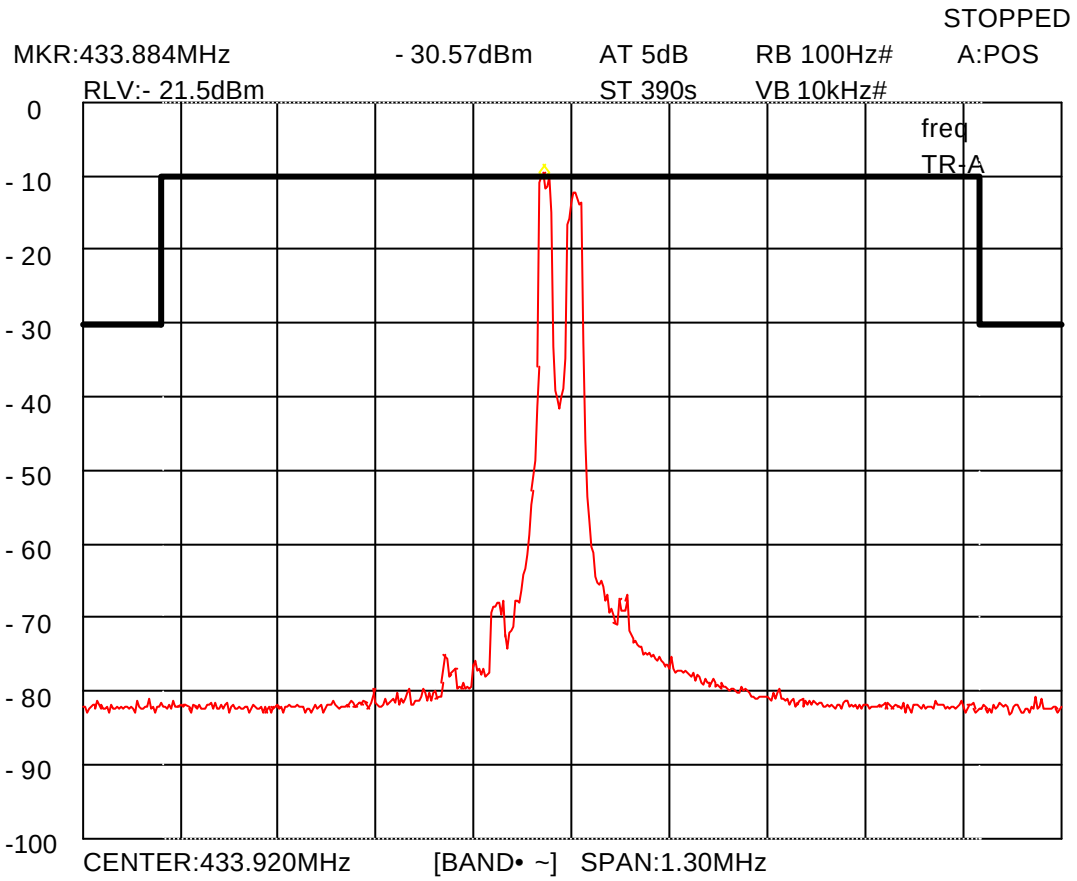
Field Strength of Fundamental

Operating Frequency (MHz)	Emission Frequency (MHz)	Identity	Result µV/m @ 3m	Spec limit at this frequency µV/m @ 3m
433.920	433.920	fundamental (fc)	9440.61	10996.68 µV/m
The field strength limit is based on the formula: Field strength limit (µV/m@3m) = 41.6667(F)-7083.3333, where F is the transmitter fundamental frequency in MHz.				

Test Instruments used: TMS 10,120,917,933.

Results in accordance with Part 15.231 Emission Limits

Bandwidth of Fundamental



The Mask in the plot above is based on the **-20 dBc bandwidth** of 0.25 % of the centre frequency: 433.920 MHz * 0.0025= **1.0848 MHz**

Test Instruments used: TMS: 6,35,101,10.

Results in accordance with Part 15.209 Emission Limits

Field Strength of Harmonics and Spurious Emissions (Transmitter operating)

Operating Frequency (MHz)	Emission Frequency (MHz)	Identity	Result µV/m @ 3m	Spec limit at this frequency µV/m @ 3m
		All greater than 20 dB within Part 15.209 limits		

Test Instruments used: TMS 6,10,35,81,118,120,904,916,917,933

Results in accordance with Part 15.209 Emission Limits

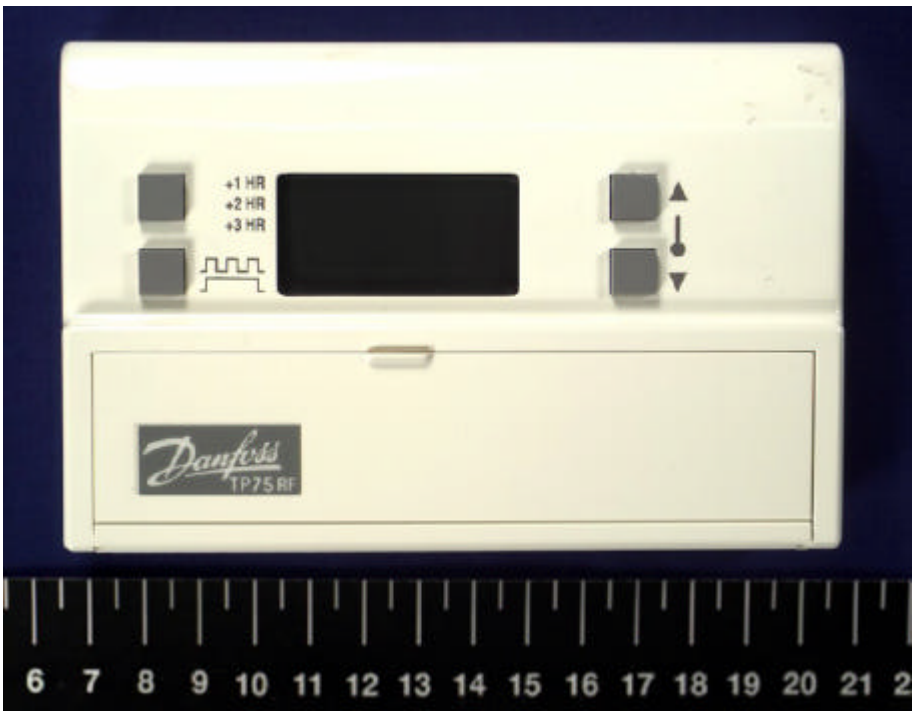
Field Strength of Spurious Emissions (Transmitter standby)

Operating Frequency (MHz)	Emission Frequency (MHz)	Identity	Result µV/m @ 3m	Spec limit at this frequency µV/m @ 3m
		All greater than 20 dB within Part 15.209 limits		

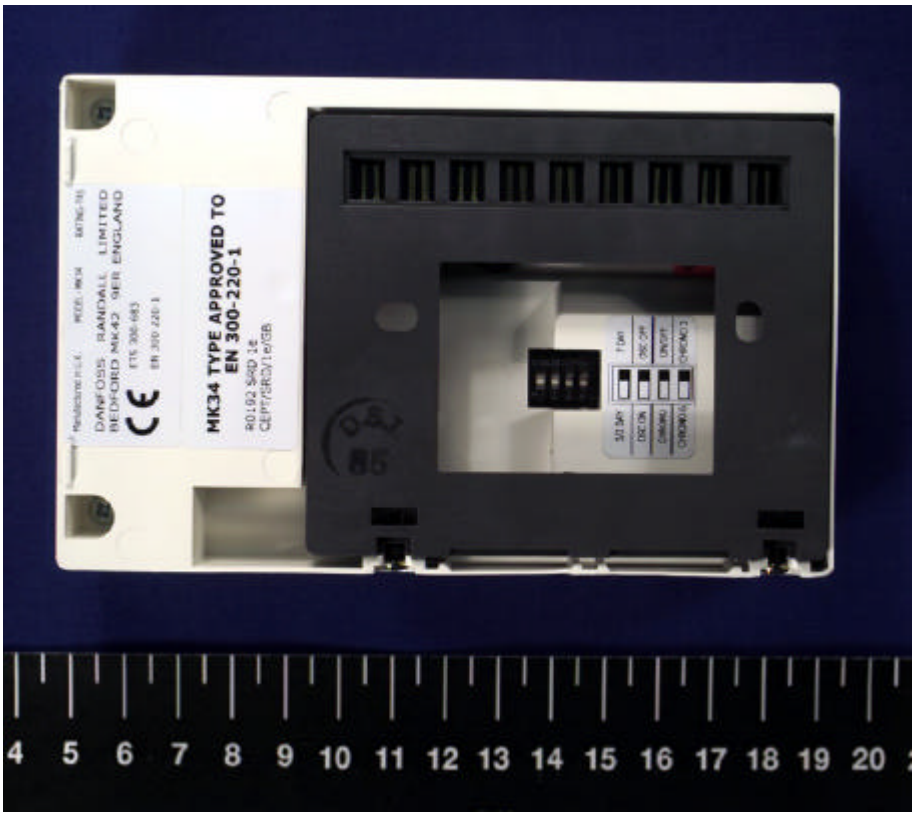
Test Instruments used: TMS 6,10,35,81,118,120,904,916,917,933

PHOTOGRAPHS OF EQUIPMENT

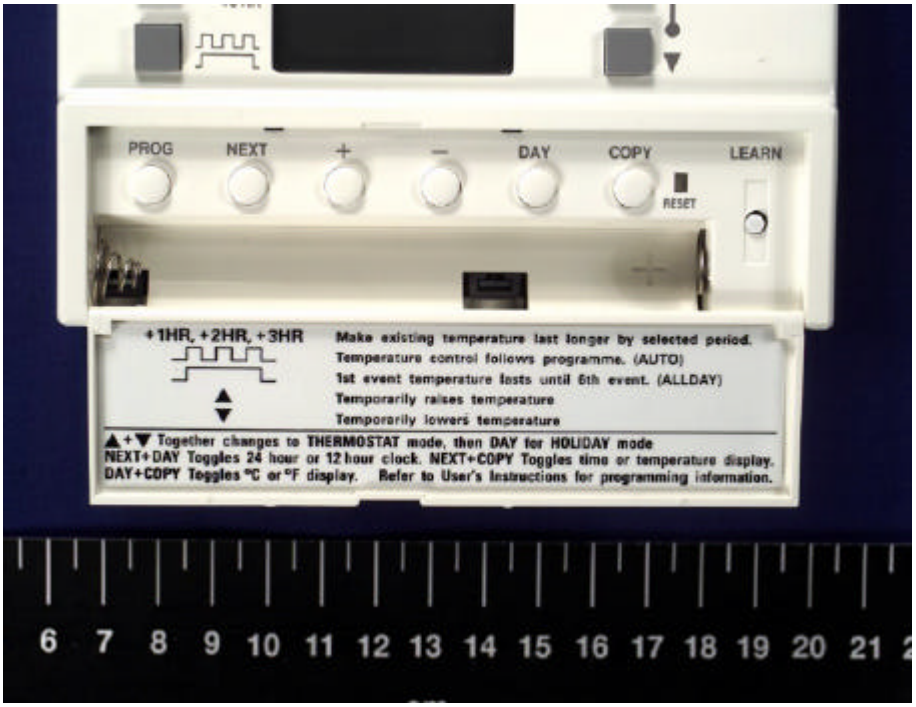
Transmitter Front View



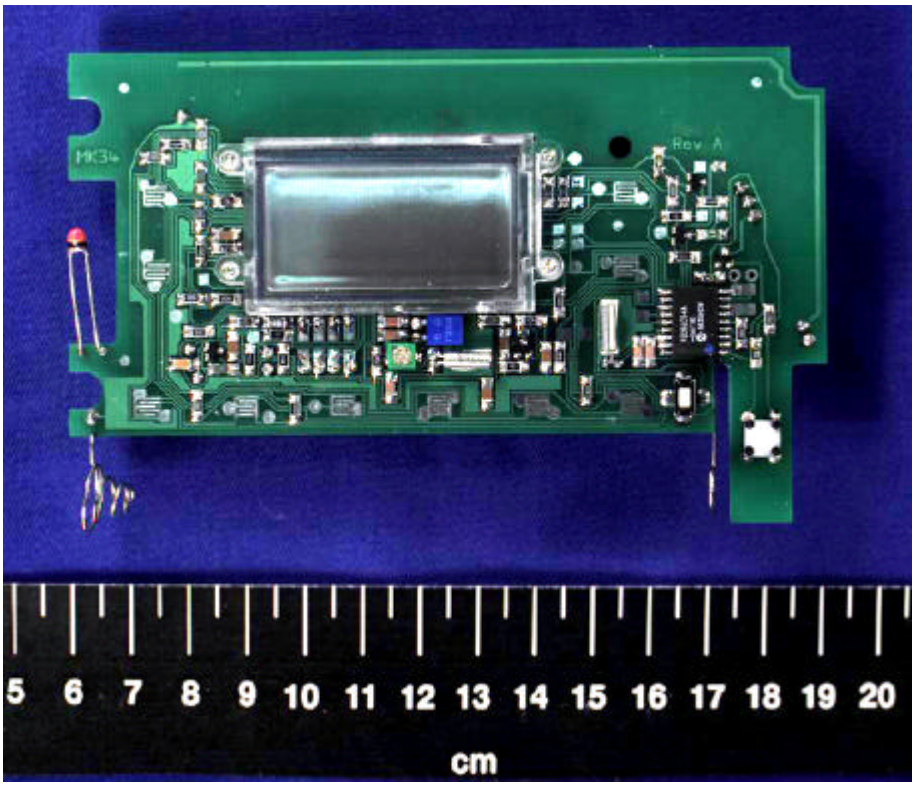
Transmitter Back View



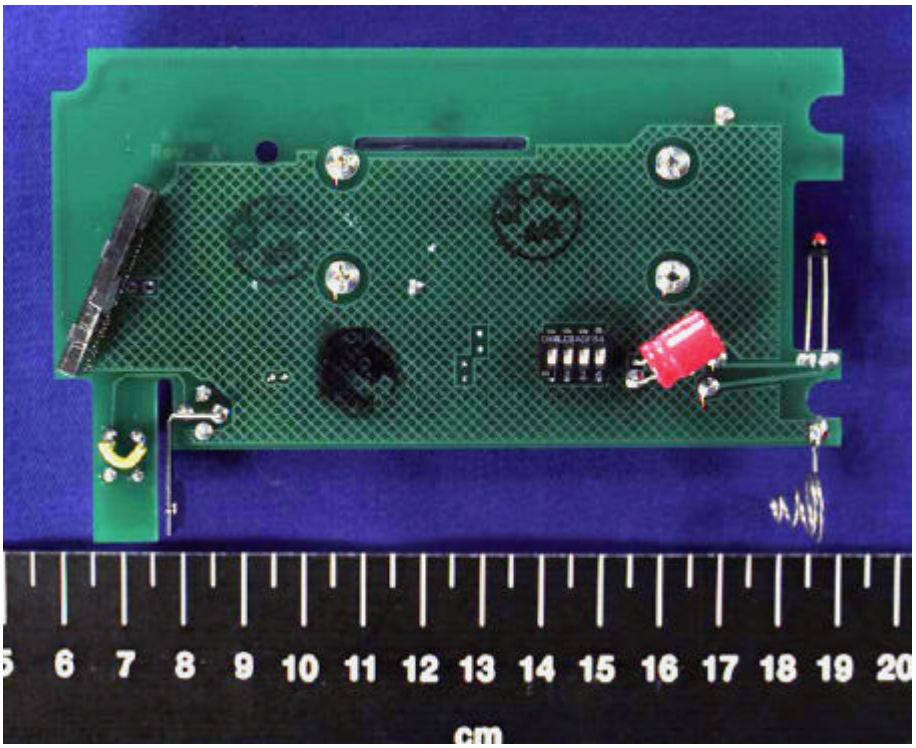
Transmitter External Controls



Transmitter PCB View 1



Transmitter PCB View 1



CTMS LTD, Company Accreditations & Credentials

United Kingdom Accreditation Service

ACCREDITATION CERTIFICATE

TESTING LABORATORY
No. 1831

Cambridge Test and Measurement Services Ltd
PO Box 465
St Andrews Road
Cambridge
CB4 1ZJ

is accredited to undertake tests as detailed in the schedule bearing the accreditation number above. From time to time this schedule may be revised and reissued by the United Kingdom Accreditation Service.

This Accreditation shall remain in force until the expiry date printed below, subject to continuing compliance with United Kingdom Accreditation Service requirements. Accredited organisations meet the requirements of EN 45001, ISO/IEC Guide 25 and the relevant requirements of the BS EN ISO 9000 series of standards, including those of the model described in BS EN ISO 9002 when acting as suppliers producing test results.

Initial Accreditation 11 June 1997

Accreditation Manager, United Kingdom Accreditation Service

This certificate issued on 16 June 2000 **Expiry date 31 May 2001**

The Department of Trade and Industry (DTI) has entered into a memorandum of understanding with the United Kingdom Accreditation Service (UKAS) through which UKAS is recognised as the national body responsible for assessing and accrediting the competence of organisations in the fields of measurement, testing, inspection and certification of systems, products and personnel.

SGS Yarsley
International Certification Services Limited

Certificate Number

Q10171

This is to certify that the
Quality Management systems of

Cambridge Test and Measurement Services Limited

have been assessed and registered as meeting the requirements of ISO 9002

The scope of registration is detailed on the Assessment Schedule bearing this certificate number.

SGS Yarsley International Certification Services Ltd
Signed by

30 June 1997

This certificate remains valid subject to satisfactory maintenance of the system

Registered Office:
SGS Yarsley
International Certification Services Limited
SGS House, 217/221 London Road,
Camberley, Surrey GU15 3EY, United Kingdom.

NATIONAL ACCREDITATION OF CERTIFICATION BODIES
Registration Number
005

Member of the SGS Group (Société Générale de Surveillance)

United Kingdom Accreditation Service

TESTING LABORATORY
No. 1831

SCHEDULE

Testing Performed at Permanent Laboratory

Address of permanent laboratory	Laboratory contact: Mr D Fisher
Cambridge Test & Measurement Services Ltd PO Box 465 St Andrews Road Cambridge CB4 1ZJ	Telephone: +44 (0) 1223 876876 Fax: +44 (0) 1223 876851 EMail: Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
Computers and peripherals Domestic appliances Electrical/Electronic components Electrical/Electronic products Telecommunications equipment IT equipment Pager and pager devices Mobile/Portable radio - PMR PMR and ancillary equipment Fixed/Link PMR equipment Low power devices	**1 EMC TESTS** 1.1 Conducted Emissions 150 kHz to 30 MHz	EN 55011:1997 EN 55014:1993 Discontinuous emissions EN 55022:1994 CISPR 14-1:1997 Disturbance power CISPR 22:1993 FCC Part 15:1996 ANSI C63.4:1992
	1.2 Radiated Emissions - Electric Field 30 MHz to 1 GHz	EN 55011:1997 EN 55022:1994 CISPR 22:1993 FCC Part 15:1996 ANSI C63.4:1992
	1.3 Mains Harmonics and Flicker	EN 61000-3-2:1995 EN 61000-3-3:1995
	1.4 Discontinuous Emissions (Clicks): 10 kHz to 30 MHz	EN 55014-1:1997
	1.5 Power Absorbing Emissions Measurements (Power Clamp) 30 MHz to 300 MHz	EN 55014-1:1997
	Continued on Sheet 2	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 1	**1 EMC TESTS** (cont'd)	
	1.6 Electrostatic Discharge Up to 15 kV	IEC 801-2:1991 IEC 1000-4-2:1995 EN 61000-4-2:1995
	1.7 Radiated Immunity 80 MHz to 1000 MHz, 1.4 GHz to 2.0 GHz up to 10 V/m	IEC 1000-4-3:1995 EN 61000-4-3:1996 Including Amendment 1:1998 ENV 50140:1993 ENV 50204:1995
	1.8 Fast Transient and Burst Immunity	IEC 801-4:1988 IEC 1000-4-4:1995 EN 61000-4-4:1995 ISO 7637:Part 1:1990
	1.9 Surge Immunity	IEC 1000-4-5:1995 EN 61000-4-5:1995 ENV 50142:1994
	1.10 Conducted Radio Frequency Disturbance	IEC 61000-4-6:1996 EN 61000-4-6:1996 ENV 50141:1993
	1.1 Mains Dips and Interruptions	IEC 1000-4-11:1994 EN 61000-4-11:1994
	1.12 Magnetic Field Immunity	EN 61000-4-8:1994
	Continued on Sheet 3	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 1	**1 EMC TESTS** (cont'd) 1.13 EMC Tests These generic and product specific tests are included in this Schedule, but limited to those basic standards that are explicitly listed in Sections 1.1 to 1.10.	Generic and Product Standards EN 50081-1:1992 EN 50081-2:1994 EN 50082-1:1996 EN 50082-2:1996 EN 50130-4:1995 EN 50199:1995 EN 55024:1998 EN 60601-1-2:1993 EN 60945:1997 EN 61000-6-2:1999 EN 61326:1997 ETS 300 279:1995 ETS 300 329:1997 ETS 300 339:1994 ETS 300 340:1994 ETS 300 342-1:1997 ETS 300 445:1996 ETS 300 446:1997 ETS 300 680-1:1997 ETS 300 682:1997 ETS 300 683:1997 ETS 300 684:1997 ETS 300 717:1997 ETS 300 741:1998 ETS 300 826:1997 ETS 300 827:1998 AS/NZS 2064:1997 AS/NZS 3548:1995 AS/NZS 4251.1:1994
Fixed, Mobile, Portable radio equipment PMR and ancillary equipment Low power telemetry Low power telecommand Low power devices Maritime (VHF) Ship to shore Maritime (VHF) Shore stations	**2 RADIO TESTS** Frequency range: 9 kHz to 4 GHz Power Output up to 150 W Tests on Radio Transmitters 2.1 Frequency 2.2 RF Power, conducted and radiated 2.3 Modulation 2.4 Adjacent channel power Continued on Sheet 4	MPT 1250:1978 MPT 1251:1973 MPT 1305:1996 MPT 1308:1978 MPT 1312:1993 MPT 1314:1994 MPT 1325:1998 MPT 1328:1997 MPT 1329:1994

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
As listed on Sheet 3	**2 RADIO TESTS** (cont'd)	
	2.5 Spurious Emissions - conducted and radiated	MPT 1330:1994 MPT 1335:1993
	2.6 Transmitter intermodulation	MPT 1336:1992
	2.7 Transmitter transient behaviour	MPT 1338:1994
	2.8 Audio response	MPT 1340:1997
	2.9 Audio distortion	MPT 1344:1994 MPT 1345:1994
	Tests on Radio Receivers	MPT 1350:1994 MPT 1357:1996
	2.10 Sensitivity - SINAD	MPT 1360:1994
	2.11 Adjacent channel selectivity	MPT 1361:1994
	2.12 Receiver intermodulation	MPT 1365:1996
	2.13 Co-channel rejection	MPT 1374:1994
	2.14 Blocking performance	MPT 1382:1997
	2.15 Spurious emissions - conducted and radiated	MPT 1411:1993 MPT 1601:1993
	2.16 Audio response	ETS 300 086:1991
	2.17 Audio distortion	ETS 300 113:1995 ETS 300 135:1991 ETS 300 162:1998 ETS 300 219:1993 I-ETS 300 220:1992 I-ETS 300 296:1994 ETS 300 328:1996 ETS 300 330:1990 ETS 300 390:1996 ETS 300 341:1995 I-ETS 300 422:1995 ETS 300 440:1999 ETS 300 454:1995 ETS 300 676:1997 ETS 300 719-1:1996 EN 300 220-1:1997 EN 300 220-2:1997 EN 300 422:V1.2.1:1999 EN 301 178:1999 EN 301 357:V1.1.1:1999 EN 301 688:1999 AS 4268.2:1995 AS 4295:1995
	Continued on Sheet 5	

United Kingdom Accreditation Service

TESTING LABORATORY No. 1831 **Testing Performed at Permanent Laboratory**	**SCHEDULE** Issue No: 7 Date: 16 June 2000

Materials/Products Tested	Type of Test/Properties Measured Range of Measurement	Standard Specifications Equipment/Techniques Used
	Facilities: Open area test site: 3, 10 and 30 m Screened Room (Partially Lined RF Absorber) 6.4 m x 4.9 m x 2.8 m Screened Room (unlined) 3.7 m x 2.6 m x 2.5 m Screened Room (unlined) 3.0 m x 2.4 m x 2.4 m Environmental Chambers (various)	
	END	

Issued by the United Kingdom Accreditation Service, 21-47 High Street, Feltham, Middlesex, TW13 4UN (AM = AMP) (1831C0_007) Sheet 5 of 5