REPORT ON

FCC Part 15 Testing in support of an Application for Grant of Equipment Authorisation
of a Symbol PDT687C Portable Data Terminal
FCC ID: H9PPDT687C

Report No OR610828/2 May 2003

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REPORT ON FCC Part 15C Testing in support of an Application for Grant of Equipment Authorisation of a Symbol PDT687C Portable Data Terminal

FCC ID: H9PPDT687C

Report No OR610661/2

May 2003

PREPARED FOR Symbol Technologies Inc
One Symbol Plaza
NY11742
United States

APPROVED BY

C H GOULD
Chief Engineer

DATED 02-05-03

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STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Portable Data Terminal
APPLICANT	Symbol Technologies Inc One Symbol Plaza NY11742 United States
MANUFACTURERS MODEL NUMBER	PDT687C
SERIAL NUMBER	M1E7284W
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C
REGISTRATION NUMBER	OR610828
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status OR610828 10th April 2003
DISPOSAL REFERENCE NUMBER DATE	Held pending disposal N/A N/A
START OF TEST FINISH OF TEST	14th March 2003 8th May 2003
TEST ENGINEERS	S C Hartley P J Harrison A Blagg
RELATED DOCUMENTS	ANSI C63.4 2001. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

TEST RATIONALE

PDT687C – FCC ID H9PPDT687C
The PDT687C is a Portable Data Terminal, which offers 2.4GHz Wireless LAN (11Mbps DSSS) connectivity.
The terminal utilizes the Cisco Systems Inc 2.4GHz Wireless LAN Module, which is approved to FCC Part 15 Subpart C. The FCC ID of the module is LDK 102040.
Section 3 of the report details testing carried out in accordance with:

- FCC: Part 15.247(c), Radiated Electric Field Emissions
- FCC: Part 15.247(b), Maximum Peak Output Power

SYSTEM CONFIGURATION DURING EMC TESTING

The EUT was set-up simulating a typical user installation on the Alternative Open Field Test Site identified on page 25, and tested in accordance with the specification.

The test software in the EUT enabled the Test Engineer to select full power and continuous transmit on the following channels;

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

TEST SETUP PHOTOGRAPH

The photograph below shows the EUT configuration during Radiated Emission testing.

Photograph 1

EQUIPMENT INFORMATION

Equipment under Test (EUT):

Equipment:	PDT687C Portable Data Terminal
Manufacturer:	Symbol Technologies Inc
Type No:	PDT687C
Serial No:	M1E72U85A
Drawing Revision:	Not Supplied

Instrumentation used for Emission Testing:

Instrument	Manufacturer	Type No	EMC No	Cal to
Turntable & Controller	HD GmbH	HD 050	2528	TU
Antenna Mast	Emco	1051	2182	TU
Antenna Mast Controller	Emco	1050	2090	TU
Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-13P	2457	TU
Spectrum Analyser	Hewlett Packard	8562A	1427	10 Jan 04
Horn	EMCO	3115	2397	29 Jun 03
Signal Generator	Rohde & Schwarz	SMR40	2768	TU
Low Noise Amplifier (8-18GHz)	Avantek	AWT 18036	1081	TU
Low Noise Amplifier (18-26GHz)	Avantek	AMT-26177-33	2072	TU
Horn	FMI	2024/20	1396	TU
Waveguide to Coax Adaptor	FMI	2093SF40	S/N 595	TU
4GHz High Pass Filter	RLC Electronics	F-100-4000-5-R	INV 04468	TU

Instrumentation used for Maximum Power measurements

Instrument	Manufacturer	Type No	EMC No	Cal to
Signal Generator	Agilent	ESG4000	3709	21/01/04
Spectrum Analyser	Rohde Schwarz	FSEM	4034	16/12/03
Peak Power Analyser	HP	8990A	1670	30/07/03
Peak Power Sensor	HP	84812A	1662	30/07/03
DRG Horn Antenna	EMCO	3115	3777	20/01/04
Attenuator	Lucas Weinscheil	1	2651	11/07/03

TU - Traceability Unscheduled

RADIATED ELECTRIC FIELD EMISSIONS (Transmitter Portion)

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(c), for Radiated Electric Field Emissions was carried out on the Measurement Test Facility detailed on page 25.

A preliminary profile of the Radiated Electric Field Emissions was obtained by operating the Equipment Under Test (EUT) on a remotely controlled turntable within a semi-anechoic chamber; measurements were taken at a 3m distance unless otherwise stated. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 25GHz. The list of worst case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured utilizing quasi-peak and average detectors.

The test was performed in accordance with ANSI C63.4.

Measurements were made with the EUT transmitting on the following channels.

Channel 1: 2412MHz
Channel 6: 2437MHz
Channel 11: 2462MHz

Radiated Emissions from 30MHz to 25GHz were made using a Hewlett Packard 8562A Spectrum Analyser.

RADIATED ELECTRIC FIELD EMISSIONS (cont'd)

TEST RESULTS

Equipment Designation: Intentional Radiator.

The EUT met the requirements of FCC Part 15.247(c) for Radiated Electric Field Emissions.

The emissions were measured at 3m unless otherwise indicated.

EUT Tx on Bottom Channel (2.412GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
0.360	H	101	95	32.1*	46.0	-	-
0.392	H	100	260	31.4*	46.0	-	-
0.440	H	198	253	33.0*	46.0	-	-
2.486	V	100	296	53.4	74.0	44.0	54.0

* Note, In accordance with the specification these measurements were made Quasi-Peak.

EUT Tx on Middle Channel (2.437GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
0.352	H	102	255	30.7*	46.0	-	-
0.392	H	100	262	30.7*	46.0	-	-
0.440	H	199	246	30.7*	46.0	-	-
2.486	V	100	296	53.8	74.0	44.5	54.0

* Note , In accordance with the specification these measurements were made Quasi-Peak.

RADIATED ELECTRIC FIELD EMISSIONS

TEST RESULTS (cont'd)

EUT Tx on Top Channel (2.462GHz)

Frequency	Antenna			Field Strength (Peak) at 3m	Limit (Peak)	Field Strength (Average) at 3m	Limit (Average)
	Polarisation	Height	Azimuth				
GHz	H/V	cm	Deg	dBµV/m	dBµV/m	dBµV/m	dBµV/m
0.360	H	101	88	32.7*	46.0	-	-
0.368	H	100	266	32.7*	46.0	-	-
0.440	H	197	245	31.7*	46.0	-	-
2.486	V	100	296	54.8	74.0	44.8	54.0

* Note , In accordance with the specification these measurements were made Quasi-Peak.

Procedure: Test Performed in accordance with ANSI C63.4.

Performed by: S C Hartley and P J Harrison, EMC Engineers.

Signatures: _____ _____

Date: 15th March 2003

MAXIMUM PEAK OUTPUT POWER

TEST PROCEDURE

Testing to the requirements of FCC Part 15 Subpart C, Section 15.247(b)(3), for Maximum Peak Output Power was carried out.

The Spectrum Analyser was tuned to the test frequency. The device output power setting was controlled via the 'Test Mode' on the EUT. The device was then rotated through 360 degrees until the highest power level was observed in both planes of polarisation. The device was then replaced with a substitution antenna, the signal to the antenna was adjusted to equal the related level detected from the device.

Maximum Peak Output Power measurements were made with the EUT set to continuous transmit at maximum power, using test software supplied by the client, on the following channels:

Channel 1: 2412MHz
Channel 6: 2347MHz
Channel 11: 2462MHz

Due to the wideband nature of DSS signals, it was not possible to measure the true maximum power using a spectrum analyser. Therefore, a comparison was made between a spectrum analyser with RBW and VBW at 1MHz and a Peak Power Analyser, (HP8990A), which has sufficient bandwidth for measurement of spread spectrum signals. Making a measurement on each instrument, a correction factor was established and applied to the radiated result made on the spectrum analyser.

ANALYSER SETTING FOR POWER MEASUREMENT

Resolution Bandwidth set to 1MHz and Video Bandwidth to 1MHz.
Bandwidth of Peak Power Analyser set at 150MHz.
Correction factor between Spectrum Analyser on 1MHz RBW and VBW and Peak Power Analyser: 4.41dB, used for DSS modulation only.

TEST RESULTS

The EUT met the requirements of FCC Part 15.247(b)(1) for Maximum Peak Output Power.

MAXIMUM POWER – POWER SETTING SET ON PDT687C TO B7

DSS MODULATION

Channel 1	18.10dBm ERP, (64.57mW)
Channel 6	19.33dBm ERP, (85.70mW)
Channel 11	19.80dBm ERP, (95.50mW)

The equipment under test was below the required 1W (30dBm) limit specified in FCC Part 15 Subpart C, Section 15.247(b)(3).

Performed by: A Blagg, Radio Engineer.

Signature: 

Date: 8th May 2003

PHOTOGRAPHS OF THE SYMBOL PDT687C

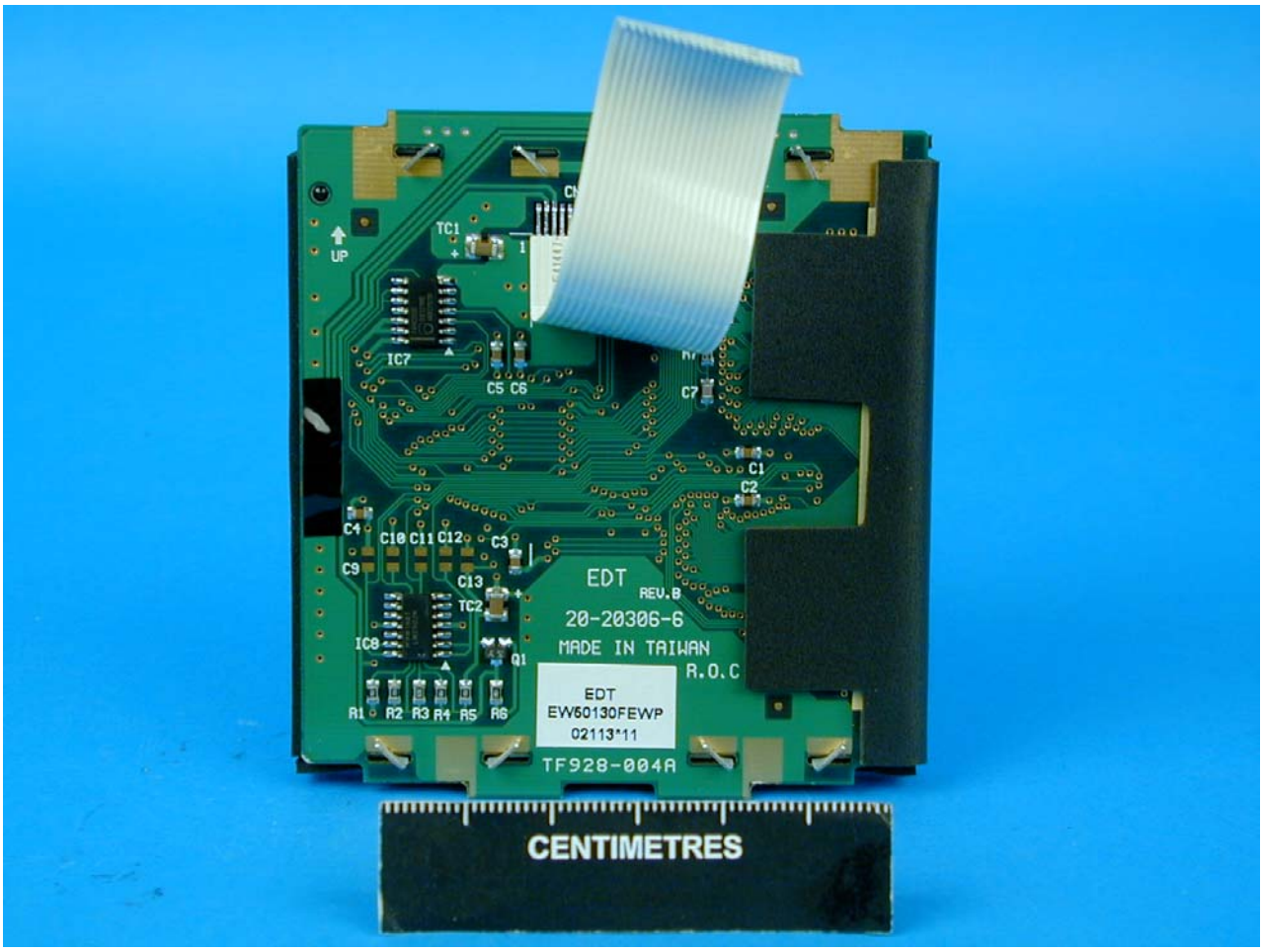
PHOTOGRAPHS OF EQUIPMENT

Photograph 2
Front View of PDT687C

PHOTOGRAPHS OF EQUIPMENT

Photograph 3
Rear View of PDT687C

PHOTOGRAPHS OF EQUIPMENT

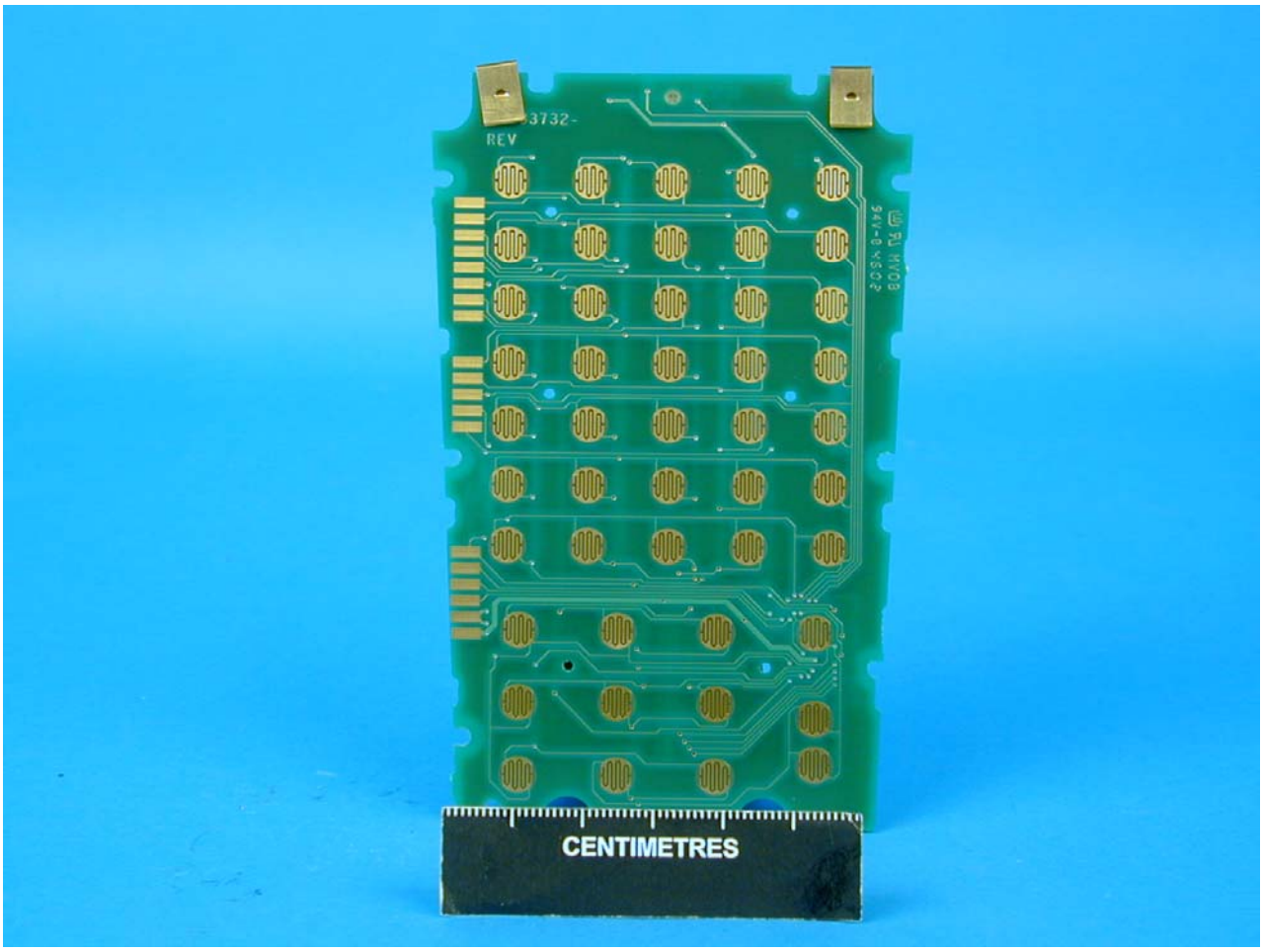


Photograph 4
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT

Photograph 5
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT

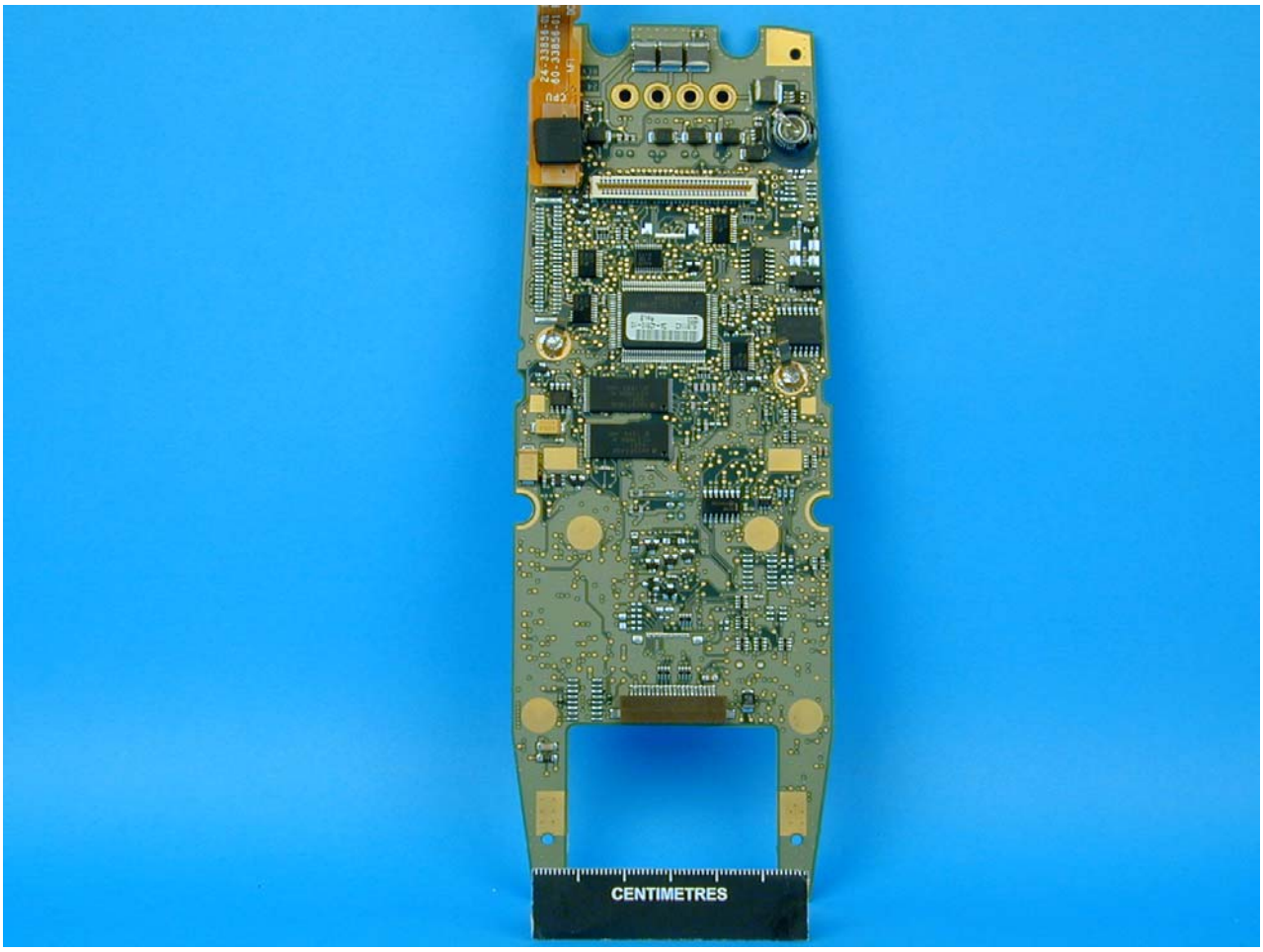


Photograph 6
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT

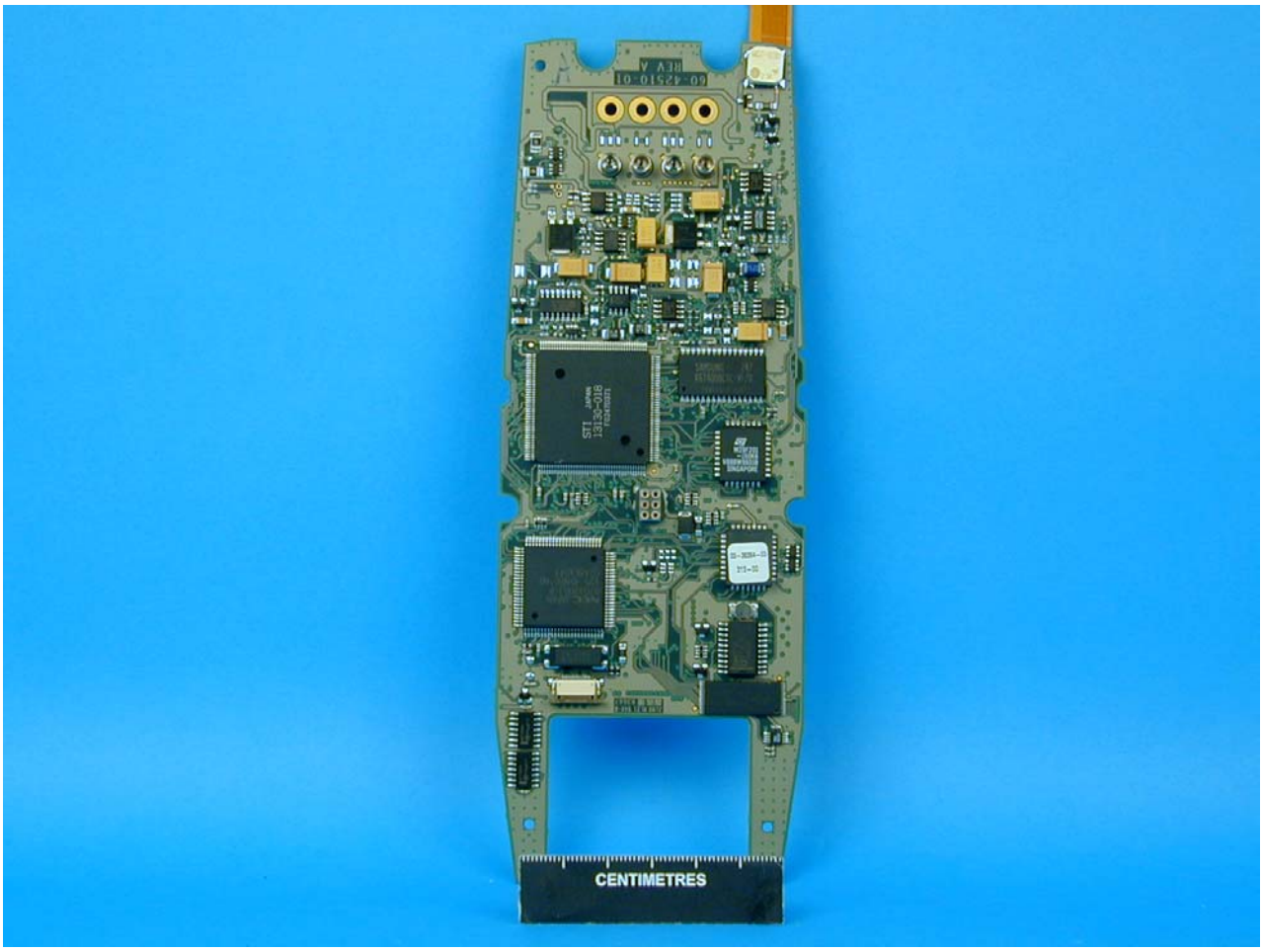
Photograph 7
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT



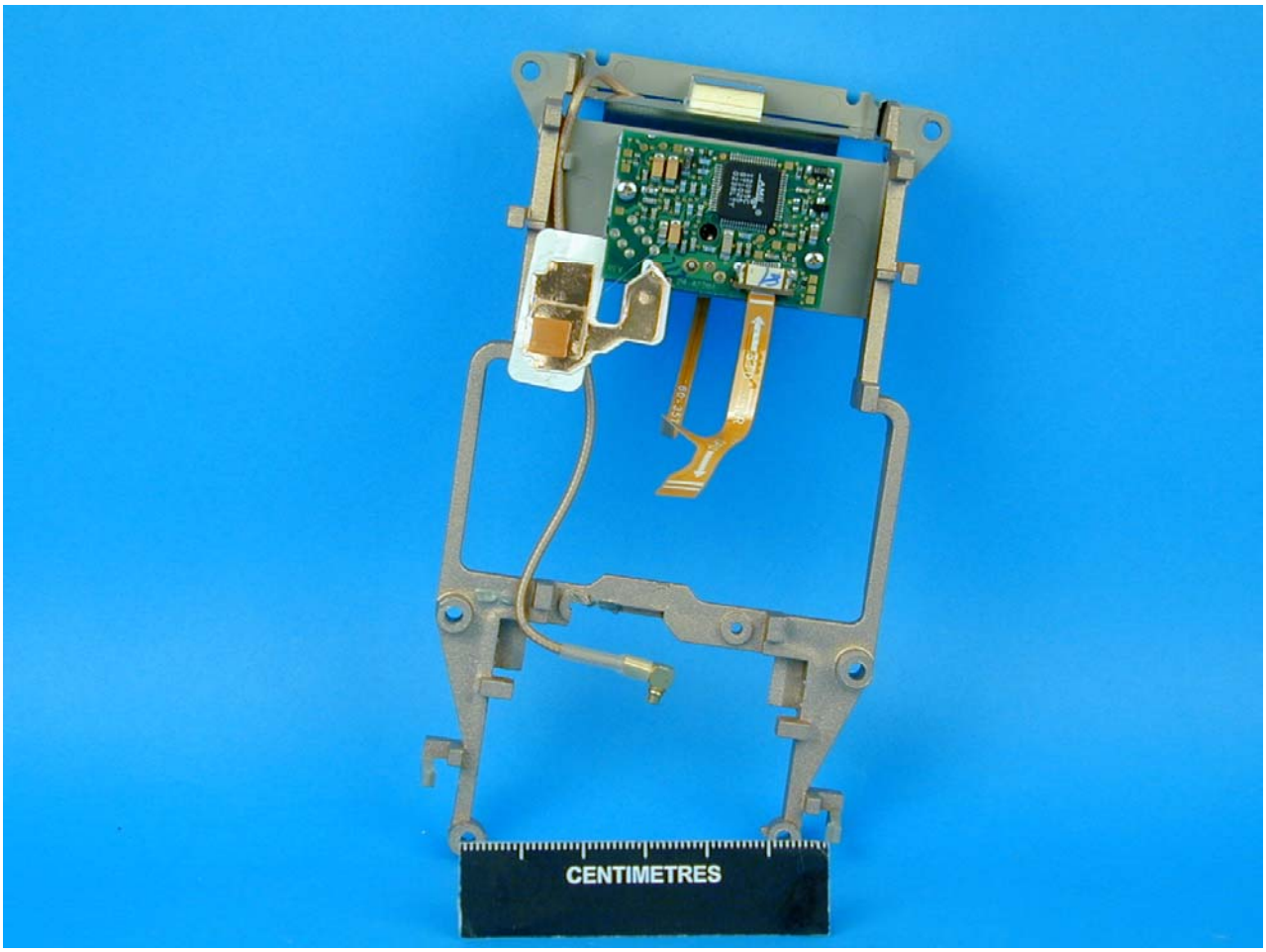
Photograph 8
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT



Photograph 9
Internal View PDT687C

PHOTOGRAPHS OF EQUIPMENT



Photograph 10
Internal View PDT687C

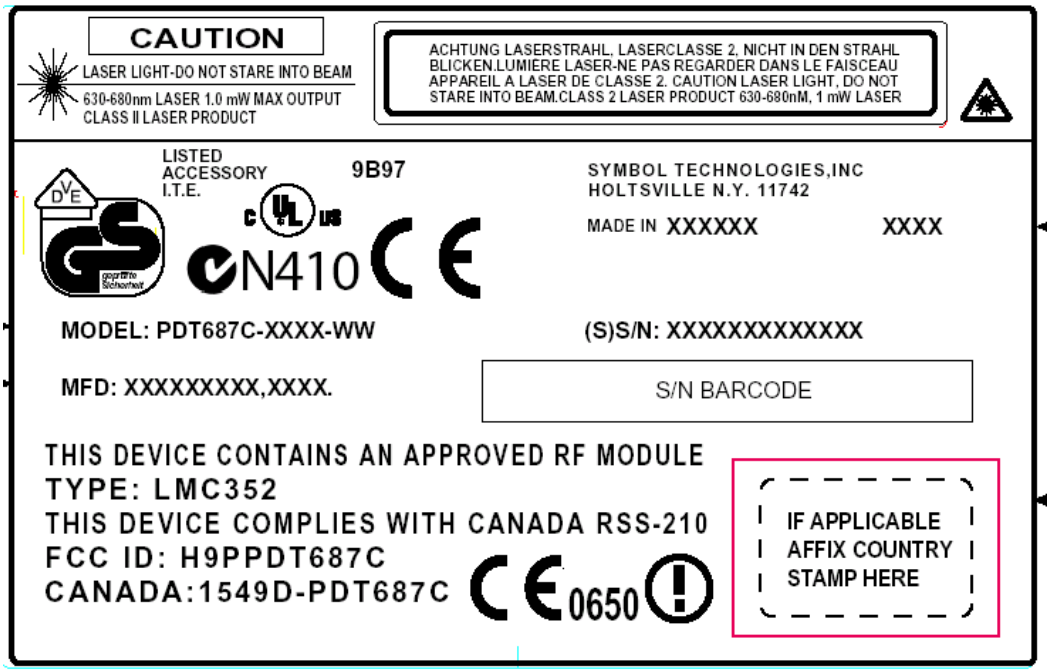
PHOTOGRAPHS OF EQUIPMENT

Photograph 11
Label View of Cisco LMC352 Wireless LAN Module

PHOTOGRAPHS OF EQUIPMENT

Photograph 12
View of Cisco LMC352 Wireless LAN Module

Manufacturers Label Diagram



Not To Scale

FCC SITE COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

October 18, 2002

Registration Number: 90987

TUV Product Service Ltd
Segensworth Road
Titchfield
Fareham, Hampshire, PO15 5RH
United Kingdom
Attention: Kevan Adsetts

Re: Measurement facility located at Titchfield
Anechoic chamber (3 meters) and 3 & 10 meter OATS
Date of Listing: October 18, 2002

Gentlemen:

Your request for registration of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC rules. The information has, therefore, been placed on file and the name of your organization added to the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Thomas W Phillips
Electronics Engineer

MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems, are :-

In the frequency range 30MHz to 1000MHz

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard EMI Receiver:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	+4.45dB (30-200MHz; 3m Measurements) -4.42dB (30-200MHz; 3m Measurements) +4.80dB (200-1000MHz; 3m Measurements) -3.81dB (200-1000MHz; 3m Measurements)

In the frequency range 1GHz to 25GHz

For Radiated Emissions measurements:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	±3.0dB (1-25GHz; 3m Measurements)

For Effective Radiated Power (ERP) measurements:-

Amplitude	±1.45dBm

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Group

This report relates only to the actual item/items tested.

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Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).