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REPORT ON: EMC Testing of the GSP-1600 Globalstar Tri Mode User Terminal in accordance with EN 300 831 V1.1.1; March 1998

Report No OR605801

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DATED 18th June 1999

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Contents

SECTION 1 - PRE-TEST INFORMATION

The following pages detail the test set up and pass/fail criteria.

STATUS

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Globalstar Tri Mode User Terminal
MANUFACTURER	Qualcomm Incorporated
MANUFACTURERS MODEL NUMBER	GSP-1600
SERIAL NUMBER	N1062HKGX
HARDWARE REVISION	Digital CCA 20-81403 X2 RF CCA 20-81545
SOFTWARE REVSIONS	4.3
TEST SPECIFICATION NUMBER	EN 300 831 V1.1.1; March 1998
TEST PLAN	80-98441-1
REGISTRATION NUMBER	YOR605801
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE DATE	Manufacturer's declaration (see Section 2) 12-04-99
ORDER NUMBER DATE	TO00010 12-04-99
START OF TEST FINISH OF TEST	13-04-99 21-04-99
TEST ENGINEERS	M Hardy
RELATED DOCUMENTS	EN 55022; 1994 CISPR 16-1; 1993 EN 61000-4-2; 1995 EN 61000-4-3; 1996 EN 61000-4-4; 1995 EN 61000-4-5; 1995 EN 61000-4-6; 1996 EN 61000-4-11; 1994

FUNCTIONAL DESCRIPTION AS DECLARED BY THE MANUFACTURER

The GSP-1600 is a Portable-Mobile Earth Station (MES), designed for use within the Globalstar Satellite Communications Network system. Testing reported in this document pertains only to the variation detailed in Section 2.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

MODES OF OPERATION AS DECLARED BY THE MANUFACTURER

Testing was performed in accordance with Qualcomm EMC Test Plan [Document No: 80-98441-1].

The EUT comprised of a GSP-1600 Portable-MES User Terminal (UT), powered by a GSP-1220 AC charging accessory.

Link Mode

For immunity and emission tests, a direct RF link was established between the EUT and the Anritsu MT 88803G Globalstar UT tester with the following communication link parameters:

- Rx Channel 63 (Frequency 2491.77MHz)
- Tx Channel 250 (Frequency 1168.11MHz)
- Transmit at maximum rated power
- Service Option 2001
- Beam Monitor Power set for -17.4dB Ec/Io (sets EUT signal strength to a level seen in normal operation)

The link was maintained during the test with no intentional tone present, with the digital deskset volume set to level 4.

Idle Mode

With the EUT configured as described above, the EUT placed in an idle state with the Forward Channel and Transmission carrier disabled.

MONITORING OF PERFORMANCE AS DECLARED BY THE MANUFACTURER

Link Mode

During all immunity tests, the EUT was monitored to ensure that the communications link was maintained throughout testing. In link mode, the Call Proc status display on the MT 8803G test set indicated that the EUT was in link mode when 'Conversation' was displayed. Any change to this display indicated that the loss of the communications link.

The UT software was configured to return the FER to the MT 8803G test set for continuous display. The display was monitored throughout the continuous phenomena immunity tests, to ensure that the FER did not exceed 0.01.

At the start and completion of all tests, functionality tests were carried out to ensure that the EUT performance was not degraded.

During the RF Electromagnetic field and RF Common mode immunity tests, the forward link speech channel was monitored for audio breakthrough. The test method described in clause 4.4 of ETS 300 342-1 (EMC standard for European digital telecommunications systems) for monitoring the forward path speech channel, was applied using a limit of 59db SPL.

A calibrated level audio level of 1kHz, 0dBPa (94dB SPL) at the Ear Reference Measurement Point was established prior to testing. The audio signal was received via an acoustic tube and audio transducer, with the AC level measured on an audio analyser, via a measuring amplifier and band pass filter, centered on 1kHz with a 200Hz pass band.

With the link established between the EUT and the MT 8803G test set, the audio breakthrough was assessed against the pre-calibrated audio level of 1kHz at 0 dBPa at the ear reference point, the limit being as least 35 dB lower than this reference level. During the test there was no intentional tone present, the EUT was assessed for a breakthrough of the 1kHz modulation tone present on the RF interference.

MODES OF OPERATION AS DECLARED BY THE MANUFACTURER - continued

Idle Mode

The EUT was monitored throughout the test to ensure no spurious transmissions occurred and that no subsequent call set-up was initiated by the EUT. The RF output from the EUT was checked using a spectrum analyser, connected in-line with the MT 8803G test set. Additionally, the Call Proc status display was monitored to ensure that 'Idle' was shown throughout testing.

TABLE SHOWING MAXIMUM CABLE LENGTHS TO BE FITTED TO APPLICABLE TEST PORTS

Port Type	Identification	N° Off
AC Mains Port	AC Charger (Plug-in)	One
DC Power Port	8.4V DC Power (Charger output) > 1m	One

Table 1

SECTION 2 - TEST RESULTS

CONFIGURATION OF EUT

The EUT was a Portable-MES User Terminal, configured with a charging accessory, as shown in photograph 1. This was set up on a 0.8 metre high bench in a screened room or test hall as applicable. Further details for specific tests are shown on each test result page.

Photograph 1 showing Equipment Configuration

INSTRUMENTATION USED FOR EMISSIONS TESTING

Instrument	Manufacturer	Type No	EMC No
Three Phase LISN	Rohde & Schwarz	ESH3 Z-5	1915
Transient Limiter	Hewlett Packard	11947A	2243
Spectrum Monitor	Rohde & Schwarz	EZM	1416
Test Receiver	Rohde & Schwarz	ESH3	1020
Plotter	Hewlett Packard	-	-
Screened Enclosure 22	Belling Lee	Hybrid	1451
EMI Test Receiver	Hewlett Packard	8542E	2286
Bilog Antenna	Chase	CBL6111	2287
Auto turntable and Controller	British Turntables	-	-
Auto Antenna Mast and Controller	Emco	-	-

Table 2

INSTRUMENTATION USED FOR IMMUNITY TESTING

Instrument	Manufacturer	Type No	EMC No
Amplifier	Amplifier Research	100W1000	2239
Signal Generator	Rohde & Schwarz	SMY01	2187
Signal Generator	Marconi	2031	1980
Isotropic Monitoring System	Amplifier Research	FM/FP 2000	2332
Bilog Antenna	Chase	CBL6111	1963
Bi-directional Coupler	Amplifier Research	DC6180	2363
Computer	Hewlett Packard	Vectra QS/165	CVF2
50Ω Termination Load	JFW	50T-054	2177
50Ω Termination Load	JFW	50T-054	2180
Millivoltmeter	Rohde & Schwarz	URV-5	2215
Power Sensor (9kHz - 2GHz)	Rohde & Schwarz	URV-5	2531
Screened Enclosure 22/23	Belling Lee	Hybrid	1451
Amplifier	Amplifier Research	150L	1922
Injection Probe	Solar	9108-1N	2222
Coupling Decoupling Network	MEB	M3-801/6	2431
ESD Gun	Keytek	MZ-15/EC	2192
Burst Generator	Omiran	EFT-5E	1671
EN 60555 Rack	Spitzenberger & Spies	PHE 4500/B	1769
Surge Generator Mainframe	Keytek	801 Plus	1623
Surge Generator Plug-in	Keytek	M801-5	1624

Table 3

INSTRUMENTATION USED FOR EXERCISING THE EUT

Instrument	Manufacturer	Type No	EMC No
Digital Comms Test Set	Anritsu	MT8803G	-
Spectrum Analyser	Hewlett Packard	8562A	2141

Table 4

EMISSION OVERVIEW TABLE/SUMMARY

Application	Equipment Test Requirements			Reference subclause EN 300 831	Reference document
	F-MES	V-MES	P-MES		
Enclosure/ Ancillary	3	1	1	8.2	EN 55022
DC power in/out	1	1	1	8.3	EN 55022 CISPR 16-1
AC mains	3	1	1	8.4	EN 55022

Table 5

Key to Above Table

F-MES Fixed Mobile Earth Station
V-MES Vehicle mounted Mobile Earth Station
P-MES Portable Mobile Earth Station

1. Not applicable
2. Not applicable, mandatory to other standards
3. Pass
4. Fail

IMMUNITY OVERVIEW TABLE/SUMMARY

Phenomena	Application	Equipment test requirements				
		F-MES	V-MES	P-MES	Reference subclause EN 300 831	Reference Document
RF electro-magnetic field 80-1000MHz	Enclosure	3	1	1	9.2	EN 61000-4-3
Electrostatic discharge	Enclosure	3*	1	1	9.3	EN 61000-4-2
Fast transient common mode	Signal & control ports	1	1	1	9.4	EN 61000-4-4
	DC Input ports	1	1	1	9.4	
	AC Input Ports	3*	1	1	9.4	
RF common mode 0.15-80MHz	Signal & control ports	1	1	1	9.5	EN 61000-4-6
	DC Input ports	1	1	1	9.5	
	AC Input Ports	3	1	1	9.5	
Transient and surges	DC power input ports	1	1	1	9.6	ISO 7637 Parts 1&2
Voltage dips and interruptions	AC mains input power ports	3*	1	1	9.7	EN 61000-4-11
Transient, common & differential mode	AC mains power input ports	3*	1	1	9.8	EN 61000-4-5

Table 6

Key to above Table

F-MES Fixed Mobile Earth Station
V-MES Vehicle mounted Mobile Earth Station
P-MES Portable Mobile Earth Station

1. Not applicable
2. Not applicable, mandatory to other standards
3. Pass
4. Fail

* The EUT was tested with the modification detailed on page 29.

RADIATED EMISSIONS TEST PROCEDURE
(Clause 8.2 - EN 300 831)

ENCLOSURE PORT

The EUT was set up on remotely controlled turntable on the open field site. A preliminary profile of the Radiated Electric Field Emissions was obtained by measurements taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in Horizontal and Vertical Polarisations. The characterisation produced a list of the highest emissions, their bearing and associated antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made of the frequency spectrum from 30MHz to 1000MHz. The list of the highest emissions was then confirmed or updated under Open Site conditions, at a distance of 10m. These emissions were then formally measured using a Quasi-Peak Detector which met the CISPR requirements. The readings were maximised by adjusting the antenna height, polarisation and turntable azimuth, in accordance with the specification. The details of these highest emissions were then recorded in the Job Log Book. Details of the highest emissions are presented in Table 7.

The Radiated Electric Field Emission measurements were made using a Hewlett Packard 8542E EMI Receiver.

The test was performed in accordance with EN 55022.

Measurement Frequency Range :	30MHz - 1000MHz
Measurement Distance :	10 metres
Antenna Height :	1 - 4 metres
Antenna Polarisation :	Vertical & Horizontal
Antenna Types :	Bilog
Receivers	
Bandwidth :	120kHz
Detectors :	Quasi-peak (CISPR time constants)
Type :	See Table 2
Configuration :	Conforming to CISPR 16
EUT Height :	0.8m table
Remarks :	All recorded emissions are the maximum value observed by: (a) rotating the EUT through 360° (b) elevating antenna from 1 to 4 m (c) polarising antenna Horizontal and Vertical (d) manipulation and placement system and power cables

Procedure: Test performed in accordance with EN 55022

Performed by: M Hardy, EMC Engineer

RADIATED EMISSIONS TEST RESULTS
(Clause 8.2 - EN 300 831)

ENCLOSURE PORT

The EUT met the requirements of EN 300 831 (Clause 8.2) for Radiated Emissions from the ancillary equipment. However, the emissions at 449.8MHz was below the specification limit but within the measurement uncertainty of the measurement equipment.

Open Field Results : The level of the highest emission measured in accordance with the specification is presented in Table 7 below :-

Frequency	Pol	Hgt	Azm	F.S at 10m	Spec Limit
MHz	H/V	cm	Deg	dBμV/m	dBμV/m
449.8	V	100	164	34.3	37.0

Table 7

The margin between the specification requirements and all other emissions was 15.0dB or more below the specification limit.

ABBREVIATIONS FOR ABOVE TABLE

H	Horizontal Polarisation	V	Vertical Polarisation
Pol	Polarisation	Hgt	Height
deg	degree	Azm	Azimuth
Spec	Specification	F S	Field Strength

MEASUREMENT UNCERTAINTY

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard Spectrum Analyser, Preselector and Quasi-Peak Adaptor:-

Frequency	$\pm 2 \times 10^{-7}$ x Centre Frequency
Amplitude	+4.40dB (30-200MHz; 10m Measurements) -4.40dB (30-200MHz; 10m Measurements) +3.70dB (200-1000MHz; 10m Measurements) -3.66dB (200-1000MHz; 10m Measurements)

RADIATED EMISSIONS TEST RESULTS
(Clause 8.2 - EN 300 831)

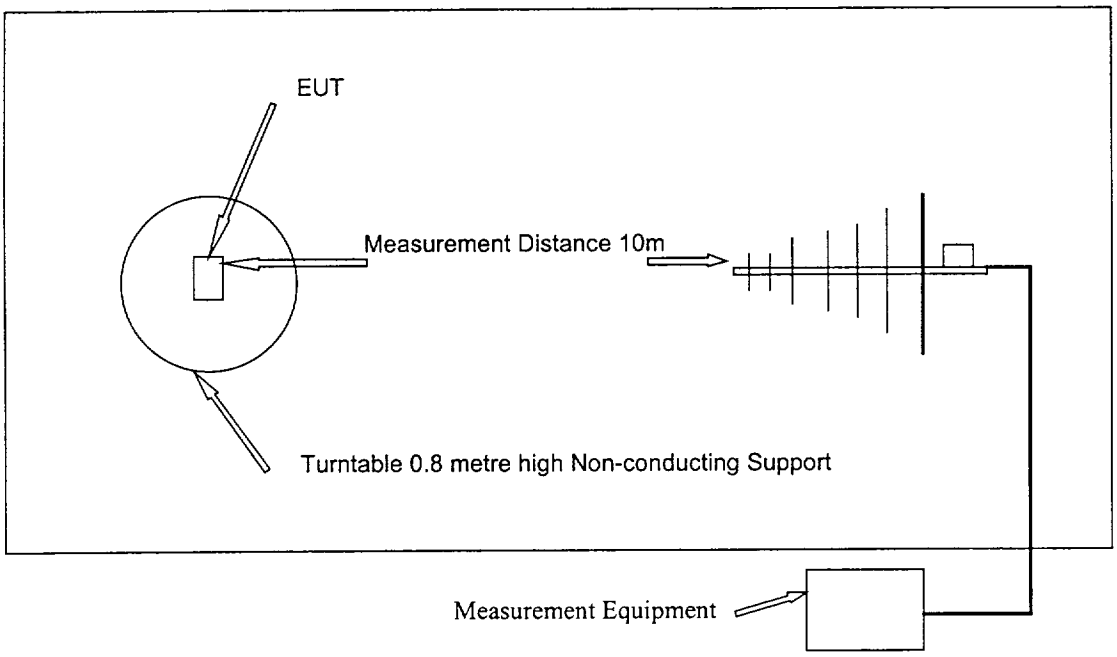


Figure 1

Diagram Showing Test Configuration for Radiated Emissions Measurement
In Accordance With EN 300 831 (Clause 8.2)

AC CONDUCTED EMISSIONS
(Clause 8.4 - EN 300 831)

TEST PROCEDURE

All Conducted Emission Measurements were undertaken within a Screened Enclosure. Conducted Emission measurements were undertaken on the Live and Neutral Lines for both Link and Idle modes of operation.

The emissions were formally measured using both Quasi-Peak and Average Detectors which meet the CISPR requirements. The details of the highest emissions were then recorded in the Job Log Book. Details of the highest emissions for the Live and Neutral Lines are presented in Tables 8 and 9 respectively.

The Conducted Emission measurements were made using a Rohde & Schwarz ESH-3 Test Receiver and EZM Spectrum Monitor.

Measurement Frequency Range	150kHz - 30MHz
Line Voltage	230V AC
Line Frequency	50Hz
LISN Impedance	50ohms/50μH
Receivers	
Bandwidth	9kHz
Detector	Quasi-peak (CISPR Constants)
Type	See table 2
Configuration	Conforming to CISPR 16-1
EUT Height	0.8m table
Remarks	All details in EN55022 1994.

Procedure: Test performed in accordance with EN 55022

Performed by: M Hardy, EMC Engineer

AC CONDUCTED EMISSIONS
(Clause 8.4 - EN 300 831)

RESULTS

The EUT met the requirements of EN 300 831 (Clause 8.4) for Conducted Emissions on the AC mains power input/output port.

Conducted Emissions Live Line

Frequency	Quasi-Peak Level	Average Level	Quasi-Peak Specification Limit	Average Specification Limit	Emission found in Mode
MHz	dBµV	dBµV	dBµV	dBµV	
0.2945	41.1	36.3	60.4	50.4	Link
0.3926	38.5	35.0	58.0	48.0	Link
0.4913	36.3	33.3	56.2	46.2	Link
1.1790	34.2	32.5	56.0	46.0	Link
3.0463	34.3	32.4	56.0	46.0	Link

Table 8

Conducted Emissions Neutral Line

Frequency	Quasi-Peak Level	Average Level	Quasi-Peak Specification Limit	Average Specification Limit	Emission found in Mode
MHz	dBµV	dBµV	dBµV	dBµV	
0.1964	50.4	44.0	63.8	53.8	Link
0.2949	41.8	38.3	60.4	50.4	Link
0.3930	37.5	36.3	58.0	48.0	Link
0.4915	35.8	33.1	56.2	46.2	Link
0.5899	36.1	34.9	56.0	46.0	Link
0.9834	33.0	31.9	56.0	46.0	Link

Table 9

The margin between the specification requirements and all other emissions was 14.8dB or more below the specified Quasi-Peak and 15.1dB or more below the specified Average limit.

AC CONDUCTED EMISSIONS
(Clause 8.4 - EN 300 831) - continued

MEASUREMENT UNCERTAINTY

For Conducted Emissions, Quasi-Peak and Average measurements using a Rohde & Schwarz ESH-3 Test Receiver and EZM Spectrum Monitor:-

Frequency	15ppm + 50kHz
Amplitude	±2.7dB

AC CONDUCTED EMISSIONS
(Clause 8.3 - EN 300 831)

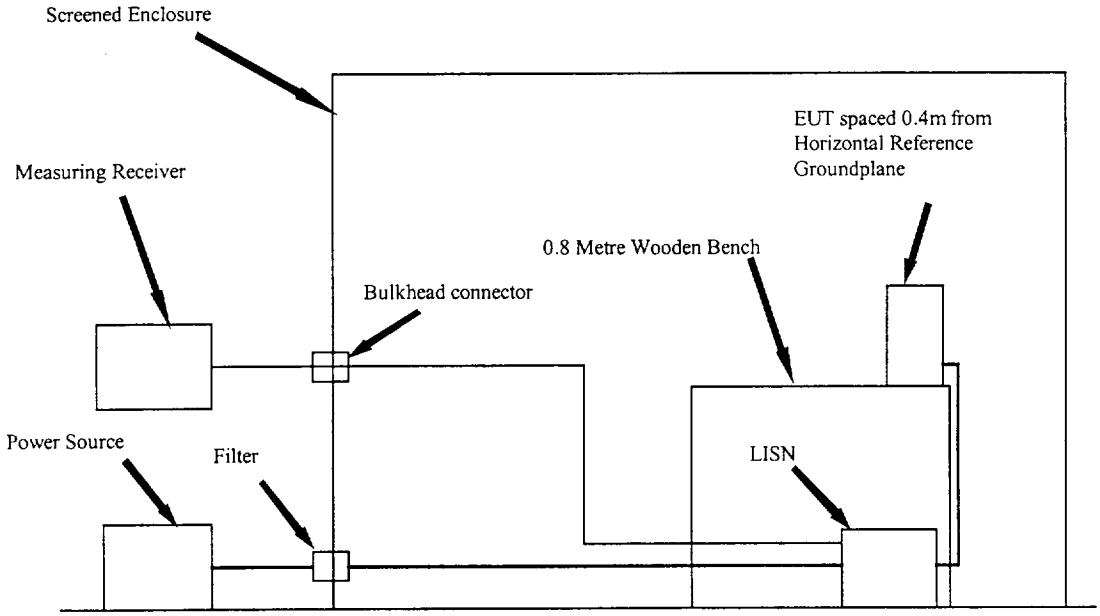


Figure 2

Diagram Showing Test Configuration for Conducted Emission Measurement
In Accordance With EN 300 831 (Clause 8.3)

IMMUNITY TO RADIO FREQUENCY ELECTROMAGENTIC FIELD TEST PROCEDURE (Clause 9.2 - EN 300 831)

ENCLOSURE PORT

The EUT was situated within a screened enclosure. The cables were arranged so that they were illuminated by the interference field. The front and rear faces of the EUT were exposed to the field. Due to the size and construction of the EUT, it was not deemed necessary to test in other orientations.

Test Level	:	3 V/m
Modulation	:	80% amplitude 1 kHz
Dwell Times	:	3 seconds for each step
Stepped Frequency Increments	:	1% of the momentary frequency
Frequency Range	:	80 - 1000 MHz
Exclusion Band Transmit	:	Not applicable – operating frequency greater than 1GHz
Configuration	:	In accordance with EN 61000-4-3

Procedure — Test performed in accordance with EN 61000-4-3.

Performed by — M Hardy, EMC Engineer.

IMMUNITY TO RADIO FREQUENCY ELECTROMAGENTIC FIELD TEST RESULTS (Clause 9.2 - EN 300 831)

Ambient Temperature 21.0°C Relative Humidity 46.5% Atmospheric Pressure 1006mbar

The EUT met the requirements of EN 300 831 (Clause 9.2) for Immunity to Radio Frequency Electromagnetic Field.

MODE	ORIENTATION	SUB-BAND (MHz)	POLARISATION (V/H)	FIELD STRENGTH (V/m)	RESULT
Link	Front	80-1000	V	3.0	COMPLIED
		80-1000	H	3.0	COMPLIED
	Rear	80-1000	V	3.0	COMPLIED
		80-1000	H	3.0	COMPLIED
Idle	Front	80-1000	V	3.0	COMPLIED
		80-1000	H	3.0	COMPLIED
	Rear	80-1000	V	3.0	COMPLIED
		80-1000	H	3.0	COMPLIED

Table 10

The EUT's performance was not degraded below the pass/fail criteria specified below during the test and no narrowband responses were detected using the stepped frequency increments in Table 11.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

IMMUNITY TO RADIO FREQUENCY ELECTROMAGENTIC FIELD TEST RESULTS (Clause 9.2 - EN 300 831) - continued

The Primary functions as described below were fully functional before and after the test.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

MEASUREMENT UNCERTAINTY FOR RADIO FREQUENCY ELECTROMAGNETIC FIELD TESTS

Frequency (Generation)	80MHz to 1000MHz ± 2 parts in 10^6
Modulation Depth	$\pm$(6% of setting + 1%AM)
Modulation Frequency	$<$ 1pp10^9
Amplitude	+0.372 V/m (10kHz to 250MHz) - 0.321 V/m
	+0.585 V/m (250MHz to 1GHz) - 0.483 V/m

For Audio Distortion Measurements

% Total Harmonic Distortion	$\pm$ 1dB

IMMUNITY TO RADIO FREQUENCY ELECTROMAGENTIC FIELD TEST RESULTS
(Clause 9.2 - EN 300 831) - Continued.

FREQUENCY INCREMENTS USED -Link and Idle Modes

Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result
80.0	COMP	103.6	COMP	134.2	COMP	173.8	COMP	225.2	COMP
80.8	COMP	104.7	COMP	135.6	COMP	175.6	COMP	227.4	COMP
81.6	COMP	105.7	COMP	136.9	COMP	177.3	COMP	229.7	COMP
82.4	COMP	106.8	COMP	138.3	COMP	179.1	COMP	232.0	COMP
83.2	COMP	107.8	COMP	139.7	COMP	180.9	COMP	234.3	COMP
84.1	COMP	108.9	COMP	141.1	COMP	182.7	COMP	236.7	COMP
84.9	COMP	110.0	COMP	142.5	COMP	184.5	COMP	239.0	COMP
85.8	COMP	111.1	COMP	143.9	COMP	186.4	COMP	241.4	COMP
86.6	COMP	112.2	COMP	145.3	COMP	188.2	COMP	243.8	COMP
87.5	COMP	113.3	COMP	146.8	COMP	190.1	COMP	246.3	COMP
88.4	COMP	114.5	COMP	148.3	COMP	192.0	COMP	248.7	COMP
89.3	COMP	115.6	COMP	149.7	COMP	194.0	COMP	251.2	COMP
90.1	COMP	116.8	COMP	151.2	COMP	195.9	COMP	253.7	COMP
91.0	COMP	117.9	COMP	152.8	COMP	197.8	COMP	256.3	COMP
92.0	COMP	119.1	COMP	154.3	COMP	199.8	COMP	258.8	COMP
92.9	COMP	120.3	COMP	155.8	COMP	201.8	COMP	261.4	COMP
93.8	COMP	121.5	COMP	157.4	COMP	203.8	COMP	264.0	COMP
94.7	COMP	122.7	COMP	159.0	COMP	205.9	COMP	266.7	COMP
95.7	COMP	123.9	COMP	160.5	COMP	207.9	COMP	269.3	COMP
96.6	COMP	125.2	COMP	162.1	COMP	210.0	COMP	272.0	COMP
97.6	COMP	126.4	COMP	163.8	COMP	212.1	COMP	274.8	COMP
98.6	COMP	127.7	COMP	165.4	COMP	214.2	COMP	277.5	COMP
99.6	COMP	129.0	COMP	167.1	COMP	216.4	COMP	280.3	COMP
100.6	COMP	130.3	COMP	168.7	COMP	218.5	COMP	283.1	COMP
101.6	COMP	131.6	COMP	170.4	COMP	220.7	COMP	285.9	COMP
102.6	COMP	132.9	COMP	172.1	COMP	222.9	COMP	288.8	COMP

Table 11

Key
COMP Complied with Specification
EX Exclusion Band
FAIL Failed to comply with Specification

IMMUNITY TO RADIO FREQUENCY ELECTROMAGENTIC FIELD TEST RESULTS
(Clause 9.2 - EN 300 831) - Continued.

FREQUENCY INCREMENTS USED – Link and Idle Modes

Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result
291.7	COMP	377.8	COMP	489.3	COMP	633.8	COMP	820.9	COMP
294.6	COMP	381.5	COMP	494.2	COMP	640.1	COMP	829.1	COMP
297.5	COMP	385.4	COMP	499.1	COMP	646.5	COMP	837.4	COMP
300.5	COMP	389.2	COMP	504.1	COMP	653.0	COMP	845.8	COMP
303.5	COMP	393.1	COMP	509.2	COMP	659.5	COMP	854.2	COMP
306.5	COMP	397.0	COMP	514.3	COMP	666.1	COMP	862.8	COMP
309.6	COMP	401.0	COMP	519.4	COMP	672.8	COMP	871.4	COMP
312.7	COMP	405.0	COMP	524.6	COMP	679.5	COMP	880.1	COMP
315.8	COMP	409.1	COMP	529.8	COMP	686.3	COMP	888.9	COMP
319.0	COMP	413.2	COMP	535.1	COMP	693.2	COMP	897.8	COMP
322.2	COMP	417.3	COMP	540.5	COMP	700.1	COMP	906.8	COMP
325.4	COMP	421.5	COMP	545.9	COMP	707.1	COMP	915.9	COMP
328.6	COMP	425.7	COMP	551.4	COMP	714.2	COMP	925.0	COMP
331.9	COMP	429.9	COMP	556.9	COMP	721.3	COMP	934.3	COMP
335.2	COMP	434.2	COMP	562.4	COMP	728.5	COMP	943.6	COMP
338.6	COMP	438.6	COMP	568.1	COMP	735.8	COMP	953.0	COMP
342.0	COMP	443.0	COMP	573.7	COMP	743.2	COMP	962.6	COMP
345.4	COMP	447.4	COMP	579.5	COMP	750.6	COMP	972.2	COMP
348.9	COMP	451.9	COMP	585.3	COMP	758.1	COMP	981.9	COMP
352.4	COMP	456.4	COMP	591.1	COMP	765.7	COMP	991.7	COMP
355.9	COMP	460.9	COMP	597.0	COMP	773.3	COMP	1000.0	COMP
359.4	COMP	465.6	COMP	603.0	COMP	781.1	COMP		
363.0	COMP	470.2	COMP	609.0	COMP	788.9	COMP		
366.7	COMP	474.9	COMP	615.1	COMP	796.8	COMP		
370.3	COMP	479.7	COMP	621.3	COMP	804.7	COMP		
374.0	COMP	484.5	COMP	627.5	COMP	812.8	COMP		

Table 11 Continued

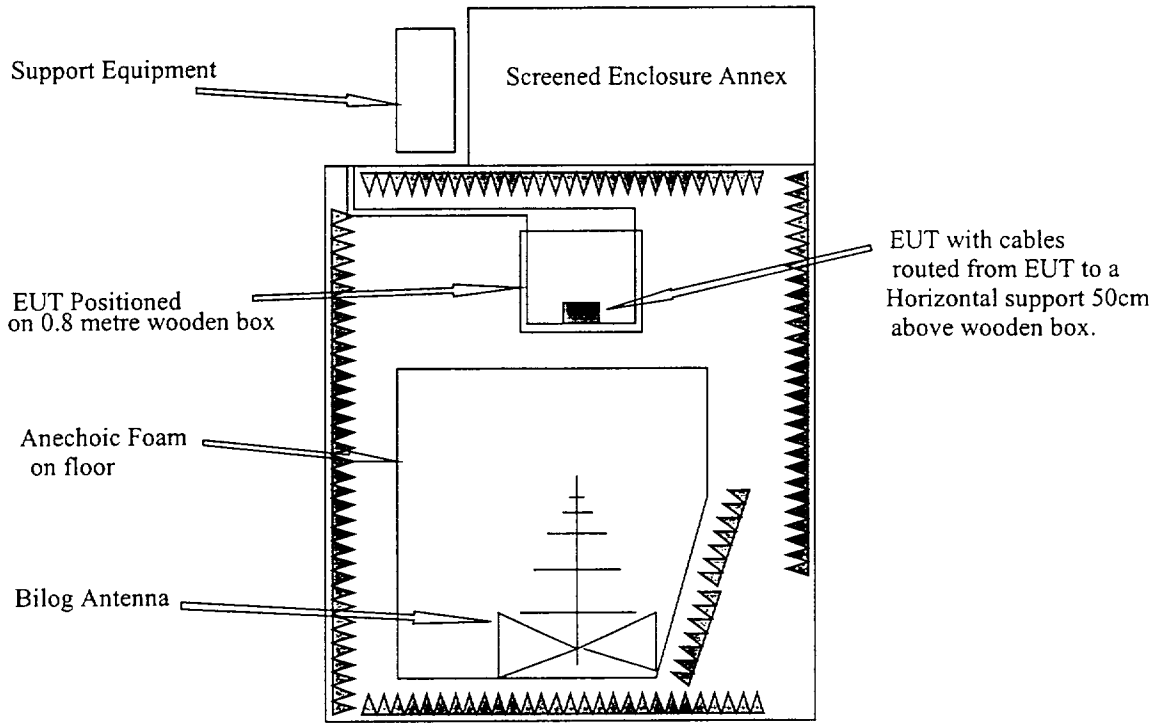


Figure 3

Diagram Showing Test Configuration for Immunity to Radio Frequency Electromagnetic Field Test In Accordance With EN 300 831 (Clause 9.2)

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST PROCEDURE
(Clause 9.3 - EN 300 831)

ENCLOSURE PORT

The EUT was set-up on insulators 0.5 millimetres above the Horizontal Coupling Plane and tested in accordance with EN 61000-4-2.

Air Discharge

A potential of 2kV was initially applied to each applicable test point in both polarities. Where discharges occurred the severity level was increased to 4kV and then to 8kV. The full discharge level was then applied a total of 20 times to each test point, 10 positive discharges and 10 negative discharges. The interval between discharges was a minimum of 1 second.

Contact Discharge

A potential of 2kV was initially applied to all user accessible conductive surfaces (Test points). The level was increased to 4kV. The full discharge level of 4kV was then applied to each test point, 10 positive and 10 negative polarity.

Each vertical side of the EUT was subjected to Vertical Coupled Plane (VCP) discharges of 4kV, 10 positive and 10 negative polarity.

The base of the EUT was subjected to Horizontal Coupled Plane (HCP) discharges of 4kV, 10 positive and 10 negative polarity.

Correct functioning of the EUT was checked throughout this test.

The EUT was tested for immunity to electrostatic discharges in both idle and link modes of operation.

TEST TYPE	TEST VOLTAGE (kV)
CONTACT	± 4kV
AIR	± 8kV

Table 12

Procedure Test performed in accordance with EN 61000-4-2.

Performed by M Hardy, EMC Engineer.

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST RESULTS (Clause 9.3 - EN 300 831)

Ambient Temperature 22.0°C Relative Humidity 47.5% Atmospheric Pressure 1000mbar

During initial testing, it was found that ±8kV air discharges applied to case seam on the right hand side of the LCD, caused the loss of the communication link.

Upon investigation, the failure was attributed to the close proximity of a ribbon cable connected to the LCD, to the casing seam. The customer fitted a non-conductive spacer to increase the distance between the cable and seam.

Upon modification the EUT met the requirements of EN 300 831 (Clause 9.3) for Immunity to Electrostatic Discharge.

The EUT's performance was not degraded below the pass/fail criteria specified below during the test.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

The Primary functions as described below were fully functional after the test.

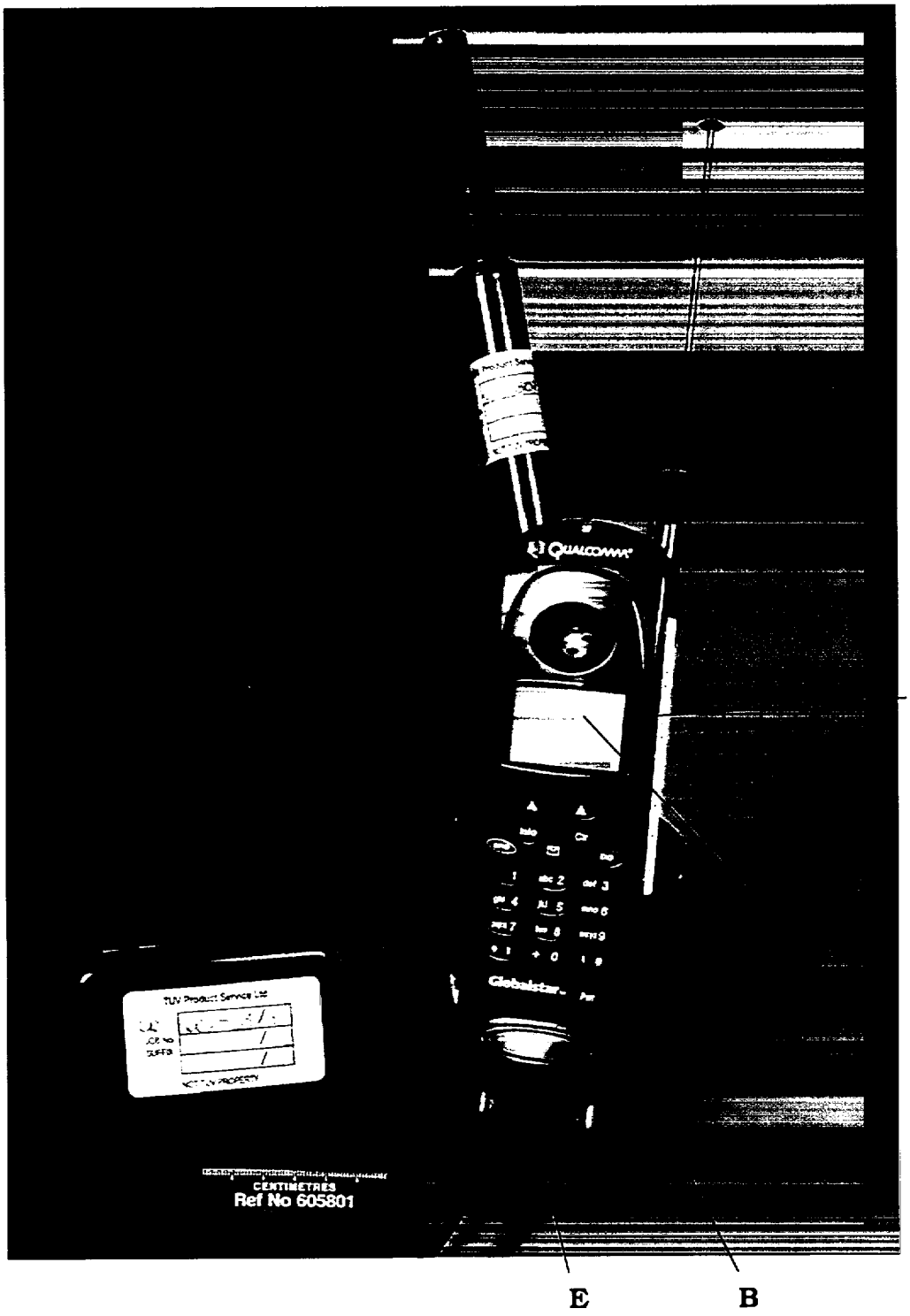
PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

The EUT's operation, defined in accordance with the specification, was not impaired during testing.

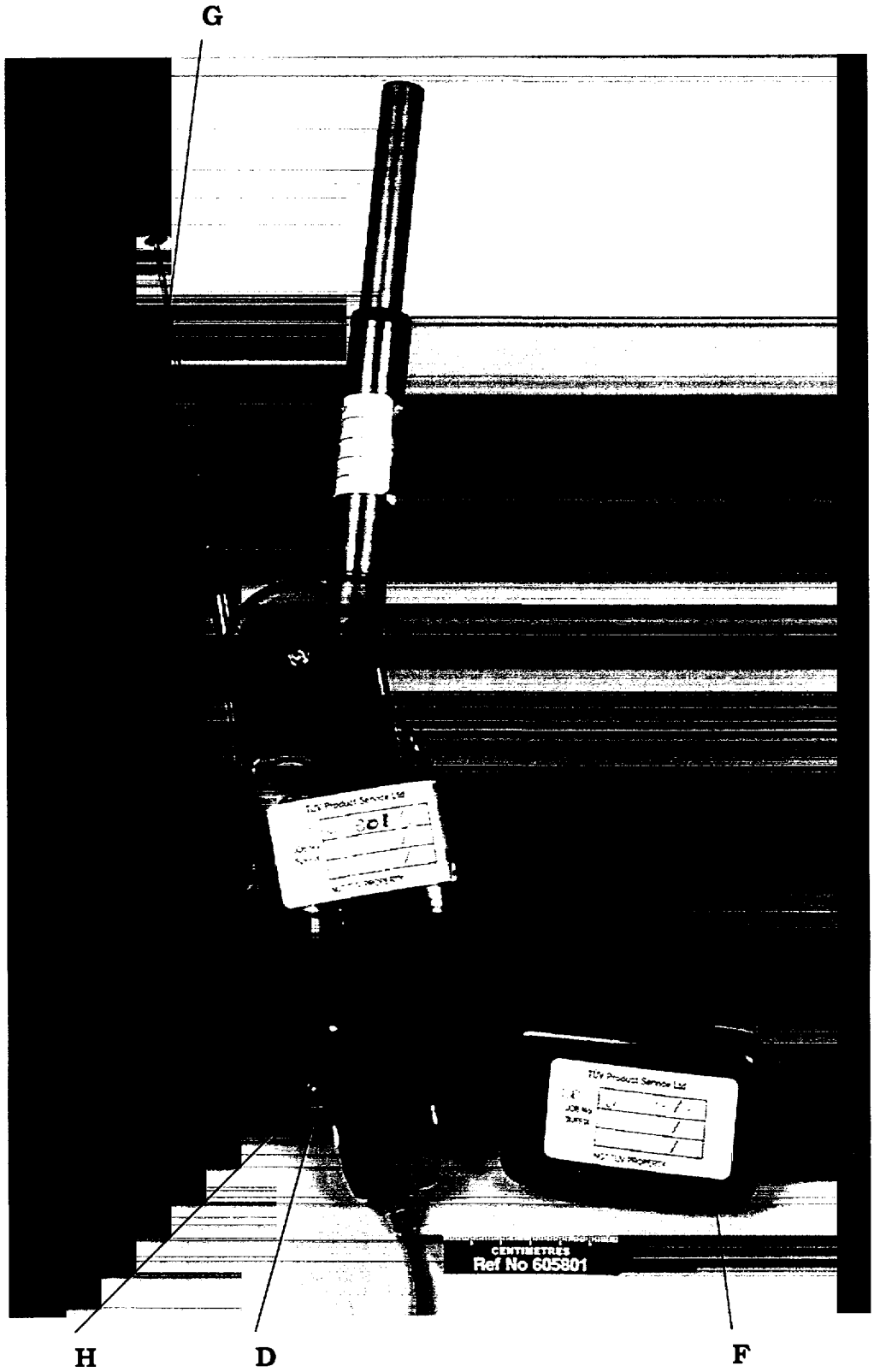
Details of the points tested are identified in Photographs 2 and 3 and presented in Table 13.

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST RESULTS
(Clause 9.3 - EN 300 831) - Continued



Photograph 2 showing ESD Test Points

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST RESULTS
(Clause 9.3 - EN 300 831) - Continued



Photograph 3 showing ESD Test Points

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST RESULTS
(Clause 9.3 - EN 300 831) - Continued

ENCLOSURE PORT – Link and Idle Modes

	Test Points	Level			
		4kV		8kV	
		Positive	Negative	Positive	Negative
A	LCD	N/A	N/A	✓*	✓*
B	Buttons	N/A	N/A	✓*	✓*
C	Case	N/A	N/A	✓	✓
D	Battery	N/A	N/A	✓*	✓*
E	DC I/P Plug	N/A	N/A	✓	✓
F	AC Charger	N/A	N/A	✓*	✓*
G	Antenna	N/A	N/A	✓*	✓*
H	Screws	✓	✓	N/A	N/A
	Horizontal Coupling Plane	✓	✓	N/A	N/A
	Vertical Coupling Plane	✓	✓	N/A	N/A

Table 13

✓ The EUT's performance was not impaired at this test point during or after the electrostatic discharge application.

✓* Attempted discharge but no discharge occurred.

N/A Test not applicable as defined in the specification.

IMMUNITY TO ELECTROSTATIC DISCHARGE TEST RESULTS
(Clause 9.3 - EN 300 831) - Continued

MEASUREMENT UNCERTAINTY FOR ELECTROSTATIC DISCHARGE

Discharge Current	±10% @1st peak ±30% @30ns ±30% @ 60ns
ESD Voltage	±5% of reading

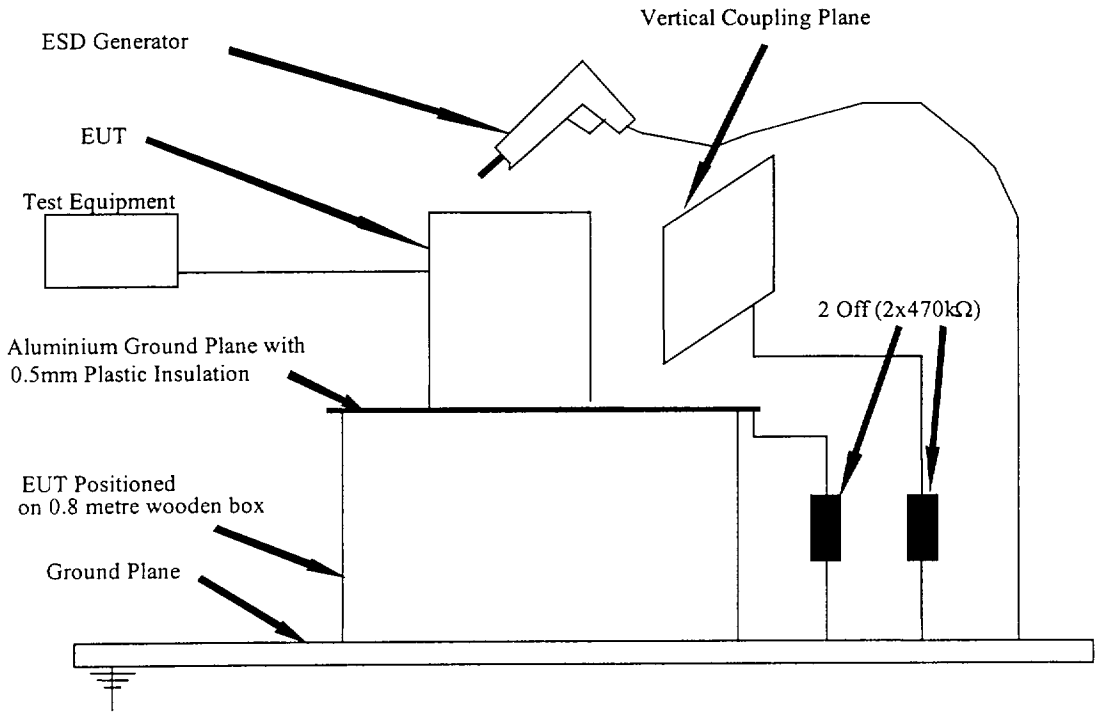


Figure 4

Diagram Showing Test Configuration for Immunity to Electrostatic Discharge Tests
In Accordance With EN 300 831 (Clause 9.3)

IMMUNITY TO ELECTRICAL FAST TRANSIENT BURSTS TEST PROCEDURE (Clause 9.4 EN 300 831)

The EUT was set-up and functioned correctly. A series of Fast Transient Bursts meeting the specification were applied for a period of greater than 60 seconds. The Transient Bursts were applied for both Positive and Negative Burst Trains, for a period of ≥60 seconds, as follows :-

The test severity level applied was 2.0kV on AC mains power lines .

A Coupling Network, complying with EN 61000-4-4, was used for testing the AC Power Line.

Correct functioning of the EUT was checked throughout this test.

The EUT was tested for Immunity to Electrical Fast Transient Bursts in both link and idle modes of operation.

LINES	TEST VOLTAGE
AC POWER	± 2.0kV

Table 14

Procedure Test performed in accordance with EN 61000-4-4.

Performed by M Hardy, EMC Engineer

IMMUNITY TO ELECTRICAL FAST TRANSIENT BURSTS TEST RESULTS (Clause 9.4 EN 300 831)

AC POWER LINE

Ambient Temperature 22.0°C Relative Humidity 47.5% Atmospheric Pressure 1000mbar

The EUT met the requirements of EN 300 831 (Clause 9.4) for Immunity to Fast Transient Bursts on the AC Mains Power Line.

The EUT's performance, defined in accordance with the specification, was not impaired during testing.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

The Primary functions as described below were fully functional after the test.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

The EUT's operation, defined in accordance with the specification, was not impaired during testing.

LINE UNDER TEST	SEVERITY LEVEL	RESULT	REMARKS
L + N + E	± 2.0kV	COMPLIED	

Table 15

IMMUNITY TO ELECTRICAL FAST TRANSIENT BURSTS TEST RESULTS
(Clause 9.4 EN 300 831) - Continued

MEASUREMENT UNCERTAINTY FOR FAST TRANSIENT BURST TESTS

Duration	±0.68ms
Amplitude	@500V Displayed value = ±10V @1000V Displayed value = ±90V @2000V Displayed value = ±280V

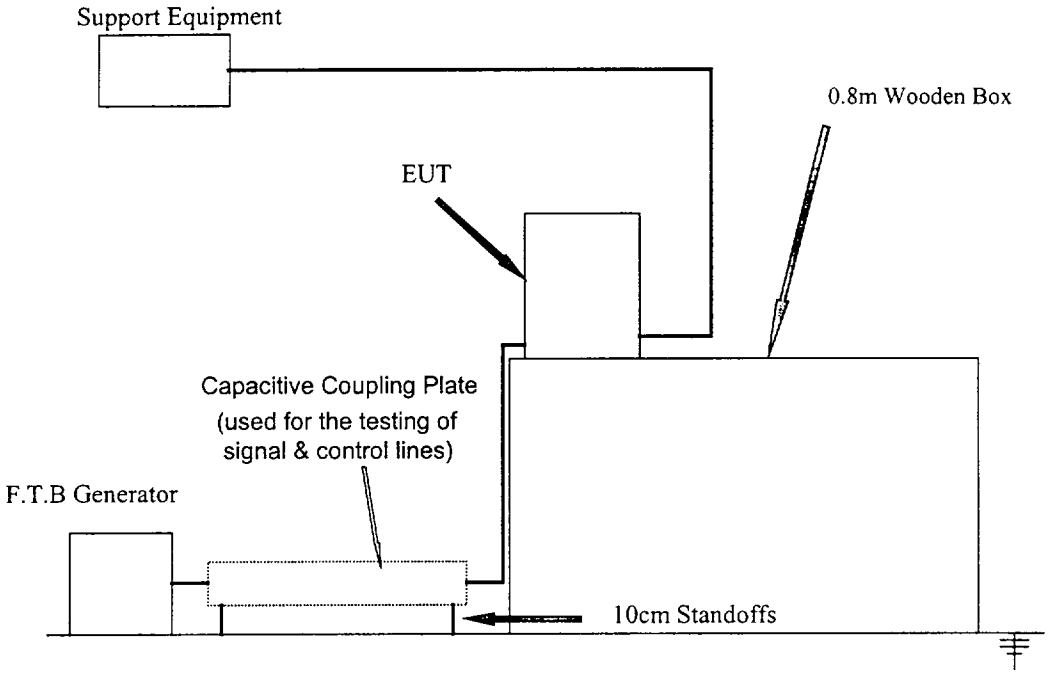


Figure 5

Diagram Showing Test Configuration for Immunity to Fast Transient Bursts Tests
In Accordance With EN 300 831 (Clause 9.4)

IMMUNITY TO RF COMMON MODE TEST PROCEDURE
(Clause 9.5 - EN 300 831

The EUT was set-up 100mm above the Ground Reference Plane. All testing was conducted within a Shielded Enclosure. The Current Injection Probe was calibrated to induce the test voltage into a 50Ω Calibration Jig. The power required to generate the required (CW) voltage was recorded over the frequency range of test. The Current Injection Probe was then clamped around the applicable EUT's Cable and the recorded power applied with the specified modulation enabled.

Correct functioning of the EUT was checked throughout this test.

The EUT was tested for immunity to continuous conducted interference in both link and idle modes of operation.

Test Level	:	3 V rms
Modulation	:	80% amplitude 1kHz
Stepped Frequency Increments	:	50kHz over the frequency range 150kHz to 5MHz, and 1% of the momentary frequency over the frequency range 5MHz to 80MHz
Frequency Range	:	150 kHz- 80 MHz
Exclusion Band	:	Not applicable - operating frequency greater than 80MHz
Configuration	:	In accordance with EN 61000-4-6

LINES	TEST VOLTAGE
AC POWER	3V rms

Table 16

Procedure Test performed in accordance with EN 61000-4-6.

Performed by M Hardy, EMC Engineer.

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831)

AC POWER PORT

Ambient Temperature 21.5°C Relative Humidity 45.0% Atmospheric Pressure 1004mbar

The EUT met the requirements of EN 300 831 (Clause 9.5) for Immunity to RF Common Mode on the AC Power Port.

The Ports tested are presented in Table 17, below

PORT DESIGNATION	SEVERITY LEVEL	RESULTS	REMARKS
AC Power	3 Vrms	COMPLIED	

Table 17

The EUT's performance was not degraded below the criteria specified below during the test, as detailed below. Narrowband responses were not detected using the stepped frequency increments denoted on in Table 18.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

The Primary functions as described below were fully functional after the test.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

The EUT's operation, defined in accordance with the specification, was not impaired during testing.

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831) - continued

MEASUREMENT UNCERTAINTY FOR RF COMMON MODE TESTS

Frequency	150kHz to 100MHz ±2 parts in 10^7
Amplitude	±1.5dB
Modulation Depth	AM @1kHz ±(4% of setting + 1%) FM @1kHz ±(5% of setting + 10 Hz)

For Audio Distortion Measurements

% Total Harmonic Distortion	±1dB

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831) - Continued

FREQUENCY INCREMENTS USED - Link and Idle Modes

Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result
0.15	COMP	1.45	COMP	4.05	COMP	5.5	COMP	8.3	COMP
0.2	COMP	1.5	COMP	4.1	COMP	5.6	COMP	8.4	COMP
0.25	COMP	1.55	COMP	4.15	COMP	5.7	COMP	8.5	COMP
0.3	COMP	1.6	COMP	4.2	COMP	5.9	COMP	8.6	COMP
0.35	COMP	1.65	COMP	4.25	COMP	6	COMP	8.7	COMP
0.4	COMP	1.7	COMP	4.3	COMP	6.06	COMP	8.8	COMP
0.45	COMP	1.75	COMP	4.35	COMP	6.1	COMP	8.9	COMP
0.5	COMP	1.8	COMP	4.4	COMP	6.2	COMP	9	COMP
0.55	COMP	1.85	COMP	4.45	COMP	6.3	COMP	9.1	COMP
0.6	COMP	1.9	COMP	4.5	COMP	6.4	COMP	9.2	COMP
0.65	COMP	1.95	COMP	4.55	COMP	6.5	COMP	9.3	COMP
0.7	COMP	2	COMP	4.6	COMP	6.7	COMP	9.4	COMP
0.75	COMP	2.05	COMP	4.65	COMP	6.8	COMP	9.5	COMP
0.8	COMP	2.1	COMP	4.7	COMP	6.9	COMP	9.6	COMP
0.85	COMP	2.15	COMP	4.75	COMP	7	COMP	9.7	COMP
0.9	COMP	2.2	COMP	4.8	COMP	7.1	COMP	9.8	COMP
0.95	COMP	2.25	COMP	4.85	COMP	7.2	COMP	9.9	COMP
1.0	COMP	2.3	COMP	4.9	COMP	7.3	COMP	10	COMP
1.05	COMP	2.35	COMP	4.95	COMP	7.4	COMP	10.1	COMP
1.10	COMP	2.4	COMP	5	COMP	7.5	COMP	10.2	COMP
1.15	COMP	2.45	COMP	5.05	COMP	7.6	COMP	10.3	COMP
1.2	COMP	2.5	COMP	5.1	COMP	7.8	COMP	10.4	COMP
1.25	COMP	2.55	COMP	5.15	COMP	7.9	COMP	10.5	COMP
1.3	COMP	2.6	COMP	5.2	COMP	8	COMP	10.6	COMP
1.35	COMP	2.65	COMP	5.3	COMP	8.1	COMP	10.7	COMP
1.4	COMP	2.7	COMP	5.4	COMP	8.2	COMP	10.8	COMP

Table 18

Key

COMP Complied with Specification
EX Exclusion Band
FAIL Failed to comply with Specification

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831) - Continued

FREQUENCY INCREMENTS USED - Link and Idle Modes

Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result
10.9	COMP	13.6	COMP	17.6	COMP	23	COMP	30.1	COMP
11	COMP	13.7	COMP	17.8	COMP	23.2	COMP	30.4	COMP
11.1	COMP	13.8	COMP	18	COMP	23.4	COMP	30.7	COMP
11.2	COMP	13.9	COMP	18.2	COMP	23.6	COMP	31	COMP
11.3	COMP	14	COMP	18.4	COMP	23.8	COMP	31.3	COMP
11.4	COMP	14.1	COMP	18.6	COMP	24	COMP	31.6	COMP
11.5	COMP	14.2	COMP	18.8	COMP	24.2	COMP	31.9	COMP
11.6	COMP	14.3	COMP	19	COMP	24.4	COMP	32.2	COMP
11.7	COMP	14.4	COMP	19.2	COMP	24.6	COMP	32.5	COMP
11.8	COMP	14.5	COMP	19.4	COMP	24.8	COMP	32.9	COMP
11.9	COMP	14.6	COMP	19.6	COMP	25	COMP	33.2	COMP
12	COMP	14.7	COMP	19.8	COMP	25.3	COMP	33.5	COMP
12.1	COMP	14.8	COMP	20	COMP	25.6	COMP	33.9	COMP
12.2	COMP	14.9	COMP	20.2	COMP	25.9	COMP	34.2	COMP
12.3	COMP	15	COMP	20.4	COMP	26.2	COMP	34.5	COMP
12.4	COMP	15.2	COMP	20.6	COMP	26.5	COMP	34.9	COMP
12.5	COMP	15.4	COMP	20.8	COMP	26.8	COMP	35.2	COMP
12.6	COMP	15.6	COMP	21	COMP	27.1	COMP	35.6	COMP
12.7	COMP	15.8	COMP	21.2	COMP	27.4	COMP	35.9	COMP
12.8	COMP	16	COMP	21.4	COMP	27.7	COMP	36.3	COMP
12.9	COMP	16.2	COMP	21.6	COMP	28	COMP	36.7	COMP
13	COMP	16.4	COMP	21.8	COMP	28.3	COMP	37	COMP
13.1	COMP	16.6	COMP	22	COMP	28.6	COMP	37.4	COMP
13.2	COMP	16.8	COMP	22.2	COMP	28.9	COMP	37.7	COMP
13.3	COMP	17	COMP	22.4	COMP	29.2	COMP	38.1	COMP
13.4	COMP	17.2	COMP	22.6	COMP	29.5	COMP	38.5	COMP
13.5	COMP	17.4	COMP	22.8	COMP	29.8	COMP	38.9	COMP

Table 18 - Continued

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831) - Continued

FREQUENCY INCREMENTS USED – Link and Idle Modes

Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result	Frequency (MHz)	Result
39.3	COMP	51	COMP	66.2	COMP				
39.7	COMP	51.5	COMP	66.9	COMP				
40.1	COMP	52	COMP	67.6	COMP				
40. 5	COMP	52.5	COMP	68.3	COMP				
40.9	COMP	53.1	COMP	69	COMP				
41.3	COMP	53.6	COMP	69.7	COMP				
41.7	COMP	54.2	COMP	70.4	COMP				
42.1	COMP	54.7	COMP	71.1	COMP				
42.6	COMP	55.2	COMP	71.8	COMP				
43	COMP	55.8	COMP	72.5	COMP				
43.5	COMP	56.4	COMP	73.3	COMP				
43.9	COMP	57	COMP	74	COMP				
44.3	COMP	57.6	COMP	74.8	COMP				
44.7	COMP	58.1	COMP	75.5	COMP				
45.2	COMP	58.7	COMP	76.3	COMP				
45.6	COMP	59.3	COMP	77.1	COMP				
46.1	COMP	59.9	COMP	77.8	COMP				
46.5	COMP	60.5	COMP	78.6	COMP				
47	COMP	61.1	COMP	79.4	COMP				
47.5	COMP	61.7	COMP	80	COMP				
48	COMP	62.3	COMP						
48.4	COMP	62.9	COMP						
48.9	COMP	63.6	COMP						
49.4	COMP	64.2	COMP						
49.9	COMP	64.9	COMP						
50.4	COMP	65.5	COMP						

Table 18 - Continued

IMMUNITY TO RF COMMON MODE TEST RESULTS
(Clause 9.5 - EN 300 831) - Continued

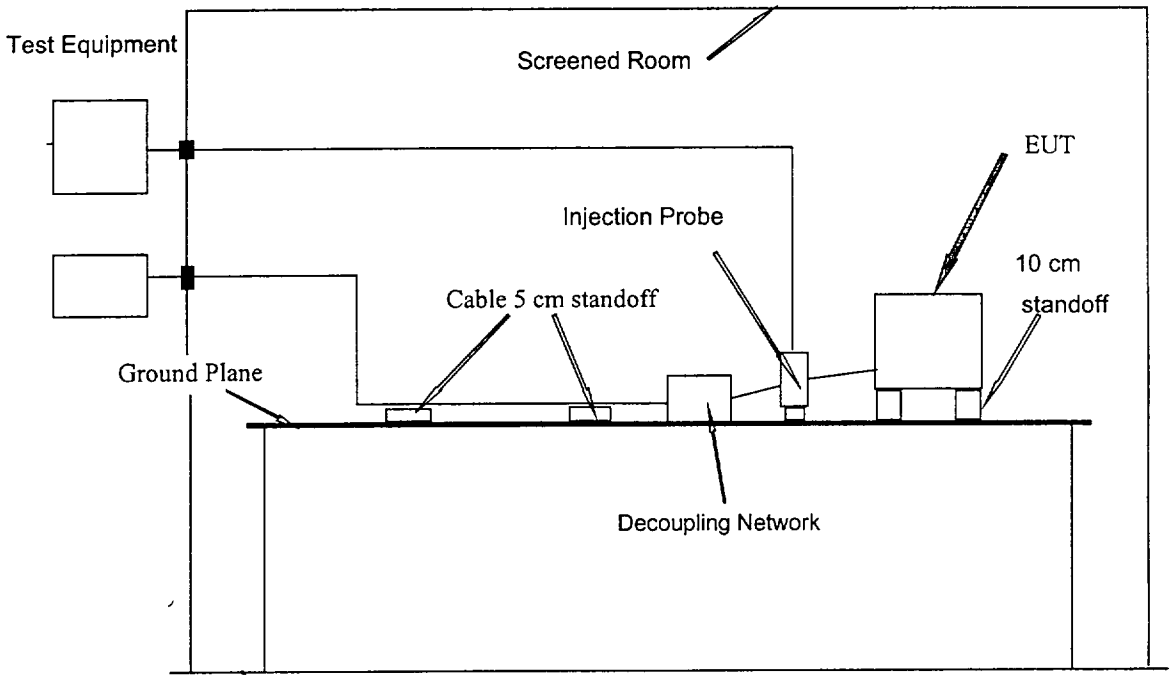


Figure 6

Diagram Showing Test Configuration for Immunity to RF Common Mode
In Accordance With EN 300 831 (Clause 9.5)

IMMUNITY TO MAINS VOLTAGE DIPS AND INTERRUPTIONS TEST PROCEDURE (Clause 9.7 - EN 300 831) CT/CR TT/TR

AC POWER PORT

Ambient Temperature 22.7°C Relative Humidity 42.3% Atmospheric Pressure 1000mbar

The EUT was set-up and functioned correctly, with a 230VAC supply voltage. In total, 3 types of voltage dips and interruptions were applied to the ac supply lines:

1. The AC mains voltage supplied to the EUT was then reduced by 30% of the nominal 230V supply for a period of 10ms, repeated 3 times at 10 second intervals.

2. The AC mains voltage supplied to the EUT was then reduced by 60% of the nominal 230V supply for a period of 100ms, repeated 3 times at 10 second intervals.

3. The AC mains voltage supplied to the EUT was then reduced by greater than 95% of the nominal 230V supply for a period of 5000ms, 3 times at 10 second intervals.

Correct functioning of the EUT was checked throughout this test.

The EUT was tested for Voltage Dips and Interruptions in both link and idle modes of operation.

Procedure Test performed in accordance with EN 300 831 and EN 61000-4-11

Performed by M Hardy, EMC Engineer.

IMMUNITY TO MAINS VOLTAGE DIPS AND INTERRUPTIONS TEST RESULTS (Clause 9.7 - EN 300 831)

The EUT met the requirements of EN 300 831 (Clause 9,7) for Immunity to Mains voltage dips and interruptions.

The EUT's performance was not degraded below the pass/fail criteria specified below during the test.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

The Primary functions as described below were fully functional after the test.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

The EUT's performance, defined in accordance with the specification, was not impaired during testing.

EUT CONFIGURED IN LINK MODE			
REDUCTION (%)	PERIOD OF REDUCTION (msec)	RESULTS	REMARKS
30	10	COMPLIED	
60	100	COMPLIED	
>95	5000	COMPLIED	

Table 19

IMMUNITY TO MAINS VOLTAGE DIPS AND INTERRUPTIONS TEST RESULTS
(Clause 9.7 - EN 300 831) - continued

EUT CONFIGURED IN IDLE MODE			
REDUCTION (%)	PERIOD OF REDUCTION (msec)	RESULTS	REMARKS
30	10	COMPLIED	
60	100	COMPLIED	
>95	5000	COMPLIED	

Table 20

MEASUREMENT UNCERTAINTY FOR MAINS VOLTAGE DIPS AND INTERRUPTIONS TEST

Voltage	±0.5% ±20 Digits (45Hz to 450Hz)
Current	±0.7% (45Hz to 450Hz

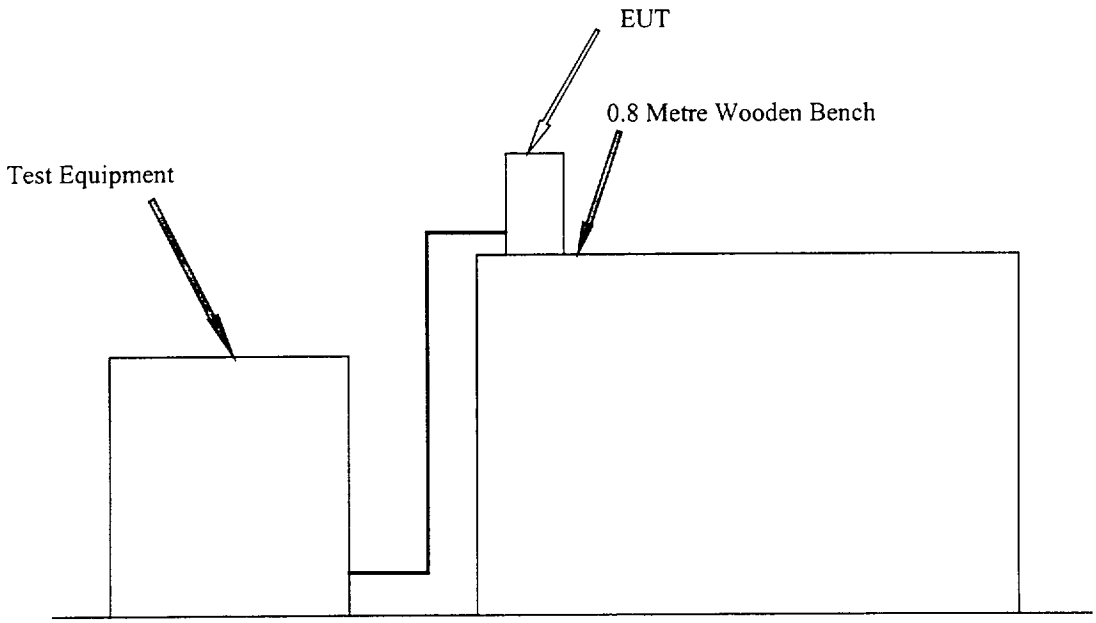


Figure 7

Diagram Showing Test Configuration for Immunity to Voltage Dips and Interruptions
In Accordance With EN 300 831 (Clause 9.7)

IMMUNITY TO TRANSIENTS, COMMON AND DIFFERENTIAL MODE, TEST PROCEDURE (Clause 9.8 - EN 300 831)

AC POWER PORT

The EUT was set-up and functioned correctly. A series of High Energy Surges were applied between lines (differential mode) and between lines and ground (common mode) as detailed in the following table. The EUT's power was supplied through a coupling/decoupling network (CDN).

Test Pulses were applied at intervals of ≥ 1 minute.

Correct functioning of the EUT was checked throughout this test.

GENERATOR IMPEDANCE (Ohms)	POLARITY (+/-)	SURGE VOLTAGE (kV)	PHASE ANGLE (deg)	NO. OF SURGES
DIFFERENTIAL MODE - LIVE LINE TO NEUTRAL LINE				
2.0	+	0.5	0	2
2.0	+	0.5	90	2
2.0	+	0.5	270	2
2.0	-	0.5	0	2
2.0	-	0.5	90	2
2.0	-	0.5	270	2
COMMON MODE - LIVE AND NEUTRAL LINES (TOGETHER) TO REFERENCE GROUND				
12.0	+	0.5	0	2
12.0	+	0.5	90	2
12.0	+	0.5	270	2
12.0	-	0.5	0	2
12.0	-	0.5	90	2
12.0	-	0.5	270	2
12.0	+	1.0	0	2
12.0	+	1.0	90	2
12.0	+	1.0	270	2
12.0	-	1.0	0	2
12.0	-	1.0	90	2
12.0	-	1.0	270	2

Table 21

Procedure Test performed in accordance with EN 61000-4-5

Performed by M Hardy, EMC Engineer.

TRANSIENTS, COMMON AND DIFFERENTIAL MODE, TEST RESULTS (Clause 9.8 - EN 300 831)

The EUT met the requirements of EN 300 831 (Clause 9.8) for Immunity to Transients, Common and Differential mode.

The EUT's performance, defined in accordance with the specification, was not impaired during testing.

PASS/FAIL CRITERIA AS DECLARED BY THE MANUFACTURER

Continuous Phenomena

1. During each individual exposure, the communications link should be maintained, and the Frame Error Rate (FER) shall not exceed 0.01 with 95% confidence.
2. At the conclusion of the test, the EUT shall operate as intended with no loss of user functions or stored data.
3. There shall be no unintentional transmissions.
4. During the RF Electromagnetic field and RF Common mode immunity tests, the audio breakthrough on to the forward speech channel shall not exceed 59dB SPL.

Transient Phenomena

5. After each exposure in the test sequence, the communications link should be maintained.
6. At the conclusion of the total test, the EUT shall operate as intended with no loss of user functions or stored data.
7. There shall be no unintentional transmissions.

The Primary functions as described below were fully functional after the test.

PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

1. To provide a communication link within the Globalstar Satellite Network system.

The EUT's operation, defined in accordance with the specification, was not impaired during testing.

MEASUREMENT UNCERTAINTY FOR TRANSIENTS, COMMON AND DIFFERENTIAL MODE TESTS

Voltage	±7.8%
Rise Time	+22.7% -18.5%
Duration	+6.8% -11.6%

TRANSIENTS, COMMON AND DIFFERENTIAL MODE, TEST RESULTS
(Clause 9.8 - EN 300 831)

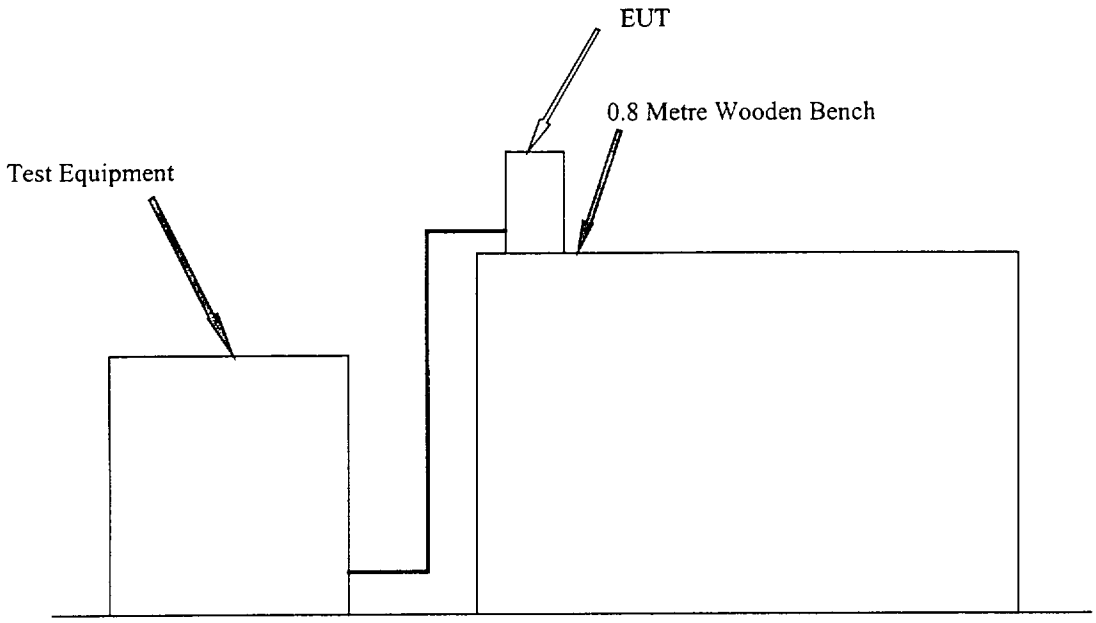
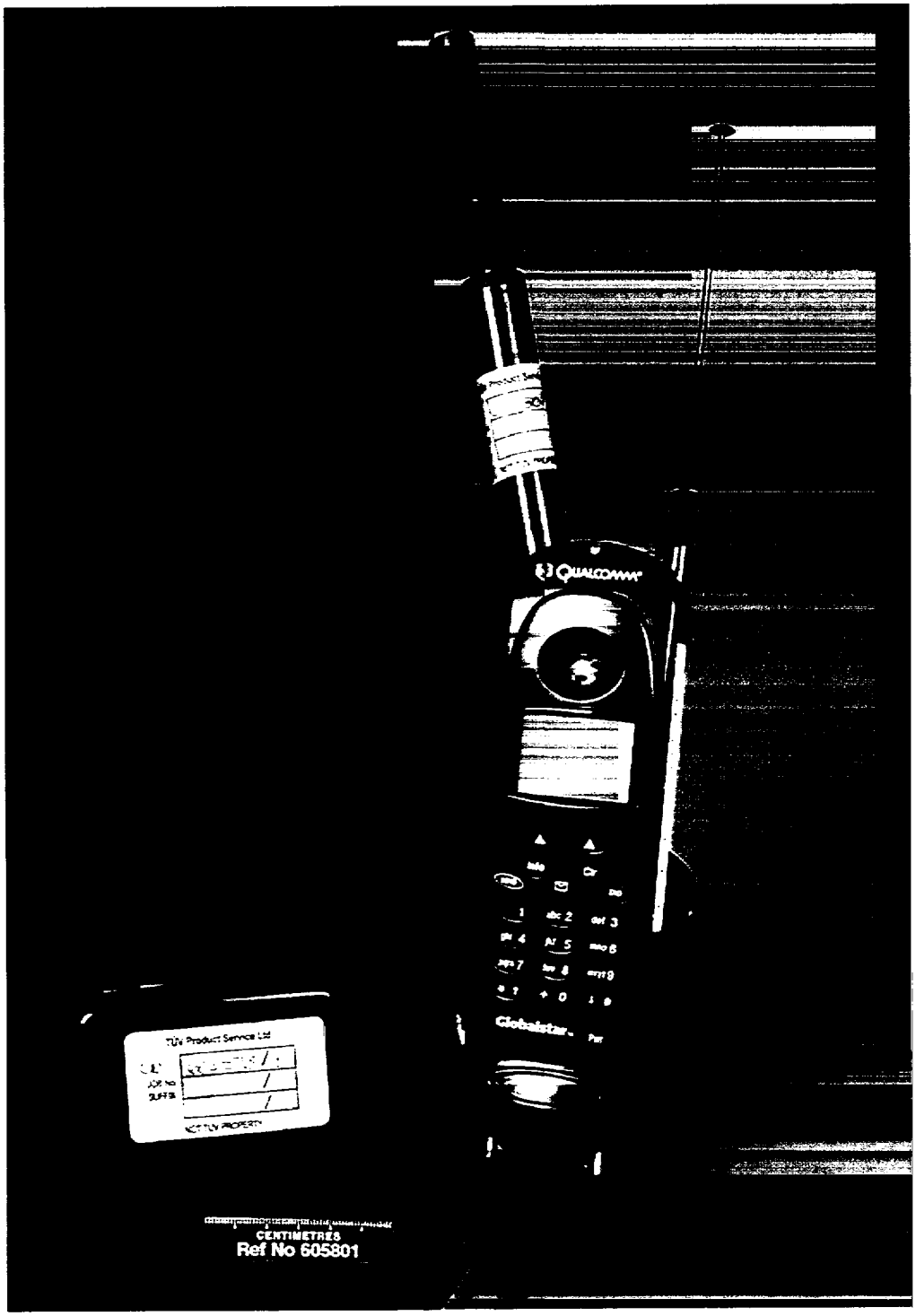


Figure 8

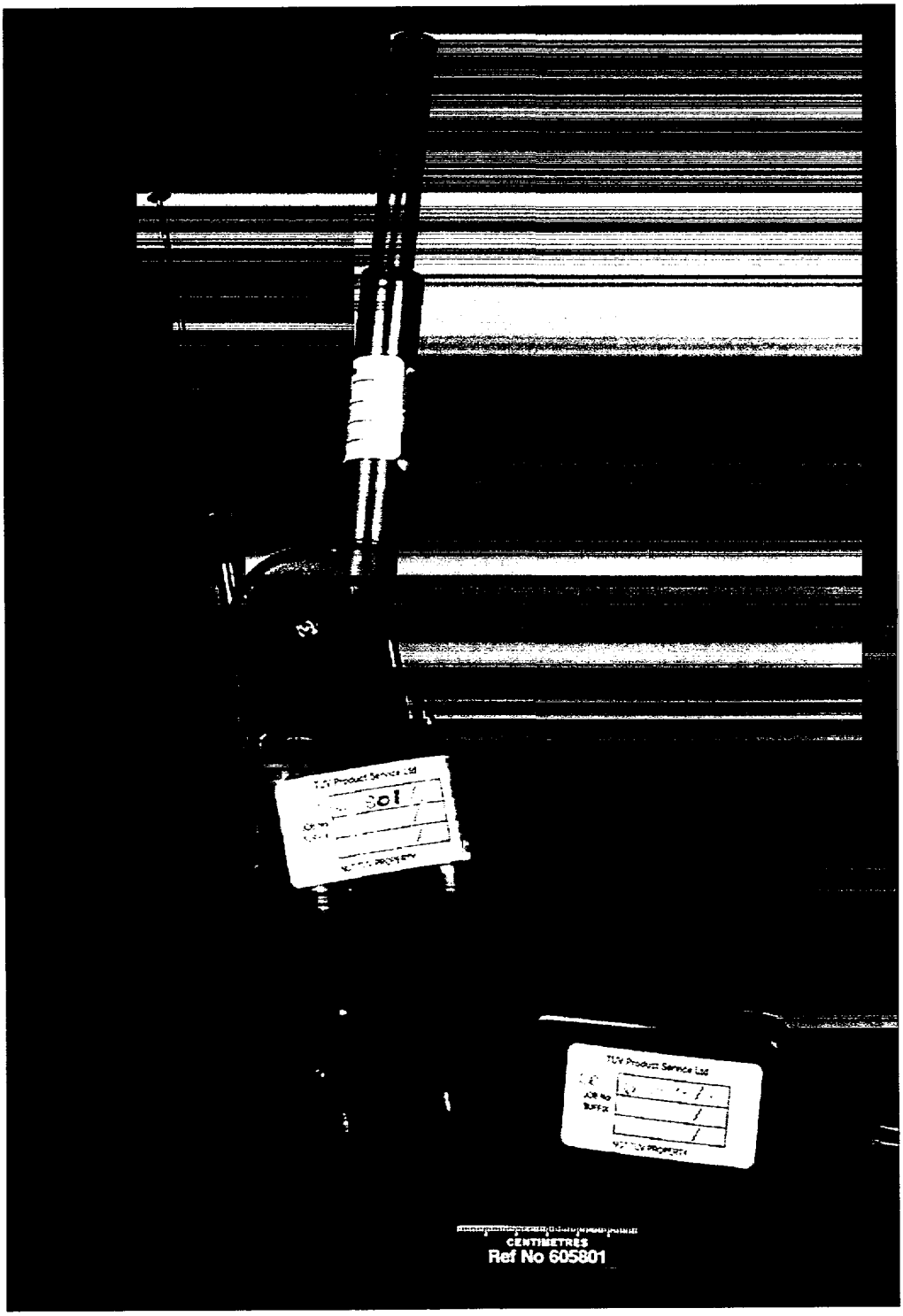
Diagram Showing Test Configuration for Immunity to Transients, Common and Differential In Accordance With EN 300 831 (Clause 9.8)

PHOTOGRAPHS OF EQUIPMENT



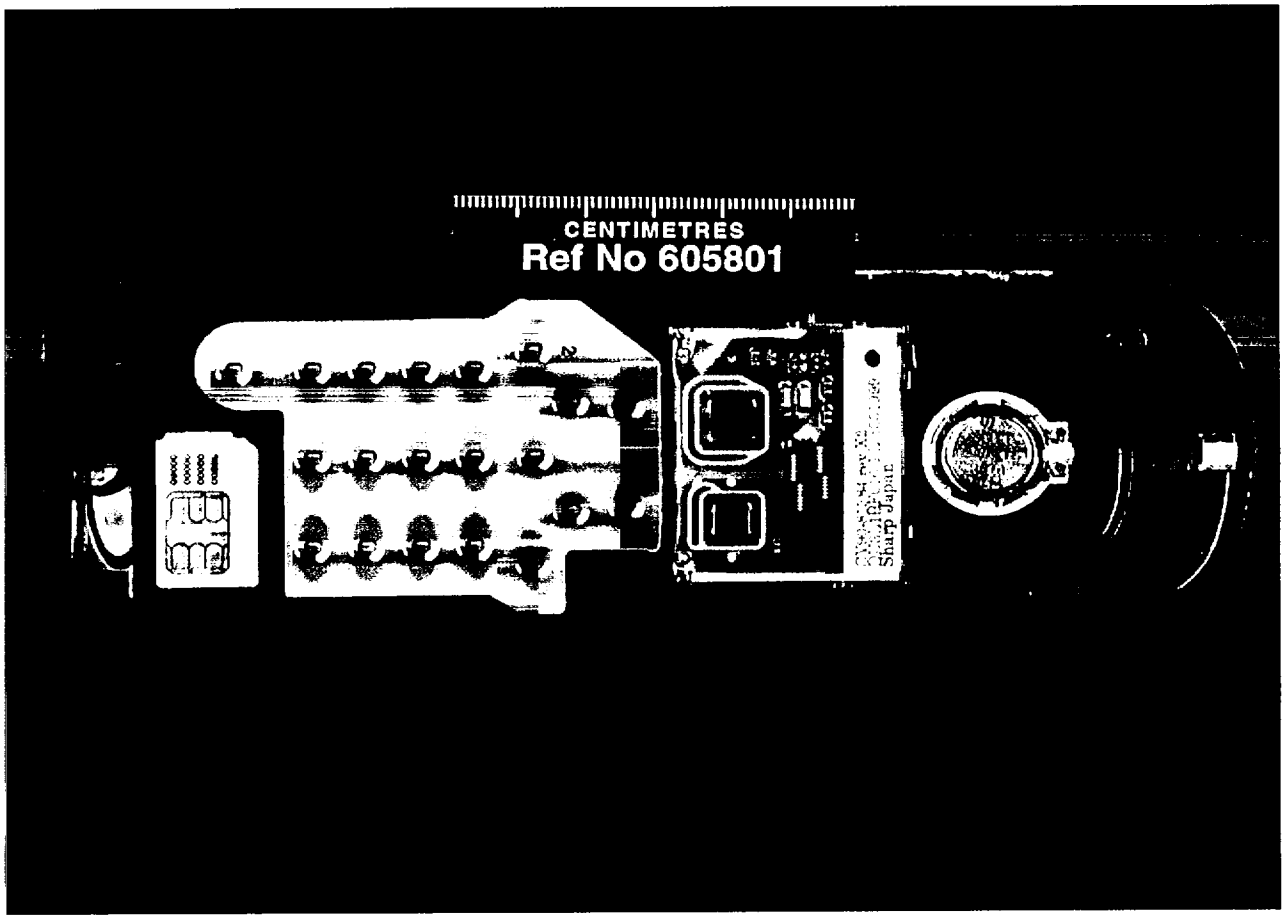
Photograph No 4 Front view

PHOTOGRAPHS OF EQUIPMENT



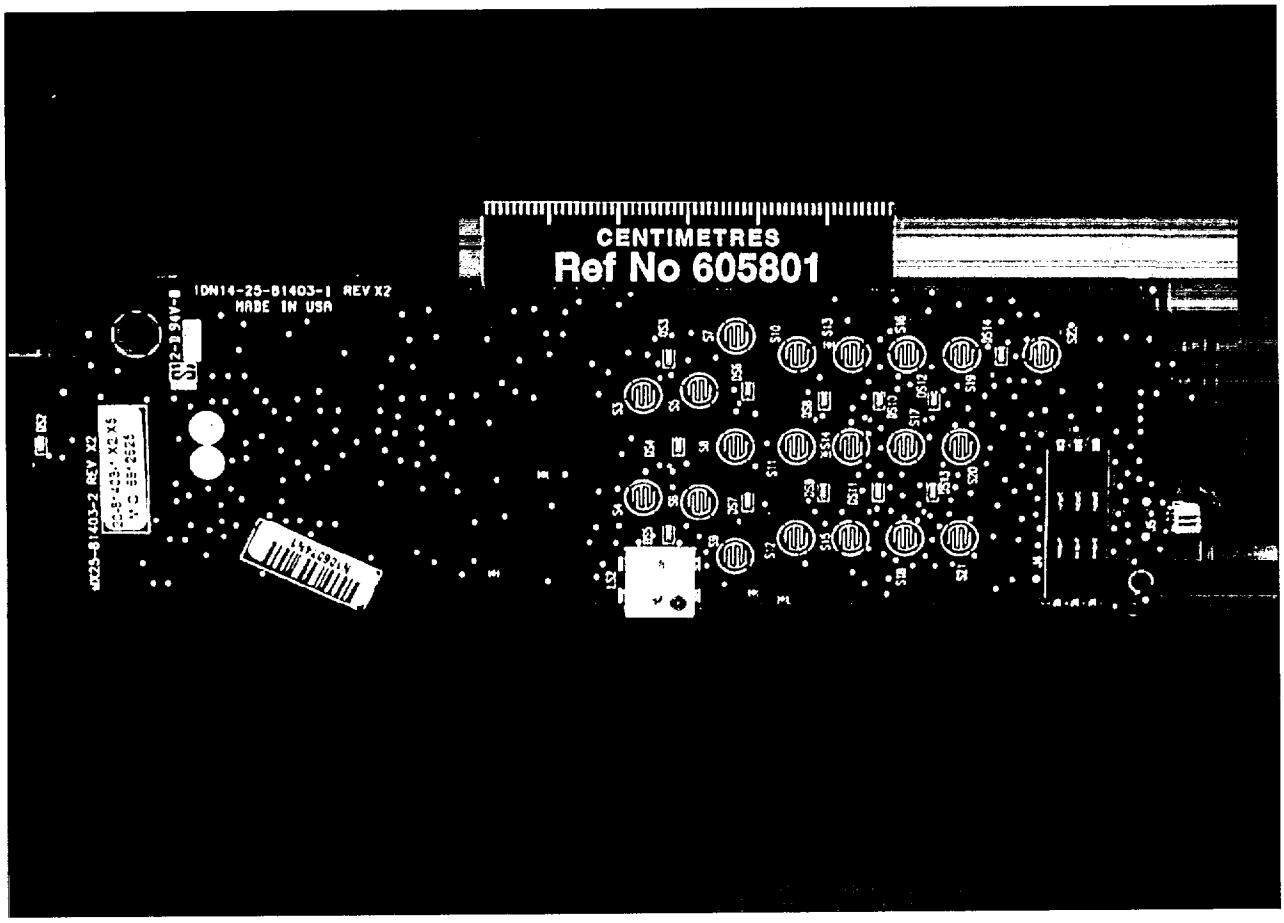
Photograph No 5 Rear view

PHOTOGRAPHS OF EQUIPMENT



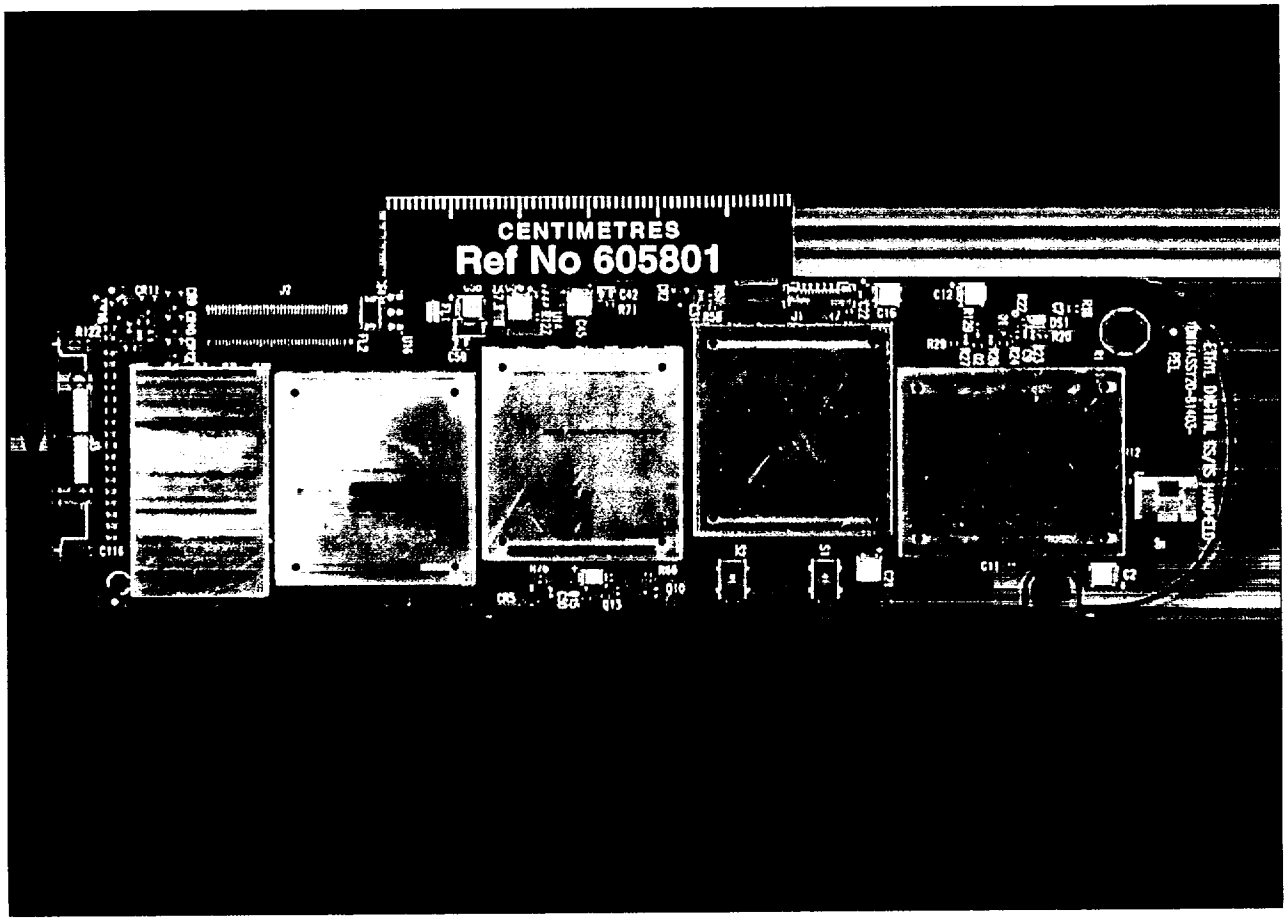
Photograph No 6 Internal view

PHOTOGRAPHS OF EQUIPMENT



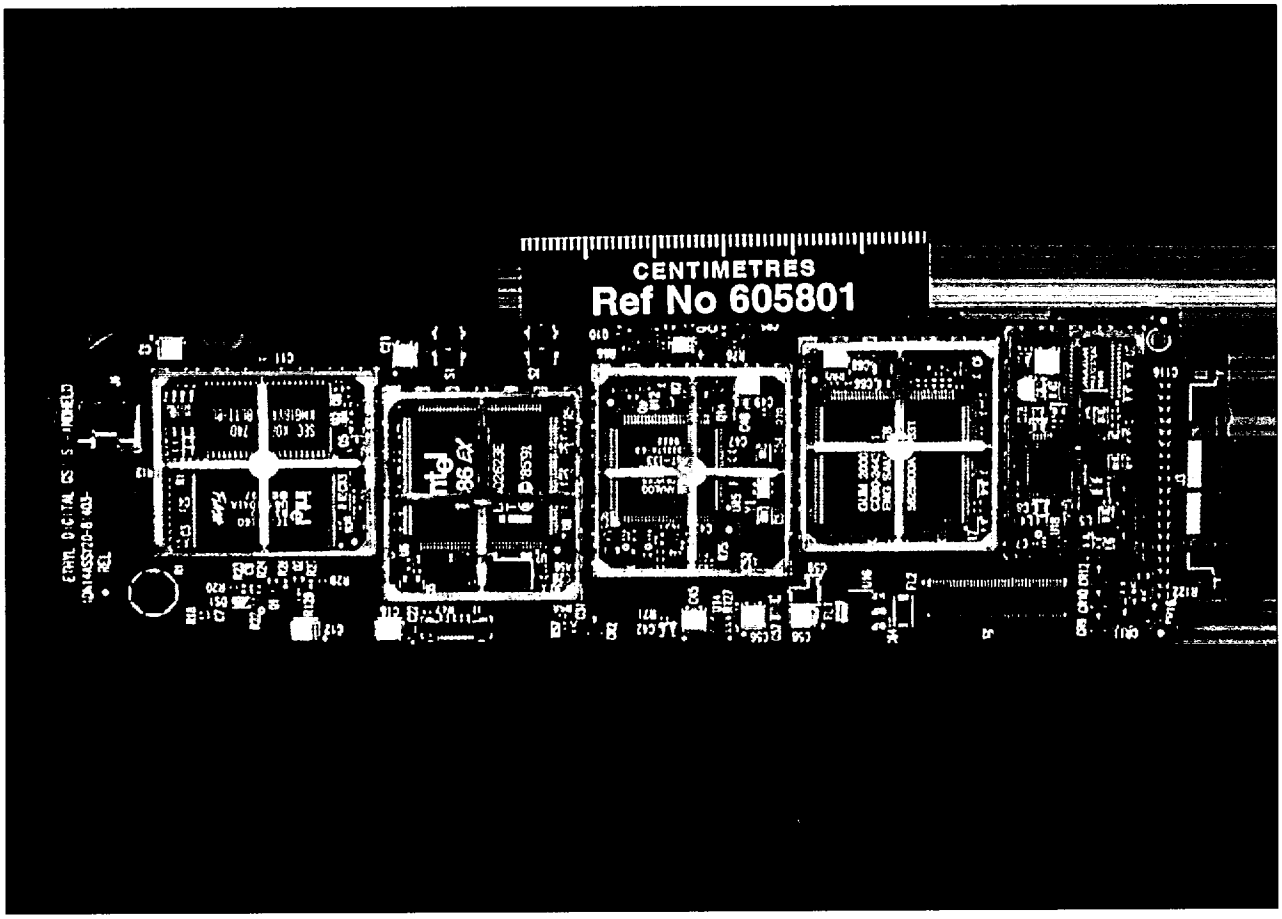
Photograph No 7 Internal view

PHOTOGRAPHS OF EQUIPMENT



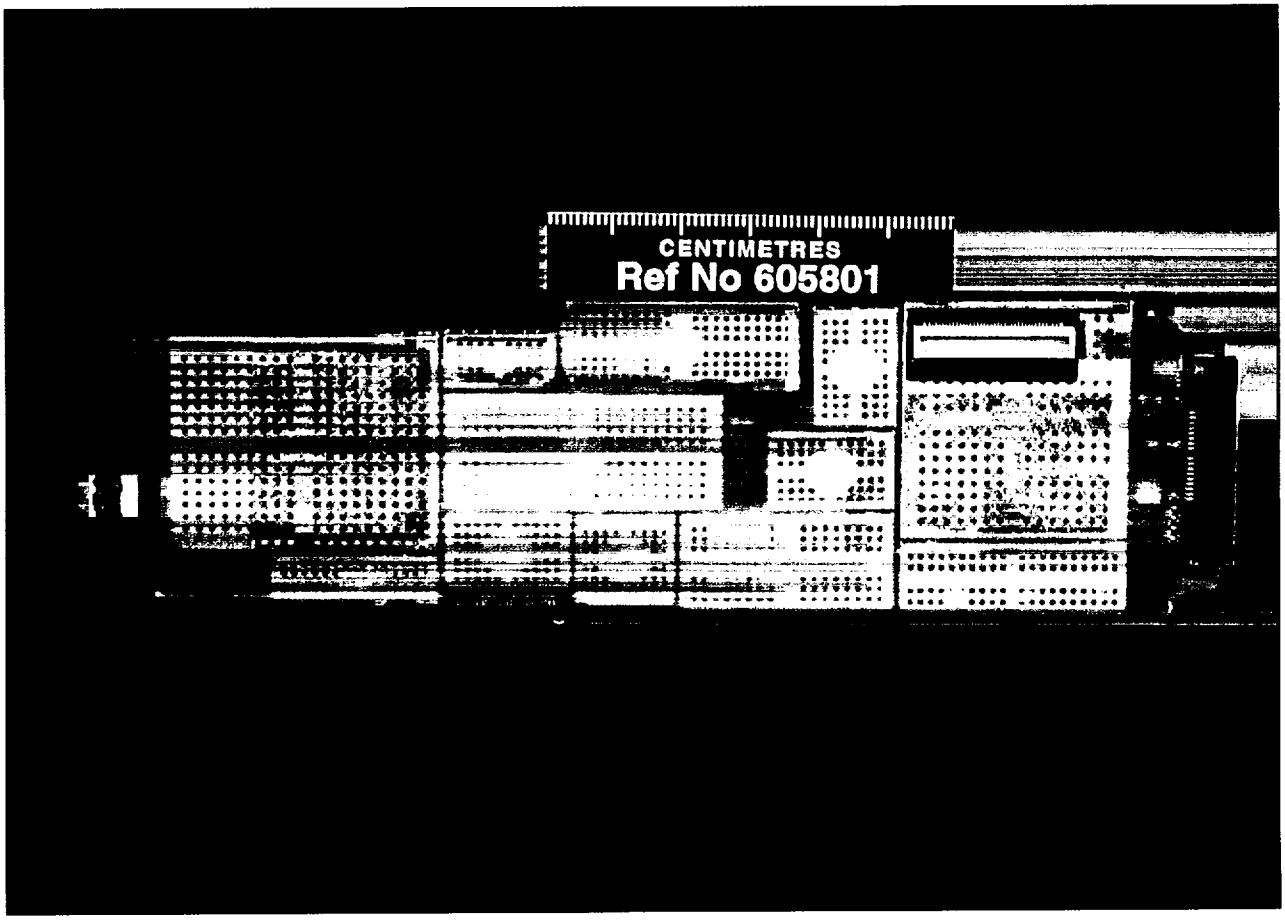
Photograph No 8 Internal view

PHOTOGRAPHS OF EQUIPMENT



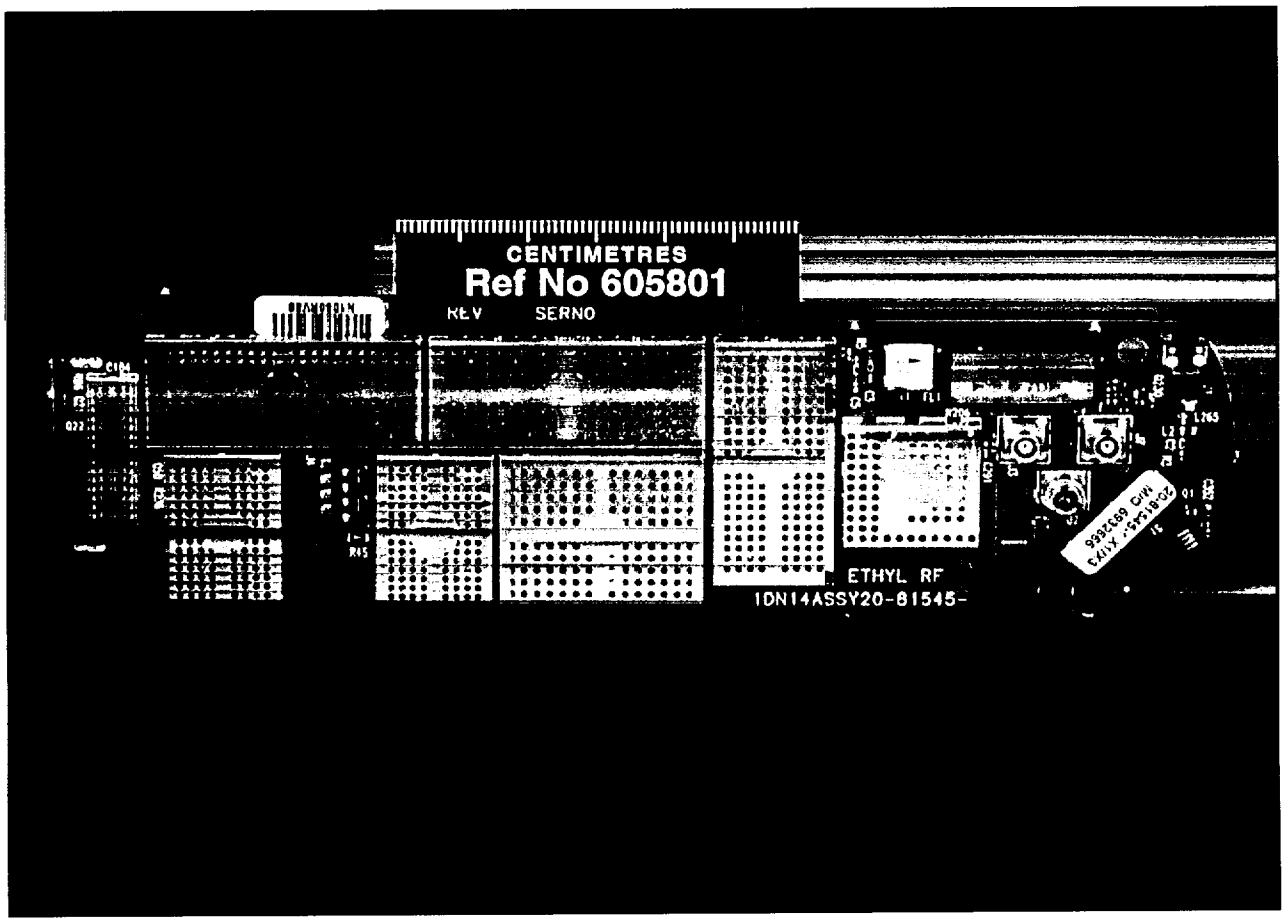
Photograph No 9 Internal view

PHOTOGRAPHS OF EQUIPMENT



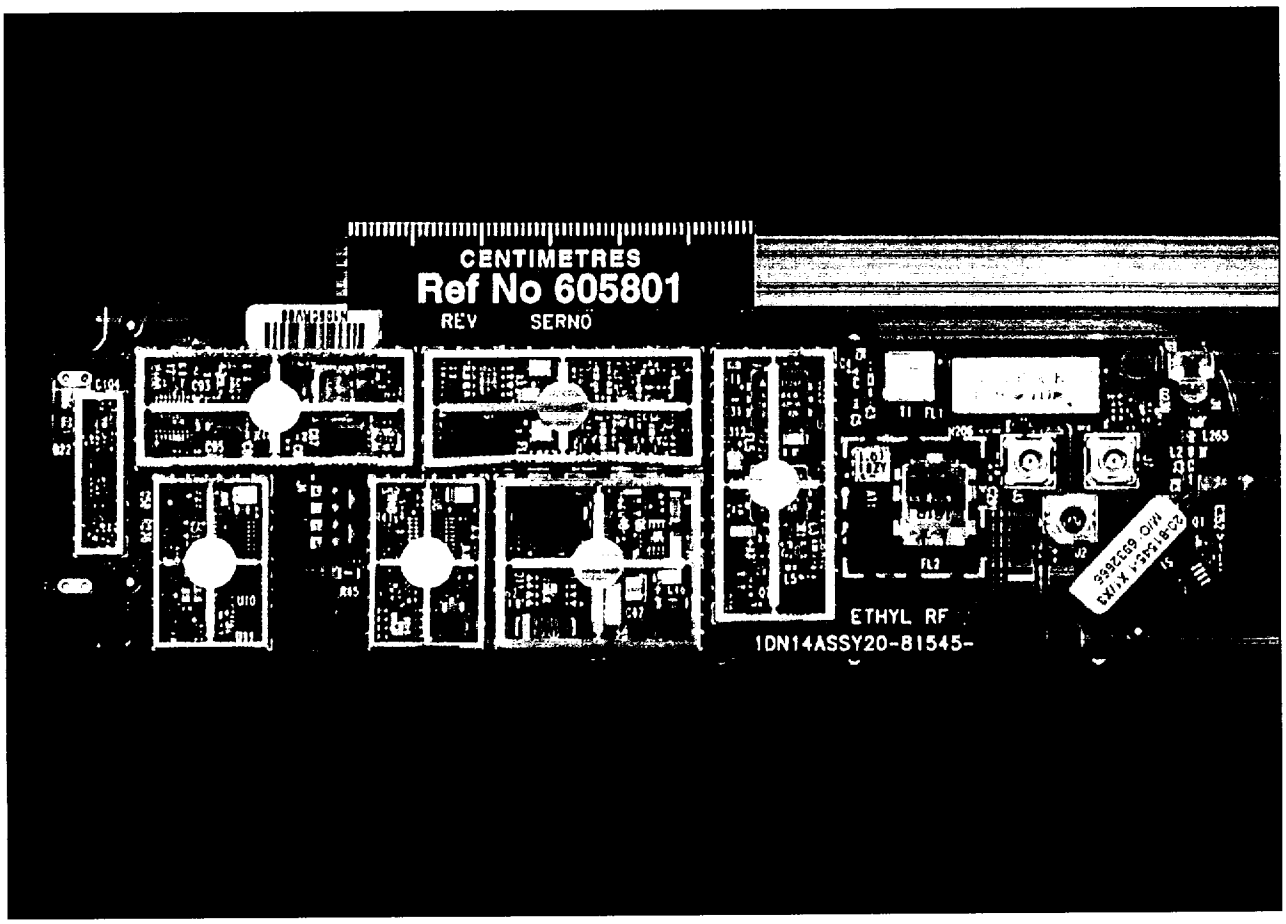
Photograph No 10 Internal view

PHOTOGRAPHS OF EQUIPMENT



Photograph No 11 Internal view

PHOTOGRAPHS OF EQUIPMENT



Photograph No 12 Internal view