

S-CEM/EMCD/TR/2004-2005/69

EMI/EMC TEST REPORT FOR GPS / MASTER CLOCK SYSTEM
MANUFACTURED BY M/S. SERTEL ELECTRONICS PVT. LTD., CHENAI



SAMEER - CENTRE FOR ELECTROMAGNETICS

(An Institution of Ministry of Communication and Information Technology)

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(An institution set-up by
Ministry of Communication & Information Technology, Government of India)
2nd Cross, CIT Campus, Taramani, Chennai - 600 113

August 2004



**SAMEER - CENTRE FOR ELECTROMAGNETICS
CHENNAI - 600 113**

EMI/EMC TEST REPORT FOR GPS / MASTER CLOCK SYSTEM
MANUFACTURED BY M/s. SERTEL ELECTRONICS PVT. LTD., CHENNAI

Test Request Particulars

01. Test request from : M/s. Sertel Electronics Pvt. Ltd., Chennai
02. Equipment Under Test (EUT) : GPS / Master Clock System
03. Number of test sample(s) : One
04. Model Number of EUT : T-PAN-300
05. Serial Number of EUT : 03-04H-033
06. Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai
07. Types of test requested : 1. Electrostatic Discharge Immunity Test
- As per IEC 61000-4-2, 2001
2. Radiated Susceptibility Test
- As per IEC 61000-4-3, 1997
3. Conducted RF Immunity Test
- As per IEC 61000-4-6, 1996-03
4. Damped Oscillatory Sinusoidal Immunity Test
-- As per IEC 61000-4-12, 2001
08. Test plan concurred by (Customer's Representative) : Mr. G. Sankar, Works Manager
Sertel Electronics Pvt. Ltd., Chennai
09. Test plan Witnessed by (Customer's Representative) : Mr. G. Venkatesh, BHEL-EDM
10. EUT arrived on : 17th August 2004
11. Test dates : 18th - 20th August 2004
12. Test venue : SAMEER-CEM, Chennai

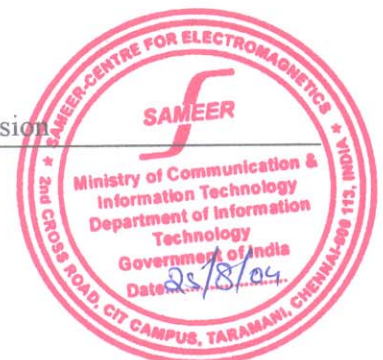
Certified that the data reported in this report are valid only for the test sample mentioned above at the time of and under the stated conditions / standards of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer along with test request and SAMEER-CEM does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Test Conducted by: Reviewed by: Approved by: Office seal

R Yegneswar
(R. Yegneswari)
Scientific Officer - SB

V. Mantharachalam
(V. Mantharachalam)
Scientific Officer - SD

Sisir K. Das
(Sisir K. Das)
Head, EMC Division



Equipment Under Test (EUT) : GPS / Master Clock System
 Model Number of EUT : T-PAN-300
 Serial Number of EUT : 03-04H-033
 Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

1. ELECTROSTATIC DISCHARGE IMMUNITY TEST

1.1 Applicable Standard: IEC 61000-4-2, 2001

1.2 Laboratory Environmental Conditions:

Ambient Temperature : 30 °C
 Relative Humidity : 45 %
 Atmospheric pressure : 1018 mb/hpa

1.3 Test Instrumentation:

Equipment	Make	Model Number	Serial Number
ESD generator	Haefely Trench	PESD 3000	H004039

1.4 EUT Configuration: EUT was energized with 230V AC. Model and Serial Numbers of the Subsystems are given in Annexure-I.

1.5 Test Specifications:

Rise time : 0.7 ns - 1 ns
 Duration : 30 ns
 Capacitance : 150 pF \pm 10%
 Resistance : 330 ohm \pm 5%
 Operating mode : Single
 Number of discharges : 10
 Charging resistance : Between 50 M Ω and 100 M Ω
 Modes of discharges : Upto \pm 4kV in contact discharge (direct and indirect)
 Upto \pm 4kV in air discharge

1.6 Test Procedure:

Electrostatic discharges were injected with output voltage increasing from \pm 1 kV to \pm 4 kV at all conductive user accessible points of the EUT in contact discharge mode and using Vertical Coupling Plane (VCP). Considering the weight of the EUT, the test was not conducted using Horizontal Coupling Plane (HCP).

Electrostatic discharges were injected with output voltage increasing from \pm 1kV to \pm 4 kV, at non-conductive user accessible points (in the front panel) of the EUT, in air discharge mode.

EUT was observed for any malfunction like error in the Master Clock Displays and in the LED indications of other subsystems, during and after injection of discharges, if any.



Equipment Under Test (EUT) : GPS / Master Clock System
 Model Number of EUT : T-PAN-300
 Serial Number of EUT : 03-04H-033
 Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

1.7 Test Observations:

Mode of Injection	Test voltage	Application Point	Observation
Contact	± 2 kV, -4 kV	Mounting screws, Back panel.	No malfunction was observed.
Contact	+4 kV	Mounting screws, Back panel.	Master A and Master B output LEDs of redundant comparator are switching alternatively. Momentary disturbance occurred in the displays of master clocks A & B.
Contact	± 2 kV, ± 4 kV	Mounting screws, Left Side panel.	No malfunction was observed.
Contact	± 2 kV, -4 kV	Mounting screws, Right Side panel.	No malfunction was observed.
Contact	+ 4 kV	Mounting screws, Right Side panel.	Master A and Master B output LEDs of redundant comparator are switching alternatively during the injection of pulses. But there was no change in the IST display in the Master Clocks.
Contact	± 2 kV, ± 4 kV	VCP used at Front Panel	No malfunction was observed.
Contact	± 2 kV	VCP used at Right Side panel.	No malfunction was observed.
Contact	± 4 kV	VCP used at Right Side panel.	Master A and Master B output LEDs of redundant comparator are switching alternatively. Momentary disturbance occurred in the displays of master clocks A & B.
Contact	± 2 kV, -4 kV	VCP used at Back panel	No malfunction was observed.
Contact	+ 4 kV	VCP used at Back panel	Master A and Master B output LEDs of redundant comparator are switching alternatively during the injection of pulses. But there was no change in the IST display in the Master Clocks.
Contact	± 2 kV, ± 4 kV	VCP used at Left side panel	No malfunction was observed.
Air	± 2 kV, ± 4 kV	Points on Front Panel	No malfunction was observed

Note: VCP- Vertical Coupling Plane

After the test, the EUT was functional.



Equipment Under Test (EUT) : GPS / Master Clock System
Model Number of EUT : T-PAN-300
Serial Number of EUT : 03-04H-033
Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

1.8 Enclosed Documents:

Annexure – I shows the Model and Serial Numbers of the Sub-systems.
Annexure – II shows the photograph of Electrostatic Discharge Test Setup.

Test Conducted by:

R. Yegneswari

(R. Yegneswari)
Scientific Officer - SB



Equipment Under Test (EUT) : GPS / Master Clock System
 Model Number of EUT : T-PAN-300
 Serial Number of EUT : 03-04H-033
 Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

2. RADIATED SUSCEPTIBILITY TEST

2.1 Applicable Standard: IEC 61000-4-3, 1997

2.2 Test Instrumentation:

Description	Make	Model Number	Serial Number
Signal generator	R&S	SMGU	832372/006
Biconilog antenna	ETS	3142B	00026416
RF power amplifier	AR	500W1000A	302035

2.3 EUT Configuration: 1.4 EUT Configuration: EUT was energized with 230V AC. Model and Serial Numbers of the Subsystems are given in Annexure-I.

2.4 Test Specifications:

Frequency range : 80 MHz to 1000 MHz
 Field strength : 3 V/m
 Modulation : 80% Amplitude Modulation, 1 kHz sine wave
 Stepped frequency increments : 1% logarithmic

2.5 Test Procedure:

The EUT was kept inside a room at a distance of one meter from the transmitting antenna. It was then subjected to RF field strength of 3 V/m, in both horizontal and vertical polarizations of the antenna, in the frequency range of 80 MHz to 1000 MHz. The RF signal was amplitude modulated with 1kHz sine wave to a modulation depth of 80%. EUT was observed for any malfunction like error in the Master Clock Displays and in the LED indications of other subsystems, during and after injection of RF field strength, if any.

Note: Considering the weight of the EUT, the test was not conducted inside the anechoic chamber. And the test was conducted in a room, as accepted by the customer.

2.6 Test Observations:

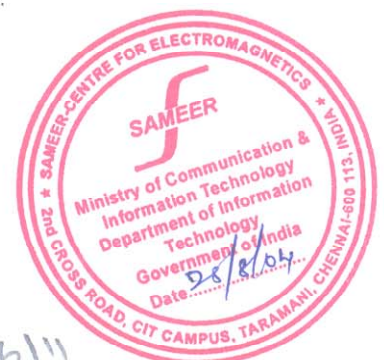
No malfunction was observed, when the EUT was subjected to 3 V/m field strength as per the test specifications. After the test, the EUT was functional.

2.7 Enclosed Documents:

Annexure - I shows the Model and Serial Numbers of the Sub-systems.
 Annexure - II shows the photograph of Radiated Susceptibility Test Setup.

Test Conducted by:

R. Yegneswar
 (R. Yegneswari)
 Scientific Officer - SB



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Equipment Under Test (EUT) : GPS / Master Clock System
 Model Number of EUT : T-PAN-300
 Serial Number of EUT : 03-04H-033
 Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

3. CONDUCTED RF IMMUNITY TEST

3.1 **Applicable Standard:** As per IEC 1000-4-6, 1996-03

3.2 **Test instrumentation:**

Equipment	Make	Model Number	Serial Number
Signal generator	IFR	2023B	202302 / 690
RF power amplifier	AR	100A 250	301590
Coupling and Decoupling Network	Schaffner	CDN M316	16925
Attenuator	Schaffner	ATN6010	16021

3.3. **EUT Configuration:** EUT was energized with 230V AC. Model and Serial Numbers of the Subsystems are given in Annexure-I.

3.4 **Test Specification:**

Frequency range : 150 kHz – 80 MHz
 RF Voltage : 3 Vrms
 Amplitude modulation : 80%, 1kHz, sinusoidal

3.5 **Test Procedure:**

The RF voltage of 3Vrms was injected on to the AC power lines using Coupling and Decoupling Network in frequency range of 150 kHz to 80 MHz. EUT was observed for any malfunction like error in the Master Clock Displays and in the LED indications of other subsystems, during and after injection of RF voltage, if any.

3.6 **Test Observation:**

No malfunction was observed, when the EUT was subjected to RF voltage of 3Vrms in the frequency range of 150kHz – 80MHz, on power lines. After the test, the EUT was functional.

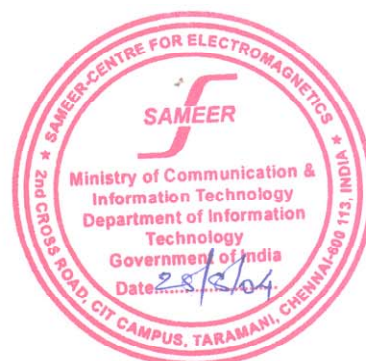
3.7 **Enclosed Documents:**

Annexure – I shows the Model and Serial Numbers of the Sub-systems.
 Annexure – II shows the photograph of Conducted RF Immunity Test Setup.

Test Conducted by:

R. Yegneswari

(R.Yegneswari)
 Scientific Officer – SB



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Equipment Under Test (EUT) : GPS / Master Clock System
 Model Number of EUT : T-PAN-300
 Serial Number of EUT : 03-04H-033
 Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

4. DAMPED OSCILLATORY SINUSOIDAL IMMUNITY TEST

4.1 Applicable standard: As per IEC 1000-4-12, 2001

4.2 Test instrumentation:

Description	Make	Model Number	Serial Number
Damped Oscillatory Sinusoidal generator	Haefely Trench	PIM 150	150028
System Controller	Haefely Trench	Psurge 8000	149819

4.3 Environmental Conditions:

Ambient Temperature : 25⁰ C
 Relative Humidity : 52 %
 Atmospheric Pressure : 1018 mb/hPa

4.4 EUT Configuration: EUT was energized with 230V AC. Model and Serial Numbers of the Subsystems are given in Annexure-I.

4.5 Test specifications:

Parameters	Specifications
Oscillation Frequency	1 MHz
Rise time	75ns
Output impedance	200Ω
Repetition frequency	400 Hz
Decaying	50% of peak value between the third and sixth periods
Test duration	3 sec.
Number of cycles	5 cycles on each polarity
Severity level with mode of injection	± 250 V to ± 2.5 kV on AC power lines in Common Mode. ± 250 V to ± 1.25 kV on AC power lines in Differential Mode.

4.6 Test procedure:

1 MHz Damped sinusoidal surges of above specified levels were superimposed on AC power lines in Common and Differential Modes. EUT was observed for any malfunction like error in the Master Clock Displays and in the LED indications of other subsystems, during and after injection of discharges, if any.



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Equipment Under Test (EUT) : GPS / Master Clock System
Model Number of EUT : T-PAN-300
Serial Number of EUT : 03-04H-033
Manufacturer : M/s. Sertel Electronics Pvt. Ltd., Chennai

4.7 Test observation:

No malfunction was observed in the EUT, when superimposing the high frequency damped oscillatory surges (1MHz) of ± 2.5 kV in Common Mode and ± 1.25 kV in Differential Mode. After the test, the EUT was functional.

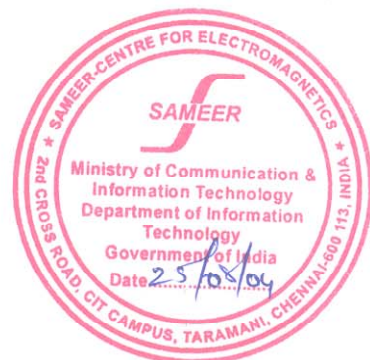
4.8 Enclosed Document:

Annexure – I shows the Model and Serial Numbers of the Sub-systems.
Annexure II Shows the Photograph of Damped Oscillatory Sinusoidal immunity test setup.

Test conducted by:

R. Yegneswari

(R. Yegneswari)
Scientific Officer-SB



SERTEL

GPS / MASTER CLOCK SYSTEM

	MODEL	SE-NO
GPS/MASTER CLOCK PANEL	T-PAN-300	03-04H-33
The system compress of the Following instrument		
1. GPS RECEIVER	T-GPS-300	90-04H-74
2. ANTENNA	T-GPA-014	90-04H-74
3. MASTER CLOCK-A	T-MA-300	30-04H-103
4. MASTER CLOCK-B	T-MA-300	30-04H-104
5. REDUNDANT COMPARATOR	T-COM-300	30-04H-105
6. SIGNAL CONDITIONER-1 With LINE driver/Receiver	T-SC-300	30-04H-49
7. SIGNAL CONDITIONER-2	T-SC-300	30-04H-50
8. SIGNAL CONDITIONER-3	T-SC-300	30-04H-51
9. SLAVE CLOCK	T-SL-300-100-6D	30-04H-238
10. POWER SUPPLY-A	T-PSU-24V	30-04H-63
11. POWER SUPPLY-B	T-PSU-24V	30-04H-64
12. REDUNDANT SUPPLY DIODE ORING	T-DR-300	30-04H-65.



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Equipment Under Test (EUT) : GPS / Master Clock System
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Annexure - II

