



# DET NORSKE VERITAS

## EMC TEST CERTIFICATE

CERTIFICATE NO. 397-96-0011

The certificate consists of 2 pages

*This is to certify that the*

**CPU BOARD**

*with type designation(s)*

**PCM-5860; PCM-4862**

*Manufactured by*

**Advantech Co., Ltd.**

**FL 4, No. 108-3, Ming -Chuan Rd., Shing-Tien City, Taipei, Taiwan, R.O.C.**

is found to comply with the following European Standard(s)

- EN 50081-2 (1993)
- prEN 50082-2 (1992)

The EMC tests were carried out at a local EMC laboratory in Taiwan, recognised by DNV after a Quality Audit and follow-ups, based on EN45001

The EMC test report for the product(s) has been assessed with respect to the standard(s) given above

*Place and date*

Taiwan, 31, December 1996  
for Det Norske Veritas AS

Robin Shih  
Industry Manager

Dennis Lin  
EMC Engineer



**Certificate No.: 397-96-0011**

**Product description**

The CPU board is a device for installing in the industrial computer or workstation

**Referenced standards and Test results**

EN 50081-2 (1993):

EN 55022 : Product(s) found to comply with Class A

EN 60555-2: Product(s) found to comply with Class A

EN 60555-3

prEN 50082-2 (1992):

IEC 801-2: Product(s) found to comply with Performance Criterion A

IEC 801-3: Product(s) found to comply with Performance Criterion A

IEC 801-4: Product(s) found to comply with Performance Criterion A

**Application/ Limitation**

Industry Environment

This certificate is based on a single evaluation of one sample of the above mentioned product

**Documentation**

EMC Test report no.: CEE-013-1

**Laboratory**

GesTek Laboratory

END OF CERTIFICATE

# TEST REPORT

## Electromagnetic Compatibility



Name & Address of the Testing Laboratory	GesTek Golbal EMC Standard Tech. Corp.	Tel: 886-2-6035321 Fax: 886-2-6035325
--	--	--

Name & Address of the applicant	<i>Advantech Co., Ltd.</i> <i>Fl.4, No. 108-3, Ming-Chuan Rd., Shing-Tien City</i> <i>Taipei, Taiwan, R.O.C.</i>
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Name & Address of the Manufacturer	<i>SAME AS APPLICANT</i>
------------------------------------	--------------------------

Name & Address of the Factory (production site)	<i>SAME AS APPLICANT</i>
---	--------------------------

Product	<i>CPU CARD</i>
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Trademark	<i>ADVANTECH</i>
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Model/Type reference	<i>PCM-5860, PCM-4862</i>
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Characteristics	<i>Pentium 100Mhz for PCM-5860</i>
-----------------	------------------------------------

	<i>Cyrix 5x86-100GP for PCM-4862</i>
--	--------------------------------------

Serial No.	<i>PROTOTYPE</i>
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Tested according to	<i>EN 50081-2 (1993)/EN 55022</i> <i>prEN50082-2 (1992)/IEC 801 SERIES</i>
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EMC Test Report No.....	<i>CEE-013-1</i>	CERTIFICATE NO. 397-96-0011
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Work carried out by.....	<i>DENNIS LIN</i>	<i>Dennis Lin</i> (Signature) <i>26-DEC-96</i> (Date)
--------------------------	-------------------	---

Work verified by.....	<i>ROBIN SHIH</i>	<i>Robin Shih</i> (Signature) <i>96/12/26</i> (Date)
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Date of issue.....	<i>31-DEC-1996</i>
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## OTHER INFORMATION

1. CUSTOMER REQUEST : -N/A-

2. EUT SERIAL APPROVAL : -N/A-

3. MODIFICATION : -N/A-

4. COMMENT: According to the EN 55022 mention, the following warning shall be inculded in the instructions for use: " This is a Class A product. In a domestic environment this product may cuase radio interference in which case the user may be required to take adequate measures.

### General Information:

Criteria A: Operate as intended during and after the test

Criteria B: Operate as intended after the test

Criteria C: Loss/Error of function



Clause	Requirement - test	Result	Verdict
1.	<b>SCOPE OF WORK</b>		<b>PASS</b>
	EN55022	Comply with Class A	
	EN60555-2		
	EN60555-3 + A1		
	IEC801-2 (1984)	Comply with Criteria A	
	IEC801-3 (1984)	Comply with Criteria A	
	IEC801-4 (1988)	Comply with Criteria A	
2.	<b>TEST LABORATORY</b>	GesTek EMC Standard Tech. Corp.	<b>O.K.</b>
	FACILITY (IEC 68-1)	ACTUAL	
	TEMPERATURE : 15-35 degree C	20-28	
	HUMIDITY : 25 - 75% RH	40-50 for ESD, 60-81 for others	
	BAROMETRIC : 860 -1060 mbar	950-1000	
	AC POWER SYSTEM	IT	
	EN45001 & ISO/IEC GUIDE 25	DNV : 510-96-1017	
3.	<b>TEST PERIOD</b>		
	SAMPLE RECEIVED TO FINAL TEST	05-NOV.-1996 to 16-NOV.-1996	



Clause	Requirement - test	Result	Verdict
4.	<b>EQUIPMENT UNDER TEST</b>		<b>O. K.</b>
	MODEL NO.	PCM-5860. PCM-4862	
	CPU SPEED	Pentium 100; Cyrix 5x86	
	CHASSIS	Seasonic, SSH-250G	
	FDD	Non-shielded, 1.5m	
	VGA CARD	On-Board	
	I/O CARD	On-Board	
	DISK CONTROL CARD	On-Board	
	SWITCH POWER SUPPLY	Seasonic, SSH-250G	
	POWER CORD	Non-shielded Detachable, 1.5m	
5.	<b>EVALUATE PERFORMANCE</b>		<b>PASS</b>
	FUNCTION TEST	Carried out before/during/after the test	
	PERFORMANCE MONITORING	Verify correct performance during the test	
6.	<b>SUMMARY</b>		<b>PASS</b>
	CERTIFICATION	There was no observable degradation in performance.  No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.	
7.	<b>TEST REPORT</b>	DNV : # CEE-013-1 Attached	<b>PASS</b>



**DET NORSKE VERITAS AS**

**Order No :96-9001**

**TCF#: CEE-013-1**

International Trade Bldg. Room 2102, 21F, 333 Keelung Rd., Sec. 1, Taipei, Taiwan, R.O.C. Tel: 886-2-757-6817 Fax: 886-2-757-6840



**Measurement Report**

**On Behalf Of**

**Advantech Co., Ltd.**

**CPU Card**

**Model # : PCM-5860, PCM-4862**

**Prepared for:**

**Advantech Co., Ltd.**

**F1, 4 No. 108-3, Ming-Chuan Road**

**Shing-Tien City, Taipei, Taiwan, R.O.C**

**Report By :Global EMC Standard Tech. Corp.**

**No.3 Pau-Tou-Tsuo Valley, Chia-Pau**

**Tsuen, Lin Kou Hsiang, Taipei County,**

**Taiwan, R.O.C.**

**Tel : (02) 603-5321**

**Fax : (02) 603-5325**

Test results given in this report only relate to the specimen(s) tested, calibrated or measured.  
This report shall not be reproduced other than in full without the written consent of DNV.



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## 1. Test Report Certification

Applicant : Advantech Co., Ltd.  
EUT Description : CPU Card  
Model Number : PCM-5860, PCM-4862  
Serial Number : Prototype  
Power Supply : 230V/ 50Hz

### MEASUREMENT PROCEDURE USED :

EN 50081-2/1993 RULES AND 55022/1991 RULES AND EN60555-2 & 3

prEN 50082-2/1992 RULES AND IEC 801 SERIES REGULATIONS

### For EN50081-2/1993 and EN55022 :

The measurement shown in the attachment where made in accordance with the procedures indicated, and the maximum energy emitted by the equipment was found to be within the EN55022 limits applicable.

### For prEN 50082-2/1992 Rules and IEC 801 Series Regulations:

The device described above was evaluated by Global EMC Standard Tech. Corp. to determine the severity levels of the device, and the severity levels of the device can endure and its performance criterion. The measurement results are contained in this test report and show that the EUT to be technically compliant with prEN50082-2/IEC801 Series regulations. Global EMC Standard Tech. Corp. recommends that the measurement results can pass performance criterion of above regulations.

### GENERAL REMARK:

The tests were performed according to the technical requirement of EUT .

- ☒ Electron-magnetic Interference (EN55022)
- ☒ Disturbance Measurement (EN60555-2 & 3)
- ☒ ESD Measurement (IEC801-2)
- ☒ RF Field strength Susceptibility Measurement(IEC801-3)
- ☒ Electrical Fast Transient/Burst Measurement (IEC801-4)

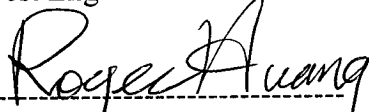
Sample Received Date : Jun. 08, 1996

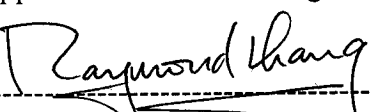
Final Test Date : Sep. 25, 1996

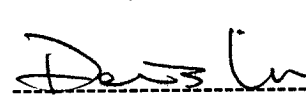
Test Engineer :

Approve & Authorized Signer :

Review by DNV:

  
ROGER HUANG

  
RAYMOND CHANG

  
DENNIS LIN



DET NORSKE VERITAS AS

Order No :96-9001

TCF#: CEE-013-1

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## 2. General Information

### 2.1 Production Description

Description	: CPU Card
Model Number	: PCM-5860, PCM-4862
Serial Number	: Prototype
Applicant	: Advantech Co., Ltd.
Address	: F1, 4 No. 108-3, Ming-Chuan Road Shing-Tien City, Taipei, Taiwan, R.O.C
Manufacturer	: Advantech Co., Ltd.
Address	: F1, 4 No. 108-3, Ming-Chuan Road Shing-Tien City, Taipei, Taiwan, R.O.C
CPU #1	: Pentium 100Mhz for PCM-5860
CPU #2	: Cyrix 5x86-100GP for PCM-4862
Chassis	: Advantech, ITC610
FDD	: Teac, FD-235HF
VGA Card	: On board
I/O Card	: On board
Disk Ctrl Card	: On board
S.P.S.	: Seasonic, SSH-250G
Power Cord	: Non-shielded, Detachable, 1.5m



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## 2.2 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system ( including inserted cards, which have grants) are:

☒ Host Personal Computer

Chassis	: Advantech, ITC610
CPU Board(EUT)	: Advantech, PCM-5860/PCM-4862
CPU #1	: Pentium 100Mhz for PCM-5860
CPU #2	: Cyrix 5x86-100GP for PCM-4862
FDD	: Teac, FD-235HF
VGA Card	: On board
I/O Card	: On board
Disk Ctrl Card	: On board
S.P.S.	: Seasonic, SSH-250G
Power Cord	: Non-shielded, Detachable, 1.5m

☒ Monitor 14"

Model Number	: M447AU
Serial Number	: 349T9000M00174
FCC ID	: GKR447A
Manufacturer	: COMPAL
Data Cable	: Shielded, Undetachable, 1.5m
Power Cord	: Shielded, Detachable, 1.8m

☒ Keyboard

Model Number	: ACK-700
Serial Number	: 600108761
FCC ID	: LZBACEKEY700
Manufacturer	: BTC
Data Cable	: Sheiled, Undetachable, 1.2 m



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Order No :96-9001

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☒ Modem

Model Number : MD-002

Serial Number : 960011392

FCC ID : IFAXDM1414

Manufacturer : ACCEX

Adaptor & Power Cord : Non-Shielded, Detachable, 1.5m

Data Cable : Shielded, Detachable, 1.2m

## 2.3 Test Methodology

EMI Test:

Both conducted and radiated testing were performed according to the procedures in EN 55022/1987. Radiated testing was performed at an antenna to EUT distance of 10 meters.

EMS Test:

Performed according to procedures in EN 61000( IEC 801)

## 2.4 Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-28
Humidity (%RH)	25-75 (45-75 for ESD, 1 <sup>st</sup> , ed.) (30-60 for ESD, 2 <sup>nd</sup> , Ed)	40-50 for ESD 60-81 for others
Barometric pressure (mbar)	860-1060	950-1000

Site Description : Hovik, 15 August, 1996 File on  
DNV Laboratory Authorization  
Det Norske Veritas AS  
(Competent and Notified Body no. 575)

Name of firm : Global EMC Standard Tech. Corp.

Site location : No. 3 Pau-Tou-Tsuo Valley, Chia-Pau Tsuen, Lin Kou  
Hsiang, Taipei County, Taiwan, R.O.C.



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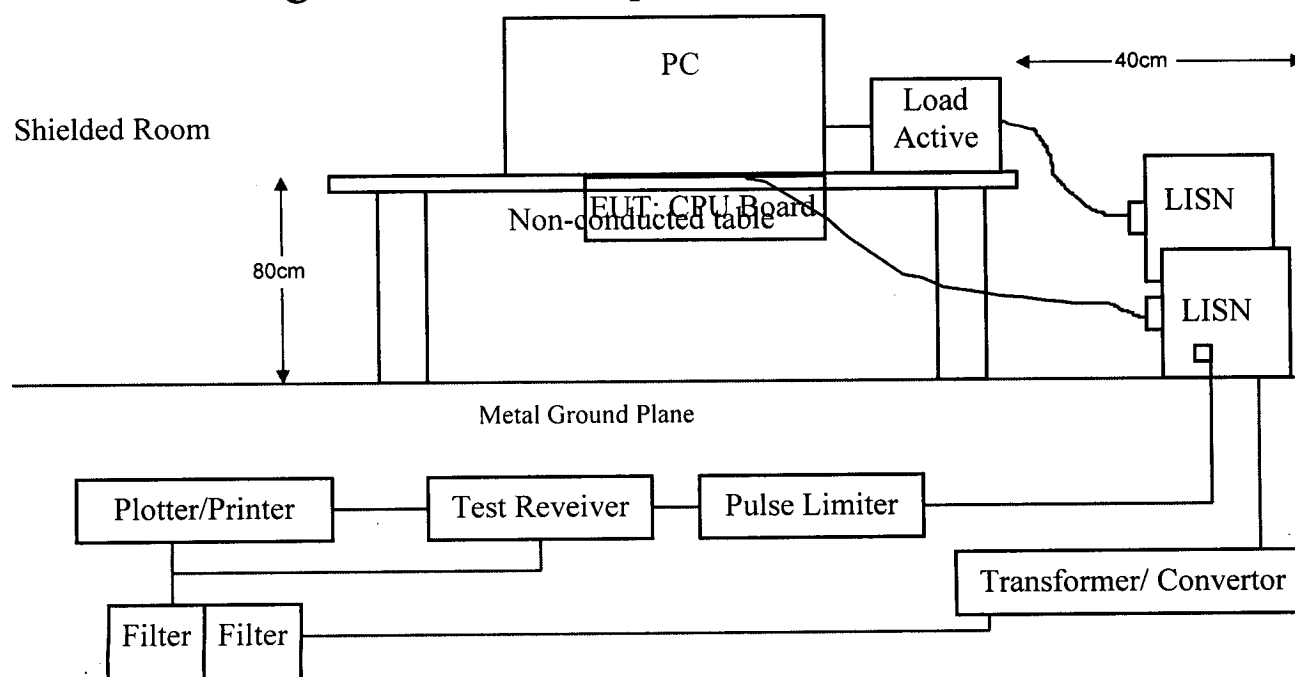
### 3. Conducted Power Line Test

#### 3.1 Test Equipments

The following test equipments are used during the conducted power line tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Test Receiver	Rohde & Schwarz	ESHS 30	Jul.1996
2	L.I.S.N.	Kyoritsu	KNW-407	Jul.1996
3	L.I.S.N.	HP	3825/2	Jun.1996
4	L.I.S.N.	Rohde & Schwarz	ESH3-Z5	Jun.1996
5	Computer	Enlight	486AT	N/A
6	Printer	NEC	6200	N/A
7	Plotter	HP	7440A	N/A
8	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	N/A
9	Shielded Room 8.0m*4.0m*3m			N/A

#### 3.2 Block Diagram of Test Setup





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### 3.3 Conducted Powerline Emission Limit

Frequency  MHz	Maximum RF Line Voltage dB(uV)			
	Class A		Class B	
	QUASI-PEAK	AVERAGE	QUASI-PEAK	AVERAGE
0.15 - 0.50	79	66	66-56	56-46
0.50-5.0	73	60	56	46
5.0 - 30	73	60	60	50

Remarks : In the Above Table, the tighter limit applies at the band edges.

### 3.4 EUT Configuration on Measurement

The equipments which is listed 3.2 are installed on Conducted Power Line Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

### 3.5 EUT Exercise Software

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

- 3.1.5.1 Setup the EUT and simulators as shown on 4.2.1.
- 3.1.5.2 Turn on the power of all equipments.
- 3.1.5.3 Boot the PC from Floppy Disk.
- 3.1.5.4 PC sent "H" Pattern to Monitor .
- 3.1.5.5 PC sent "H" Pattern to Parallel port.
- 3.1.5.6 PC sent "H" Pattern to Serial port.
- 3.1.5.7 Repeat 3.5.4 to 3.5.6

### 3.6 Conducted Emission Data

The measurement range of conducted emission which is from **0.15 MHz to 30 MHz** was investigated. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages .

The total uncertainty for this test is as follows:

- Uncertainty in conducted emission measured:  $< \pm 2.0$  dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.



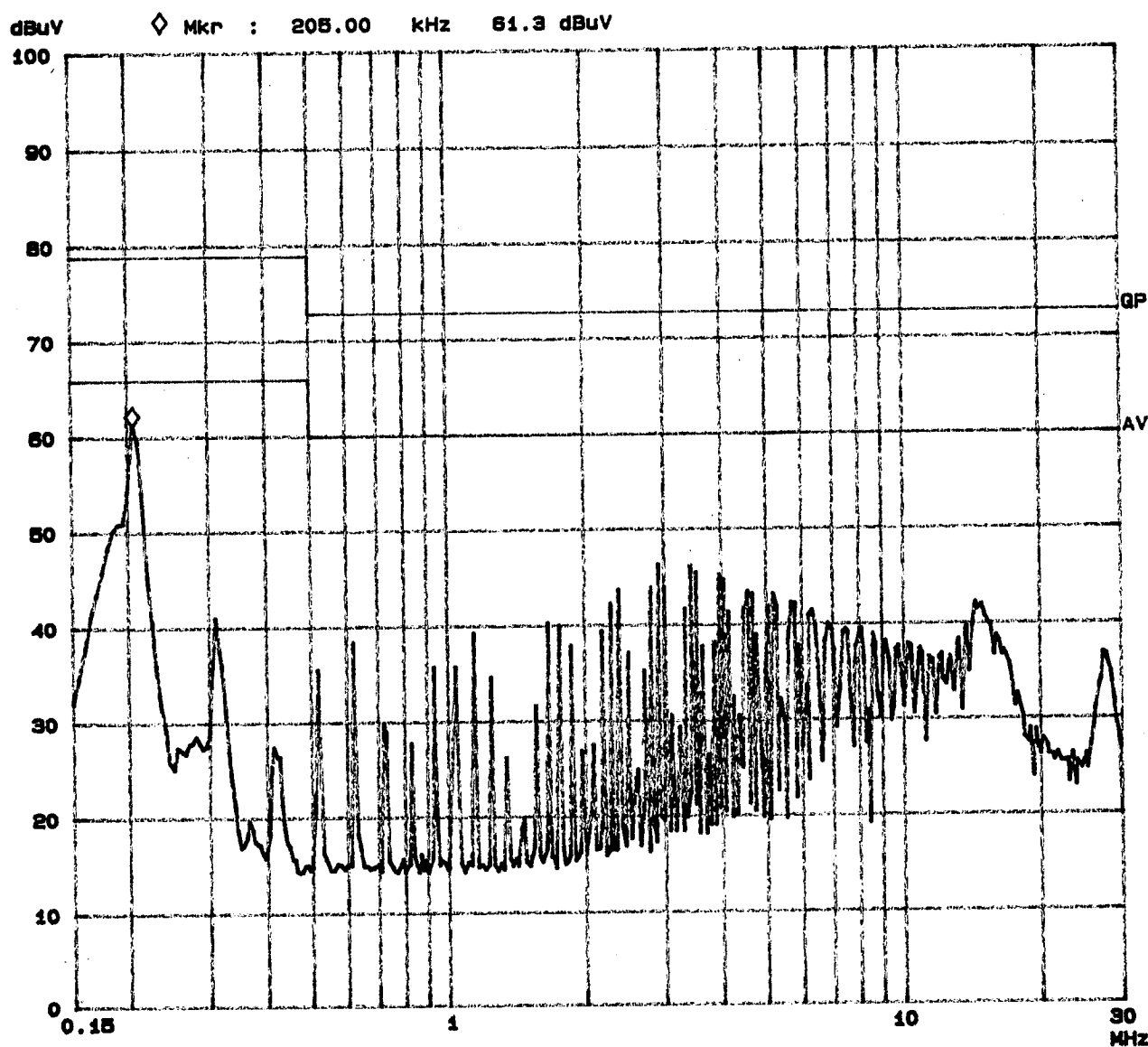


ROHDE &amp; SCHWARZ ESHS 30

18. Sep 95 00:19

GesTek, PowerLine Conducted Emission

EUT: CPU BOARD  
Manuf: ADVANTECH  
Op Cond: FULL SYSTEM  
Operator: ROGER  
Test Spec: EN55022 A  
Comment: Line 1  
M/N: PCM-5860

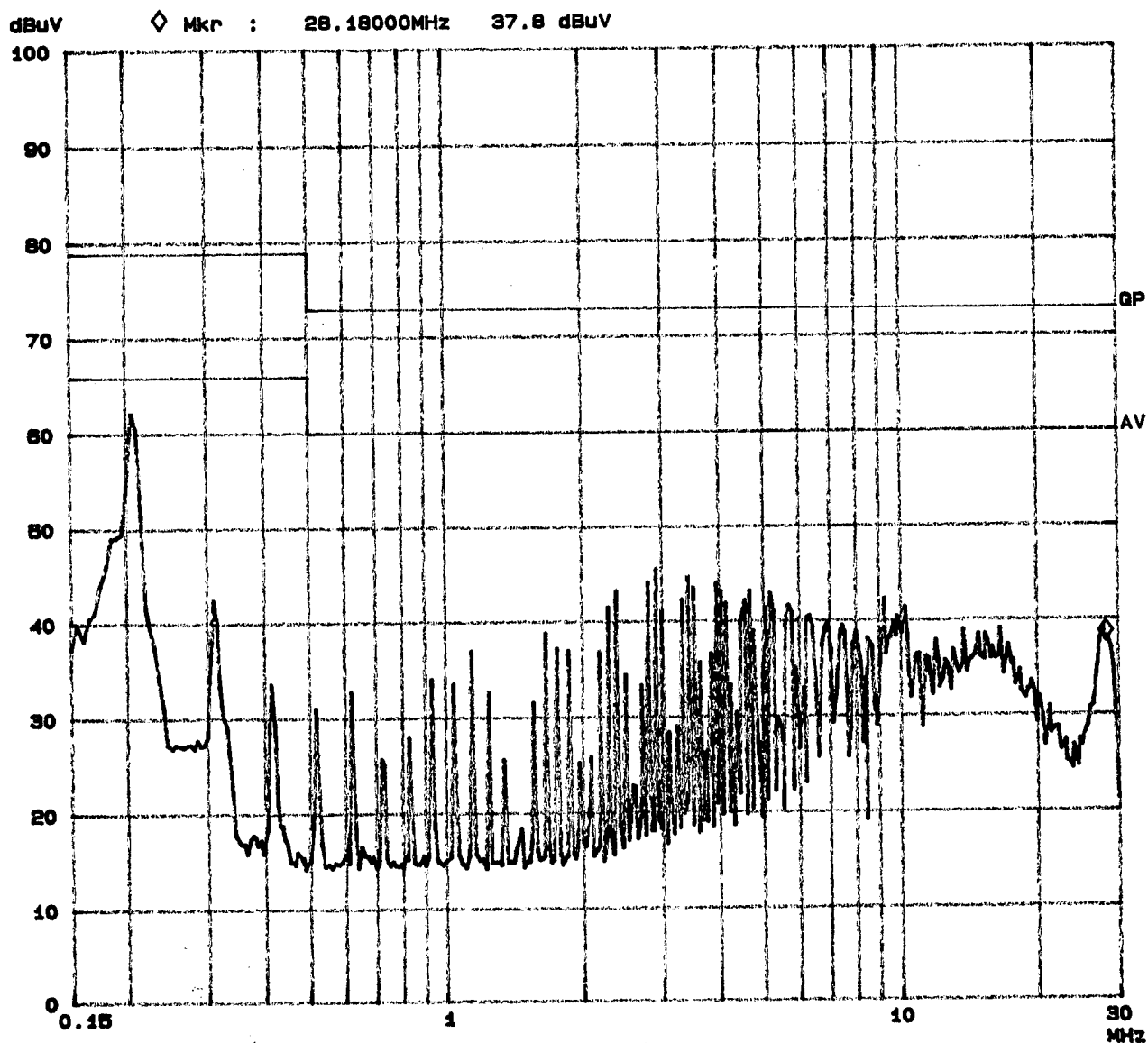


ROHDE &amp; SCHWARZ ESHS 30

17. Sep 95 23:54

GesTek, PowerLine Conducted Emission

EUT: CPU BOARD  
Manuf: ADVANTECH  
Op Cond: FULL SYSTEM  
Operator: ROGER  
Test Spec: EN55022 A  
Comment: Line 2  
M/N: PCM-5860





DET NORSKE VERITAS AS

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**CONDUCTED EMISSION DATA**

Date of Test : Sep. 18, 1996 Temperature : 26 °C  
EUT : CPU Card(PCM-4862) Humidity : 56 %  
Test Mode : Full System Display Pattern : H Pattern

FREQUENCY MHz	READING LEVEL dBuV				LIMITS	
	LINE1 QP	LINE1 AV	LINE2 QP	LINE2 AV	QP	AV
0.20662	61.4	*	60.8	*	79	66
0.51661	36.2	*	33.0	*	73	60
1.55325	42.3	*	41.0	*	73	60
3.72864	44.7	*	44.1	*	73	60
13.72010	18.9	*	34.0	*	73	60
28.50188	26.9	*	35.3	*	73	60

Remarks : 1. All readings are Quasi-peak values.

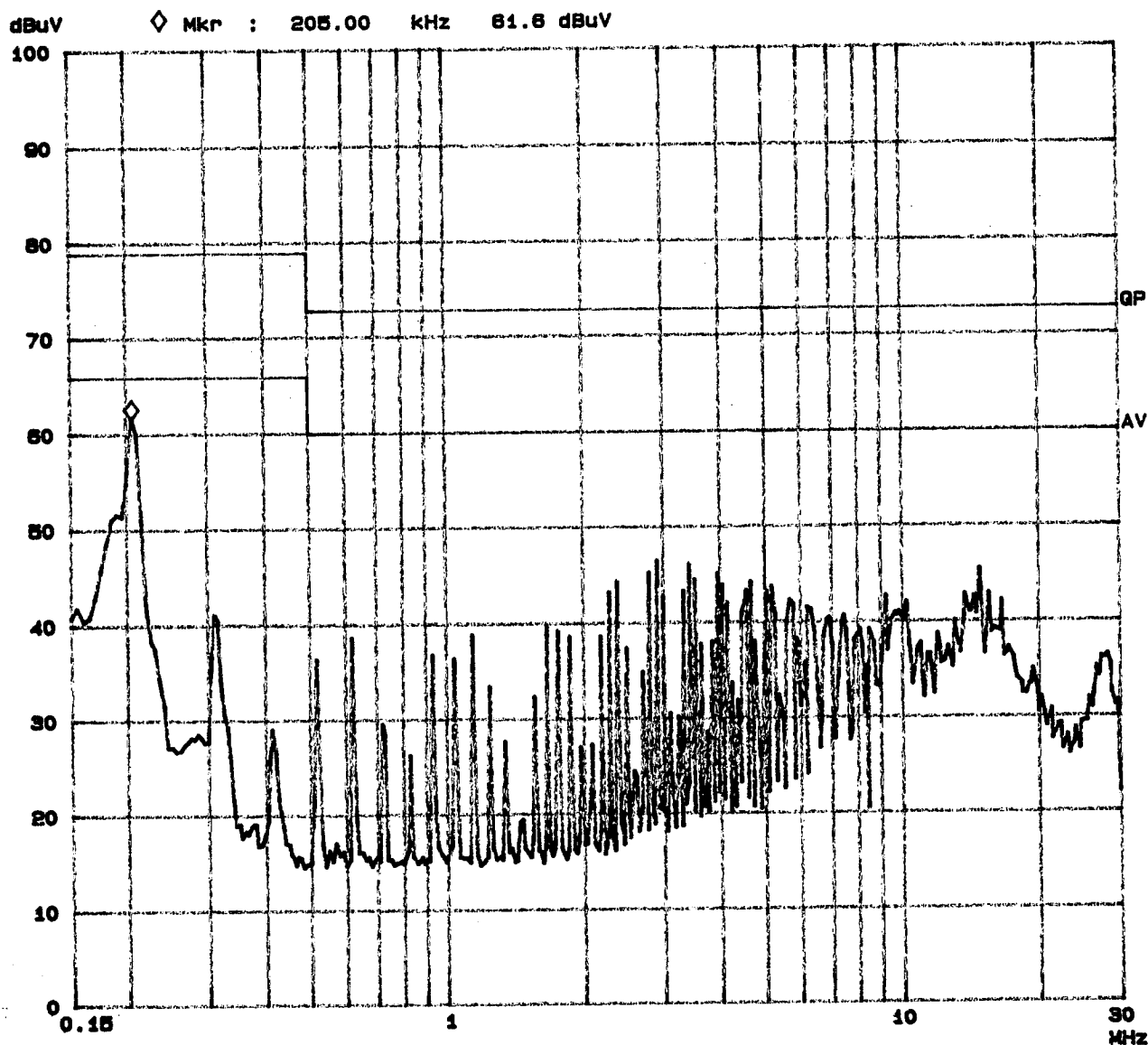
2. " \* " means that the level is too low.

ROHDE &amp; SCHWARZ ESHS 30

18. Sep 98 00:09

GesTek, PowerLine Conducted Emission

EUT: CPU BOARD  
Manuf: ADVANTECH  
Op Cond: FULL SYSTEM  
Operator: ROGER  
Test Spec: EN55022 A  
Comment: Line 1  
M/N: PCM-4862

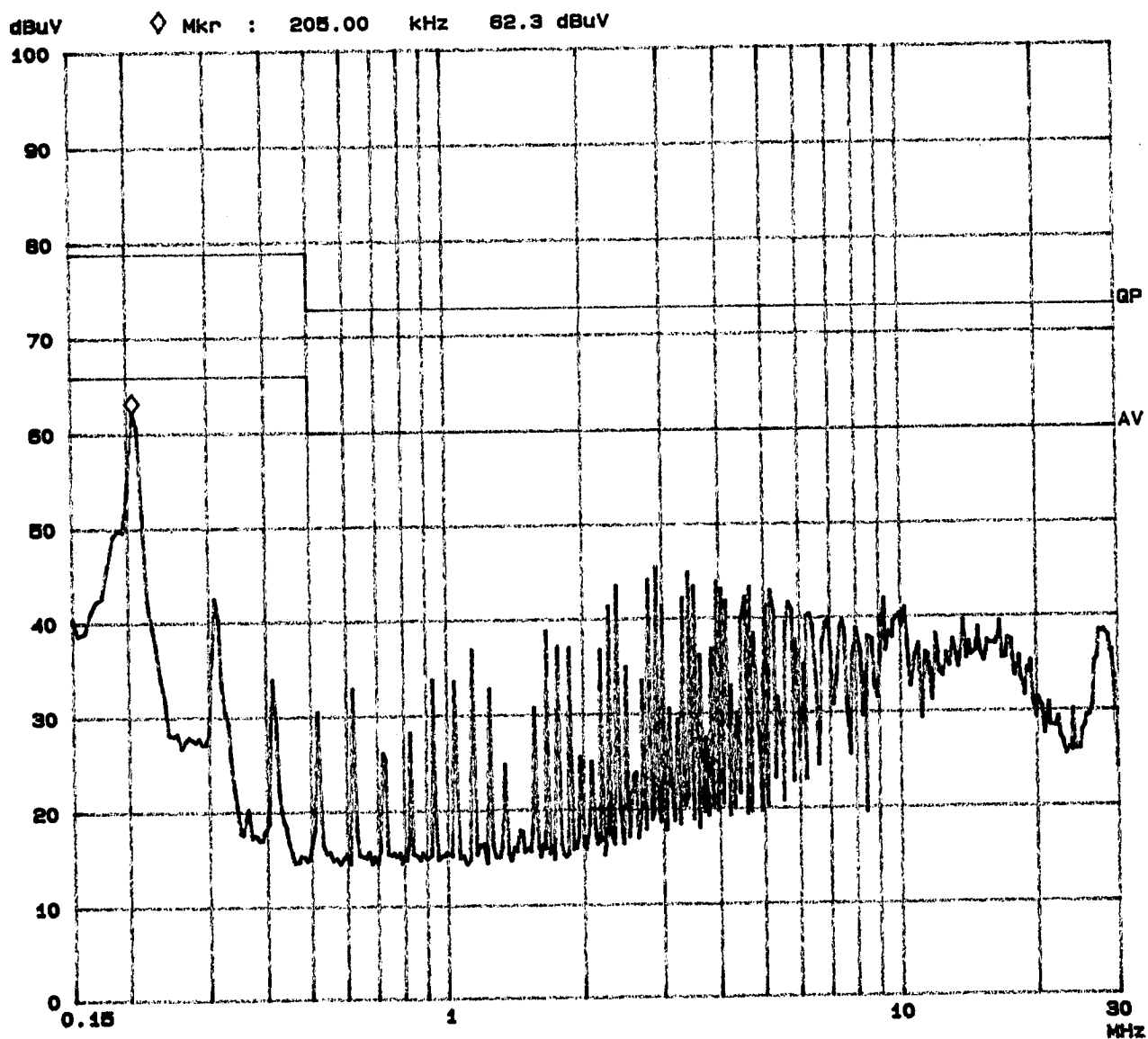


ROHDE &amp; SCHWARZ ESHS 30

18. Sep 95 00:01

GesTek, PowerLine Conducted Emission

EUT: CPU BOARD  
Manuf: ADVANTECH  
Op Cond: FULL SYSTEM  
Operator: ROGER  
Test Spec: EN55022 A  
Comment: Line 2  
M/N: PCM-4862





DET NORSKE VERITAS AS

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International Trade Bldg. Room 2102, 21F, 333 Keelung Rd., Sec. 1, Taipei, Taiwan, R.O.C. Tel: 886-2-757-6817 Fax: 886-2-757-6840

## 4. Radiation Emission Test

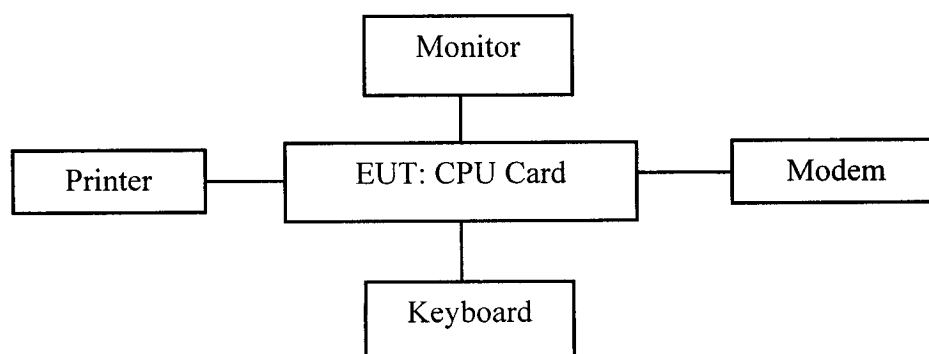
### 4.1 Test Equipment

The following test equipments are used during the radiated emission tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Spectrum Analyzer	Anristu	MA2601B	Jun. 1996
2	Test Receiver	Rohde & Schwarz	ESVS 30	Jun. 1996
3	Pre-Amplifier	HP	7447F	Jun.1996
4	Computer	DTK	486DX2/66	N/A
5	Printer	NEC	P6200	N/A
6	Antenna & Turn Table Controller	GesTek	AT7007	N/A
7	Spectrum Analyzer	HP	8568B	Aug. 1996
8	Test Receiver	Rohde & Schwarz	ESVS 10	Aug. 1996
9	Pre Amplifier	HP	8447D	Aug. 1996
10	Bilog Antenna	Chase	CBL6111	Jul. 1996
11	Broadband Antenna 30Mhz-2Ghz	Chase	CBL 6112	Feb. 1996

### 4.2 Test Setup

#### 4.2.1 Block Diagram of Connections between EUT and simulators





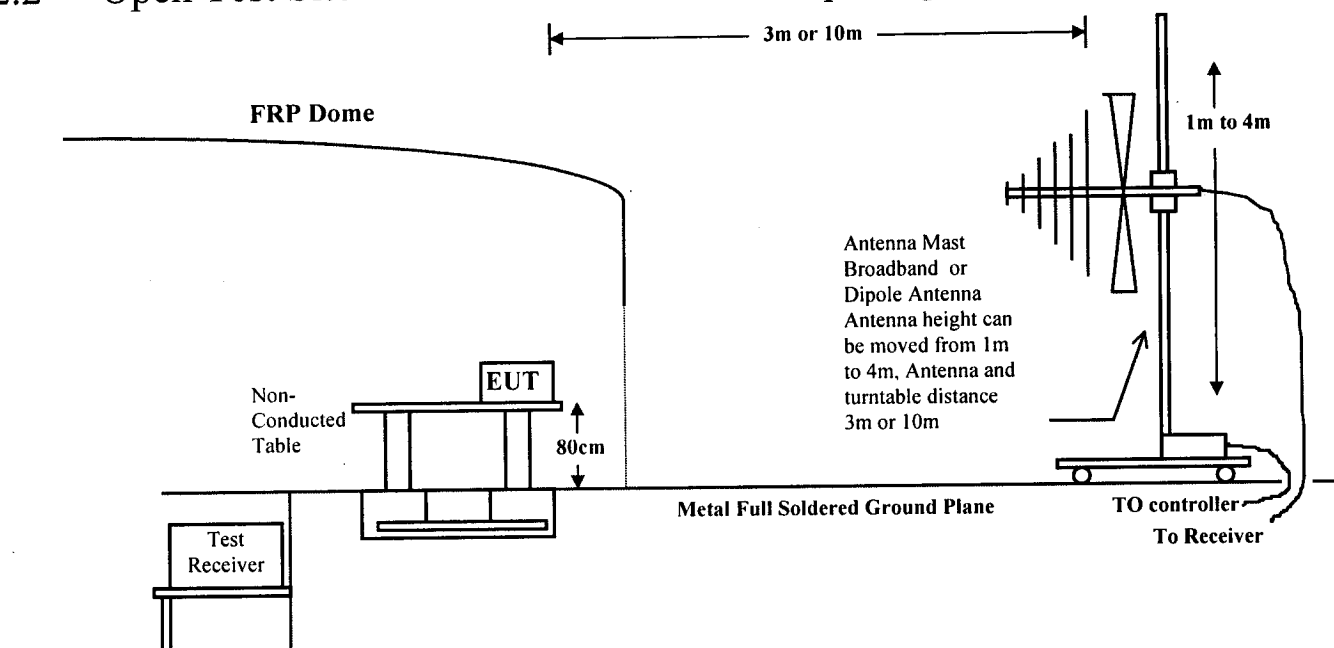
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Order No :96-9001

TCF#: CEE-013-1

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## 4.2.2 Open Test Site & Anechoic Chamber Setup Diagram



## 4.3 Radiated Emission Limit

### □ Class A Limits

Frequency	Distance / Field Strength		
MHz	(30m)	(10m)	(3m)
30 - 230	30	40	50
230 - 1000	37	47	57

### □ Class B Limits

Frequency	Distance / Field Strength	
MHz	(10m)	(3m)
30 - 230	30	40
230 - 1000	37	47



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Remarks:

- 1.The lower limit shall apply at the transition frequency.
- 2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

#### 4.4 EUT Configuration

The equipments which is listed 3.2.2 are installed on Radiated Emission Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

#### 4.5 Operating Condition of EUT

Same as Conducted Power Line Test which is listed in 3.1.5.

#### 4.6 Radiated Emission Data

The measurement range of radiated emission which is from 30 MHz to 1 GHz was investigated. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages .

The total uncertainty for this test is as follows:

- Uncertainty in the field strength measured (3m antenna distance):  $< \pm 4.0$  dB
- Uncertainty in the field strength measured (10m antenna distance):  $< \pm 4.0$  dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.





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## Radiated Emission Data

Date of Test :07-24,1996 Wed      Temperature :27 deg/C  
EUT :CPU Card(PCM-5860)      Humidity :70 %RH  
Test Mode :Full System      Display Pattern:H Pattern

Frequency	Cable	Antenna	Reading Level	Emission Level	Limits
(MHz)	Loss	Factor	Horizontal	Horizontal	(dBuV/m)
	(dB)	(dB)	(dBuV/m)	(dBuV/m)	
125.136	1.26	12.80	15.00	29.06	40.00
150.319	1.41	12.00	16.84	30.25	40.00
200.119	1.70	10.60	23.82	36.12	40.00
225.170	1.85	11.04	13.94	26.83	40.00
250.170	1.99	13.47	24.62	40.08	47.00
300.220	2.29	14.50	14.24	31.03	47.00
400.958	2.88	17.51	10.56	30.95	47.00

Remarks:All Readings below 1GHz are Quasi-Peak, above are average value.



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## Radiated Emission Data

Date of Test :07-24,1996 Wed      Temperature :27 deg/C  
EUT :CPU Card(PCM-5860)      Humidity :70 %RH  
Test Mode :Full System      Display Pattern:H Pattern

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB)	Reading Level Vertical (dBuV/m)	Emission Level Vertical (dBuV/m)	Limits (dBuV/m)
47.917	0.81	7.90	16.47	25.18	40.00
150.120	1.41	11.50	18.06	30.97	40.00
175.183	1.55	10.03	26.26	37.84	40.00
200.128	1.70	10.70	24.34	36.74	40.00
250.158	1.99	12.42	17.12	31.53	47.00
429.619	3.04	16.51	9.8	29.35	47.00
444.000	3.13	17.67	12.64	33.45	47.00
800.746	5.23	23.00	-1.60	26.63	47.00

Remarks:All Readings below 1GHz are Quasi-Peak, above are average value.



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## Radiated Emission Data

Date of Test :07-25,1996 Thu      Temperature :27 deg/C  
EUT :CPU Card(PCM-4862)      Humidity :70 %RH  
Test Mode :Full System      Display Pattern:H Pattern

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB)	Reading Level Horizontal (dBuV/m)	Emission Level Horizontal (dBuV/m)	Limits (dBuV/m)
72.040	0.95	7.05	21.14	29.13	40.00
114.563	1.20	12.18	10.86	24.24	40.00
125.896	1.26	12.80	6.83	20.89	40.00
143.206	1.36	12.14	8.41	21.91	40.00
192.118	1.65	10.36	12.29	24.30	40.00
200.184	1.70	10.60	11.51	23.81	40.00
352.383	2.59	15.17	13.20	30.96	47.00
377.549	2.74	16.12	11.41	30.27	47.00

Remarks:All Readings below 1GHz are Quasi-Peak, above are average value.



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## Radiated Emission Data

Date of Test :07-25,1996 Thu      Temperature :27 deg/C  
EUT :CPU Card(PCM-4862)      Humidity :70 %RH  
Test Mode :Full System      Display Pattern:H Pattern

Frequency	Cable	Antenna	Reading Level	Emission Level	Limits
(MHz)	Loss	Factor	Vertical	Vertical	(dBuV/m)
	(dB)	(dB)	(dBuV/m)	(dBuV/m)	
50.682	0.82	6.90	15.10	22.82	40.00
57.960	0.87	7.34	16.37	24.58	40.00
85.970	1.02	8.50	10.66	20.18	40.00
125.845	1.26	12.84	3.58	17.68	40.00
176.195	1.56	10.14	12.84	24.54	40.00
192.130	1.65	11.34	10.40	23.40	40.00
200.113	1.70	10.70	11.09	23.49	40.00
276.868	2.15	14.39	12.49	29.02	47.00
300.180	2.29	14.10	4.27	20.66	47.00
312.200	2.36	14.61	11.46	28.43	47.00
352.394	2.59	15.25	10.21	28.06	47.00
402.716	2.89	18.14	4.50	25.53	47.00

Remarks:All Readings below 1GHz are Quasi-Peak, above are average value.



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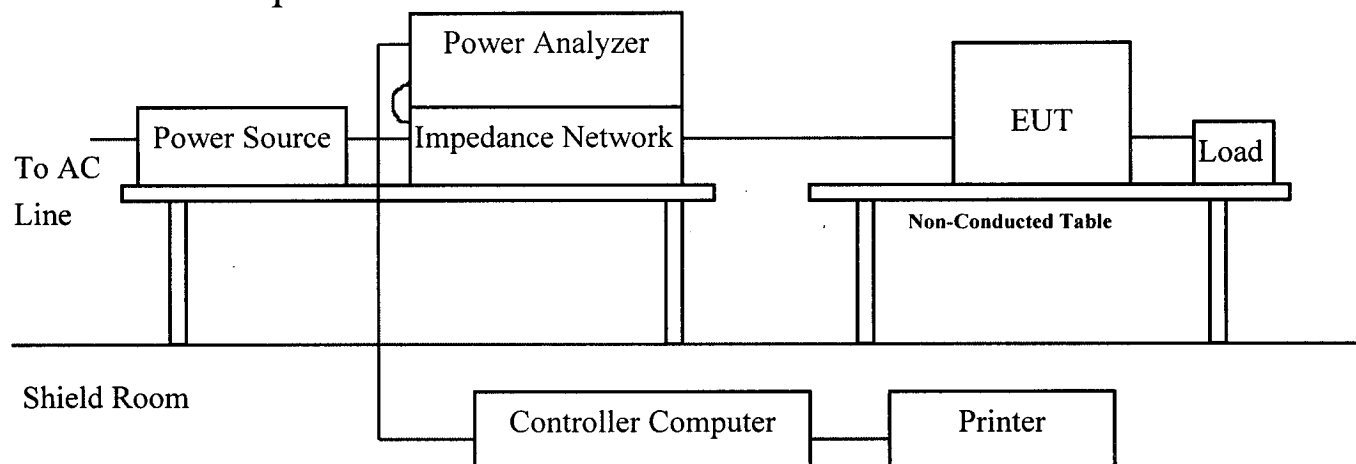
## 5. Disturbance Measurement

### 5.1 Test Equipment

The following test equipments are used during the Disturbance tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Power Analyzer	Voltech	PM 3000A	Oct. 1995
2	Power Source	Pacific	345AMX/UPC32	Oct. 1995
3	Impedance Network	Voltech	IB0718921	Oct. 1995

### 5.2 Test Setup of EUT





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### 5.3 Limits of Harmonics Currents

Harmonics Order	Maximum Permissible harmonic current (in amperes)	Harmonics Order	Maximum Permissible harmonic current (in amperes)
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	$8 \leq n \leq 40$	$0.23 * 8/n$
11	0.33		
13	0.21		
$15 \leq n \leq 39$	$0.15 * 15/n$		

### 5.4 EUT Operating Condition

1. Setup the EUT and Test Equipment as shown on 4.2.
2. Power on.

### 5.5 Test Procedure

Power Harmonic:

The EUT is supplied in series with power analyzer from a power source having the same normal voltage and frequency as the rated supply voltage and the equipment under test. And the rated voltage at the supply voltage of EUT of 0.94 times and 1.06 times shall be performed.

### 5.6 Test Method

According to EN60555-2 & 3

### 5.7 Test Result

The measurement of the power harmonics which test at the extremes of EUT's supply range was investigated and test result were reported the following data pages.

The measurement limit were met, and the EUT **passed** the test.

The total uncertainty for this test is as follows:

- Uncertainty in the current measured:  $< \pm 10\%$

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.

GesTek Lab. Voltech PM3000A-002 Universal Power Analyzer  
Manufacturer: ADVANTECH  
EUT: CPU BOARD  
M/N: PCM-5860  
NOTE: FULL SYSTEM

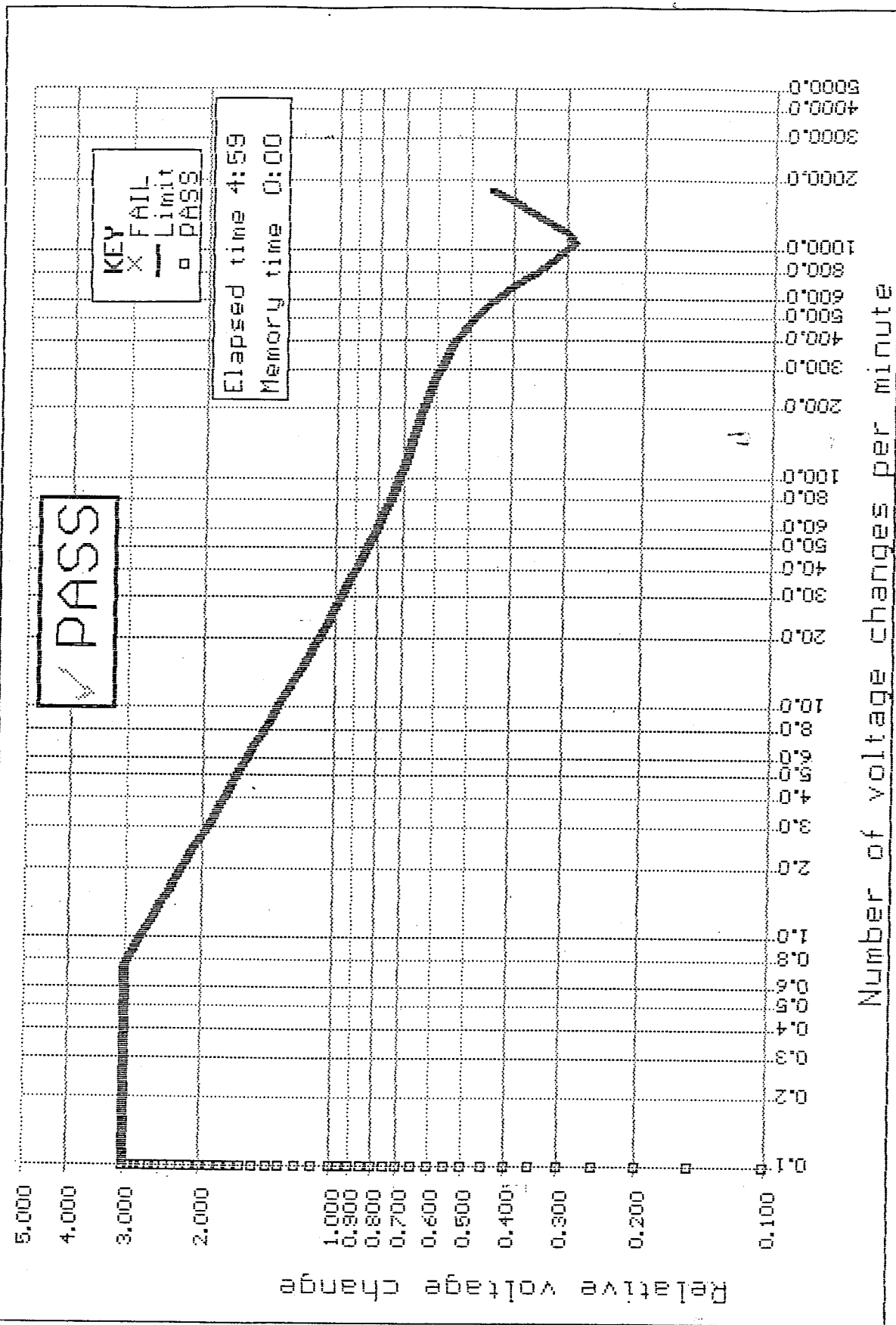
CH1 Steady State Harmonics Test. Thu Jul 25 08:12:30 1996

Volts 230.199997V  
Amps 0.686700A  
Watts 75.739998W  
Power Factor 0.479600  
Limits multiplied by 1.00

HNumber	IEC Limit (class A)	Magnitude	PASS FAIL
2	1.080A	0.006925A	PASS
3	2.300A	0.306800A	PASS
4	0.430A	0.004844A	PASS
5	1.140A	0.286900A	PASS
6	0.300A	0.004694A	PASS
7	0.770A	0.255900A	PASS
8	0.230A	0.003678A	PASS
9	0.400A	0.221000A	PASS
10	0.184A	0.003218A	PASS
11	0.330A	0.181580A	PASS
12	0.153A	0.002295A	PASS
13	0.210A	0.141220A	PASS
14	0.131A	0.001558A	PASS
15	0.150A	0.102400A	PASS
16	0.115A	0.000847A	PASS
17	0.132A	0.066980A	PASS
18	0.102A	0.000538A	PASS
19	0.118A	0.037530A	PASS
20	0.092A	0.000374A	PASS
21	0.107A	0.014606A	PASS
22	0.084A	0.000333A	PASS
23	0.098A	0.006601A	PASS
24	0.077A	0.000266A	PASS
25	0.090A	0.014878A	PASS
26	0.071A	0.000319A	PASS
27	0.083A	0.018696A	PASS
28	0.066A	0.000110A	PASS
29	0.078A	0.018706A	PASS
30	0.061A	0.000142A	PASS
31	0.073A	0.014998A	PASS
32	0.058A	0.000321A	PASS
33	0.068A	0.010016A	PASS
34	0.054A	0.000348A	PASS
35	0.064A	0.004110A	PASS
36	0.051A	0.000379A	PASS
37	0.061A	0.000935A	PASS
38	0.048A	0.000415A	PASS
39	0.058A	0.004958A	PASS
40	0.046A	0.000359A	PASS

Passed Steady State Harmonics test

CH1 Changing Voltage Thu Jul 25 08:40:38 1996





Gestek Lab. Voltech PM3000A-002 Universal Power Analyzer  
Manufactur: ADVANTECH  
EUT: CPU BOARD  
M/N: PCM-4862  
NOTE: FULL SYSTEM

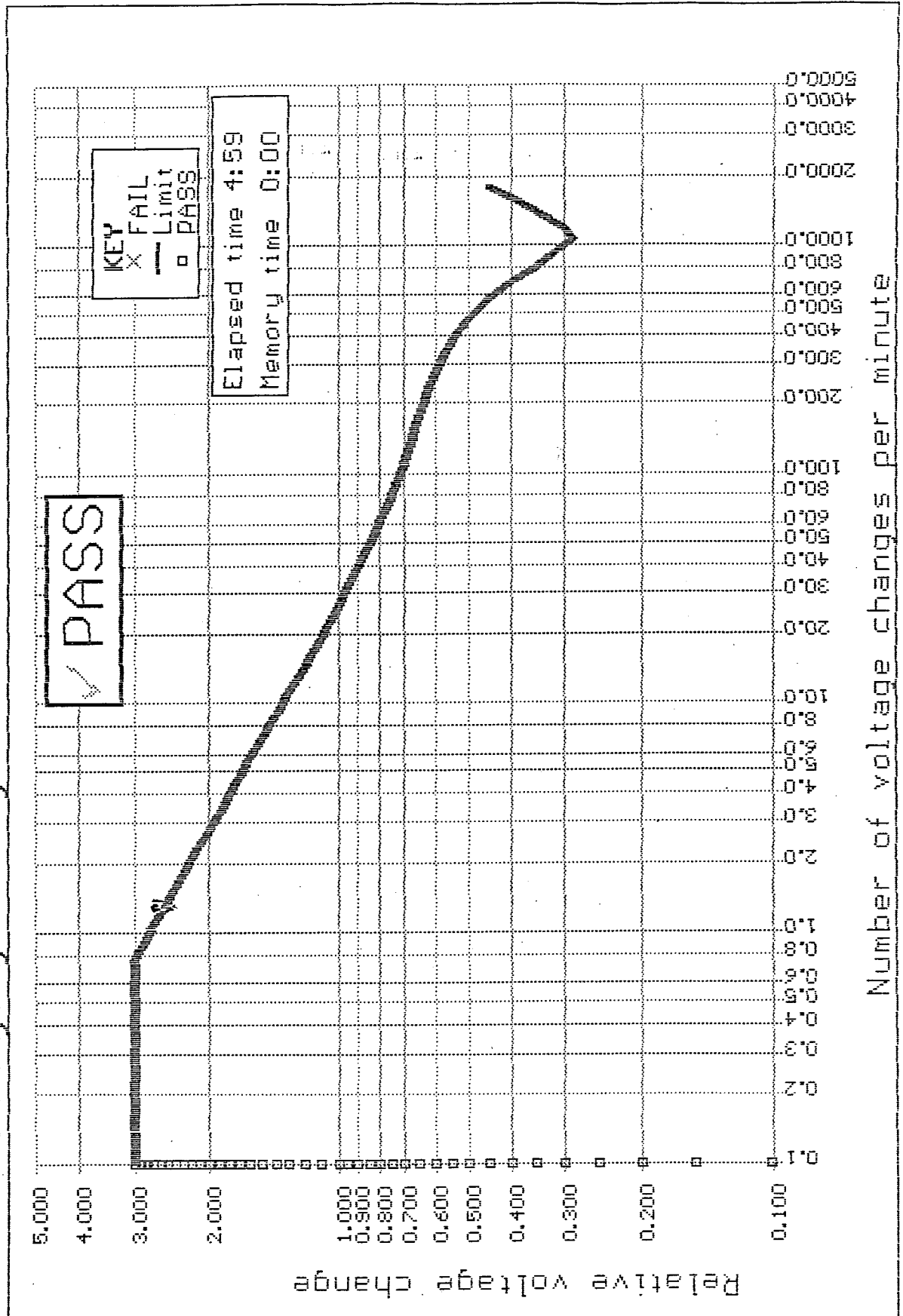
CH1 Steady State Harmonics Test. Thu Jul 25 08:19:48 1996

Volts 230.199997V  
Amps 0.695000A  
Watts 76.580002W  
Power Factor 0.479500  
Limits multiplied by 1.00

HNumber	IEC Limit (class A)	Magnitude	PASS FAIL
2	1.080A	0.008498A	PASS
3	2.300A	0.309000A	PASS
4	0.430A	0.006276A	PASS
5	1.140A	0.289100A	PASS
6	0.300A	0.005901A	PASS
7	0.770A	0.257900A	PASS
8	0.230A	0.004618A	PASS
9	0.400A	0.222800A	PASS
10	0.184A	0.003808A	PASS
11	0.330A	0.183200A	PASS
12	0.153A	0.002599A	PASS
13	0.210A	0.142590A	PASS
14	0.131A	0.001459A	PASS
15	0.150A	0.103430A	PASS
16	0.115A	0.000703A	PASS
17	0.132A	0.067850A	PASS
18	0.102A	0.000373A	PASS
19	0.118A	0.038090A	PASS
20	0.092A	0.000570A	PASS
21	0.107A	0.014722A	PASS
22	0.084A	0.000553A	PASS
23	0.098A	0.005993A	PASS
24	0.077A	0.000530A	PASS
25	0.090A	0.014707A	PASS
26	0.071A	0.000444A	PASS
27	0.083A	0.018794A	PASS
28	0.066A	0.000088A	PASS
29	0.078A	0.018787A	PASS
30	0.061A	0.000177A	PASS
31	0.073A	0.015240A	PASS
32	0.058A	0.000443A	PASS
33	0.068A	0.010428A	PASS
34	0.054A	0.000543A	PASS
35	0.064A	0.004427A	PASS
36	0.051A	0.000609A	PASS
37	0.061A	0.000730A	PASS
38	0.048A	0.000544A	PASS
39	0.058A	0.004815A	PASS
40	0.046A	0.000543A	PASS

Passed Steady State Harmonics test

CH1 Changing Voltage Thu Jul 25 08:40:38 1996





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## 6. ESD Measurement

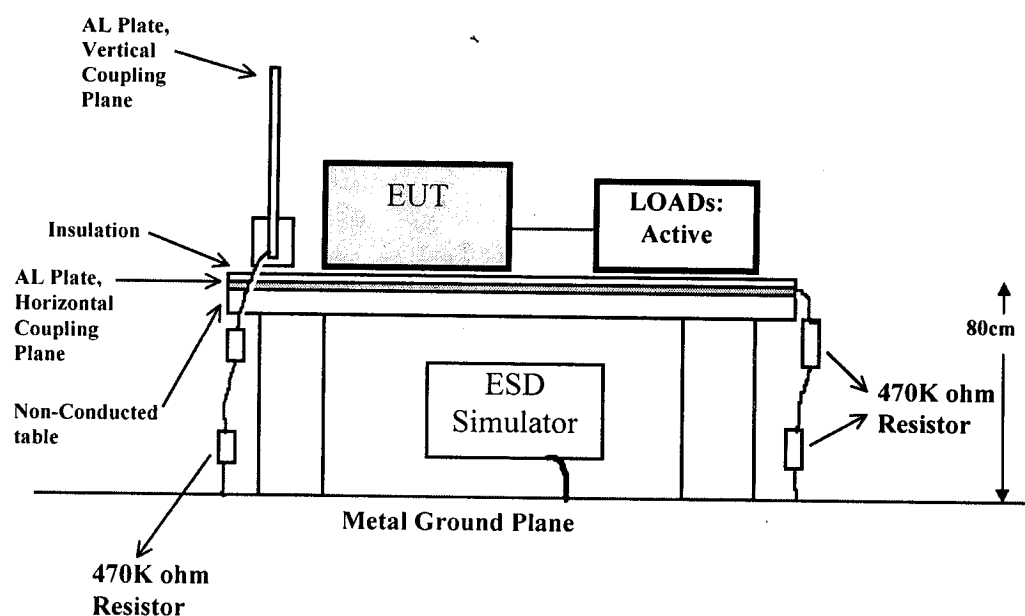
### 6.1 Test Equipment

The following test equipments are used during the ESD tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	ESD Simulator System	HAEFELY	ESD Tester	Apr. 1996
2	Shielded Room	GesTek	GTK 02	N/A

### 6.2 Test Setup

#### 6.2.1 Block Diagram of Connections between EUT and simulators





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## 6.3 Severity Levels

LEVEL	TEST VOLTAGE CONTACT DISCHARGE	TEST VOLTAGE AIR DISCHARGE
1	2KV	2KV
2	4KV	4KV
3	6KV	8KV
4	8KV	15KV
X	SPECIAL	SPECIAL

Pursuant to EN50082-2:

Required Performance Criteria : A

Limit :  $\pm 15\text{Kv}$  (Air Discharge)

## 6.4 EUT Operating Condition

1. Setup the EUT and Test Equipment as shown on 3.2.2
2. Power on.

## 6.5 Test Procedure

Direct ESD :

Single discharge at  $> 1$  second interval, 10 positive & 10 negative.

Air discharges to surfaces of the EUT.

Air Discharge:

This test was done above a non-conductive surfaces. The round discharge electrode about 30cm away will approach as fast as possible to touch test points of the EUT. Discharge happens before the contact. This procedure is repeated ten times on one selected location.

Indirect ESD : (Horizontal Coupling Plane under the EUT & Vertical Coupling Plane beside EUT)

Vertical Coupling Plane shall be positioned at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.

Apply ESD to the earth reference plane on each accessible side of the EUT.

Single discharge at  $> 1$  second interval, 10 positive & 10 negative



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## 6.6 Test Method

According to IEC 801-2/1991.

## 6.7 Test Result

ITEM	AMOUNT OF DISCHARGE	VOLTAGE	CRITERIA (A, B, C)	RESULTS
Direct Discharge Air	20	+2/4/8/15KV	A	PASS
	20	-2/4/8/15KV	A	PASS
Direct Discharge Contact	20	+2/4/6/8KV	A	PASS
	20	-2/4/6/8KV	A	PASS
Indirect Discharge VCP	20	+2/4/8/15KV	A	PASS
	20	-2/4/8/15KV	A	PASS
Indirect Discharge HCP	20	+2/4/8/15KV	A	PASS
	20	-2/4/8/15KV	A	PASS

☒ Meet criteria A: Operate as intended during and after the test☐ Meet criteria B: Operate as intended after the test☐ Meet criteria C: Loss/Error of function☐ Additional Information☐ EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ KV of mode .☒ No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

The total uncertainty for this test is as follows:

- Uncertainty in risetime (10%/90%) in first peak of the discharge pulse: < ±20%
- Uncertainty in first peak value of the discharge pulse: < ±8%
- Uncertainty in the discharge pulse value at 30ns: < ±30%
- Uncertainty in the discharge pulse value at 60ns: < ±30%



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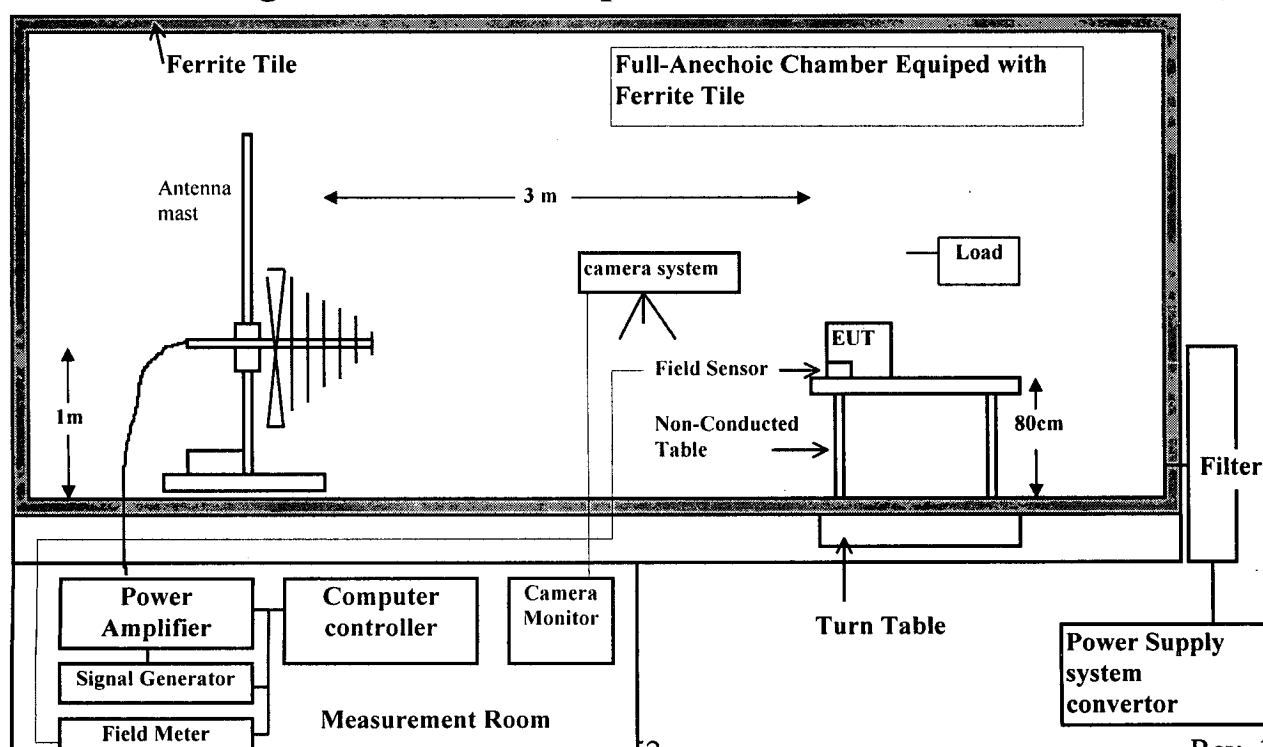
## 7. RF Field Strength Susceptibility Measurement

### 7.1 Test Equipment

The following test equipments are used during the RS tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Signal Generator	HP	8657A	Aug. 1996
2	Power Amplifier	A & R	100W1000M1	Aug. 1996
3	Field Strength Meter	A & R	FM2000	Jun, 1996
4	Field Strength Sensor	A & R	FP2000	Jun, 1996
5	Power Antenna	Chase	CBL 6111A	Jun, 1996
6	Power Amplifier	A & R	75A220	Aug. 1996
7	Spectrum	HP	8591E	Aug. 1996
8	Pre-Amplifier	HP	8447F	Aug. 1996

### 7.2 Block Diagram of Test Setup





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## 7.3 Severity Levels

LEVEL	FIELD STRENGTH V/M
1	1
2	3
3	10
X	SPECIAL

Pursuant to EN50082-2:

Required Performance Criteria : A  
Limit : 10.V/m

## 7.4 EUT Operating Condition

Same as section 3.2.4.

## 7.5 Test Procedure

The EUT and load are placed on a table which is 0.8 meter above ground. The field sensor is also placed on the same table to monitor field strength from transmitting antenna. EUT is set 3 meter away from the transmitting antenna which is mounted on an antenna each time. The antenna is fixed 1 meter above ground. Both horizontal and vertical polarization of the antenna are set on measurement. In order to judge the EUT performance, a CCD camera is used to monitor EUT screen.

All the scanning conditions are as follows:

Condition of Test	Remarks
1. Field Strength	10 V/m Level 3
2. Radiated Signal	Un-modulated
3. Scanning Frequency	27MHz-500MHz
4. Frequency step size $\Delta f$ :	$\Delta f = f_n - f(n-1) = \frac{1}{Q} f(n-1)$

where:

$\Delta f$  = frequency step size  
 $f(n-1)$  = previous test frequency  
 $f_n$  = next test frequency  
 $Q$  = ratio center frequency to bandwidth



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## 7.6 Test Method

According to IEC 801-3/1984.

## 7.7 Test Result

Freq. Range (MHz)	Position (Angle)	Polarity (H or V)	Field Strength (V/M)	Criteria	Results
27-500	0	H	10	A	PASS
27-500	90	H	10	A	PASS
27-500	180	H	10	A	PASS
27-500	270	H	10	A	PASS
27-500	0	V	10	A	PASS
27-500	90	V	10	A	PASS
27-500	180	V	10	A	PASS
27-500	270	V	10	A	PASS

☒ Meet criteria A: Operate as intended during and after the test☐ Meet criteria B: Operate as intended after the test☐ Meet criteria C: Loss/Error of function☒ Additional Information☒ There was no observable degradation in performance.☐ EUT stopped operation and could / could not be reset by operator at \_\_\_\_\_ V/m  
at frequency \_\_\_\_\_ MHz.☒ No false alarms or other malfunctions were observed during or after the test. The  
acceptance criteria were met, and the EUT passed the test.

The total uncertainty for this test is as follows:

- Uncertainty in applied field strength (3m antenna distance): -2.1/+2.9 dB

The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviations.





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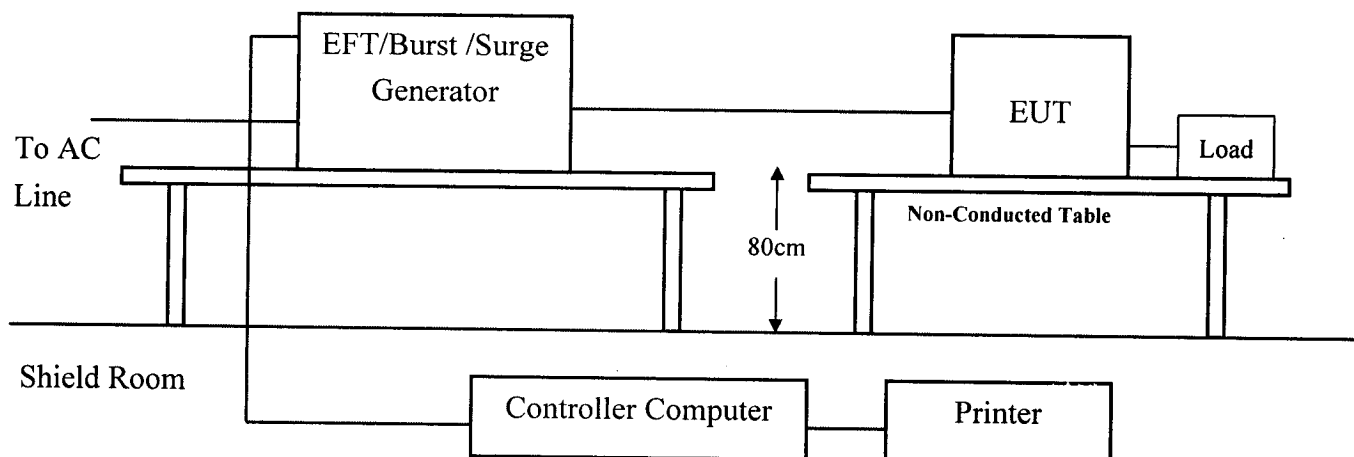
## 8. Electrical Fast Transient/Burst Measurement

### 8.1 Test Equipment

The following test equipments are used during the EFT tests:

Item	Instrument	Manufacturer	Type No.	Last Calibration
1	Fast Transient/Burst Generator	HAEFELY	EFT/Burst Tester PEFT-J	Apr. 1996
2	Dips/Interruptions and Variations	HAEFELY	PLINE1610	Jul. 1996

### 8.2 Block Diagram of Test Setup





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### 8.3 Severity Levels

Open Circuit Output Test Voltage +/- 10%	
Level	On power supply lines
1	0.5KV
2	1KV
3	2KV
4	4KV
X	Special

Pursuant to EN50082-2:

Required Performance Criteria : A

Limit :  $\pm 1.0\text{KV}$  for Signal Lines and Control Lines  
 $\pm 2.0\text{KV}$  for Power Lines and protective earth terminal

### 8.4 EUT Operation Condition

Same as section 3.2.4.

### 8.5 Test Procedure

The EUT and its load are placed on a table which is 0.8 meter above a metal ground plane measured 1m\*1m min. And 0.65mm thick min. And projected beyond the EUT by at least 0.1m on all sides. The EUT is away from the walls of the test AC power line test is as follows:

For AC Power line test:

The EUT is connected to the power mains through a coupling device that directly couples the EFT interference signal.

Each of the Line and Neutral conductor is impressed with burst noise for 1 min.

For Signal Lines and Control Lines test:

The EFT interference signal is through a coupling clamp device couples to the signal and control lines of the EUT.

### 8.6 Test Method

According to IEC 801-4/1988.



DET NORSKE VERITAS AS

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Order No :96-9001

TCF#: CEE-013-1

## 8.7 Test Result

Inject Line	Voltage KV	Inject time (second)	Inject Method	Result
L1-PE	+1/+2	60	DIRECT	PASS
L1-PE	-1/-2	60	DIRECT	PASS
L2-PE	+1/+2	60	DIRECT	PASS
L2-PE	-1/-2	60	DIRECT	PASS
L1-L2	+1/+2	60	DIRECT	PASS
L1-L2	-1/-2	60	DIRECT	PASS
Signal	+1	60	CLAMP	PASS
Signal	-1	60	CLAMP	PASS

☒ Meet criteria A: Operate as intended during and after the test

☐ Meet criteria B: Operate as intended after the test

☐ Meet criteria C: Loss/Error of function

☐ Additional Information

☐ EUT stopped operation and could / could not be reset by operator at \_\_\_ KV of Line

☒ No false alarms or other malfunctions were observed during or after the test. The acceptance criteria were met, and the EUT passed the test.

The total uncertainty for this test is as follows:

- Uncertainty in risetime (10%/90%) in of the pulse:
- Uncertainty in half width (50%/50%) in of the pulse:
- Uncertainty in pulse repetition:
- Uncertainty in the amplitude of the pulse:

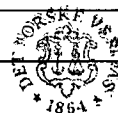
The uncertainty is calculated in accordance with NAMAS document NIS 81, and is given as 2 standard deviation

< ±30%

< ±30%

< ±20%

< ±10.8%

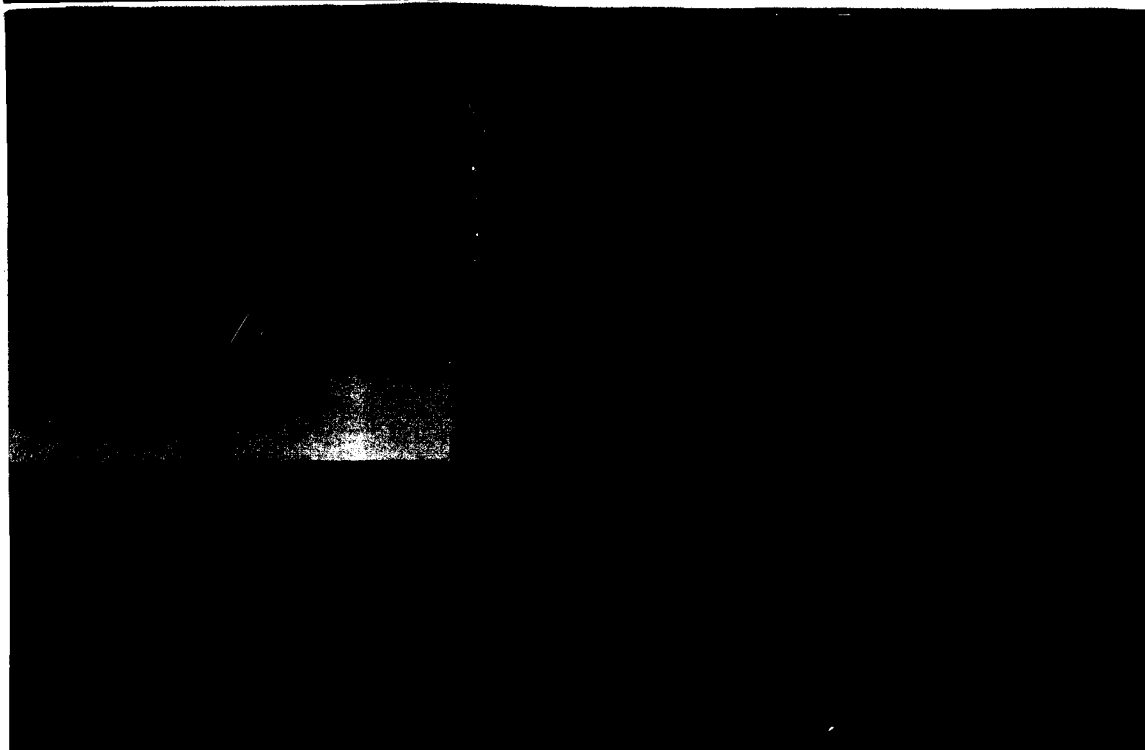


DATE: 31-Dec-96

SIGN: Dennis Lin

## 9. Photographs

1. FRONT VIEW OF CONDUCTED TEST(PCM-5860)
2. BACK VIEW OF CONDUCTED TEST(PCM-5860)



GESTEK

MODEL: PCM-5860, PCM-4862



APPROVED

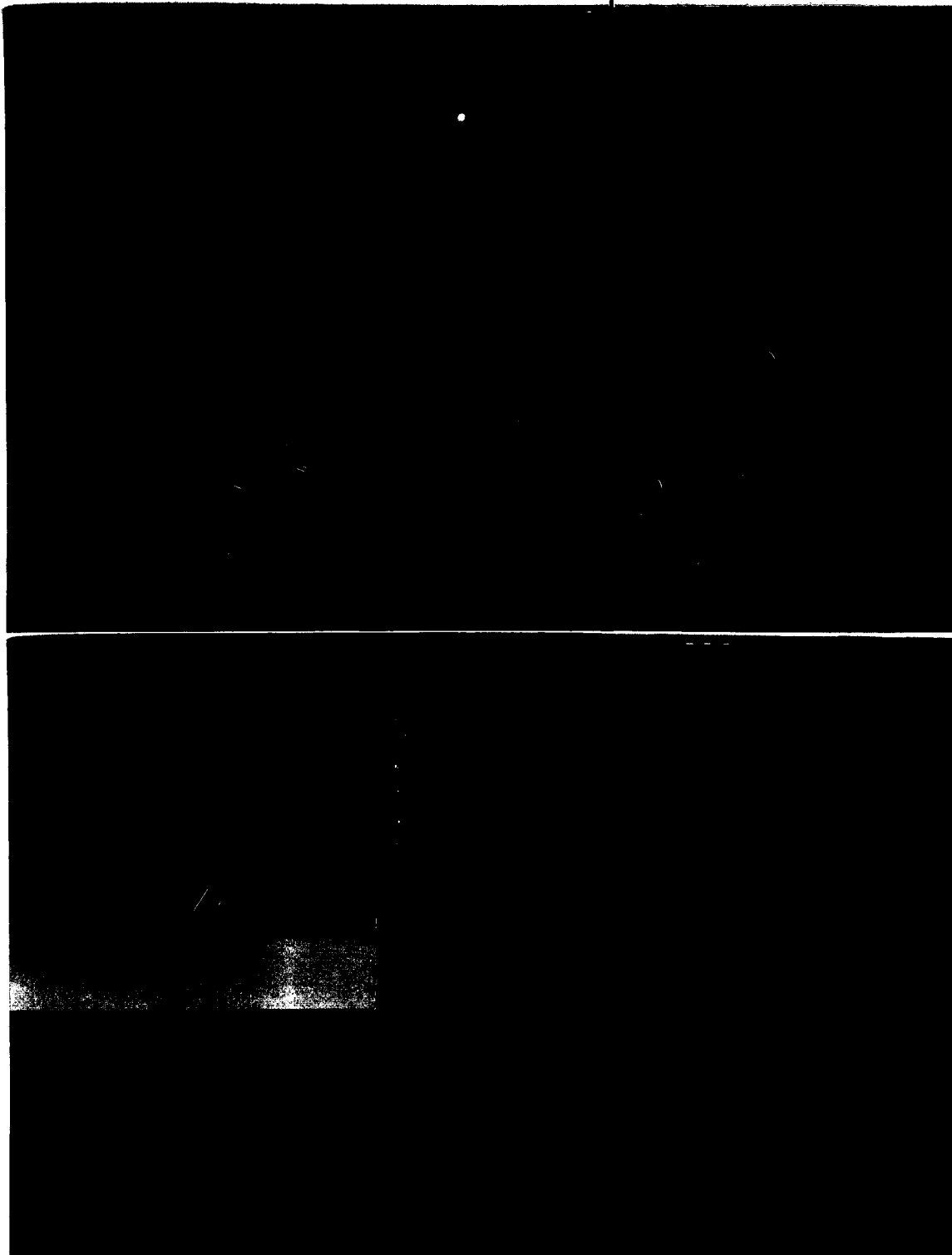
Report #: 967021E  
DATE:

SIGN: *Dennis Lin* 31-Dec-96

3. FRONT VIEW OF CONDUCTED TEST(PCM-4862)

4. BACK VIEW OF CONDUCTED TEST(PCM-4862)

DET NORSKE VERITAS CLASSIFICATION AS  
TAIPEI



GESTEK

MODEL: PCM-5860, PCM-4862



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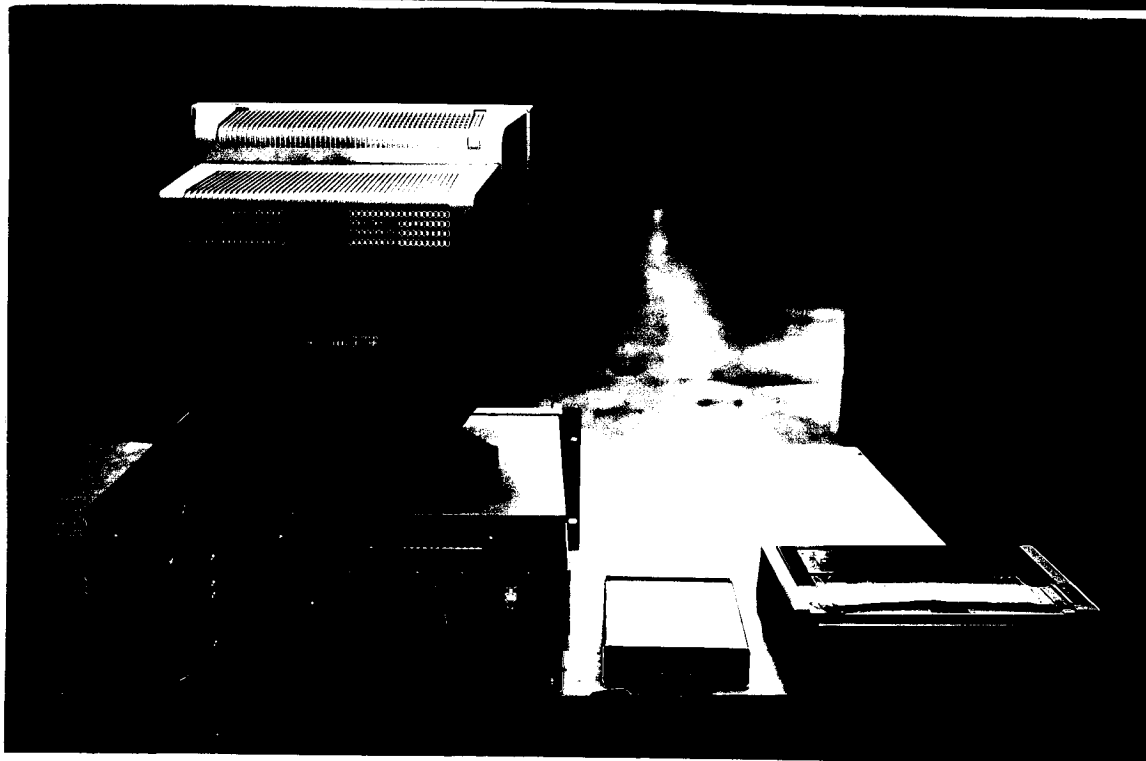
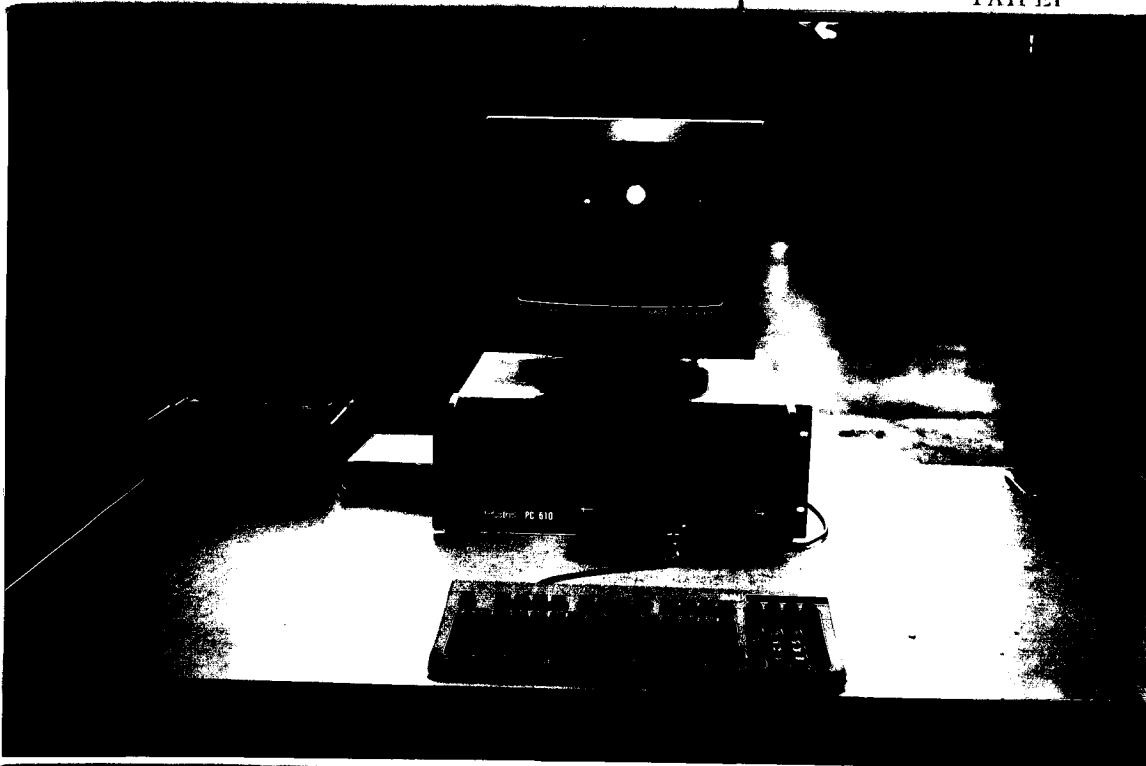
DATE: Report #: 967021E

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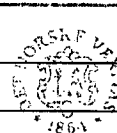
5. FRONT VIEW OF RADIATED TEST(PCM-5860)

6. BACK VIEW OF RADIATED TEST(PCM-5860)



GESTEK

MODEL: PCM-5860, PCM-4862



APPROVED

Report #: 967021E

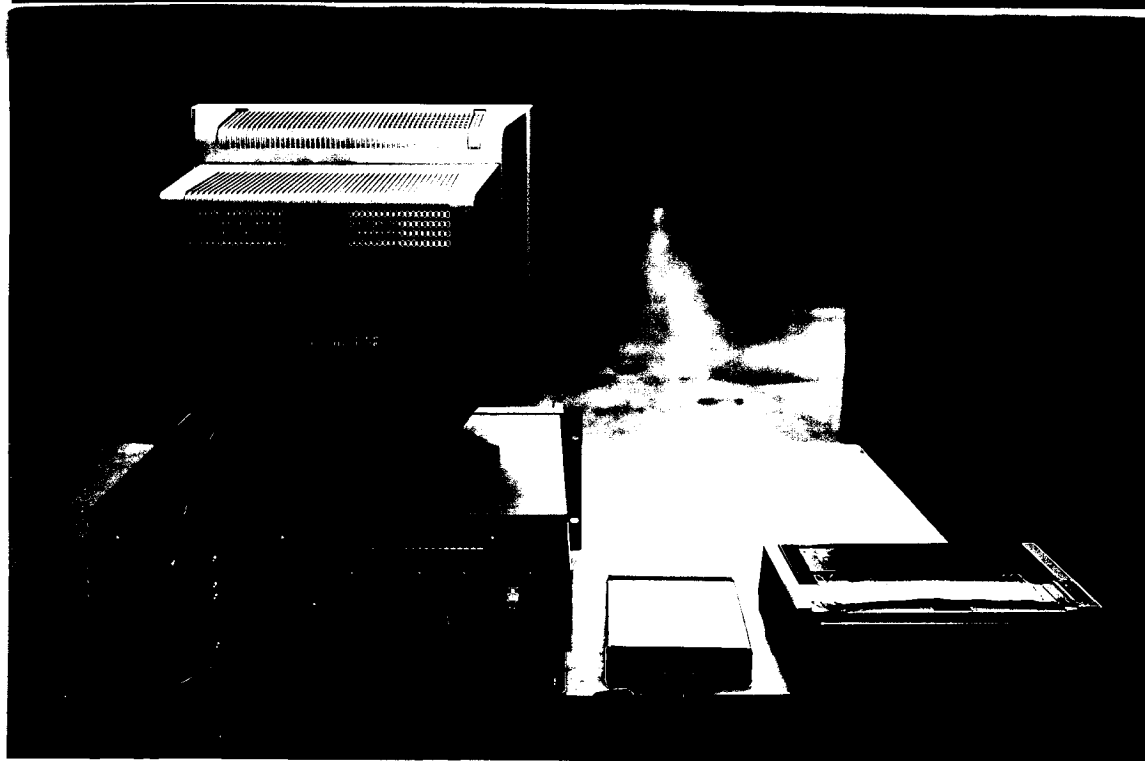
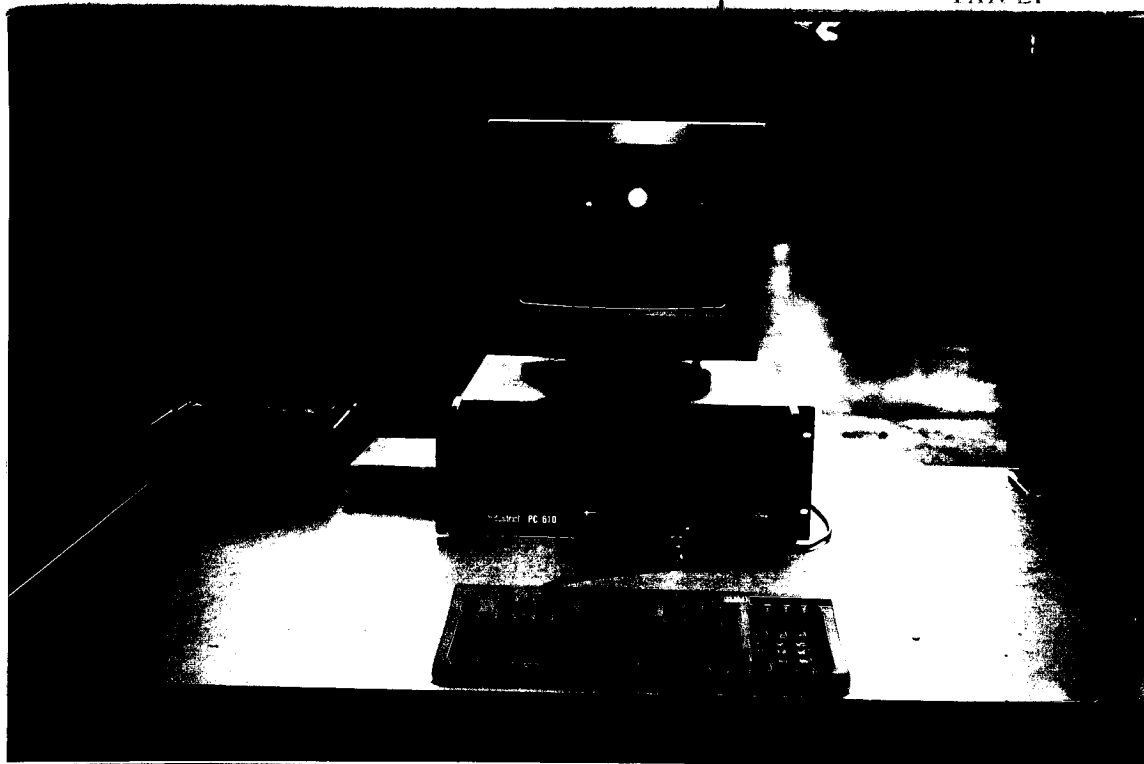
DATE

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7. FRONT VIEW OF RADIATED TEST(PCM-4862)

8. BACK VIEW OF RADIATED TEST(PCM-4862)



GESTEK

MODEL: PCM-5860, PCM-4862



APPROVED

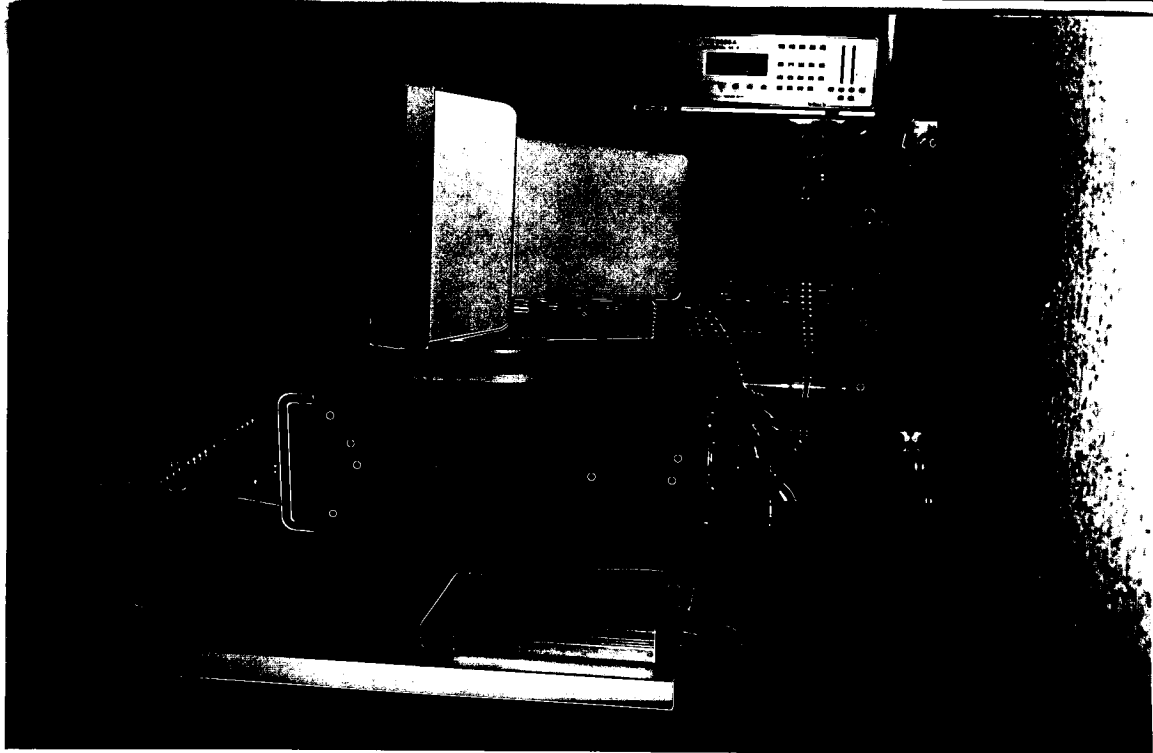
DATE: Report #: 967021E

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9. FRONT VIEW OF HARMONIC TEST SETUP(PCM-5860)

10. BACK VIEW OF HARMONIC TEST SETUP(PCM-5860)

DET NORSKE VERITAS CLASSIFICATION AS  
TAIPEI





GESTEK

MODEL: PCM-5860, PCM-4862



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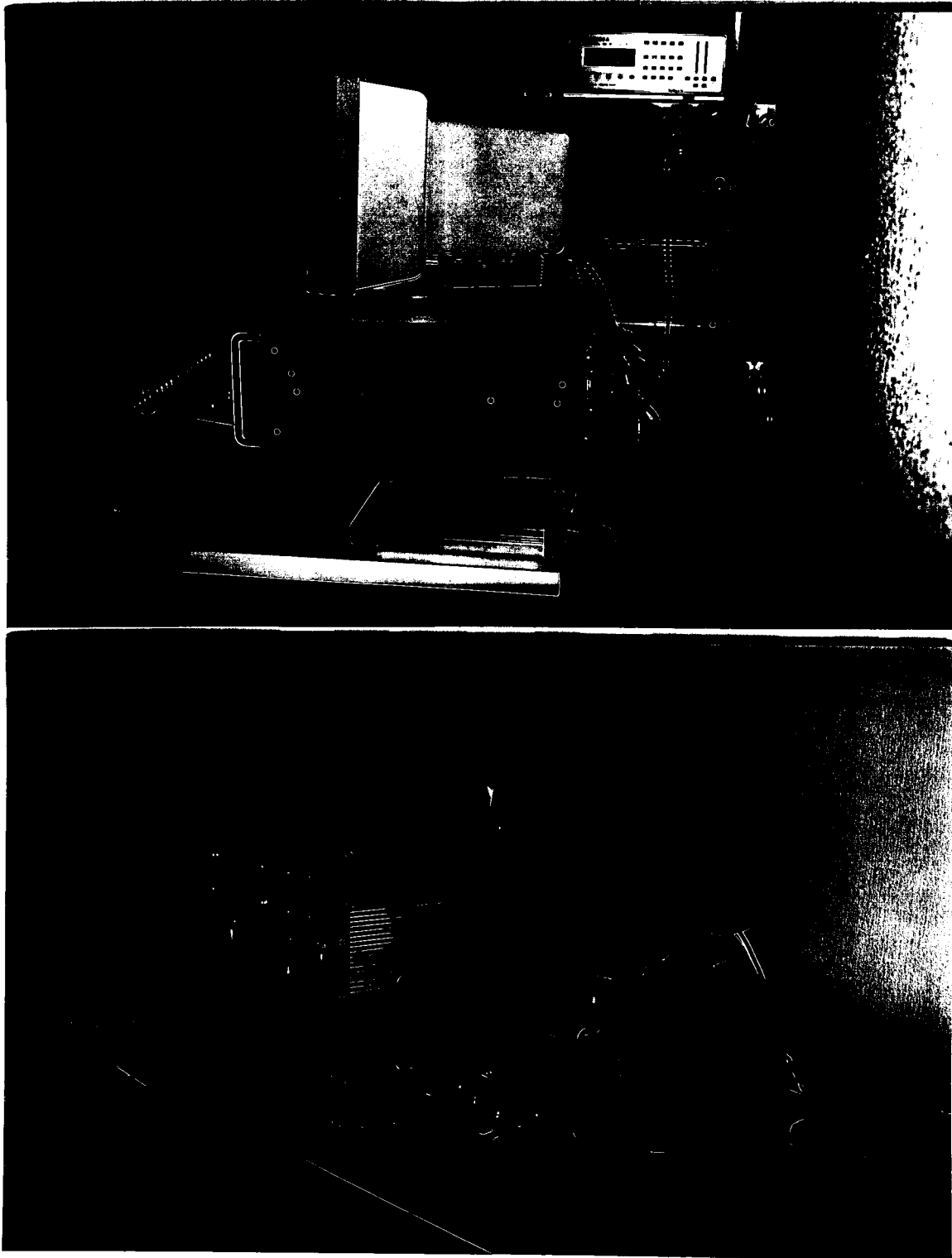
DATE: Report #: 967021E

SIGN: Davis Linde 96

11. FRONT VIEW OF HARMONIC TEST SETUP(PCM-4862)

12. BACK VIEW OF HARMONIC TEST SETUP(PCM-4862)

DET NORSKE VERITAS CLASSIFICATION AS  
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GESTEK

MODEL: PCM-5860, PCM-4862



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Report #: 967021E

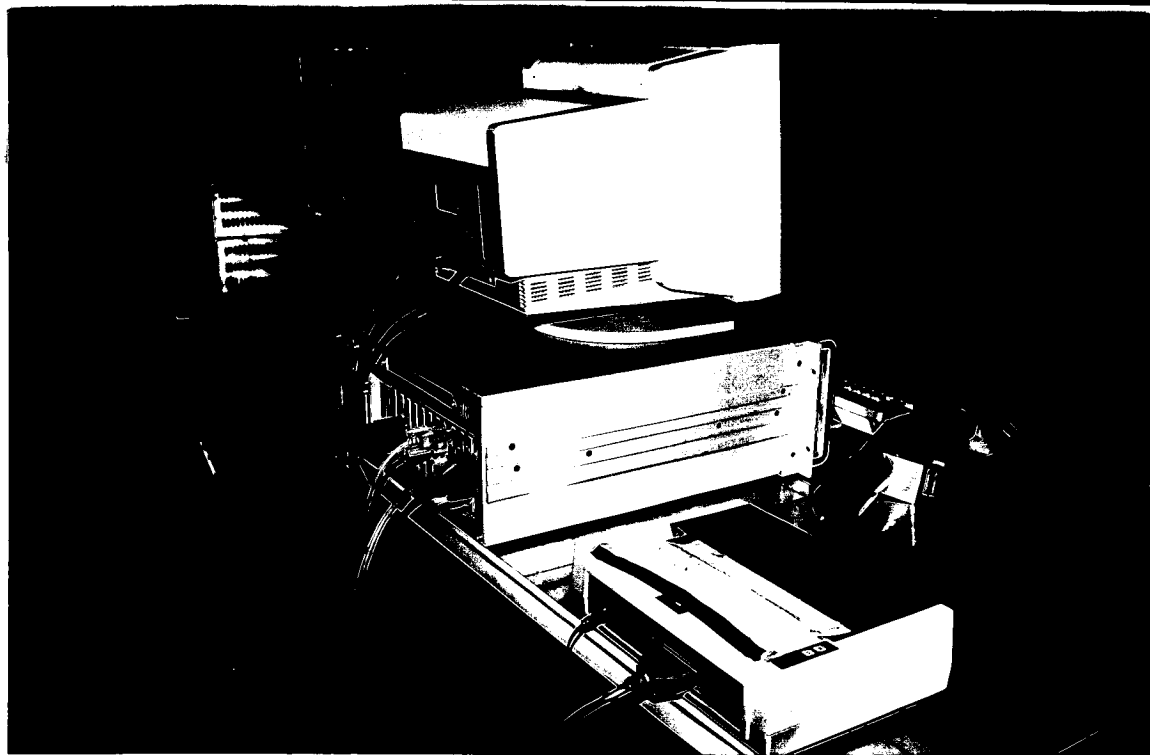
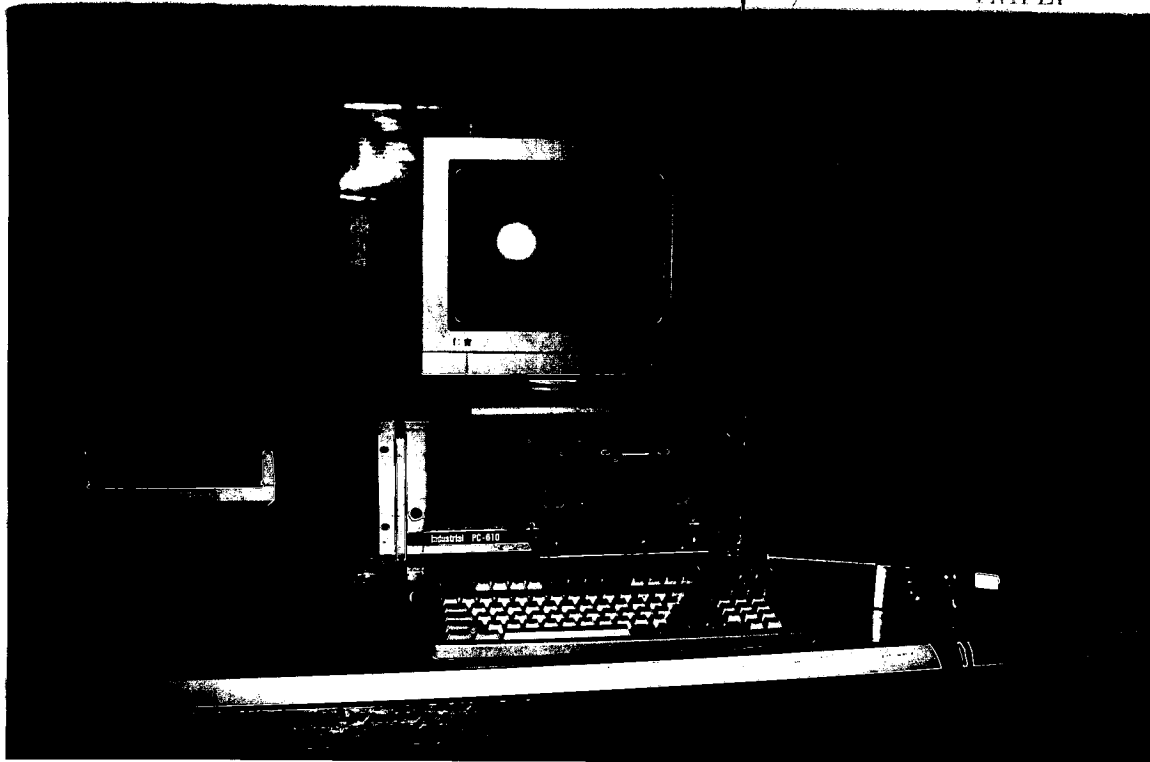
DATE:

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13. FRONT VIEW OF ESD TEST POINT(PCM-5860)

14. BACK VIEW OF ESD TEST POINT(PCM-5860)



GESTEK

MODEL: PCM-5860, PCM-4862



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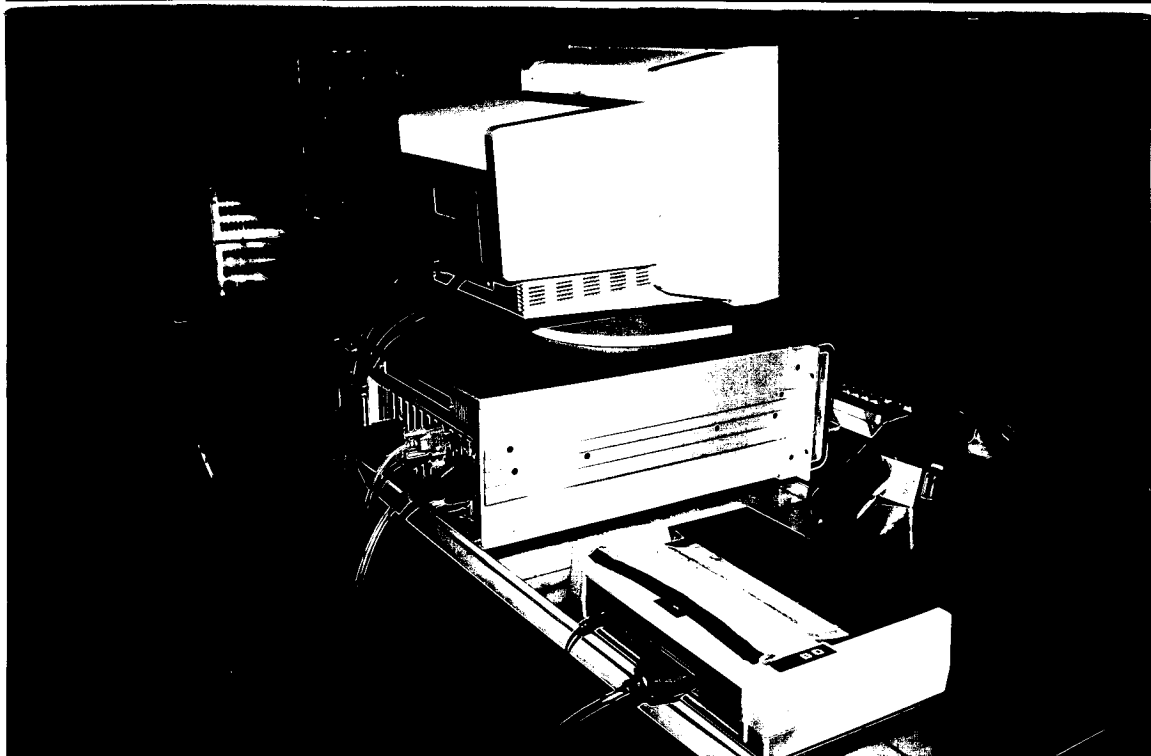
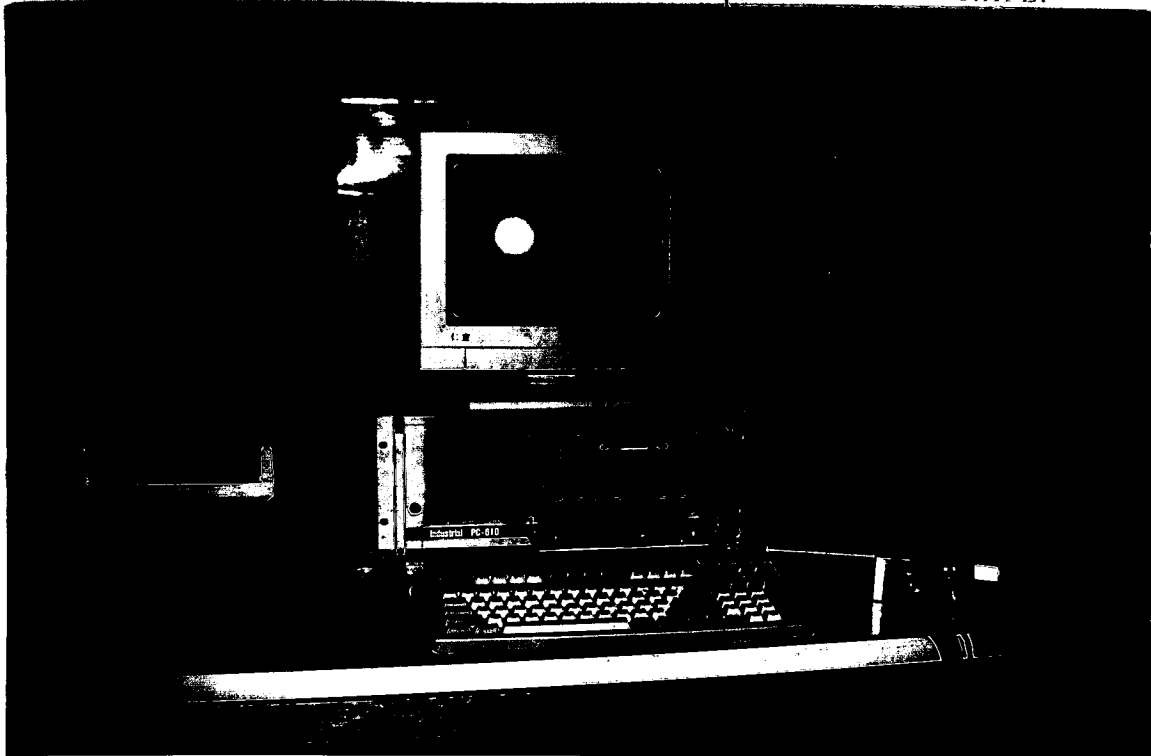
DATE: Report #: 967021E

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15. FRONT VIEW OF ESD TEST POINT(PCM-4862)

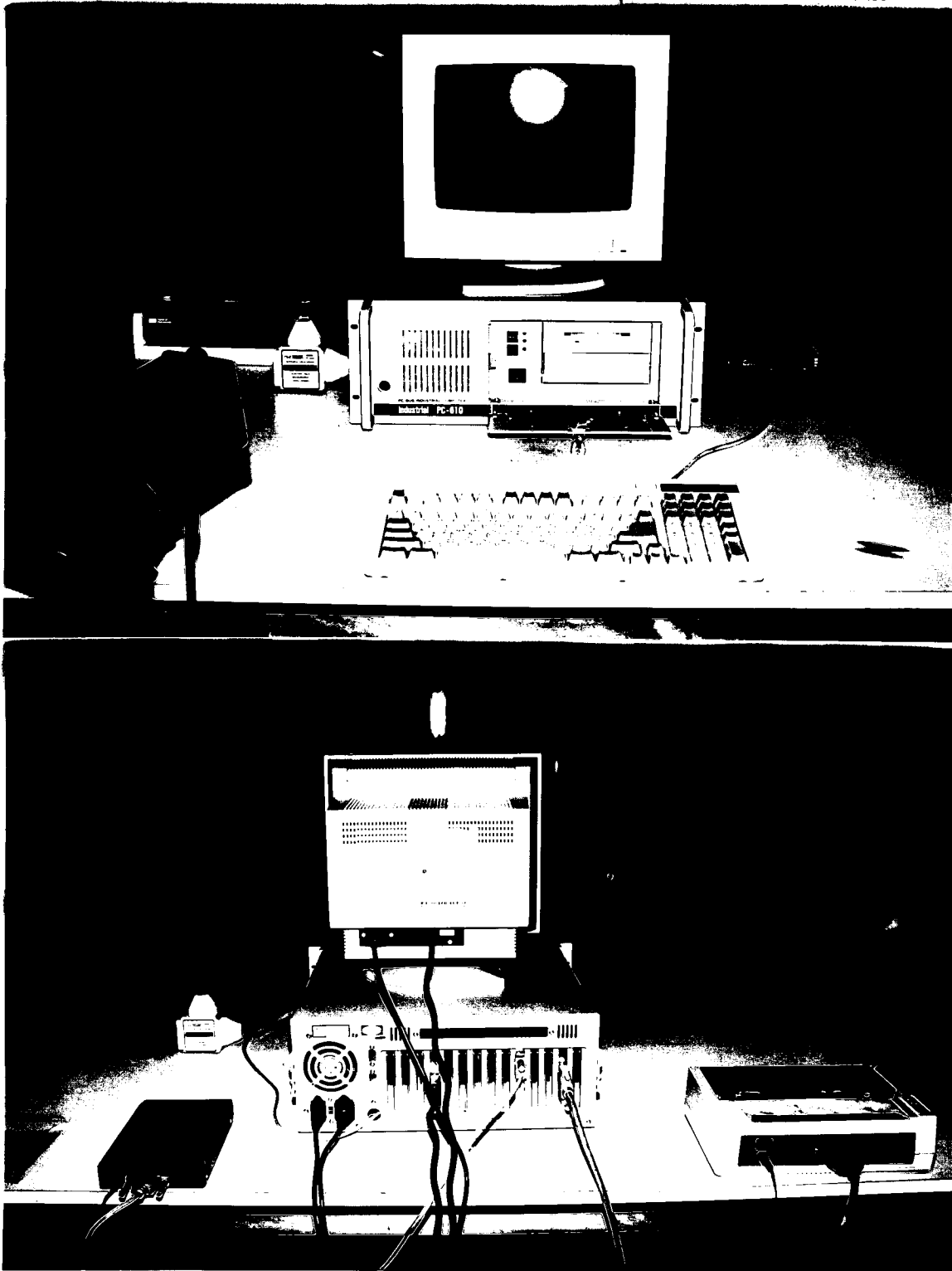
16. BACK VIEW OF ESD TEST POINT(PCM-4862)



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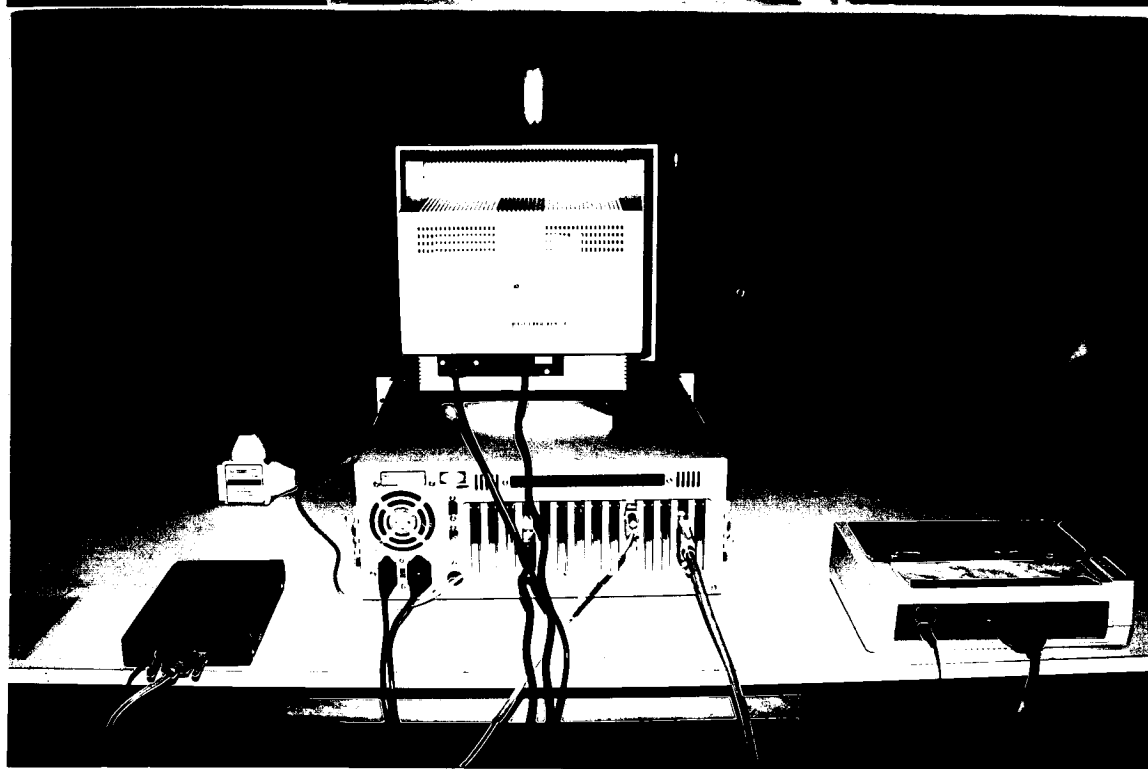
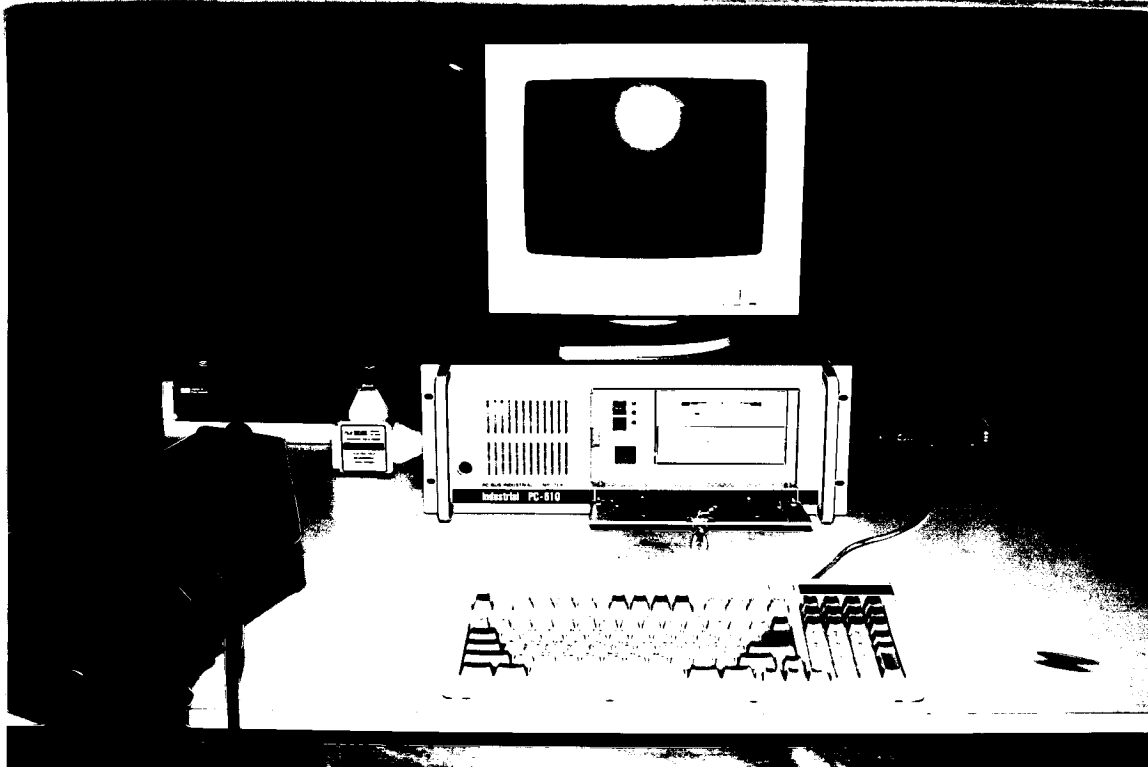
17. FRONT VIEW OF RS TEST SETUP(PCM-5860)

18. BACK VIEW OF RS TEST SETUP(PCM-5860)



19. FRONT VIEW OF RS TEST SETUP(PCM-4862)

20. BACK VIEW OF RS TEST SETUP(PCM-4862)



GESTEK

MODEL: PCM-5860, PCM-4862



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21. FRONT VIEW OF EFT TEST SETUP(PCM-5860)

22. BACK VIEW OF EFT TEST SETUP(PCM-5860)

DET-NORSKE VERITAS CLASSIFICATION AS  
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GESTEK

MODEL: PCM-5860, PCM-4862



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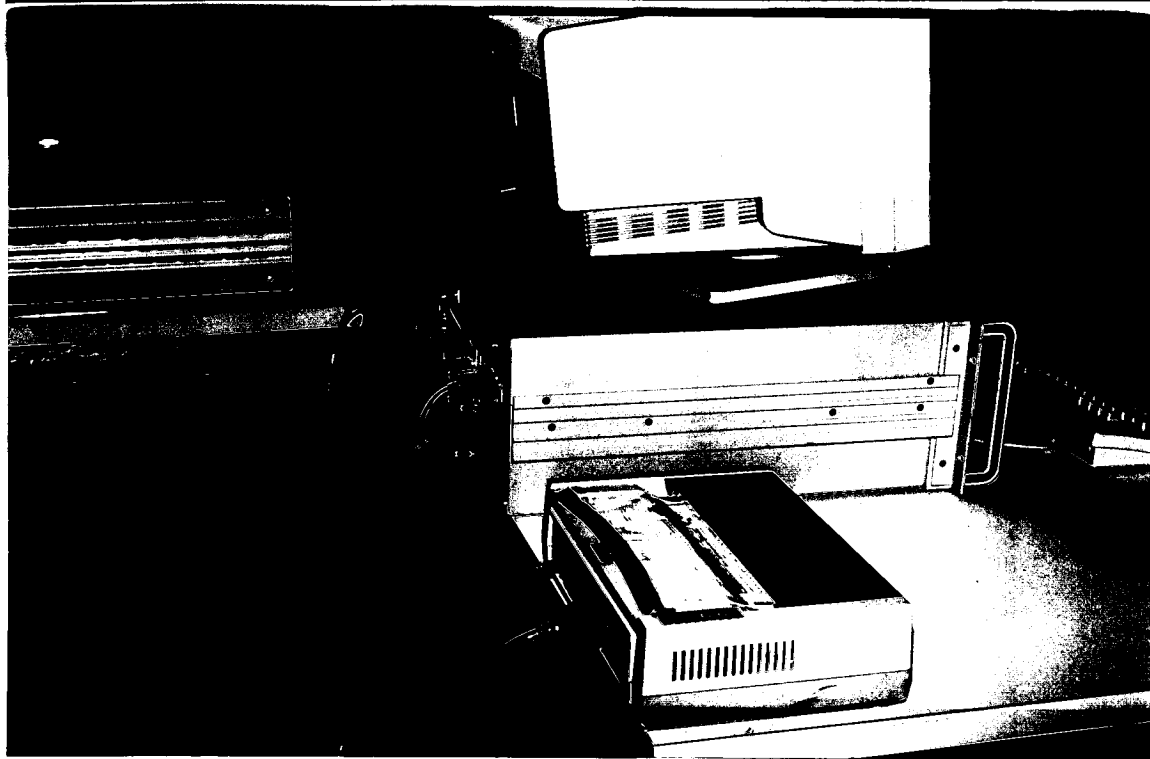
DATE Report #: 967021E

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23. FRONT VIEW OF EFT TEST SETUP(PCM-4862)

24. BACK VIEW OF EFT TEST SETUP(PCM-4862)



GESTEK

MODEL: PCM-5860, PCM-4862



APPROVED

Report #: 967021E

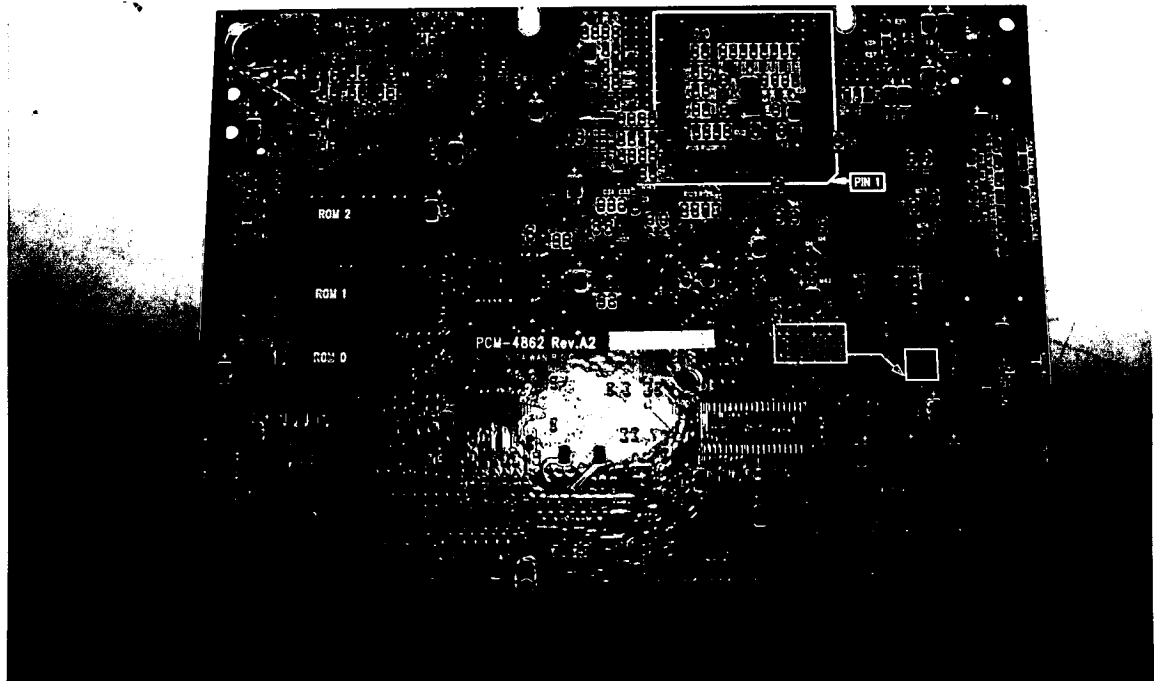
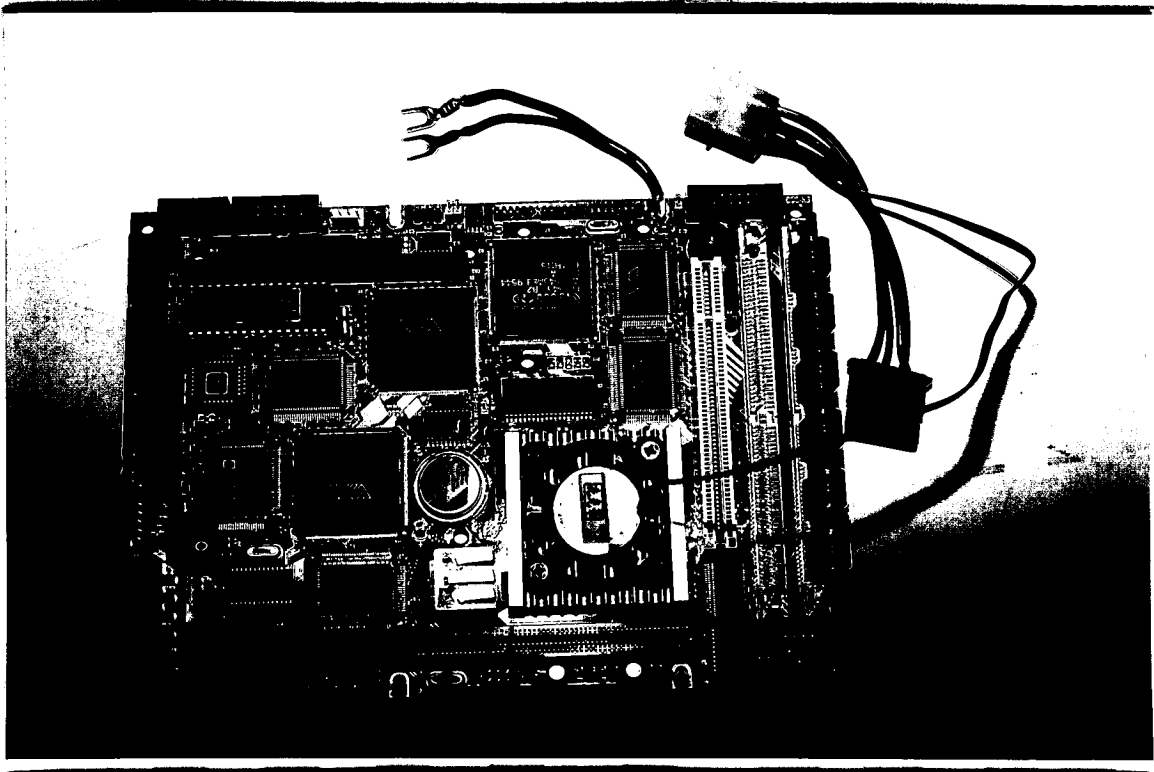
DATE:

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DET NORSKE VERITAS CLASSIFICATION AS  
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25. COMPONENT SIDE OF MAIN BOARD(PCM-5860)

26. SOLDER SIDE OF MAIN BOARD(PCM-5860)





GESTEK

MODEL: PCM-5860, PCM-4862



APPROVED

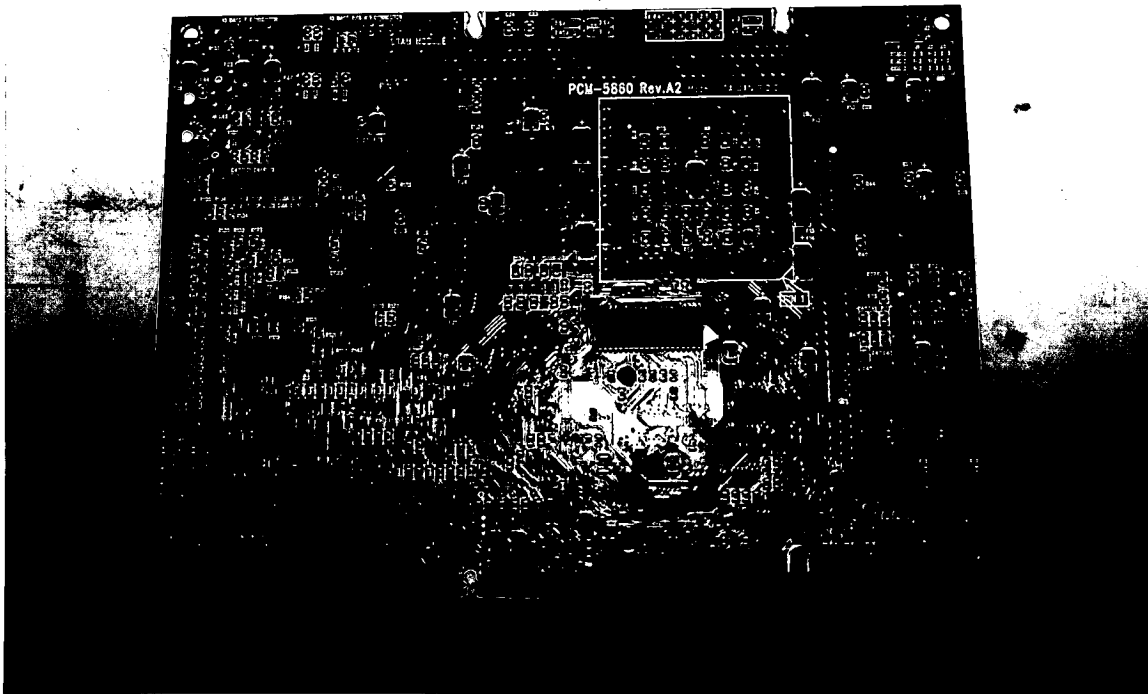
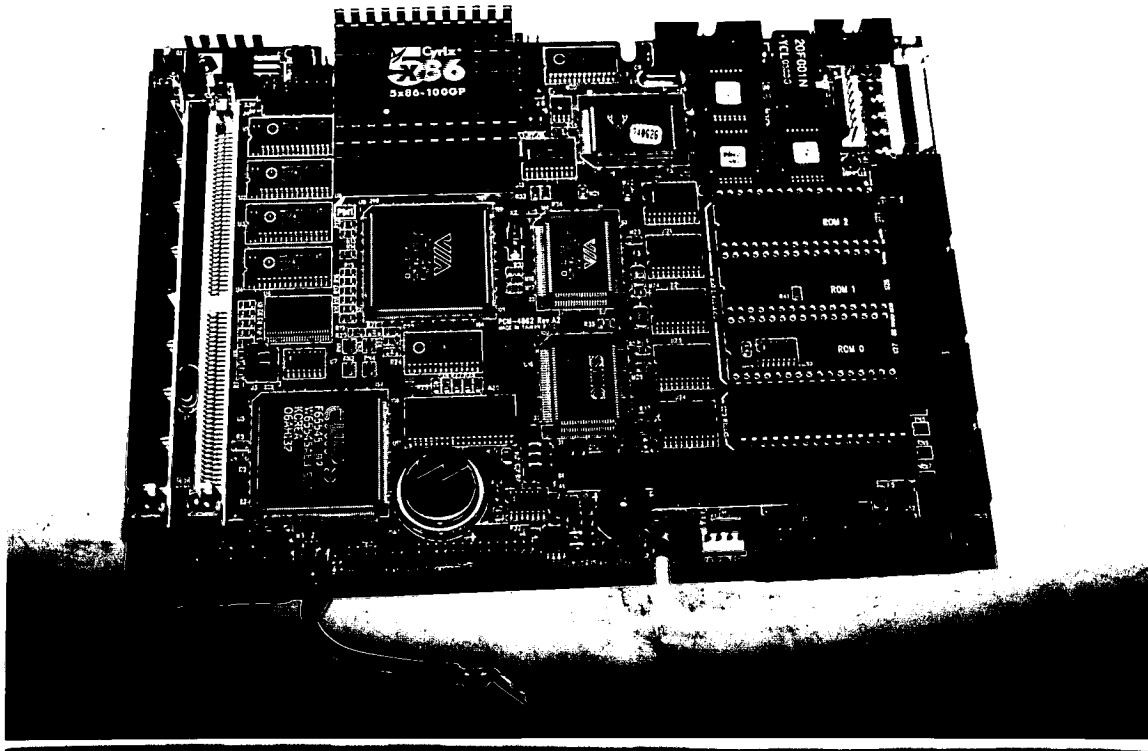
DATE Report #: 967021E

SIGN: Dennis Lin 31-Dec-96

DET NORSKE VERITAS CLASSIFICATION AS  
TAIPEI

27. COMPONENT SIDE OF MAIN BOARD(PCM-4862)

28. SOLDER SIDE OF MAIN BOARD(PCM-4862)





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Order No :96-9001

TCF#: CEE-013-1

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## 10. EMI/EMS Reduction Method During Compliance Testing

No modification was made during testing.

