Operating Manual
16-channel preamplifier CPA16
Rev.B.....SN.0040

multichannel systems

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Imprint

Printed in Germany, July 2006

Publisher responsible for the contents:	Multi Channel Systems MCS GmbH Aspenhaustrasse 21 D-72770 Reutlingen Germany info@multichannelsystems.com www.multichannelsystems.com
Editing and layout:	Multi Channel Systems MCS GmbH Germany

Foreword

This manual will help you to become acquainted with the 16-channel CPA16 and its proper use. Important safety instructions and warnings will help you to operate the 16-channel preamplifier CPA16 safely and competently.

The right to make technical modifications is reserved.

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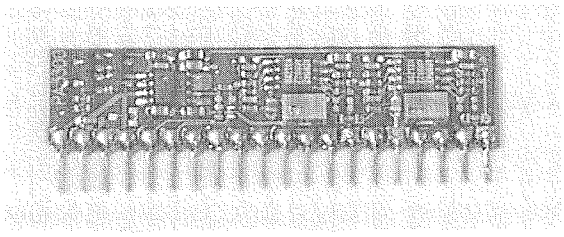
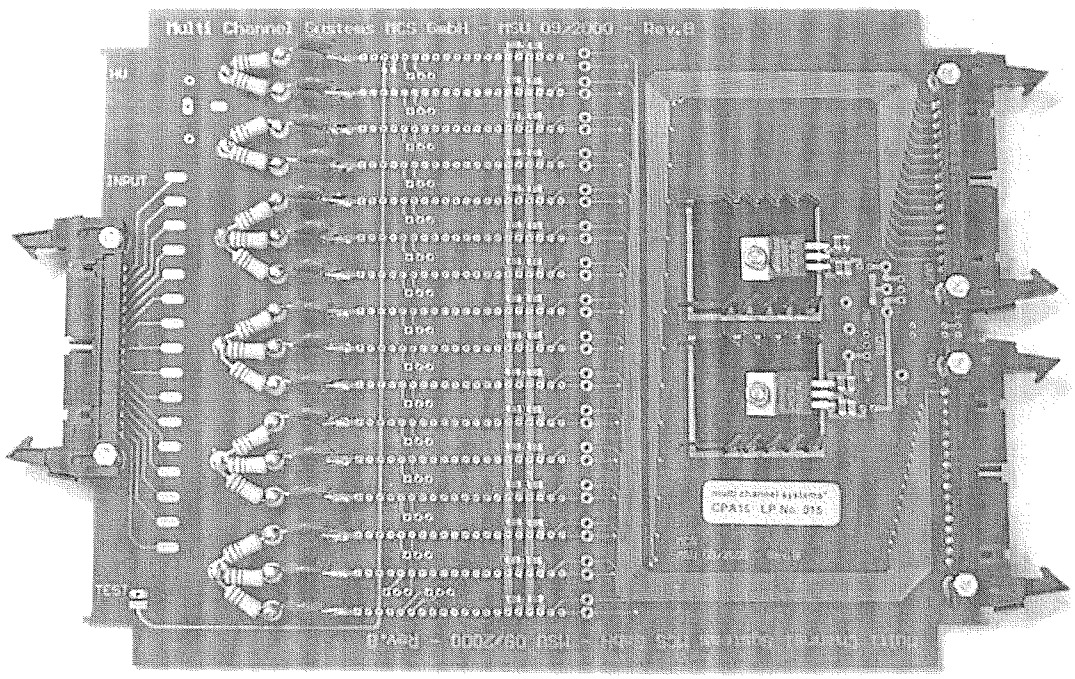
preamplifier module PA3300



the device CPA16, housing & printed circuit board



Physical Dimensions

CPA16

total width:	169 mm
total length:	200 mm
total height:	52 mm

Weight

net:	2,0 kg
ship:	5,0 kg

Important note !

For safety use and for your own health, do not remove the cover of the housing before switching off the high voltage. Wait for discharge of high voltage capacities before opening the housing!

Device Specifications

CPA16

channel number	16
preamplifier	PA3300, modular
HV network	installed

Connectors

signal input	34pin 2-row connector, Au plated
HV input	SHV
test input	BNC
signal output	34pin 2-row connector, Au plated
power supply	9pin Sub-D connector (supply side) 3pin LEMOSA, type 1S (device side)

PA3300 (intern)

low gain stage	0.1 V / pC
high gain stage	10 V / pC
decay time	220 µs (only internal observable)
shaping time	100 ns
e^- noise equivalent	about 1700
power supply voltage	± 5.0 V
power supply current	± 50 mA each module
input protection network	built of clamping diodes

POWER SUPPLY

external

supply voltage	from ± 6.0 V to ± 12.0 V

internal

positive rail	
voltage:	+ 5.0 V
current:	+ 0.8 A
negative rail	
voltage:	- 5.0 V
current:	- 0.8 A

OPERATING TEMPERATURE

air temperature:	T_A = 10°C to 40°C

Electrical Connections & Power Supply

Power Supply

The supply voltage ranges from ± 6.0 V to ±12.0 V.

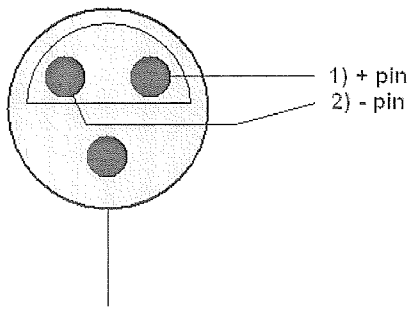
The internal power supply voltages are 5.0 V, positive and negative polarity. The stabilization is made using the linear regulation technique. The power loss dissipated is distributed to the environment using heat sinks.

Internal power supply:

positive rail:	
supply voltage:	+ 5.0 V
supply current:	+ 0.8 A
negative rail:	
supply voltage:	- 5.0 V
supply current:	- 0.8 A

Attention: Do not mismatch the polarity of the external power supply. False connection will harm the unit permanently.

Pin layout of the power supply connector, type LEMOSA 1S



pin 1: positive rail
U > + 6.0 V
pin 2: negative rail
U < - 6.0 V
pin 3: ground

The power cable connector on the supply side is a male 9pin SUB-D connector. The pins used are: pin 1 & 2 for ground, pin 5 for positive voltage and pin 8 for negative voltage. These pins are used due to the fact that the pins 4, 6, 7 and 9 deliver the NIM standard voltages of ±12 V and of ±24 V. Be careful, wrong connections may be damage power supply bin.

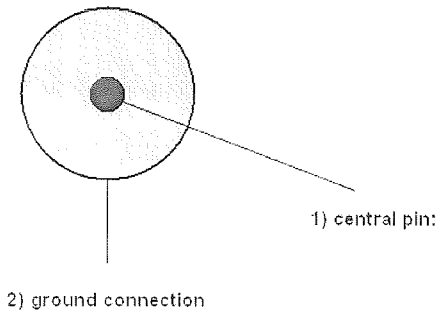
Signal Connections

Serveral signal connections have to be made before using the device. On the front side of CPA16, the connectors for input signals, for the high voltage and, optionally, for testing the device are located. The output signal connector, the power supply connector and 2 LEDs are mounted on the rear side.

Each of the connections are described now briefly.

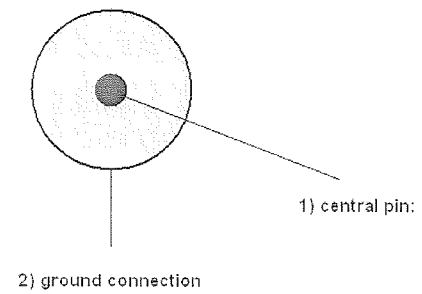
Front Panel Connection

- SHV - high voltage input. Note: if the input signal connector is not from a HV type, please use only voltages up to about 500 V.



pin 1: high voltage
positive rail
U_{max} = + 500 V
pin 2: ground

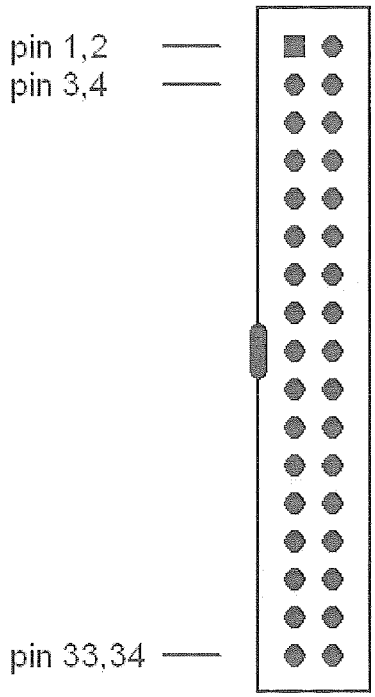
- BNC – test input (terminated by 50 ohms internally)



pin 1: test signal input

pin 2: ground

- input signal connector



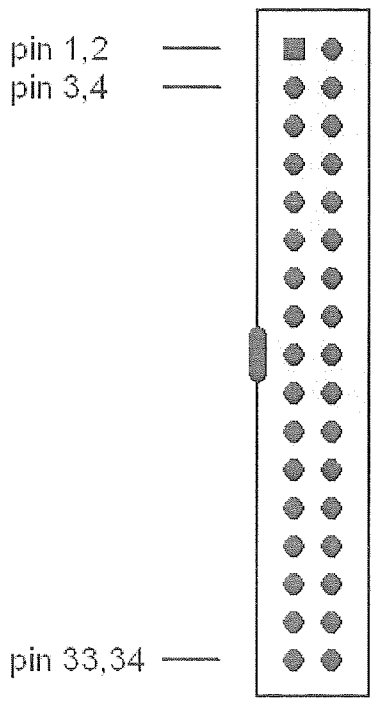
1)	channel 1
3)	channel 2
5)	channel 3
7)	channel 4
9)	channel 5
11)	channel 6
13)	channel 7
15)	channel 8
17)	channel 9
19)	channel 10
21)	channel 11
23)	channel 12
25)	channel 13
27)	channel 14
29)	channel 15
31)	channel 16

All other pins are connected to ground!

Rear panel connections

The power connector is mounted on the rear side of the housing. The pin layout is described above. Two green LED's are also installed on the rear panel. There indicate the stabilized 5 V of both polarities. A non-permanent illumination indicates a failure of the power stage: an over-temperature, a short-circuit or a voltage reduction. The next section shows the pin layout of the output signal connectors which is from 34pin 2-row type with Au plated

- output signal connectors



1)	channel 1
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15)	channel 8
17)	channel 9
19)	channel 10
21)	channel 11
23)	channel 12
25)	channel 13
27)	channel 14
29)	channel 15
31)	channel 16

All other pins are connected to ground!

contacts.

The outputs are delivered using 2 connectors having the same pin layout. The difference consists of the signal amplification: one delivers the low gain signals, the other one the high gain signals.

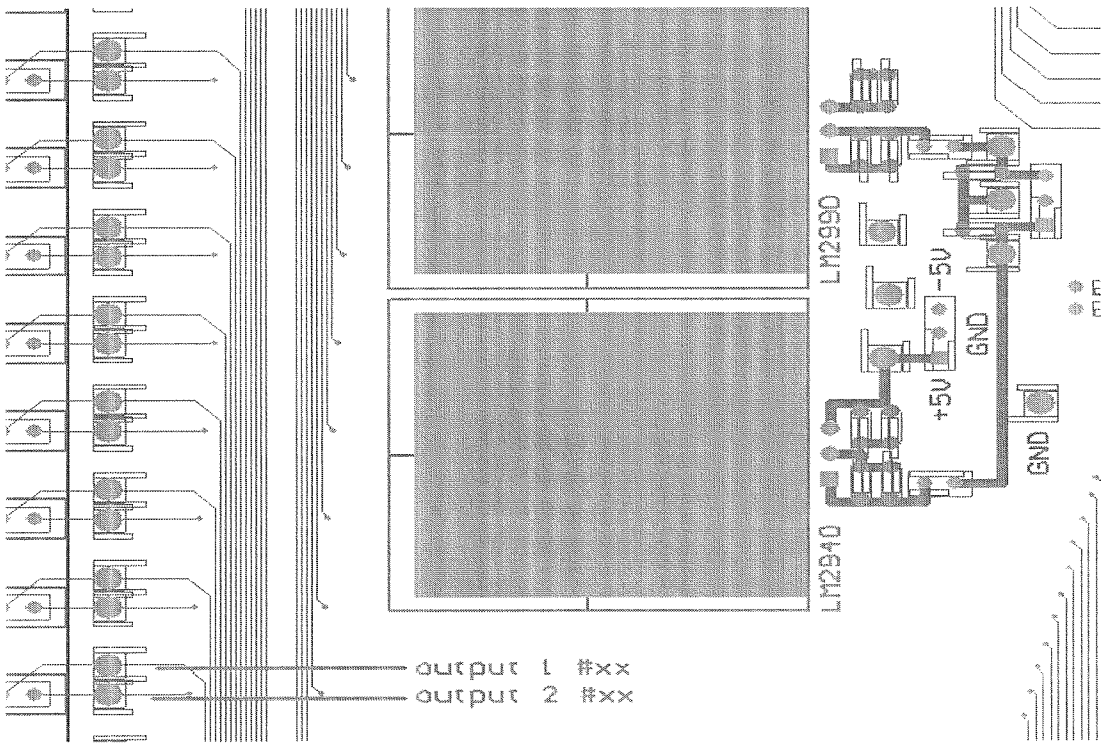
Points of Measurements

Analog signals

The signals delivered by the preamplifiers PA3300 can be checked using the free pads on the main board shown in the next figure. The pads are on the output side of PA3300. Note: Please use only the professional measuring tools to check the individual preamplifier signals yourself.

Power supply

The supply voltage can be measured on some points on the main board. Be careful, short circuits of the power supply input line can destroy the external power stage! The measuring point are situated in front of the regulator IC's.

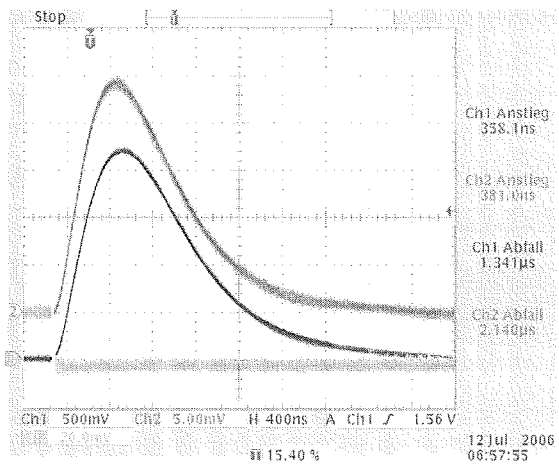


The measuring point are indicated using the following markers:

- ALxx: low gain output of channel xx
- AHxx: high gain output of channel xx
- PS_P: positive internal voltage
- PS_N: negative internal voltage
- PS_GND: ground

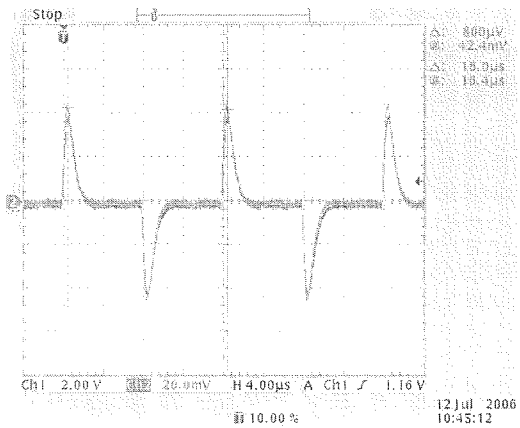
Test Measurement of PA3300 & CPA16

Each of the 16 PA3300 modules has been checked for proper work.
The figure on the right is an example of such measurement.
The line (depicted by 1 on the left) is a typical preamplifier pulse response of a square wave signal on the test input. The signal has an amplitude of about 2 V, the line (depicted by 2) has 24 mV.
On the right column of the figure, the width and the rise time of the two signals are indicated.
CH3 (green line) is the test signal.



All modules have been checked using the settings as described above. The notes of the measurements are available in the appendix.
Several checks have been done after mounting the printed circuit board of the analog part into the housing. One of there concerns the power distribution to the main board. The voltages have been measured and found to be correct. A next step has checked the power consumption with all installed PA3300 modules.
After mounting the analog main board into the housing, the high voltage stability has been tested using a HV power supply. All the detector inputs have been connected to a test circuit simulating a detector capacity of about 100 pF.

The figure on the right gives an example of the high repetition frequency of PA3300. The input signal is a square wave with an amplitude of about 20 mV.



Hardware and Software

1) 16-channel preamplifier device CPA16
   incl.
   - 1 analog board
   - 16 units preamplifier module PA3300
   - 1 3-wire power supply cable
   - 1 flat band cable with 34pin connectors

2) 0 spare unit preamplifier module PA3300
3) this manual

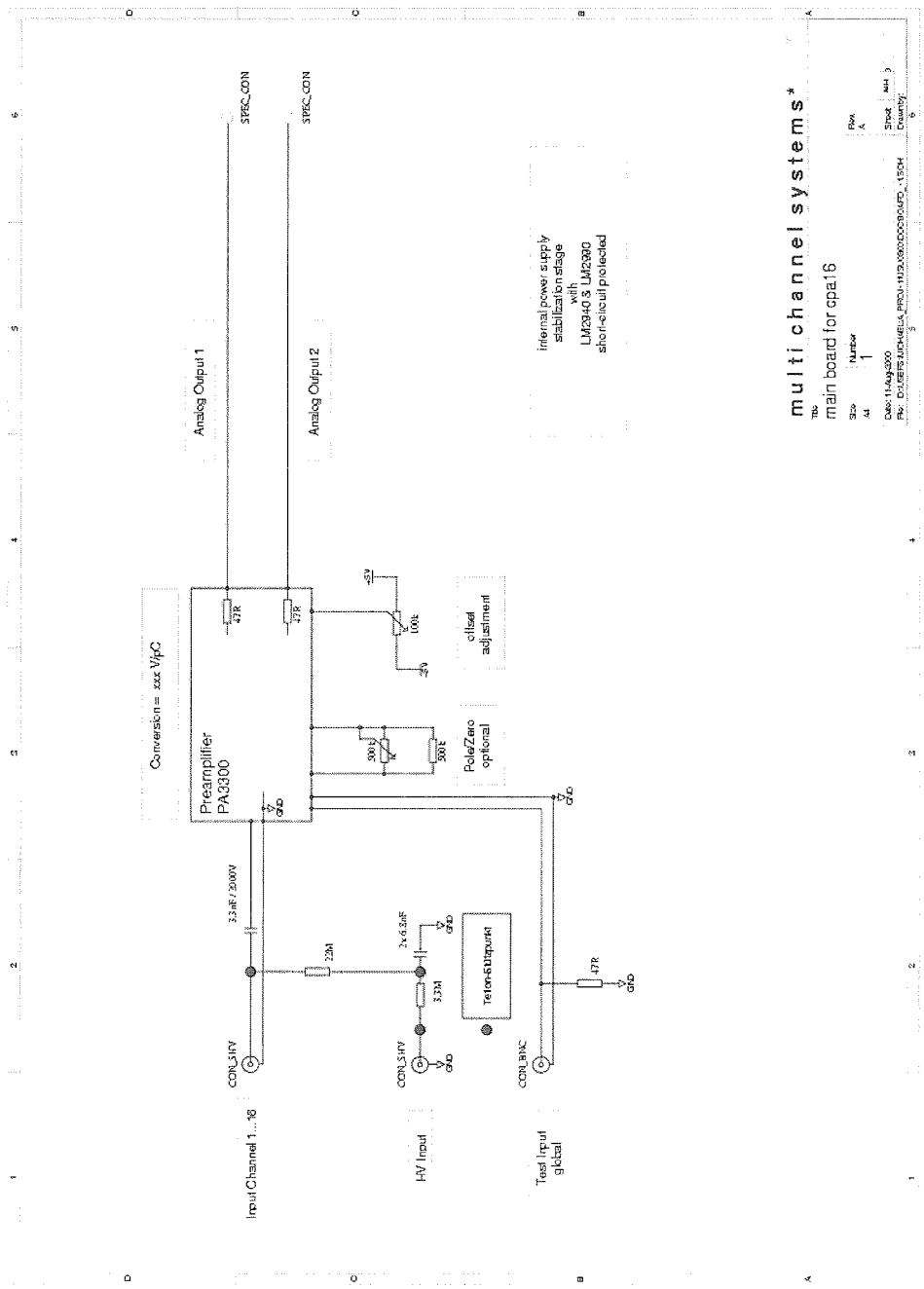
Service

Multi Channel Systems offers a fast factory repair service with quality check. Please contact Multi Channel Systems or your local representative before shipping your device. Please include a detailed description of the malfunction and send it to the address indicated on the front page of this manual.

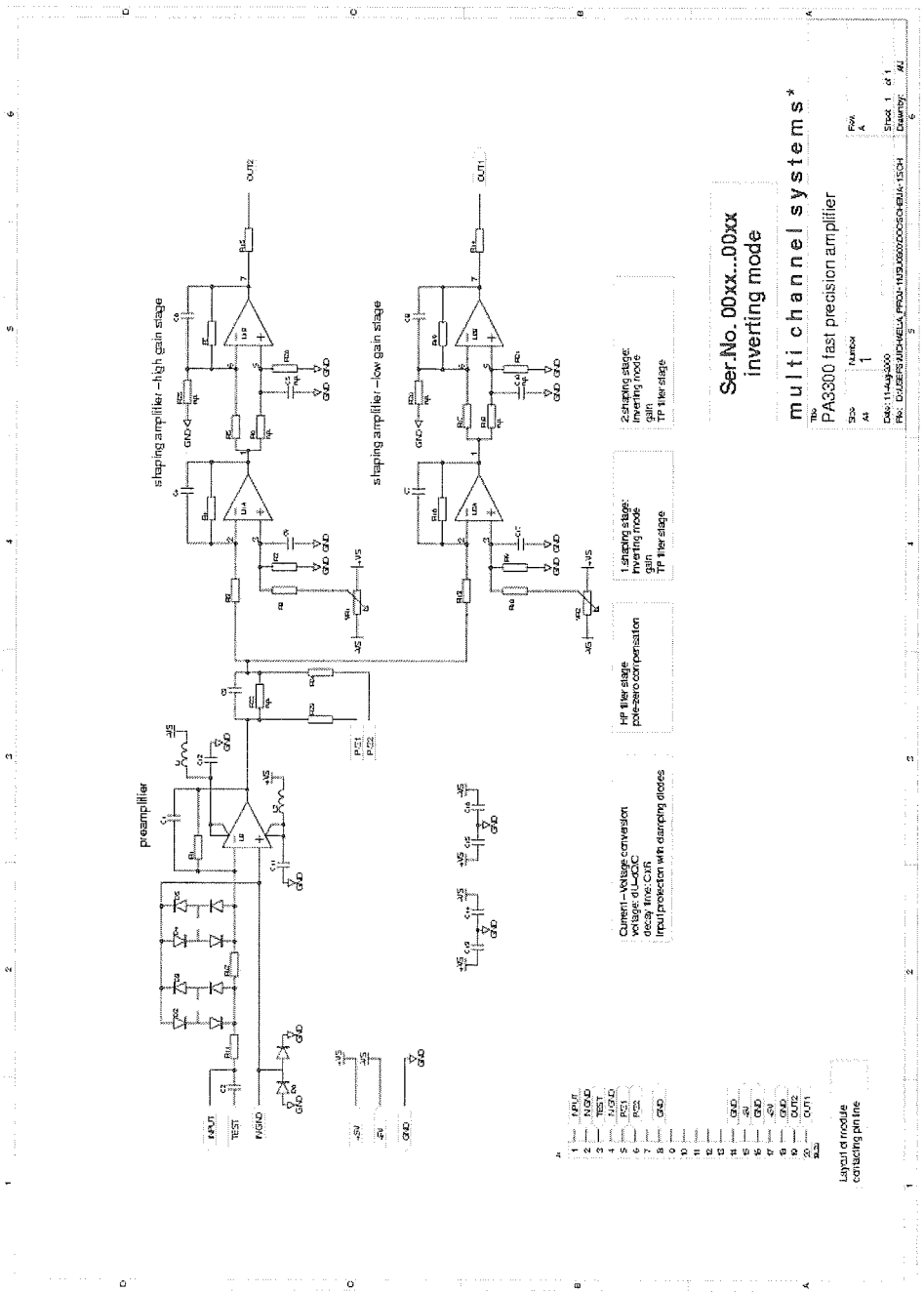
Appendix

1) principle electronic design of CPA16
2) electronic design of PA3300
3) printed circuit board of PA3300
4) printed circuit board of main board
5) PA3300 module check
6) to do – steps for installing / changing of CPA16 parts
7) list of serial numbers of PA3300 & CPA16

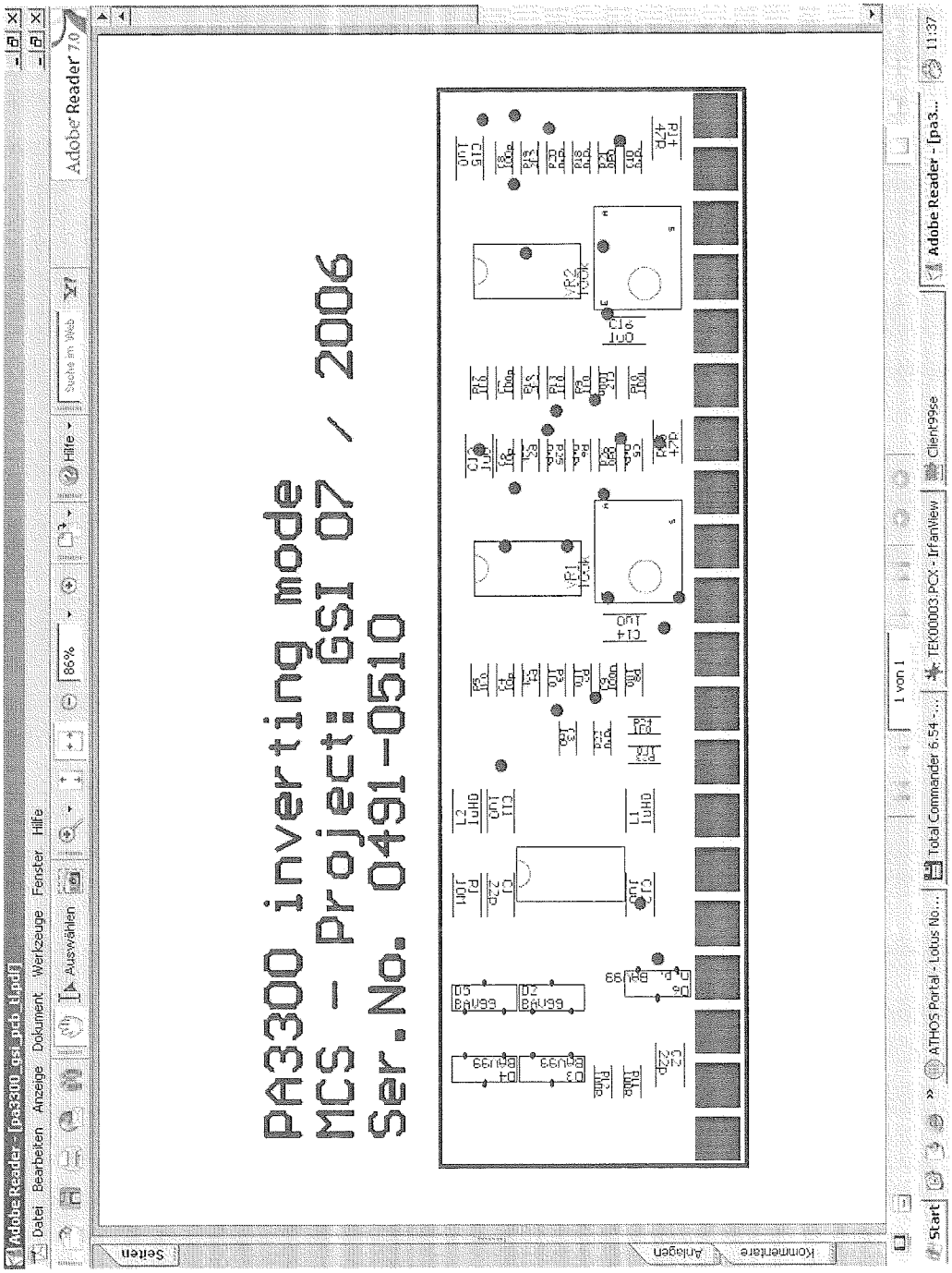
Principle electronic design of CPA16



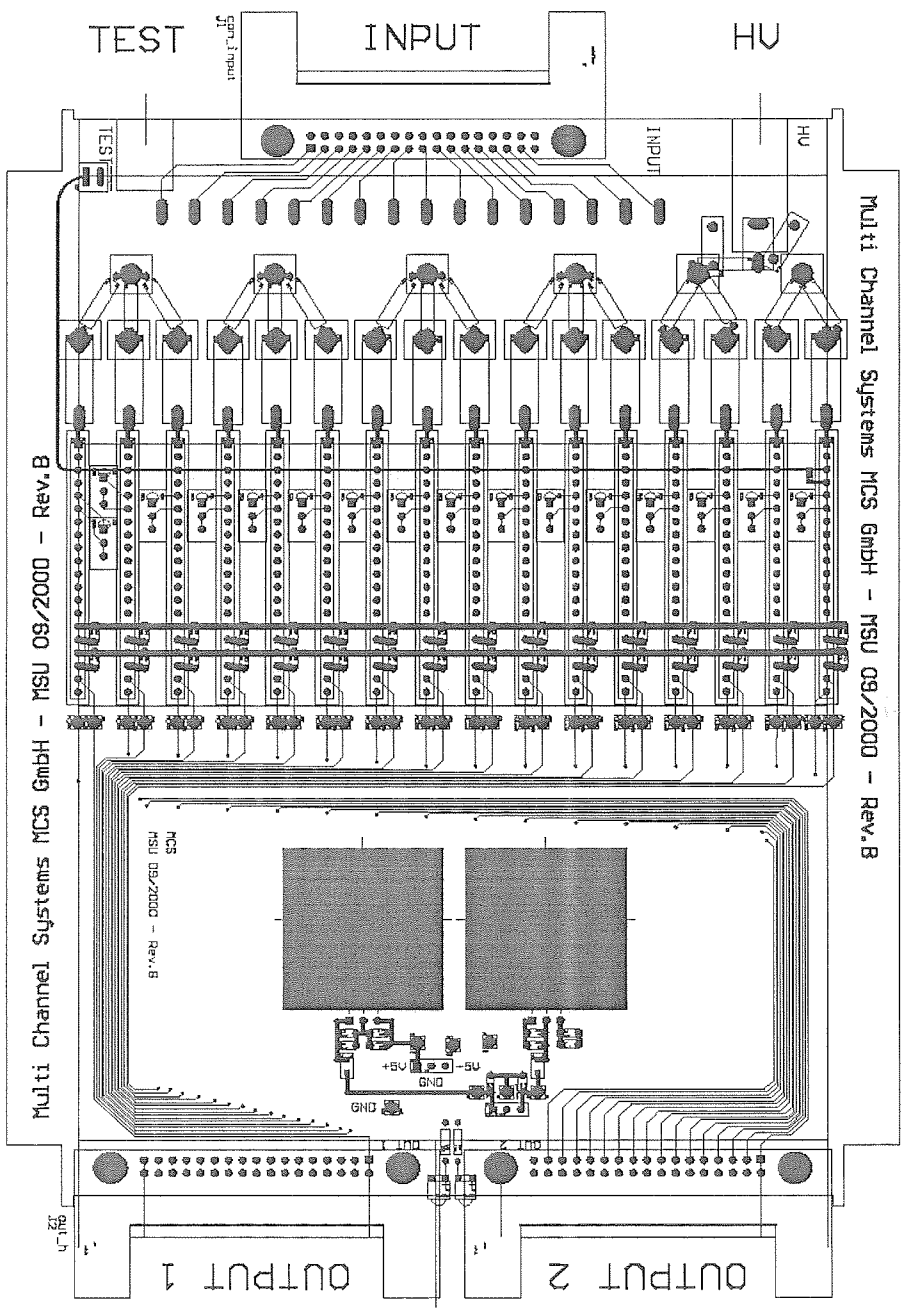
Electronic design of preamplifier module PA3300



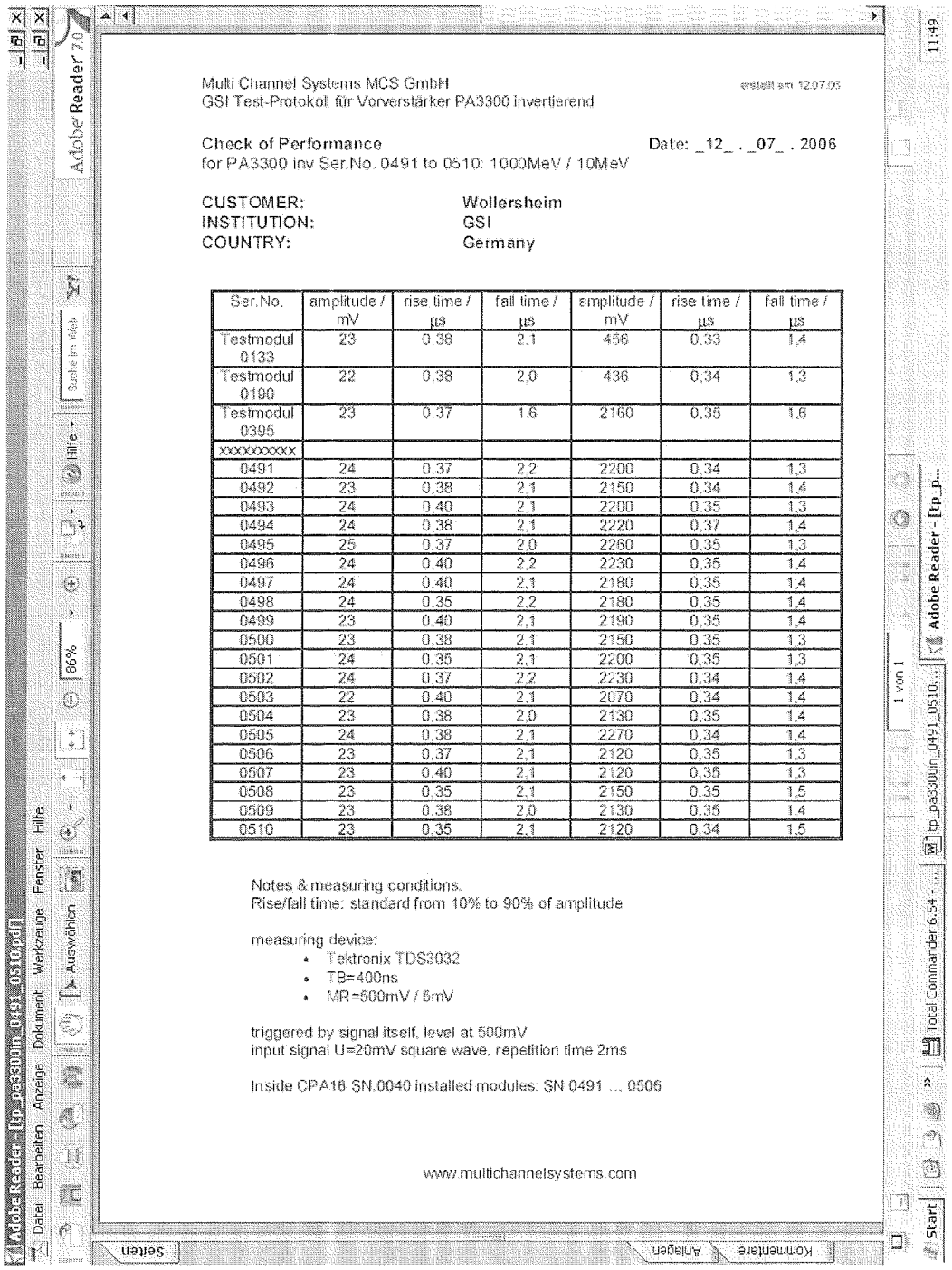
Printed circuit layout of PA3300



Printed circuit layout of main board



Check of preamplifier modules PA3300 / testversion



Multi Channel Systems MCS GmbH
GSI Test-Protokoll für Vorverstärker PA3300 invertierend

erstellt am 12.07.06

Check of Performance
for PA3300 inv Ser.No. 0491 to 0510: 1000MeV / 10MeV

Date: _12_ . _07_ . 2006

CUSTOMER: Wollersheim
INSTITUTION: GSI
COUNTRY: Germany

Ser.No.	amplitude / mV	rise time / µs	fall time / µs	amplitude / mV	rise time / µs	fall time / µs
Testmodul 0133	23	0,38	2,1	456	0,33	1,4
Testmodul 0190	22	0,38	2,0	436	0,34	1,3
Testmodul 0395	23	0,37	1,6	2160	0,35	1,6
xxxxxxxxx						
0491	24	0,37	2,2	2200	0,34	1,3
0492	23	0,38	2,1	2150	0,34	1,4
0493	24	0,40	2,1	2200	0,35	1,3
0494	24	0,38	2,1	2220	0,37	1,4
0495	25	0,37	2,0	2260	0,35	1,3
0496	24	0,40	2,2	2230	0,35	1,4
0497	24	0,40	2,1	2180	0,35	1,4
0498	24	0,35	2,2	2180	0,35	1,4
0499	23	0,40	2,1	2190	0,35	1,4
0500	23	0,38	2,1	2150	0,35	1,3
0501	24	0,35	2,1	2200	0,35	1,3
0502	24	0,37	2,2	2230	0,34	1,4
0503	22	0,40	2,1	2070	0,34	1,4
0504	23	0,38	2,0	2130	0,35	1,4
0505	24	0,38	2,1	2270	0,34	1,4
0506	23	0,37	2,1	2120	0,35	1,3
0507	23	0,40	2,1	2120	0,35	1,3
0508	23	0,35	2,1	2150	0,35	1,5
0509	23	0,38	2,0	2130	0,35	1,4
0510	23	0,35	2,1	2120	0,34	1,5

Notes & measuring conditions.
Rise/fall time: standard from 10% to 90% of amplitude

measuring device:
- Tektronix TDS3032
- TB=400ns
- MR=500mV / 5mV

triggered by signal itself, level at 500mV
input signal U=20mV square wave, repetition time 2ms

Inside CPA16 SN.0040 installed modules: SN 0491 ... 0505

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To do – steps for changing of CPA16 parts

This subsection describes the steps for replacing preamplifier modules. The customer should pay highest attention to exclude electrostatic discharges during the work. Please use only the right mechanical tools for screws and nuts. Please be careful if you change preamplifier modules. Do not bend the module pins.

Changing PA3300 modules

- switch off the power supply
- disconnect all external connections
- open the device on the rear side
- disconnect the internal power supply connector
- remove the rear panel
- open the device on the front side
- take out the main board
- change the module of interest
- take the steps described vice versa to close the device

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List of serial numbers of PA3300 & CPA16

device CPA16 SN040
inverting mode
PA3300 with SN from 0491 to 0506