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PERKIN ELMER
Bodenseewerk Perkin-Elmer GmbH Überlingen
Technische Schule

Serviceinformation

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No. : 341001A.STB

Subj.: Polarimeter 341/343 Service Manual

PROBLEM:

N/A

PURPOSE:

Provide Service Info for Polarimeter 341 / 343 to FSE

MATERIAL REQUIRED:

N/A

GENERAL:

Conts.:

1. General Information
2. Technical Data
3. Operation
4. Installation and Instrument Test
5. Electronics
6. Optics
7. Test- and Measurementpoints
8. Spare Parts List
9. Schematics

PROCEDURE:

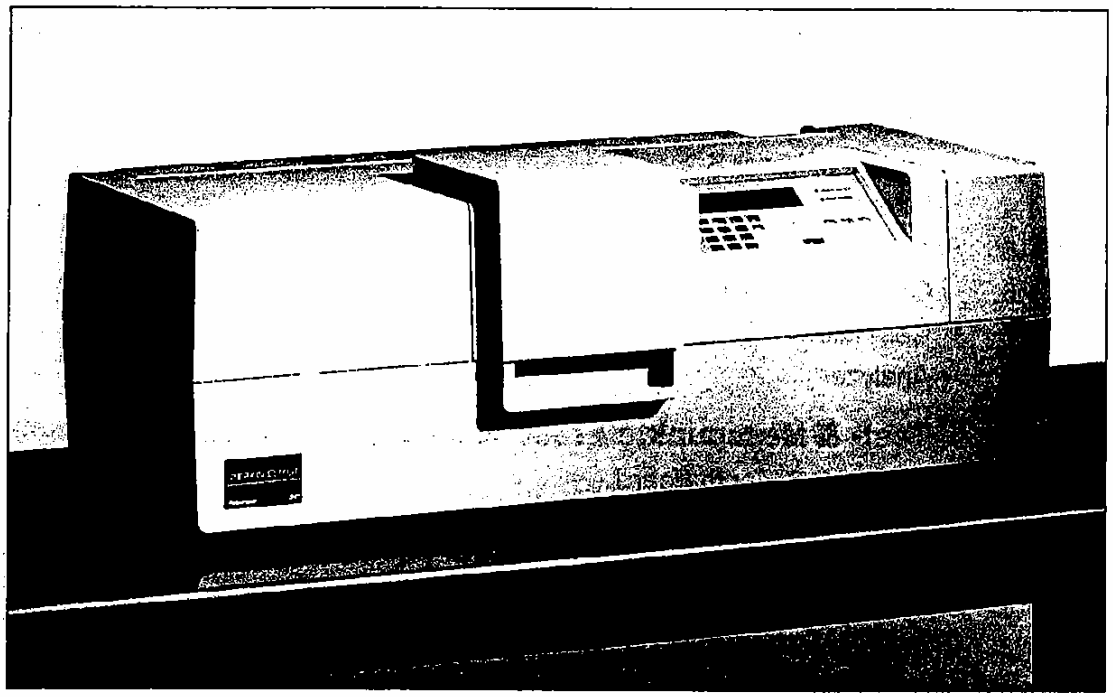
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Author	27.02.95	

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1. General Description

Model 341 (343) is an Automatic Precision Polarimeter. It uses the proven optical null principle with automatic rotation of the analyzer, which has been the basic of Perkin-Elmer's reputation for excellence in polarimetry. This principle is combined with state-of-the-art microprocessor electronics to produce an instrument offering the highest possible accuracy and precision with simple operation and handling. The angle of rotation is measured by an optical encoder with a resolution of 0.1 millidegrees and is displayed on a vacuum fluorescence display with the sign of rotation. A foil keyboard is used for operation. Wavelength and aperture are set via the keyboard. An ST46 Hg lamp and 20W Na lamp are used as light sources.



The complete electronics is accommodated on PCB's plugged into the motherboard. A voltage selector is provided to change from 115 to 230 V (50/60 Hz). Power consumption is 200 VA.

The sample compartment is located at the front (center) and has the same dimensions as the previous model. The lamp housing, filter wheel and aperture are located on the right-hand side. The analyzer is located to the left of the sample compartment and is the only component that is secured for transport. The transport brackets (marked in red) must be removed prior to starting-up the instrument.

2. Technical Data

Specifications

Principle	Automatic precision polarimeter with optical null principle by rotation of the analyzer; automatic gain control
Radiation	Hg high-pressure lamp; Na spectral lamp
Spectral lines	Selectable from instrument keypad: Na 589 nm, Hg 578 nm, Hg 546 nm, Hg 436 nm and Hg 365 nm; four spare positions for additional optional filters
Apertures	Selectable apertures for standard cells and microcells
Detector	Photomultiplier 1P28A
Polarizer and analyzer	UV-transmitting calcite Glan prisms
Rotatory range	± 85°
Balancing speed	1.3°/s at 50 Hz 1.5°/s at 60 Hz
Accuracy	± 0.002° for rotations ≦ 1° ± 0.2 % for rotations > 1°
Reproducibility	Better than 0.002° (for zero and rotational reading)
Internal angular resolution	1×10^{-4}°
Integration times	0.1 s; 0.2 s; 0.5 s; 1 s; 2 s, 5 s; 10 s; 20 s; 50 s and 100 s
Autozero setting	Electronically from instrument keypad at any desired position in the rotatory range
User interaction	Menu-driven from integrated touch keys (multilingual. English, German, French, Italian, Spanish)
Display	Vacuum fluorescence display, two lines with 20 characters each
Format of results	Selectable from instrument keypad; angular rotation, specific rotation, molar rotation, International Sugar Scale, as well as user-defined factor and offset
Printer output	Standard parallel printer port (Centronics port)
Communications	RS-232C serial interface, selectable baud rate and communication parameters
Data input	Input port for Intermec 9720 barcode reader and/or standard PC/AT keyboard
Analog output	Digital-to-analog conversion of angular rotation for the connection of chart recorders; recording ranges ± 50°, ± 5°, ± 0.5°, ± 0.05°; resolution 0.1 % of range width; cyclic repeatability in all ranges; output voltage 0 to 10 mV, 100 mV, and 1 V
External "Ready"	Relay contact closure (normally open), signal floating; maximum load 110 V, 0.3 A AC or 30 V, 1 A DC; activated by print signal, selectable delay and duration
External autozero	External activation of autozero function; TTL signal, low active; or contact closure, duration 100 ms minimum
Temperature sensor	PT-100 temperature sensor for sample cells (optional accessory); temperature range -23 °C to +198 °C
Power requirements	90 to 132 V AC or 190 to 264 V AC 50 ± 0.5 Hz or 60 ± 0.5 Hz, 200 VA
Dimensions	825 mm x 310 mm x 390 mm (WxHxD) (32.5 in x 12 in x 15.5 in)
Weight	approx. 40 kg

Perkin-Elmer reserves the right to change specifications without notice as part of our continuous program of product improvement.

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ALL ANALYTICAL INSTRUMENTS AND SYSTEMS MANUFACTURED BY PERKIN-ELMER ARE CERTIFIED UNDER THE QUALITY REQUIREMENTS OF ISO 9001

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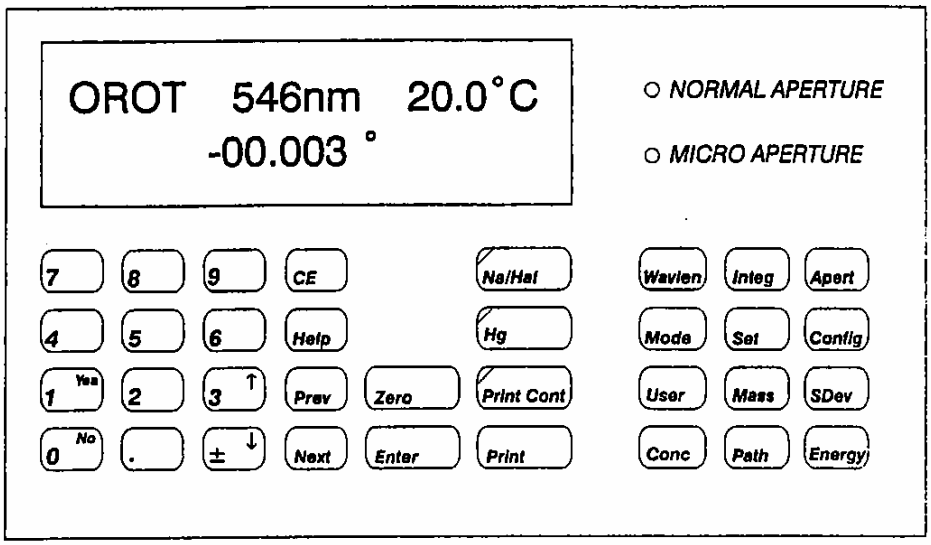
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3. Operation

Instrument operation is described extensively in the documentation provided. The following brief instructions are not intended to substitute the instrument manual. Some additional hints for Service engineers are included.

3.1 Operating keypad



Key	Function
0 to 9	Numerical keys.
↑ , ↓	Arrow keys for selecting parameter values.
CE	Clears any incorrect entry or error message.
Help	Calls additional context sensitive information (permitted value range, etc.).
Prev	Scrolls the previous parameter into the display.
Next	Scrolls the next parameter into the display.
Zero	Sets the reading on the display to zero
Enter	Confirms parameter entries.
Na/Hal	Switches on/off the Na/Hal lamp.
Hg	Switches on/off the Hg lamp.
Print Cont	Prints the results continuously.
Print	Prints the current result.

Key	Function
Na/Hal	Switches on/off the Na/Hal lamp.
Hg	Switches on/off the Hg lamp.
Print Cont	Prints the results continuously.
Print	Prints the current result.
Wavlen	Sets the measurement wavelength.
Mode	Selects the measurement mode: OROT, SROT, MROT, UROT, ZROT.
User	Sets user defined output of results.
Conc	To enter the sample concentration.
Integ	Sets the integration time.
Set	Sets the documentation parameters: Sample temperature, Sample No. and Recorder range.
Mass	To enter the molar mass of the sample.
Path	To enter the pathlength (mm) of the cell.
Apert	Switches between normal and micro aperture.
Config	Sets the configuration parameters.
SDev	Shows the standard deviation of the actual result.
Energy	Shows energy on the photomultiplier.

Keys with Toggle-switch Function

These keys switch between two conditions:

Apert	Switches between normal and micro aperture.
Hg	Switches on/off the Hg lamp.
Na/Hal	Switches on/off the Na/Hal lamp.

3.2 Special Service Functions

Pressing the "Config key will access the Instrument Configurations Mode which also includes a hidden Test Program.

The first option selects the operating language. After pressing Prev , the software version is indicated, followed by the serial number, and subsequent alignment test for analyzer deflection (increased energy = reduced deflection).

Pressing Prev once again will access the test program, including instrument functions, operating hour counter, default settings and hardware diagnostics.

This program level is accessed by entering the code: 1974 and pressing Enter.

Test Programm 2 prints the following summary:

PERKIN-ELMER Polarimeter 341

Serial No. 7004

Test program #2

TEST PROGRAMS AT A GLANCE

	MISCELLANEOUS		HARDWARE DIAGNOSE I
0	Leave test mode	10	Display overview
1	Display test table	11	Display test
2	Print test table	12	Keyboard test
3	Print instrument inspec. Sheet	13	Temperature sensor (cts / deg)
4	Recall Na/Hal-lamp elap. time	14	Energy signal (cts / %)
5	Recall Hg-lamp elap. time	15	Sample lid sensor
6	Recall instrument elap. time	16	Endstop switch left / right
7	Recall measurement counter	17	Ext. Auto Zero input signal
8	Recall temp. sensor offset	18	Ext. Ready output signal
9	...	19	Beeper test
	PRE - SETTINGS		HARDWARE DIAGNOSTICS II
90	Display pre-setting overview	20	CPU test
91	Set serial number	21	ROM test
92	Set model number	22	RAM test
93	Set Na/Hal-lamp elap. time	23	Light barrier filter wheel
94	Set Hg-lamp elap. time	24	Light barriers aperture
95	Set instrument elap. time	25	Rotation Signal (cts / deg)
96	Set measurement counter	26	Lamp power supply positions
97	Set national anthem	27	...
98	Set Low Energy limit	28	...
99	Make instrument virginal	29	...

Test Program 3 prints the following instrument inspection report:

PERKIN-ELMER Polarimeter 341

Serial No. 7004

Test program #3

INSTUMENT INSPECTION SHEET

Instrument Software Version: V1.00 - released at : 22.08.94

Elap. Time Meter Instrument :220 hours
Elap. Time Meter Hg-Lamp : 141 hours
Elap. Time Meter Na-Lamp : 166 hours
Measurement Counter : 63 prints (Print Cont. = 1 x Print)

Power Supply for Hg-Lamp : INSTALLED - Position : Front
Power Supply for Na-Lamp : INSTALLED - Position : Back
Temperature Sensor : NONE - Offset : deg. Celsius

Filter Wheel Position 1 : 578 nm - Default : 578 nm
Position 2 : 546 nm - Default : 546 nm
Position 3 : 436 nm - Default : 436 nm
Position 4 : 365 nm - Default : 365 nm
Position 5 : [----]
Position 6 : [----]
Position 7 : [----]
Position 8 : [----]
Position 9 : 589 nm - Default : 589 nm (Na)
Position 10 : [AUS] - Unchangeable

Pre-Settings National Anthem : ON - Default : OFF
Low Energy Limit : 5 % - Default : 5 %

Bodenseewerk Date : 05.10.1994 16:58:05

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Made in Germany Inspector

This printout provides a general summary of the operating hours and instrument use.

Test programs 4 to 6 are operating hours. Test program 4 is for the Na - lamp, Test program 5 for the Hg - lamp and with Test program 6 you see the instrument life time hours.

Test program 7 shows the no. of sample printouts.

Test programs 10 to 29 are hardware tests. Not all of them are usefull.

Test programs 90 to 99 are instrument setting parameters. These are the instrument serial number, the model e.g. 343, the lamp operation time and all default settings for new installation or Firmware exchange.

Your own notes :

4. Installation and Instrument Test

Remove the instrument from its packaging and place it on a suitable work bench. Loosen the four screws from the instrument cover, carefully lift it up and place it behind or beside the instrument. Remove the transport brackets marked in red and screw them into the holes provided on the left for later use. Replace the cover carefully and accurately (watch the keyboard cable). Set the voltage selector to local line voltage (120 / 230V) and plug-in the line cable. Switch on the instrument and select the requested wavelength and lamp via the keyboard.

The analyzer performs an optical zero run. After several minutes the lamps have reached the required brightness. Press zero to put the instrument into its Ready state. The Config Menu includes an alignment test for analyzer deflection (increased energy = less deflection). Deflections towards the right and left must always be returned to optical zero (null). The energy display must show approx. 75 %, depending on the lamp, filter and aperture used.

The rotating values can be tested by means of the quartz standards B009-8799 (left 1°) und B009-8800 (right 1°). The test is factory-performed before the instruments are shipped to customers.

Test the rotating values by using the OROT setting (optical rotation).

Use hoses to connect the quartz standards to the 20°C waterbath and wait until the correct temperature value has been reached.

Select the test wavelength, e.g. 546 nm.

Press the zero key for optical null (zero position).

Insert the quartz standard in the sample compartment and secure with holders.

Close the sample compartment, read-off the rotating value and compare it with the quartz standard certificate. By adding the tolerance values of the quartz and instrument the greatest possible deviation is obtained.

If a printer is connected to the instrument, the test results can be printed out directly in the form of an **Instrument Performance Validation (IPV).**

If there is no printer connected, the two following pages should be copied and completed.

The wavelengths indicated in the certificate are the key values. For the model 341, the selected wavelength for use with Na lamps is 589 nm. The wavelength settings for use with Hg lamps are 578, 546, 435 and 365 nm.

The wavelength setting of 365 nm is not possible for model 343, due to the polarizer foil. Only the installed lamp and filter can be used.

IPV TEST CERTIFICATE

Customer	_____	Date Tested	_____
Address	_____	Recommended Recertification	
	_____	Period 12 Months	
	_____	**Recertification**	
Unit		**Due:**	_____
Location:	_____	Model	_____
		Serial No.	_____
User Name:	_____	Date Last Certified	_____
Phone	_____	Call Number	_____

REMARKS:

_____

This is to certify that the above tests have been performed according to Service Information 341001A.STB and the configuration tested

[ ] meets

[ ] does not meet

The Perkin-Elmer Specifications listed on this certificate.

This certificate does not modify Perkin-Elmer's standard terms and conditions of sale, including warranty terms.

Authorized PE Representative:_____ Serv. Ing. No.. _____

Service Engineer: _____ Signature:_____

IPV TEST CERTIFICATE

SERIAL NUMBER _____ **DATE TESTED** _____

Quartz standard, left 1˚ Measuring Temp T=20.0˚C

B009-8799 Serial # _____

Wavelength	**Nominal Value**	**Actual Value**	**Tolerance**	**Deviation ***	**OK**
nm	**˚Angle**	**˚Angle**	**%**	**%**	**Y/N**
589.3					
578.0					
546.1					
435.8					
365.4					

Quartz Standard right 1˚ Measuring Temp. T=20.0˚C

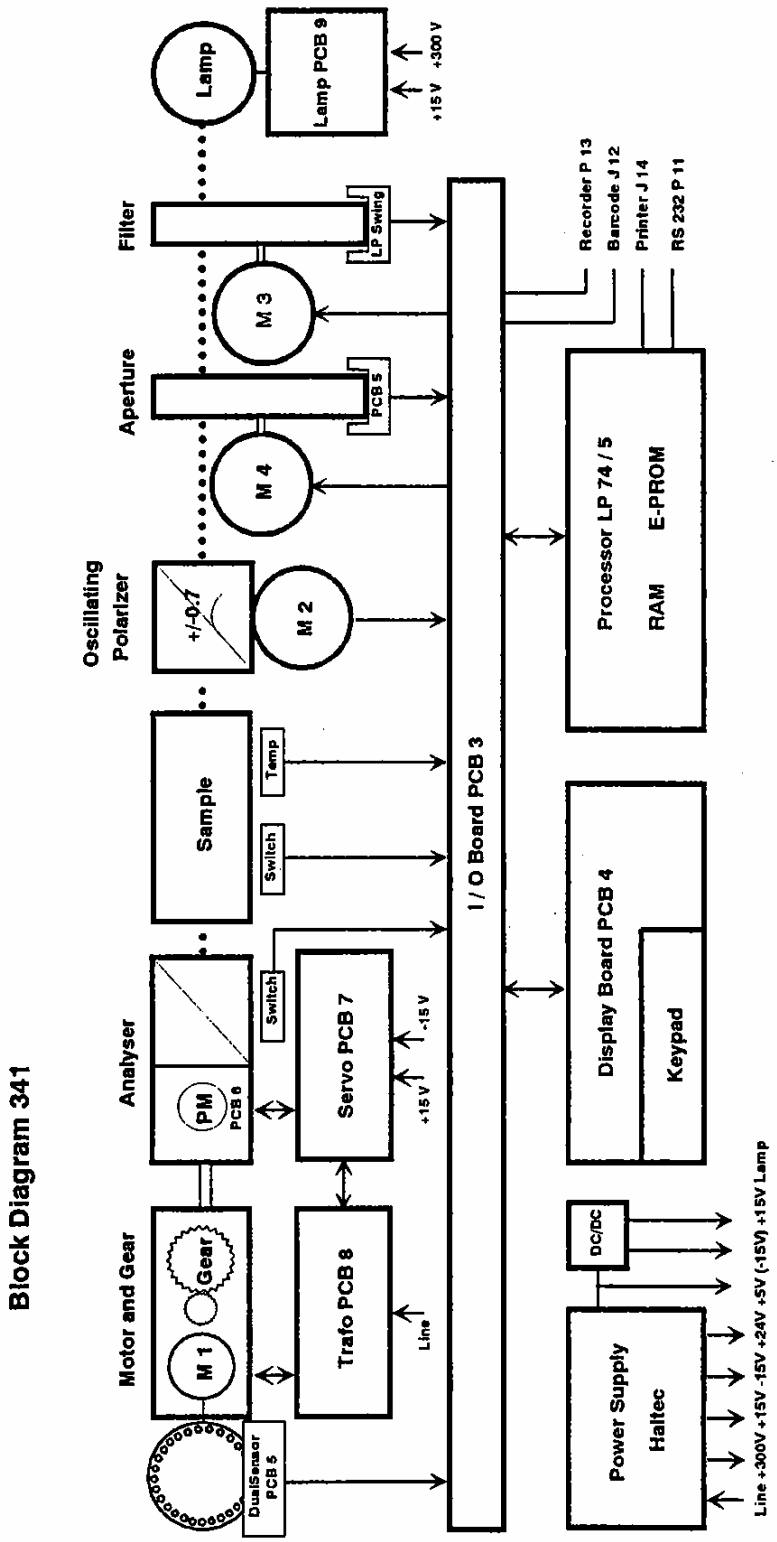
B009-8800 Serial # _____

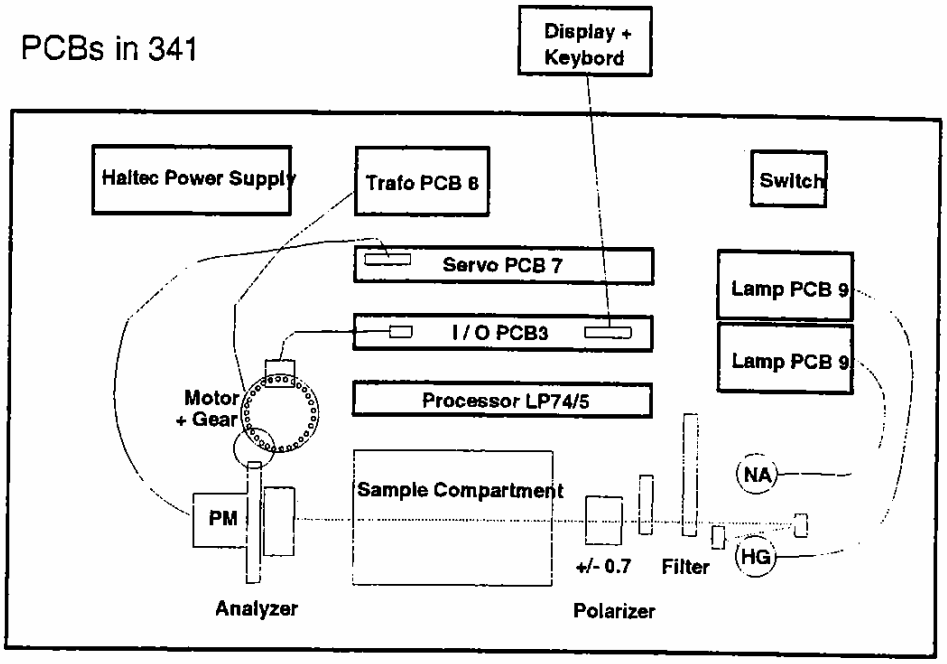
Wavelength	**Nominal Value**	**Actual Value**	**Tolerance**	**Deviation ***	**OK**
nm	**˚Angle**	**˚Angle**	**%**	**%**	**Y/N**
589.3					
578.0					
546.1					
435.8					
365.4					

* The admissible deviation is calculated from the specifications plus filter tolerances indicated in the standard certificate.

5. Electronics

An overview can be obtained from the two block diagrams shown below:





5.1 PCB 1 Motherboard

The motherboard includes the slots for the PCB's and all plugs for external connections, such as the Centronix port for parallel printer, analog and synchronous connections for recorder, serial connection for bar code / PC AT keyboard, RS232 for computer or serial printer, and line input with line fuses Si 1 and Si 2 (each 2.5 AT for 230 V and 5.0 AT for 120 V).

From the line plug, one cable is routed via the line filter to the power switch and from there, via the voltage selector (120 - 230 V) to the Haltec Power Supply and subsequently to the PCB 8 transformer. The board also accommodates the DC / DC converter IC 1 generating the 15 V supply for the lamp. Fuses with Si 3 and Si 4, as well as the recorder control functions. Moreover, the motors, switches and sensors are fitted on the board.

5.2 PCB 3 I / O Board

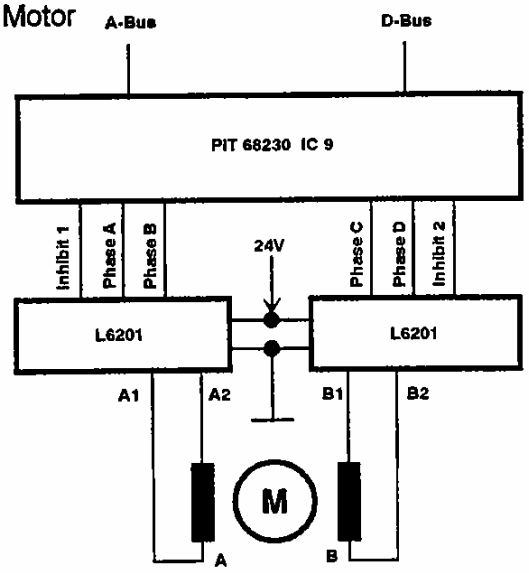
This board is used to control the motors, display and keyboard, and to digitalize energy and temperature readings, detect the rotating value and provide an analog output of the rotating value via the recorder.

The address bus, data bus and control bus are led from the processor PCB 74 / 5 via the VME bus. The user bus serves as the output. The keyboard display and angular encoder are directly fitted on the PCB.

5.2.1 Motor Control Functions

The three stepper motors for the aperture, filter and oscillating polarizer are controlled in the same way. The oscillating polarizer has one winding firmly connected to 24 V. An overview is given in the block diagram shown below:

Block Diagram: Stepper Motor



The corresponding motor windings are triggered from the processor, via the data and address bus, by means of IC 9 Parallel Interface Timer MC 68230 (PIT) and motor drivers IC 29 + IC 30, IC 31 + IC 32 and IC 19 (type L 6201). One each of the two motor windings is operated with 24 V in the H - bridge of a driver.

5.2.2 Keyboard and Display

The display data are received from the data and address bus and transmitted to PCB 4 by means of PIT IC 16 and the drivers IC 8 and IC 11.

Keyboard functions are controlled and identified in the same way. Via PIT IC 9 and drivers IC 2 A and IC 6 A, the rows of keys COL 0 - COL 8 are operated. Keystrokes are identified via drivers IC 8 and PIT IC 16 by means of the signals ROW 0 - ROW 3.

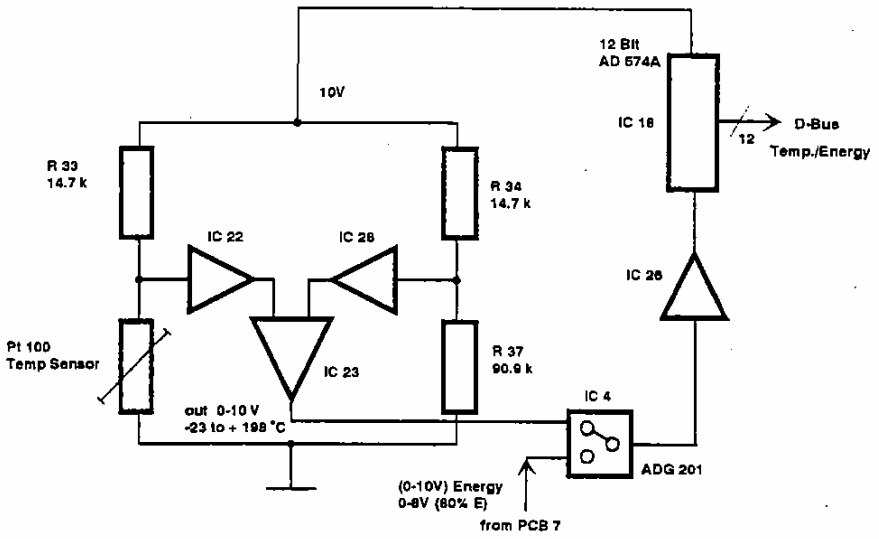
5.2.3 Digitalization of Energy and Temperature Values

The 12 bit A / D converter IC 18 (AD 574) converts the 0 - 10 V for 0 - 100% energy reading and 0 - 10 V for the temperature reading of -23° to +198°Celsius. Analog switch IC 4 (ADG 201) with secondary amplifier IC 26 switches over to the appropriate signal by means of control signals ASW TEMP and ASW ENERGY. Three 10 M resistors, R 50, 51 and 52 to GRDA prevent an open A / D input without unnecessary load on the measuring signal.

The analog 0 - 10 V for the energy display are obtained from Servo PCB 7. Within the normal measuring range, approx. 0 - 8 V are used for an 80% energy display.

The analog temperature value is generated in a bridge circuit by Pt 100, which acts as a temperature sensor.

Block Diagram: Temperature and Energy Measurements

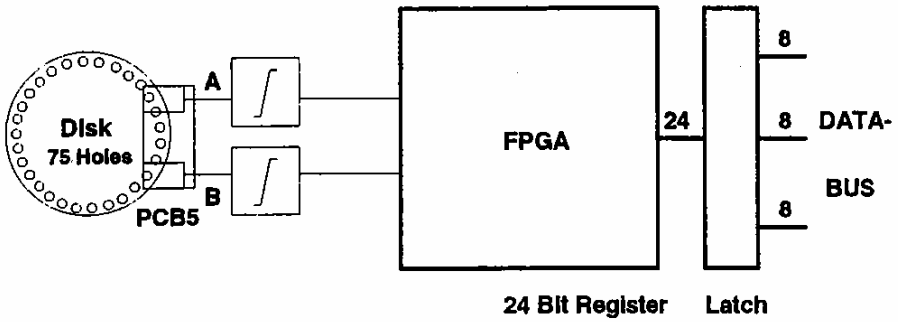


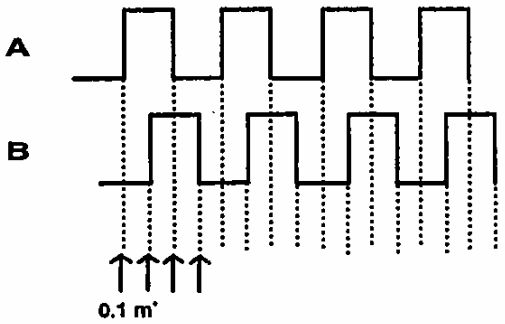
The bridge circuit, consisting of Pt 100 + R 33 and R 37 + R 34, is fed with a reference voltage of 10 V by IC 18. The two branches of the bridge circuit are decoupled by means of Op amp IC's 22 / 28 (amplification 1:1) and supplied to the subtracter Op Amp IC 23. After its gain, 0 volts are obtained for -23°C, and +10 volts for a temperature reading of 198° Celsius.

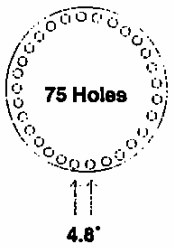
5.2.4 Detection of the Rotating Value

For measuring the optical rotating value, a coding disk is mounted on the motor axis of the analyzer. This disk is fitted with 75 holes at a distance of 4.8°, which corresponds to 2.5 holes at a rotating value of 1m°. The holes are decoded by means of two light barriers.

Block Diagram: Detection of Rotating Value







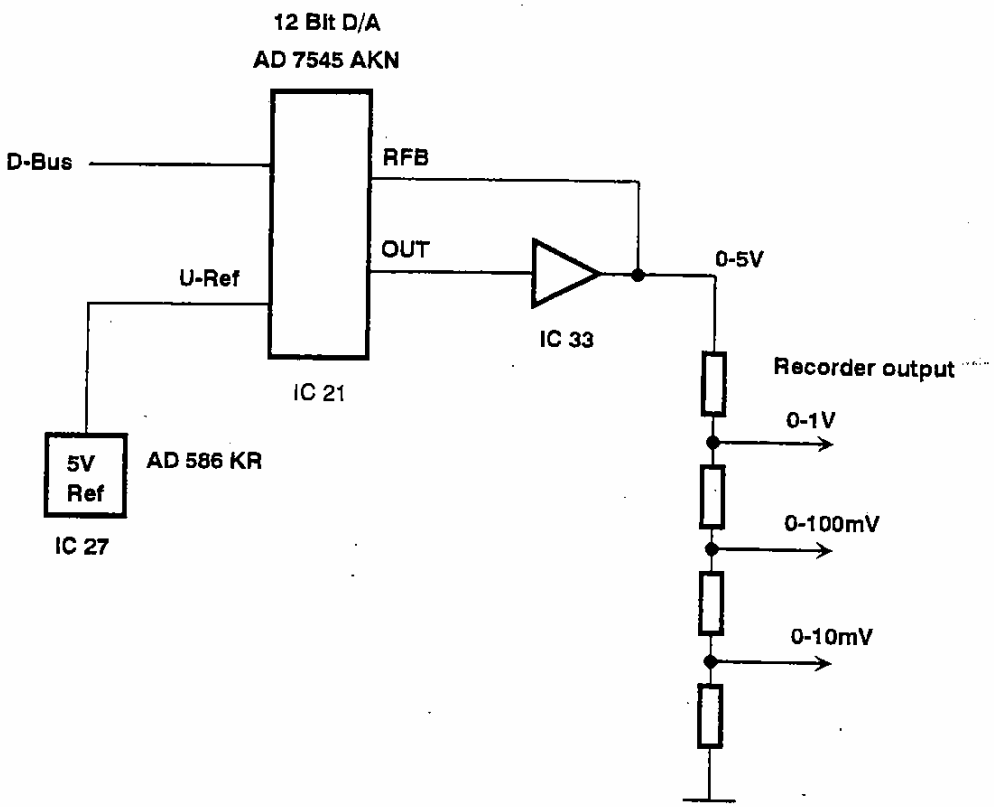
The two light barrier signals A and B must be phase-shifted against one another by exactly 90°. By means of the Schmitt triggers IC 5 E and IC 5 F, the edge steepness of pulses is corrected. Via IC 14, an FPGA (Freely Programmable Gate Array), each pulse edge in the rotating direction A before B or B before A is detected and counted in a 24-bit register. The latch (IC 10, 13 and 15) passes the information to the data bus in two stages. CS Low Latch takes over the first 16 data bits, and CS High Latch takes over the following 8 data bits. The rotating value thus obtained (24 bits) corresponds to a resolution of 0.1 m°.

In addition to the rotating values, FPGA IC 14 generates the Chip Select signals.

5.2.5 Analog Recorder Output

A recorder can be used to provide an analog output of the rotating value. The output receives 0 - 1V (100 mV, 10 mV) for the range of ± 0.5° (± 0.05°, ± 5°, ± 50°), which is selectable via the keyboard. To generate this voltage, the digital rotating value is converted by means of a 12-bit A / D converter.

Block Diagram: A/D Converter



IC 27 (AD 586) is used to generate a reference voltage of -5 V for the D / A converter IC 21. The converter receives the rotating value from the data bus and converts it to 0-5 V. Via the amplifier IC 33, the voltage is supplied to the voltage divider on the motherboard. Voltage at the recorder plug is 0 - 1 V (0 - 100 mV or 0 - 10 mV). At zero the output voltage is always the half level.

5.3 PCB 4 Display + Keyboard

PCB 3 controls and detects the keyboard functions. The rows of keys COL 0 to COL 8 are activated via PIT IC 9 and drivers IC 2 A and IC 6 A. Keystrokes are recognized by means of the signals ROW 0 to ROW 3 via driver IC 8 and PIT IC 16.

The data for the display are received from the data and address bus and passed from PCB 3 to PCB 4 by means of PIT IC 16 and drivers IC 8 and IC11.

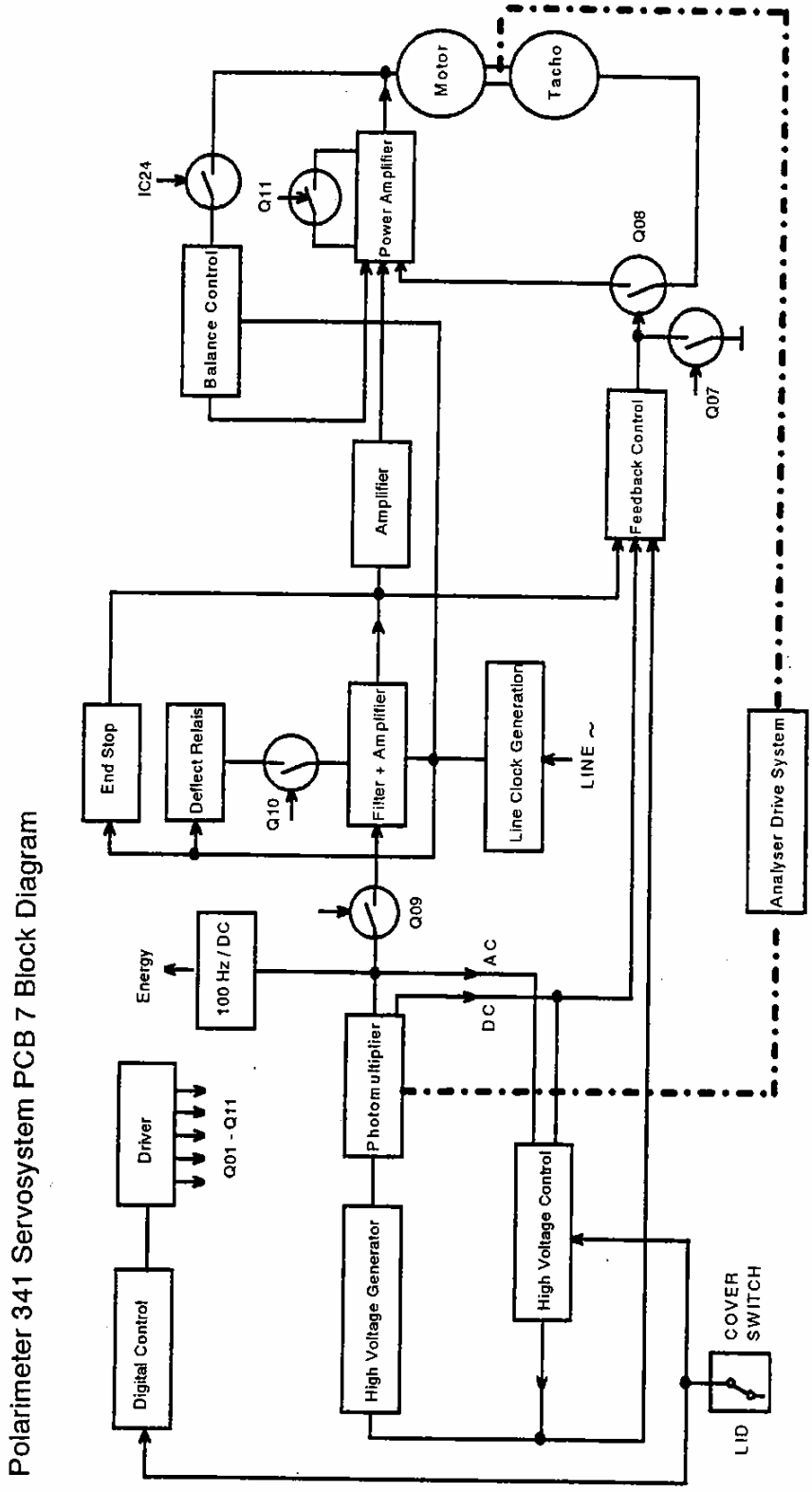
The display is controlled by IC 5, which is a microprocessor chip with EPROM.

Data is received from processor board 74 / 5 and converted by IC 5 to control the vacuum fluorescence display unit. Drivers IC 1 and IC 2 feed the dot matrix control (5 x 7 = 35 dots) (P1 - 1 to P 5 - 7). Drivers IC 3 and IC 4 control the grid (GRID) of the respective sign (2 x 20 signs in total).

Clock Generator IC 9 (12 MHz) controls the μP clock frequency. The 12 MHz signal is divided down to 50 kHz by IC 8 and subsequently used as the clock pulse for the switched power supply feeding the display. Transistors Q 1 and Q 2 alternately connect to ground the +5 V voltage across transformer TR 1. Transformer winding 4 / 5 is rectified with CR 2 - 5 and filtered by means of C 5. The +40 V thus obtained are used to supply the vacuum display. Transformer winding 6 / 7 / 8 (5 V pp) supplies the heater voltage for cathodes 1 and 2 (F 1 + F 2).

5.4 PCB 7 Servo Control System

Block Diagram:



5.4.0 Content

5.4.1 Summary
5.4.2 Block Scheme of the System
5.4.3 Detailed Description of Function Groups
5.4.4 Electronical Alignment Instructions

5.4.1 Summary

The measuring system is composed of a servo circuit and associated multiplier voltage supply. The servo circuit consists of an opto-mechanical part and an electrical part. In addition, high voltage is provided for the multiplier, which is coupled to the servo circuit in a separate control circuit. The system is completed by a low voltage supply for the two mentioned control circuits and their various auxiliary circuits.

5.4.2 Block Scheme of the System

The functions of the servo system are summarized in two different blocks.
The complete circuit consists of:

3 Control Circuits

a) Angular rotation (servo circuit)
b) Multiplier (MP) Gain Control (AGC = Automatic Gain Control)
c) Balance Control (ABC = Automatic Balance Control)

3 Control Elements

a) Feedback Control (FC)
b) Automatic Balance Control
c) Sample Compartment Switch

5.4.2.1 Servo Control Circuit

The servo circuit receives reference input from the multiplier, which is amplitude-controlled and carries 50 Hz, 100 Hz and DC voltage, depending on the phase angle error of the analyzer. The 50 Hz frequency component is filtered in a triggered bandpass filter. The amplitude and phase indicate the amount and direction of the deviation from the point of alignment. The AC motor with tacho generator rotates the analyzer prism via a gear until the phase angle error and, hence, 50 Hz voltage, have reached a value of zero. The feedback branch is led from the tacho generator to the input of the power stage. The feedback is necessary to stabilize the servo circuit during alignment. To increase the alignment speed, the feedback is switched off when the instrument is run-in. Change-over is performed by the Feedback Control.

5.4.2.2 Multiplier Control

The operating voltage of the multiplier is controlled as a function of its starting signal. Hence, the servo circuit receives a signal with a constant amplitude over a wide range of light intensity in the vicinity of the point of alignment (AC branch). For deviation angles > ± 45°, the DC component of the signal, via the DC branch, acts as the main control variable and reduces amplification. In this way, the multiplier is efficiently protected against overload caused by constant light in connection with wide angles.

The initial voltage of the multiplier via the AC and DC branches is amplified, smoothed and compared to a reference voltage. The voltage difference controls the amplitude of the 17 kHz square wave, from which the multiplier high voltage (max. -1000 V) is generated via transformer, rectifier and capacitors (voltage doubling).

5.4.2.3 Balance Control

The balance control circuit is closed for approx. 5 seconds (measuring cycle) at an interval of 2.7 minutes only, if the sample compartment is closed for a longer period of time.

During these intervals the servo circuit is out of function. The balance control has the task of measuring the 50 Hz interference voltage within the servo circuit (including the residual voltage of the tachometer) while the multiplier signal is off, and of minimizing this component by adjusting the balancing voltage. The adjustment is stored for the subsequent sample run and ensures the highest possible polarimeter accuracy, which again is expressed by very low dark drift characteristics.

5.4.2.4 Feedback Control

The feedback control (tachometer voltage) of the servo circuit is only activated if very low angular differences from the reference point are detected, so as to allow fast compensation of phase angle errors and, at the same time, stabilize the servo circuit alignment at an early stage. The switching threshold of the GC switch is triggered by four parameters:

1. The starting voltage of the 50 Hz filter is rectified and saved as the negative peak value U 1. During alignment, this voltage value is set to zero.

2. The control voltage that provides the operating voltage for the multiplier is fed as U 2 to the summation point of the control amplifier.

3. A fixed voltage U 3 on the summation point creates an adjustable power-on level for other functions.

4. If the analyzer exhibits large angular differences, the DC signal component U 4 goes beyond a voltage threshold. Despite a very low 50 Hz voltage, U 4 keeps the GC switch open and the maximum alignment speed is reached. The objective of this complex control system is to ensure optimal alignment characteristics under all given operating conditions, i.e. minimal run-in time, minimal overshooting, good zero point stability and good noise suppression.

5.4.2.5 Balance Control

The balance control circuit (5.4.3) is switched on and off by means of the Digital Balance Control function.

At the start of a measuring cycle, Q 09 deactivates the input signal of the servo circuit. By means of the signals Break RH RT and Break LH RT, Q 13 and Q 14 are cut off to deactivate any possible end stop functions. By means of Feedback On, Q 07 enables the feedback to reliable measure any interference voltages across this branch. Voltage jumps resulting from the switching processes within the servo circuit will not interfere with the motor functions because Q 11 is used to temporarily deactivate the power stage. Upon reactivation of the power stage and decay of the transition cycles, the balance control circuit is closed by means of IC 24 C + D, so that interference voltages at the motor are kept at a minimum. At the end of the measurement, IC 24 C + D is opened and the adjusted balance voltage is stored. After changing over Q 09, Q 13 + Q 14 and Q 11, the run in progress is continued by using the newly determined balance value, thus ensuring lowest possible interference voltage and minimal measuring errors.

5.4.2.6 Sample Compartment Switch

The sample compartment cover actuates a switch function that switches the servo circuit on or off when the cover is opened or closed. When this function is switched off the multiplier voltage is reset to zero via the amplitude control, and the balance control function is switched on continuously, so that minimum interference voltage is applied to the motor.

When the cover is closed, i.e. when the system is switched on, the smoothing capacitor of the multiplier control is first reset to its point of operation by means of a controlled current surge via an accelerating function. At the same time, the balance control function is disabled and releases the servo circuit for measurement. Due to this accelerating circuit, the time that elapses between closing the sample compartment and the start of the alignment is kept at a minimum.

5.4.3 Detailed Description of Function Groups

5.4.3.1 Electrical Supply of the Multiplier

Amplifier IC 1 is fitted as a free-running multivibrator and generates a square wave voltage of approx. 17 kHz at an amplitude of ± 15V. By means of CR 3 CR 4, this voltage is limited to a positive peak value of +12V. Via CR 5, the negative peak value of the square wave voltage is limited to the DC voltage supplied by amplifier IC 2. This means that at a control voltage of -14 V, U_{ss} = 26 V and at +14 V, U_{ss} = 0. Impedance converter Q 02 and high-pass R 04, C 04 are used to trigger the single-ended Darlington input Q 01. The regulated voltage of 17 kHz is transformed by means of a transformer at a ratio of 1 : 75 and brought to the negative multiplier operating voltage of max. -1000V in a voltage doubling rectifier circuit (CR 1 + CR 2, C 01 + C 02). The load of the voltage supply is provided by 10 identical dynode resistors R 1 - R 10, which are required for uniform voltage division at the individual multiplier stages.

5.4.3.2 Multiplier Control

The starting signal of the multiplier includes FET impedance converter Q 2. The PM signal is transmitted to the inputs of amplifier IC 4 via resistor R 54, and a distinction is made between DC and AC voltage (DC and AC branches CR 16 + CR 17 and C 17).

If the analyzer creates smaller angular differences (< ± 45°), the multiplier voltage is controlled according to the AC voltage amplitude of the output signal. The voltage is applied to the inverting input of IC 4 via a high-pass filter (C 17, R 32, R 30). Upon amplification, negative control voltage is obtained by single-wave rectification and smoothing with R 22, R 23, C 12. When the angular differences are greater, the DC voltage portion rises to more than -10 V, so that Zener diode CR 17 becomes conductive and triggers the non-inverting input of IC 4. Since the constant light change in this range is considerably higher than the amplitude change of the AC voltage of the photomultiplier, only DC voltage is applied when angular differences are high.

The control voltage across C 12 is compared to the reference voltage adjusted at R16 via amplifier IC 2. The amplified voltage difference at the output is regulated until it reaches a value of zero.

5.4.3.3 Accelerating Function

When the sample compartment cover is opened, GRD is applied to IC 6 A above the switch S 04 (LID). Optocoupler IC 5 renders transistor Q 03 conductive. Hence, the HV control voltage applied to C 12 is set to 0 volts, i.e. high voltage is switched Off.

When the cover is closed, switch S 04 is opened, and Q 03 is locked, so that +15V are applied to IC 3 via R 26 (10 k). Due to the fact that IC 3 acts as a comparator, the smoothing capacitor C 12 is charged much faster. Without this load circuit, the start-up routine would be very slow, due to the large time constant of R 22 / C 12. The charging process is limited by zener diodes CR 36 / 37 and terminated upon receipt of the multiplier signal (across IC 4). The control cycle itself is now started.

5.4.3.4 Pre-Amplifier, Filter, Power Stage

The PM signal (PM OUT) is led to PCB 7 by means of FET Q 2. Voltage supply for the FET preselector stage is generated by means of DC / DC converter IC 9. The +15 and -15 V voltage is set to +6 and -24 V by means of voltage divider R 41, 42 and 43 and secondary amplifier IC 8 with its output transistors Q 04 and Q 05, which prevents that the max. photomultiplier signal is already limited at -15 volts.

The PM OUT signal is filtered by means of R 54 C 39 and coupled into the servo circuit via C 40 as PM SIG AC. It is then put to a DC level of +7.5 V by means of R 55 / R 56 / C 42, so that the voltage is adapted to the working range of the CMOS switches (0 - +15 V). Upon amplification via IC 13 (adjustable with R 62), it is passed to the 50 Hz Filter Phase Sensitive Detection as PS IN signal.

The 50 Hz portion of the signal voltage is selected by the Phase Sensitive Detection bandpass filter (50 Hz), consisting of 4 switches and 2 capacitors. The switches are actuated by 50 Hz square wave voltages and operated as push-pull demodulators / modulators of the input voltage. Via the high-pass filter C 48 / R 71, the output voltage is decoupled from the DC component and amplified by IC 15 (Signal SERVO).

Upon amplification by IC 15, the signal voltage is passed via R 73 and on to the summation point of the push-pull power stage. Driver stage IC 16 directly controls the complementary power-stage transistors (Q1 / Q2 on PCB 8) for driving the servo motor.

To avoid fluctuations in the ± 15V supply voltage caused load jumps at the power stage, the power stage is supplied from its own non-stabilized, ± 23 V power supply.

5.4.3.5 Limit Switches

Two limit switches, S 05 and S 06, are provided to protect the gear and restrict the rotating range of the analzyer to 270°. Touching one of the switches initiates the Endstop Time Control. Timer IC 22 for the right end stop is triggered by IC 6. IC 6 E sets timer IC 23 for the left end stop. The timer interval is approx. 90 seconds. During this time, transistor Q 13 or Q 14 enable the corresponding relay (Rel 1, Rel 2), and C 47 / R 72 apply square wave voltage of opposite phase to the servo circuit, so that the motor turns back from the end stop. If the balance circuit is activated during this time, the signals Break RH RT or Break LH RT switch off the stop function for five seconds until the balance function has been completed.

5.4.3.6 Deflection Test

To test the servo circuit, a deflection test can be performed via *the Config Deflect* (left or right) menu. This is done by applying a square wave voltage to the input of the 50 Hz filter via Q 10, by means of relay 3 or relay 4. Q 10 interlocks the test if a balance step takes place.

5.4.3.7 50 / 60 Hz Clock Generation

The opposite phase square wave voltages for modulation of the phase sensitive detection bandpass filter (50 Hz) are generated from 36 V AC. By means of R 45, C 32, the phase is shifted by 90 degrees and led to voltage comparator IC 10. IC 10 A and IC 10 B act as square wave pulse generators. An opposite phase square wave voltage of 15 V is obtained at the output. These signals are used for the end stop circuit, deflection test, and as the clock pulse for the digital control timer.

5.4.3.8 Balance Control

The balance control circuit is provided to compensate for interference voltages, which are coupled into the servo circuit and amplified, and which cause undesired rotating movements of the motor.

The partial servo signal (sum of all rest voltages and interference voltages) is directly passed, via R 105, from the power stage (Q 1 / Q 2) to the balance circuit amplifier IC 25. This amplifier has two functions: 1. it compensates for losses in the balance control circuit and reduces the rest of this control circuit to a very low level. 2. It acts as a level converter, i.e. the desired signal is brought to the required center voltage of +7.5 V via R 106 (at -15 V), so that CMOS switch IC 24 can be triggered correctly. CR 28 / CR 29 are used for signal limitation, i.e. to prevent the locked input switches from becoming conductive at normal operation (full motor voltage). IC 24 (a quadruple switch), together with C 70 and C 71, forms a 50 Hz bandpass which can be compared to the bandpass filter in the servo circuit.

A separator circuit including one FET each (common source) is provided between the input and output modulator. This makes it possible to use C 70 and C 71 for storing the compensating voltage after the input demodulation has been switched off. It is assumed that this component has a high insulating resistance (> 10^4 M). Moreover, the two memory C's are at +7.5 V (via voltage divider R 97 / R 98, C 69 as a filter) to avoid any basic charge.

The stored DC voltages form the positive and negative half waves that are alternately polled by the output modulators and, via C 68, are applied to the power stage for compensation.

Thus, C 70 and C 71 are low-pass capacitors when the control circuit is enabled and storage capacitors when the balance circuit is disabled. The input switches of IC 24 act as demodulators when the control circuit is enabled, and as opened switches when the balance circuit is disabled.

To disable the circuit, the 50 Hz modulator signal is connected to ground via CR 30 / CR 31. R 99 and R 100 are used to decouple the clock generator.

5.4.3.9 Digital Control

The complete balance control circuit is a digital circuit so as trigger all control circuit elements very precisely and in a reproducible way, following a time schedule. The control circuit consists of a clock generator, a selection logic, address counter, (programmable) permanent memory and output drivers.

From the 50 Hz filter clock signal, the clock generator IC 19 (which acts as a frequency divider) generates a 320 ms clock for the working cycle of the balance circuit (5 seconds) and a clock of 2.7 minutes for the working cycle of the servo circuit. Both signals and the switch on the cover (LID) control the select logic IC 20.

After closing the sample compartment cover, clock generator IC 19, which was previously stopped, is restarted. The select logic applies a 320 msec clock to the clock of binary counter IC 17 via the LID signal. The counter passes its binary information (addresses) to the PROM, where the individual programmed memory locations are selected. To reach the required FET control level, driver IC 21 with pull-up resistors (+15 V) must be provided.

5.4.3.10 Feedback Control

The feedback control circuit does not enable the tachometer voltage of the servo motor within the servo circuit of the analyzer unless differences in the rotating angle vs. the reference points are very small. In this way, very stable alignment and simultaneously, high alignment speed, is achieved.

Q 08 passes the tachometer voltage to the power stage of the servo circuit. When a balance function is active, Q 07 applies the tachometer voltage directly to the servo circuit. Different starting conditions must be fulfilled for alignment.

The output voltage of the 50 Hz filter is passed to IC 11 via C 50. This voltage is set to zero during alignment. The control voltage for the PM HV is fed to the positive input of IC 11 and must be changed to negative (low light energy - optical zero). The DC voltage of the photomultiplier is directly supplied to Q 8 and must be less than 6.2 volts (CR 18). The power-on threshold can be adjusted by means of potentiometer R 46.

5.4.3.11 Polarizer Control

The polarizer stepper motor requires a control voltage that is synchronous to line voltage. The 36 V transformer voltage adjusted via R 37, C 19 and R 38 is phase-shifted and passed to the voltage comparator IC 7 A, where it is transformed to a 50 Hz square wave voltage and supplied to the motor driver.

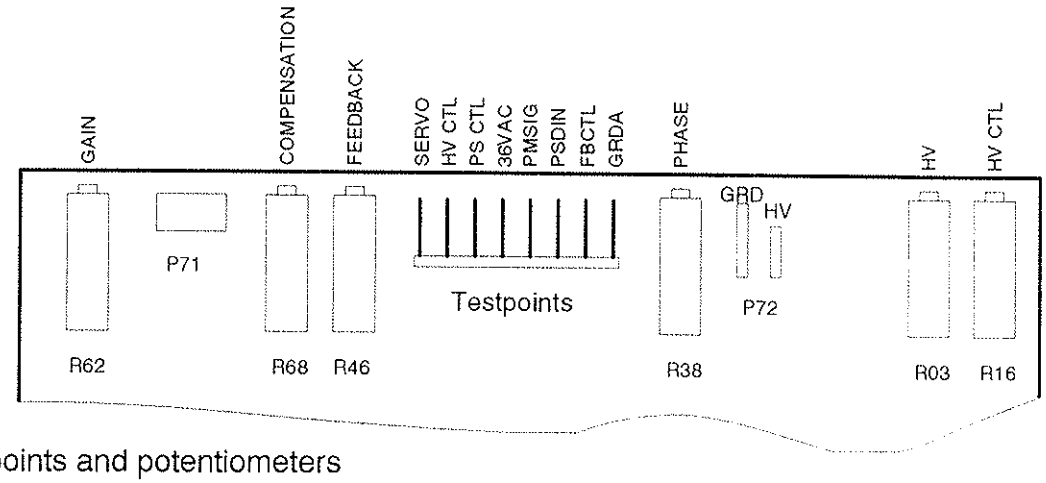
5.4.3.12 Energy Measurement

It is intended that only the 100 Hz portion of the PM signal is picked up to provide the energy display. To achieve this, 100 Hz (synchronous to line voltage) are required for selection and generated by the Energy Measurement Control. IC 28 C and IC 28 B act as precision rectifiers of the 36 volts from the transformer, and a positively rectified sine voltage of 100 Hz is obtained at the output of IC 28 B. IC 28 D and CR 35 transform this voltage to a DC signal of 0.7 times the value of the sine voltage. Via the filter (R 127, R 128, C 80 and R 129) and buffer amplifier IC 28 A, a DC signal that amounts to 0.7 x times the sine voltage is applied to voltage comparator IC 7 B. The positive input obtains the 100 Hz sine voltage, so that 100 Hz symmetrical square wave pulses are obtained at the output that triggers FET switch IC 29.

The photomultiplier signal is passed to IC 27 D via IC 26, where it is applied to the 100 Hz of FET switch IC 29. IC 27 D acts as a 100 Hz bandpass. Hence, the output voltage is the intensity value of the 100 Hz photomultiplier voltage and a DC signal is obtained after IC 27 B by means of the filters R 112, R 113 and C 79. IC 27 C is fitted with diode CR 32 and has a logarithmizing function. The secondary amplifier IC 27 A has an output voltage of 0 - 10 volts corresponding to an energy range of 0 - 100%. Under normal conditions, these are approx. 8 volts for the mercury and 7.5 for the Na lamp. Voltages are digitalized on I / O PCB 3.

5.4.4 Alignment Instructions for the Electronics on PCB 7

Note: The alignment described should not be performed unless the optical system and oscillating polarizer have been checked and found to be ok.



Test points and potentiometers

5.4.4.1 Multiplier Voltage (High Voltage Control)

Allow the instrument to warm up for approx. 30 minutes. Leave the lamp turned off, the sample compartment switch closed, and shield the multiplier housing against stray light (avoid electric light and day light).

a. HV Control: Connect the DC voltmeter to HV CTL and P 72 / GND (or GNDA). Adjust the voltage to -9.9 V by means of R 16.

Attention! P 72 / 1 kV carries high voltage (- 1 kV)!!

b. HV : Connect the DC voltmeter (min range 1000 V) to P 72 / 1 kV and P 72 / GND (or GNDA). By means of R 03, adjust the high voltage at P 72 / 1 kV to 1000 V.

Remark: Turning R 16 to the right will increase the voltage value of HV CTL and, hence, the value of high voltage! Turning R 03 to the right will just increase the value of high voltage.

5.4.4.2 Feedback Control

Make sure that the multiplier is in a completely dark environment. Connect the DC scope or voltmeter to FB CTL and GNDA. Adjust to a value of approx. -12 V by turning R 46 to the right. Determine the 0 volt jump by turning back, and continue turning by three quarters to keep the setting safely on the zero volt side.

To doublecheck, set the integration time to 5 seconds. The update indicators on the display must flash every 5 seconds. Re-adjust if the flashing interval is still 1 second.

5.4.4.3 Gain

Operate the instrument with Na lamp (589 nm) and large aperture. Adjust the integration time to 1 second and perform an optical null. The lid switch remains closed. Switch off the servo motor control by means of the servo switch on PCB 7. (Pre-series instruments are not fitted with this switch, so you have to pull the servo plug out of transformer board plug J 81. Make sure to wear protective (insulating) gloves!)

Connect the oscilloscopes to the SERVO test points (ground to GNDA). By turning the coded disk, adjust to a minimum amplitude and set to zero by means of the zero key. Subsequently, deflect to an angle of 0.05° by using the coded disk and set the amplitude to 7 - 8 V_{ss} by means of R 62. The same amplitude should be obtained at a deflection to -0.05°.

Note: Turning R 62 to the right will increase the amplitude!

Switch on the plug again (or re-insert the connection with protective gloves).

NOTE: When HV and feedback are adjusted correctly, the gain adjustment can be performed by checking the transient response. After 2 - 3 pre-pulses. the servo motor should come to a halt.

5.4.4.4 Compensation

(Compensation of the residual line frequency in the servo circuit)

This adjustment should only be made after a warming-up period of at least one hour (make sure that the multiplier is in a completely dark environment). During this warming-up period, it is already possible to determine the drift or drift tendency. Potentiometer R 68 is now turned to the left or right, depending on the phasing of the interference signals, until the dark drift has been compensated, i.e. the value no longer changes. The max. admissible value is 10 m° per minute.

Remark: turning R 68 to the right effects drift to the right
(towards the positive range)
Turning R 68 to the left effects drift to the left
(towards the negative range).

5.4.4.5 Phase Angle (Polarizer Control)

Operate the instrument with Hg lamp 546 nm (or Na lamp 589 nm) and large aperture. Using the deflection test left or manual, deflect the multiplier by approx. -10°. Switch off the servo motor control by means of the servo plug on PCB 7. (Pre-series instruments are not fitted with this switch, so you have to pull the servo plug out of transformer board plug J 81. Make sure to wear protective (insulating) gloves!)

Connect the oscilloscope ground to GNDA. Connect channel 1 to PS CTL and channel 2 to PSD IN (trigger on channel 1 or line). By means of R 38, adjust until both signals are on the same phase: this is exactly the case when the PSD IN sine signal intersects the square wave signal edges of PS CTL on the horizontal centerline of the screen.

Subsequently, switch on the servo plug again (or re-insert the connection with protective gloves).

Remark: Turning R 38 to the right effects the sine signal PSD IN to be shifted to the right.

5.4.4.6 Alignment of the Oscillating Polarizer

The oscillating polarizer is adjusted to its mechanical default position by fastening the plate spring and the spring mount to the motor shaft during one winding of the stepper motor is connected to 24V. To do this, the POLARIZER switch on PCB 3 must be set to ADJUST. When the adjustment is completed, reset the switch to ON.

NOTE: The first series of instruments do not have this switch, so you will have to remove the black motor cable from the coupling (P16 pin B 1). (Press-in the barbed end of the pin and carefully pull-out the cable). Insert the coupling in plug P 16 (motherboard). Switch on the instrument. When the adjustment is completed, re-insert the motor cable into the coupling (before doing this, carefully bend the barbed ends outward).

Loosen the plate spring of the oscillating polarizer and loosen the spring mount to the motor shaft, then lock it again. The optical null adjustment is now completed.

Checking the Optical Null:

Operate the instrument with Hg lamp at 546 nm and large aperture.

Connect the oscilloscope ground to GNDA. Connect channel 1 to PM SIG. The lower peaks of the 100 Hz signal must be in the same height.

Hint: This test can be done with the Lissajous image, see next page.

Set the oscilloscope to the X / Y mode.

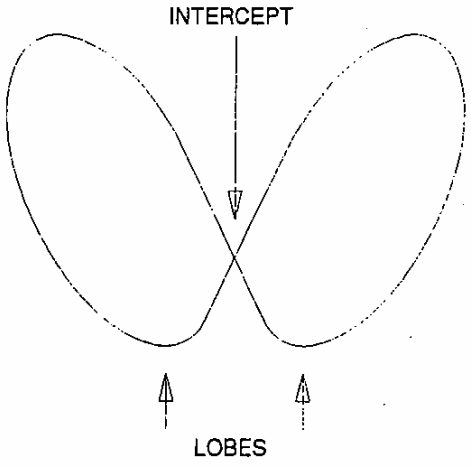
X channel: Connect the probe to PCB 7 test point 36 VAC (20 V / DIV).

Y channel: Connect the probe to PCB 7 test point "PM SIG" (0.2 V / DIV).

Connect (ground to "GNDA").X and Y channel to GND and adjust the light dot to the center of the screen (horizontal and vertical direction). Then switch the X and Y channels to AC.

The mechanical adjustment of the polarizer is correct when the Lissajous image shows an intercept on the vertical centerline on the screen of the oscillograph and two lobes at the same height.

Lissajous Image for Polarizer Adjustment



Adjusting the Analyzer Prism

Operate the instrument with Hg lamp at 546 nm and large aperture, as described above.

Adjust the analyzer prism until the optical zero point (alignment position) of the photomultiplier housing is centric with the stop switches.

Adjusting the Photomultiplier

(factory adjusted and normally not necessary)

Operate the instrument with Hg lamp at 546 nm and large aperture, as described above.

Using the screws on the side of the photomultiplier housing, adjust the photomultiplier until high voltage is at its minimum.

5.5 PCB 8 Transformer Board

This board includes the electrical supply for the servo circuit, the power stage transistors of the servo circuit, and the servo motor plugs.

230 V or 120 V are fed from the line to the primary side of transformer Tr 1 via the line voltage selector and fuse Si 1 (0.63 AT). A 220 V winding supplies the exciting coil of the servo motor via Si 5 (0.25 AT). The tachometer generator is supplied with 36 V, fused by Si 4 (0.25 AT), and the clock frequency is generated on PCB 7.

Two transformer windings, 16.7 V, whose centerpoints are on ground potential (GRD), generate +23V at load capacitor C 1 and -23 V at load capacitor C 2 by means of bridge rectifier CR 1 (positive and negative mid-point rectification). The servo power stages Q 1 and Q 2 supply the voltage to the control winding of the servo motor, depending on the servo control voltage of PCB 7. This winding also picks up the motor control voltage (servo drive feedback to the power stage).

5.6 PCB 9 Lamp Board

Attention: The complete circuit, including GRD, is on line potential!

PCB 9 is used to supply power to all lamps. One PCB is required for each of the two possible lamps. This is a current-controlled switched-mode power supply with automatic lamp ignition. Each of the lamps is recognized and set by means of the coding at lamp plug P 99.

The power supply of approx. +320 Volt to PCB 9 comes from the Haltec power supply unit, +15 V lamp current comes from the DC / DC converter on motherboard PCB 1. The +15 V lamp is needed to control the lamp current. Voltage regulator Q 3 is used to generate +5 Volt lamp from the +15 Volt lamp for the control circuits of the lamps.

When the supply voltage is switched on, POR (Power On Reset) for FPGA (Freely Programmable Gate Array) IC 2 is triggered on PCB 9 with Reset IC 7. The Reset of IC 7 and the CTRL_OUT from IC 2 stop the switched-mode power supply control unit IC 1 at Pin 10 (I ST).

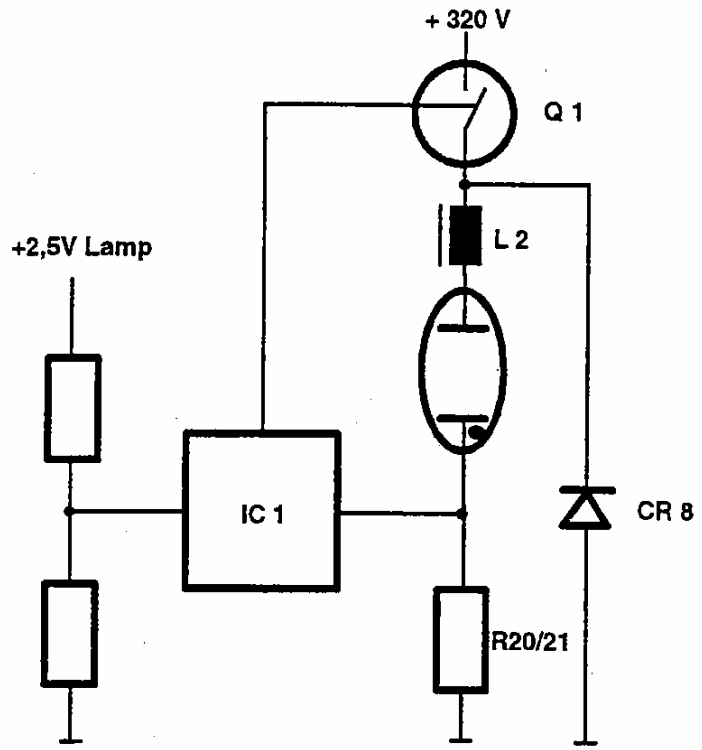
The lamp is switched on by means of the LAMP CTL signal. The respective lamp type is coded with LAMP DET A (B, C), and lamp operation is recognized with LAMP STATUS.

The lamp current can be measured as a voltage via the resistors R 20 / R 21. This should be 0.6 V for the 1.2 A of the Na lamp and 0.3 V for the 0.6 A of the Hg lamp. The polarity of the Na lamp is switched over approx. every 3 minutes with relay V 1.

5.6.1 Lamp operation

While the lamp is in operation, the current is controlled by the switched-mode power supply. The following block diagram shows the principle of operation:

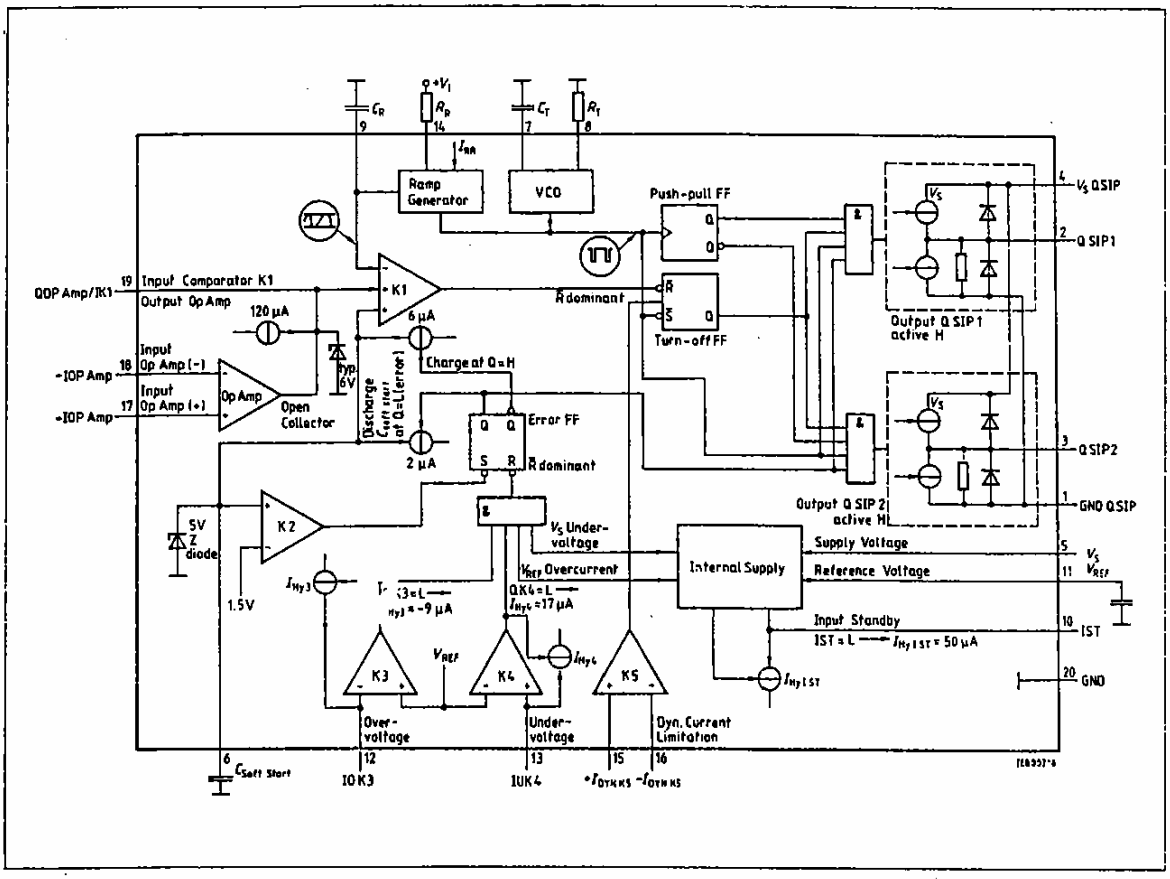
Block diagram



The lamp is inserted onto the PCB with lamp plug P 99, and the lamp type is set with the coding bridge (LAMP DET 0, 1, 2). The lamp type is transmitted to the I / O board by optocouplers IC 10, (11), 12. The reference value of the lamp current is switched on with IC 5 A, IC 5 B and IC 6 A. The resistors are used to obtain this desired value from the 2.5 V reference lamp current of the switching controller IC 1. Thus, 0.3 V is applied to the + input of the difference amplifier of the switching controller IC 1 for the Hg lamp and 0.6 V for the Na lamp. The actual value of the lamp current is applied to the - input as voltage value of the current sensor resistors R 20 / 21. The final stages Q 1 / Q 2 of the output of IC 1 switch the +15 V lamp current to the driver transformer TR 01 with a 50 kHz clock frequency. The output voltage, rectified with diodes CR 5 / CR 7, controls switching transistor Q 1 directly via CR 1 / R 4. Its switching time determines the lamp current.

Blockdiagram IC TDA 4918 A

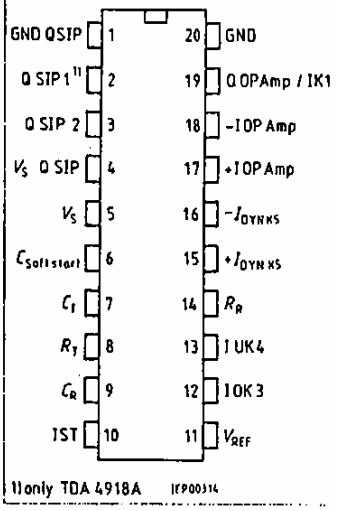
Block Diagram (TDA 4918)



Pin Definitions and Functions

Pin	Symbol	Function
1	GND Q SIP	Ground driver
2	Q SIP1	SIPMOS driver 1 (only TDA 4918)
3	Q SIP2	SIPMOS driver 2
4	V_S QSIP	Supply voltage driver
5	V_S	Supply voltage
6	$C_{soft\ start}$	Soft start
7	C_T	Frequency generator
8	R_T	Frequency generator
9	C_R	Ramp generator
10	I ST	Input standby
11	V_{REF}	Reference voltage
12	I OK3	Input overvoltage
13	I UK4	Input undervoltage
14	R_R	Ramp generator
15	$+ I_{DYN\,KS}$	Dyn. current limitation
16	$- I_{DYN\,KS}$	Dyn. current limitation
17	I Op Amp (+)	Input operational amplifier
18	I Op Amp (–)	Input operational amplifier
19	Q Op Amp/IK1	Output operational amplifier Q Op Amp / input comparator
20	GND	Ground

TDA 4918 A, TDA 4919 A



[1] only TDA 4918A

Pin Configuration
(top view)

5.6.2 Lamp ignition

The ignition and operation of the lamp are controlled via FPGA IC 2. The lamp current is controlled by the switched-mode power supply IC 1. By means of a code at lamp plug P 99, the lamp is recognized by the signal DET 0, 1, (2), the lamp is detected and the respective signal is transmitted to PCB 3 of the I / O board as LAMP DET A, B, (C) via the optocoupler IC 10, (11), 12.

The lamp is switched on by PCB 3 through the signal LAMP CTL (Lamp Control). Control IC 2 receives the CTL_IN from optocoupler IC 9 and then triggers the activation of the lamp. IC 2 starts the control unit IC 1 of the switched-mode power supply with the signal CTL_OUT. When IGNITE is activated at Pin 2, the current sensor of the lamp is set to zero, and IGNITE at Pin 1 (for 40 ms) causes the ignition transistor Q 4 to switch the power supply of the lamp to +320V via the storage inductor L 2 at GRD. The ignition current (inductor charging current) is limited via the input -IDYN at IC 1 through the reference at +IDYN. The maximum ignition current is set by means of the lamp detection via analog switches IC 5 A, B, (C), and the control unit IC 1 increases the current during the ignition time to 1.6 A for the Na lamp and 2.4 A for the Hg lamp. After ignition time is over, Q 4 is disabled and the induced voltage of inductor L 2 ignites the lamp, and the normal current control of the lamp is activated.

The clock frequency for IC 2 is generated by means of the saw-tooth CT signal of IC 1. Square wave signals are formed from this signal by means of IC 3 A and B, and these signals are then transmitted to IC 2 as SCL (Set Clock) and RCL (Reset Clock).

The lamp current is transmitted to the control IC as a voltage value, and it is also used as a status control. A voltage of 0.1 V is applied to a reference at IC 3 C, and a voltage of 0.2 V is applied at IC 3 D. When the voltage value of the lamp drops below 0.1 V, RST (Reset Status) is activated; when it is above 0.2 V, SST (Set Status) is activated. When the lamp is lit, the signal status is sent from IC 2 to the I / O board via the optocoupler. Thus, the LED in the lamp key on the keyboard lights up. When the lamp is not on, IC 2 triggers an ignition every 10 seconds. When, after about 15 minutes, the ignition attempts prove unsuccessful, the lamp is switched off completely by the firmware.

Inductor L 1 with the diodes CR 4 / 6 limits the power-on current of Q 1. L 3 and R 15 / 17 limit the ignition current. Varistor VDR 1 limits the ignition voltage to approximately 800 Volt. Only protected signals are switched from the optocouplers for Lamp Detect, Control and Status to the power supply of the lamp.

Attention: The complete circuit, including GRD, is on line potential!

5.7 LP 74 / 5 Processor PCB

This board controls the complete instrument. Its structure is similar to that of an VME bus, but not quite identical. The VME BUS ADAPTER CARD must **NOT** be used. Instead, use the adapter card B018-1137.

The computer itself consists of IC 3 J, Motorola type 68000. The RESET signal is received from PCB 3 as SYSRESET. Quartz Y 8 J provides the CLOCK (20 MHz) via FF IC 8 G (10 MHz) and driver IC 2 G. This 10 MHz signal provides the clock pulse. An E-CLOCK pulse of 1 MHz is generated to trigger the IC's of the 68000 family and is used for PTM IC 3 D.

The ADRESS-BUS is passed via the drivers IC 7 K / IC 5 K / IC 3 K. The DATA BUS leads to the Centronix drivers IC 4 B / IC 2 B / IC 2 F, to the PTM IC 3 D and to the RS 232 ACIA IC 1 D. Via the drivers IC 2 M / IC 2 F, the buffered DATA BUS is led to the RAMs and to the motherboard. This data bus is blocked by IC 5 E after the internal circuit (Centronix, Timer, ACIA) has been triggered, which is detected by the chip select signals CS-KD / CS 6 / CS 7.

The RAM consists of the battery-buffered RAMs IC 7 R and IC 4 R for the LOWER and UPPER RAM areas, and has a storage capacity of 8 x 1 Mbit each.

The batteries are powered by means of detector IC 1 R / IC 3 R. These IC's have the function of a power detector and provide the chip select signal for the battery RAMs. IC 3 R also includes the real time clock.

The two EPROM's IC 7 M / IC 4 M (storage capacity 8 x 4 Mbit) are also located on the processor board. The operating system is stored in these EPROMs.

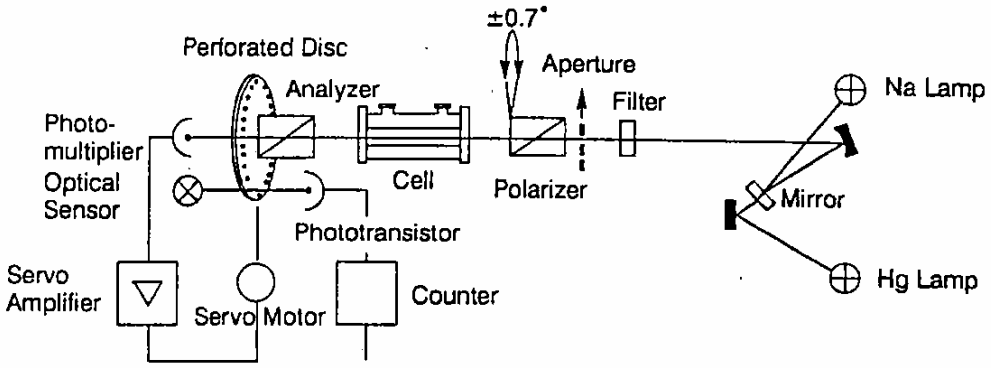
IC 8 M (PAL) generates the chip and board select signals. IC 2 G is the driver for the control signals LDS, UDS, AS and R / W (Lower Data Select, Upper Data Select, Address Strobe and Read / Write). By means of the gates in IC 3 L, the RAM and EPROM areas are triggered from the LDS and UDS, together with the chip select and Reset signals.

With gate IC 5 G and delay IC 7 J, the UDS and LDS signals form the DTACK signal (together with the BS and CS), which is a ready message sent to the computer. By means of IC 7 C / IC 7 B, the AS forms a time loop for generating the BERR signal (BUS ERROR). If the DTACK signal is not received within a certain time, the BERR signal detects that this part of the program is not active.

The signal names and standard descriptions are given on the VME bus. PCB 74 indicates the Motorola descriptions.

6. Optical System

Block Diagram of the Beam Path:



The light of the lamp is directly focused on the folding mirror, which is slewed with a lever on the filter wheel for filter position 589 nm (Na lamp). By means of an eccentric screw, the filter positions for the Na and Hg lamps can be adjusted. The light must be centered on the spherical mirror S 2 and, from there, it is reflected through the window in the wall of the lamp compartment. It then passes through the filter, the aperture, and, via the lens, focuses on the oscillating polarizer. Subsequently, it passes through the sample compartment and to the analyzer and from the analyzer to the photomultiplier. The photomultiplier is tightly connected to the analyzer. The complete unit is driven by a servo motor.

6.1 Optical Alignment

6.1.1 Lamps

Lamps can only be moved very slightly within their holders. When aligning Na lamps, fasten the holder in such a way that the retaining wire does not face the mirror and matches the height of the lamp center.

6.1.2 Folding mirror

Switch on the Hg lamp and adjust the left-hand eccentric screw until the center of spherical mirror S 2 is illuminated. The Na lamp (filter position 589 nm) is used to set the right-hand eccentric screw. Fix the lever to the axis until it is positioned on the tip of the plastic cam and at a right angle to the axis. Avoid squeezing it.

6.1.3 Spherical Mirror S 2

The mirror must be aligned in such a way that the light beam passes through the center of the aperture in the lamp compartment wall. The filter (or filter wheel aperture) must be centrically illuminated. The aperture must be focused on the center of the light spot. The light beam is then passed through the lens and to the center of the polarizer aperture. When the sample compartment is removed, the light beam can also be seen at the entrance of the analyzer (the light beam must also be focused on the center).

Note: The light spot can be best seen on white paper behind the wall of the lamp compartment. In the filter position, it is recommended not to have a filter in the beam path and to insert the paper behind the filter wheel.
A sticker (address sticker or similar) can be placed above the polarizer aperture. The edges should be made visible by leaving your fingerprints around them. The image on the center of the polarizer aperture can also be reflected without a mask screen. In this case, the image is larger.

6.1.4 Filter Wheel Assembly

The position of the filter wheel assembly is predetermined by the coding pins. When the filter wheel is in its position, it is controlled by the coding disk. The coding disk is fixed with a cylinder pin (item 800) and retained by means of an O-ring (item 501 see drawing: filter wheel assembly). Mount the filter wheel on the gear motor axis in such a way that it runs along the center of the light barriers. Adjust the mirror transport axis (items 1 + 203) until the folding mirror is operating correctly (see item 6.1.2 folding mirror).

6.1.5 Aperture

The lateral position towards the light beam is adjusted by shifting the complete assembly. The height can be adjusted by means of two cams. The front cam is used for the standard aperture, the rear cam is used for the micro-aperture. Adjust the respective cam until the light spot is in the center of the polarizer opening. Using the micro-aperture results in a lower intensity while the position remains the same. The change-over of apertures is controlled via a stepper motor and two light barriers. The drawing Aperture complete is not quite correct: the sketch on the upper right shows the standard aperture position and the slider in the micro position. The slider (item 206) is fastened by means of a screw (item 502). The change-over is effected by a spring (item 205).

6.1.6 Oscillating Polarizer

The polarizer is factory-adjusted and, under normal circumstances, does not have to be realigned. The complete assembly does not have to be dismantled for changing the ball-bearings (item 500), motor (item 51) or spring-mounted wires (item 206 in the polarizer drawing).

For adjusting or checking the position, the light beam must be reflected from the lamp to the center of the filter, aperture and lens on the analyzer entrance. Use the three screws (item 400) to adjust the polarizer at a right angle to the chassis and center of the light beam.

6.1.7 Cell Holder

The cell must be located exactly in the center of the light beam. For this purpose, the sides and height of the cell holder can be adjusted on the left and right. Insert the alignment cell B001-7072 with the crosshairs to the right or left and adjust to the center by using the appropriate screws. Adjust to the small aperture. If the light beam is too large for micro cells, this can be corrected by means of the lens.

Note: This adjustment can also be performed by using a piece of transparent paper. Provide a center mark on the paper and place it on a glass cell.

6.1.8 Analyzer

NOTE: The analyzer assembly is factory-aligned to the window of the lamp compartment and must not be re-aligned!

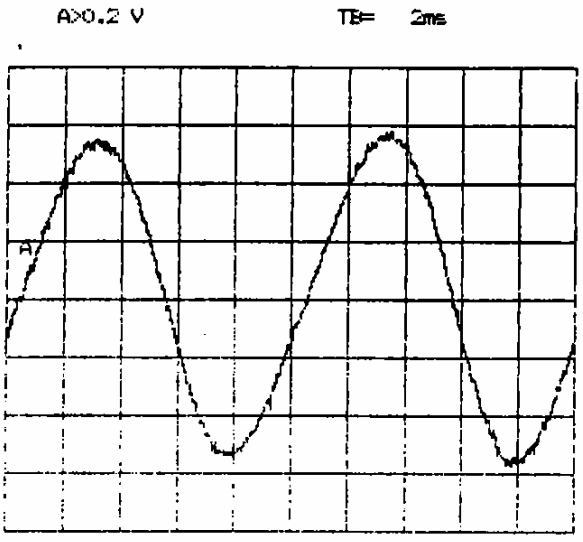
The analyzer does not have to be adjusted. Never loosen the bearing block on the chassis after changing the ball bearings or any other parts. After performing any jobs on the analyzer, check the zero position and, if necessary, turn the prism until the photomultiplier housing is located in the center between the limit switches.

7. Test- und Messpunkte / Test- and Measurement Points

7.1 LP / PCB 7 Servo Board

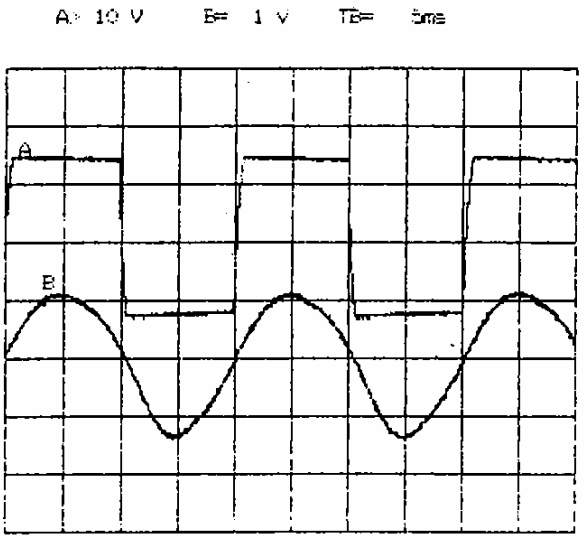
7.1.1 PMSIG

PM - Signal at Optical Zero with Hg-Lamp 546 nm (100 Hz)



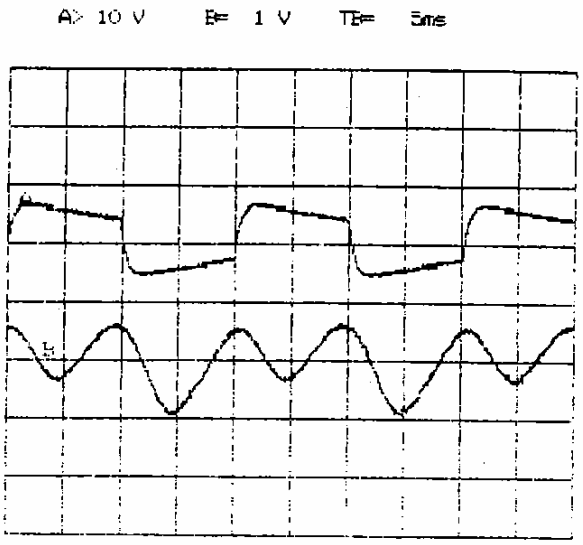
7.1.2 SERVO + PMSIG

SERVO and PMSIG during run to Optical Zero (50 Hz)



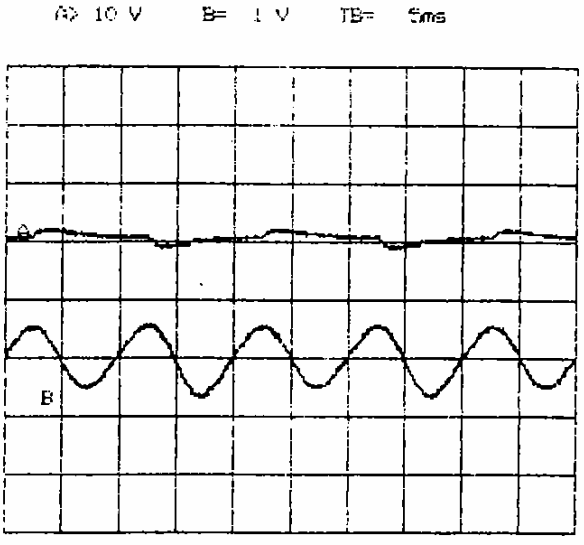
7.1.3 SERVO + PMSIG

SERVO and PMSIG during run to Optical Zero (near to zero)



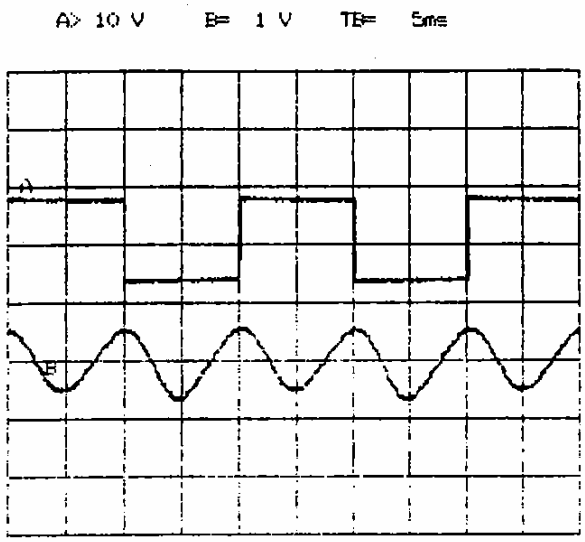
7.1.4 SERVO + PMSIG

SERVO and PMSIG during run to Optical Zero (very close to zero)



7.1.5 PSCTL + PMSIG

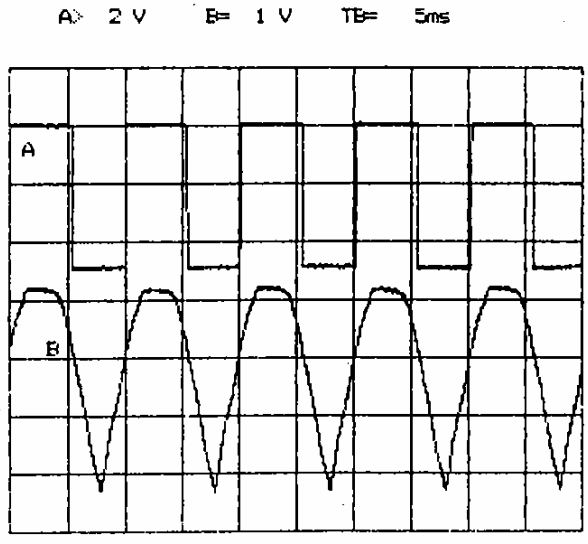
50 / 60 Hz and PMSIG at Optical Zero



7.1.6 Energy Measurement Control

IC 7 B pin 8 and IC 28 B pin 7

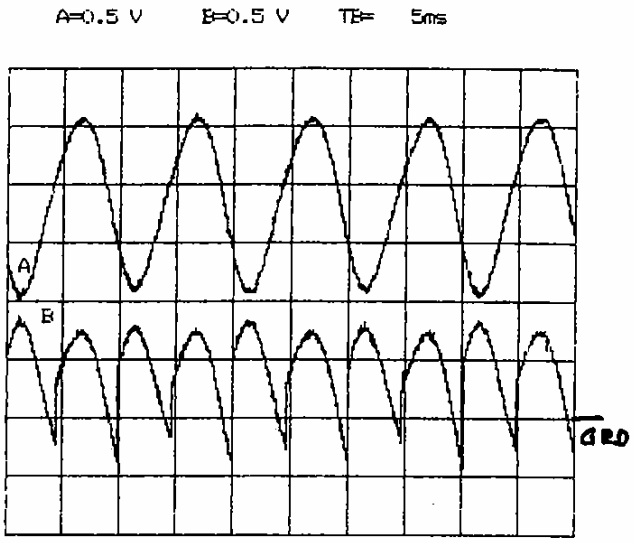
double line frequency signal : square (INVERSION CTL) and rectified sinus



7.1.7 Energy Measurement

IC 26 pin 6 and IC 27 D pin 14

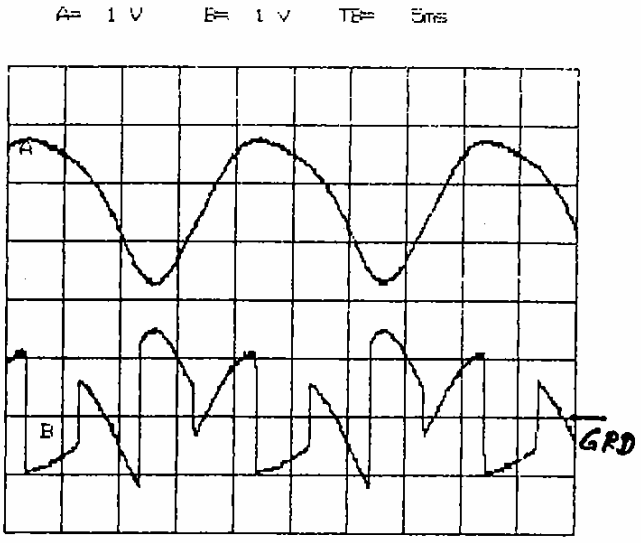
PM Sinal (at optical zero) direct and chopped after rectified (INVERSION CTL)



7.1.8 Energy Measurement as above

IC 26 pin 6 and IC 27 D pin 14 as above

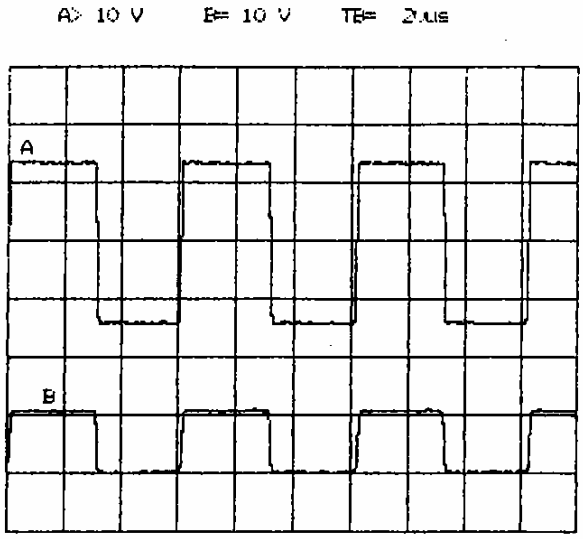
PM Sinal (not at optical zero) direct and chopped after rectified



7.1.9 High Voltage Generator

IC 1 pin 6 to R 06 and R 06 other side

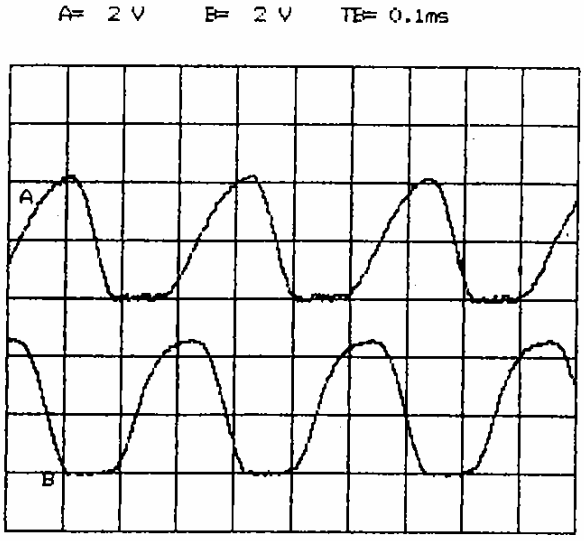
HV-Oscillator 17 kHz square and with HVCTL limited square (AC for HV-PMT)



7.2 LP / PCB 3 I / O BOARD

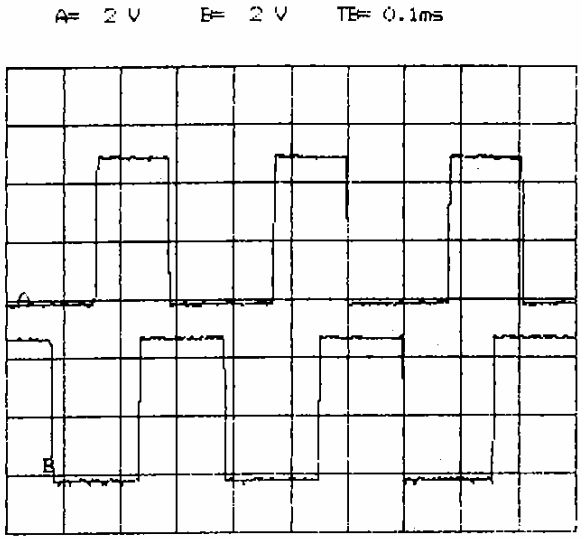
7.2.1 Angular Encoder Signal

CHANNEL A and CHANNEL B encoder light barrier signal at P 31 pin 3 and 4



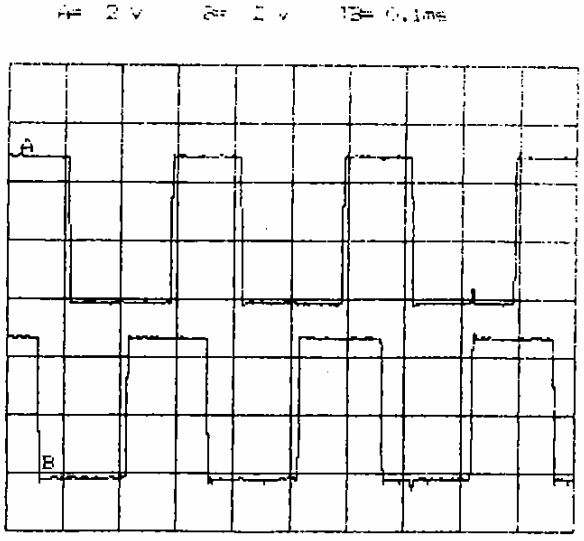
7.2.2 Angular Encoder Signal

TP 1 and TP 2 CHANNEL A and CHANNEL B behind Schmitt-Trigger (left rotation)



7.2.3 Angular Encoder Signal

TP 1 and TP 2 CHANNEL A and CHANNEL B behind Schmitt-Trigger (right rotation)



8. Ersatzteilliste / Spare part list

Lampen / Lamps

B000-8754	Na-Lampe
B051-0581	Hg-Lampe ST46

Leiterplatten / PCBs

B210-1013	PCB 1 Motherboard
B210-1033	PCB 3 I/O-Board
B210-1043	PCB 4 Display-Board
B210-1053	PCB 5 Dual-Sensor
B210-1063	PCB 6 PM-Circuit
B210-1073	PCB 7 Servo-Control
B210-1083	PCB 8 Trafo-Board
B210-1093	PCB 9 Lamp Unit
B050-6643	LP 74 / 5 Processor
B017-3208	PCB Light Barrier Swing (Filter)
B051-0580	Power Supply Haltec
B210-0022	Keypad PCB 4 (Teil vom / part of Display Board)

Baugruppen / Component Groups

B210-0024	Drehspiegel kpl / Folding Mirror
B210-0025	Küvettenaufnahme / Cell Mount
B210-0026	Filterrad kpl. / Filter Wheel
B210-0027	Blende kpl. / Aperture
B210-0028	Schwingpolarisator / Oscillating Polarizer
B210-0099	Motorbock kpl / Motor Accy

Motoren / Motors

B016-6343	Steppermotor RDM 37/6 25:1 M 03, M 04 (Filter, Aperture)
B210-1153	Steppermotor M 02 (Polarizer)
B210-1154	Servo Motor (mit Stecker / with connector)
B210-0120	Lüfter / Fan (with connector)

Optische Teile / Optical Parts

B010-5454	Filter 589 NM
B006-7770	Filter 578 NM
B006-7771	Filter 546 NM
B008-3843	Filter 546 NM selected for Sugar
B006-7772	Filter 436 NM
B006-7773	Filter 365 NM
B009-4404	Filter 302 NM
B050-6560	Polarisations Prisma
B007-4706	Photomultiplier 1P28A selected
B006-4992	Hohlspiegel / Concave Mirror
B210-0052	Drehspiegel / Lamp change mirror
B001-7072	Justierküvette / Adjusting Cell
B009-8799	Quarz Standard links 1° / Quartz Contol Plate left 1°
B009-8800	Quarz Standard rechts 1° / Quartz Contol Plate right 1°

Einzelteile / Single Parts

B006-5152	Trafo BV 510
B050-7590	Trafo BV 639
B051-0046	Trafo BV 656
B210-1086	Trafo BV 658
B050-7152	Drossel Coke 100 µH 410 mA
B016-1736	Drossel Coke 2 x 24 mH 4 A (line filter)
B011-6408	Drossel Coke 1 µH 2.2 A (L 1 PCB 9)
B050-7275	Drossel Coke 24 mH 1.2 A (L 2 PCB 9)
B051-0600	Drossel Coke 96 µH 1.5 A (L 3 PCB 9)
B014-4251	Reed-Relay 5 V
B006-6238	Relay PRME 15005
B050-7348	Relay 12 V (PCB 9)
B019-4484	Lautsprecher / Speaker AL 11
B007-8462	Varistor GEV 275
B011-4646	Varistor S 10 K 385
B009-1382	LED rt 5082-4655
B007-3493	LED rt 5082-4684 (PCB9)
B010-7740	H 21 A 6 Light Barrier

Gleichrichter / Rectifier

B006-1461	B 80 C 800 Rectifier

Dioden / Diodes

B017-3811	BYV 27 / 200
B015-2480	1 N 5641
B003-4223	1 N 4148
B050-9234	BYD 77
B018-3378	MUR 850
B050-5412	BAS 21
B006-9133	EG 200

Zenerdioden / Zenerdiodes

B005-3948	ZPD 3.3
B005-3955	ZPD 6.2
B050-9201	ZMY 6.8
B005-3959	ZPD 10
B005-3961	ZPD 12
B005-3967	ZPD 22
B050-6038	ZPD 36

Transistoren / Transistors

B004-4071	2 N 2222
B005-4727	2 N 2907
B006-1611	2 N 3956
B005-9970	2 N 5463
B006-0419	MJ 2500
B006-0420	MJ 3000
B007-4856	BF 245
B019-6719	BUZ 71 L
B050-5419	BSS 138
B018-3377	IRF 830
B050-8315	BUK 436-1000

IC,s

B012-6964	74 ALS 04	Hex Inverter
0997-4539	7407	Hex Buffer O.C. PCB 3
B006-6214	7407	Hex Buffer O.C. PCB 71, 74/5
B012-6854	74 ALS 08	AND Gate
B012-6855	74 ALS 10	NAND Gate
B017-3741	74 ALS 14	Schmitt Trigger
B019-0654	74 HCT 14	Schmitt Trigger
B012-4134	74 ALS 32	4 OR
B012-6859	74 ALS 74	2 D FF
B014-7763	74 LS 148	Encoder
B050-1167	74 ALS 164	8 Bit Shiftregister
B017-3743	74 ALS 175	D Register
B019-3099	74 HCT 240	Bus Driver
B014-7764	74 LS 293	4Bit Counter
B017-0446	74 HCT 574	8 Bit D FF
B017-3744	74 ALS 645	Trasceiver
B050-8388	74 HCT 4040	Binary Counter
B011-2549	74 LS 125	Bus Driver
B019-9050	74 ACT 11245	Transmitter Receiver
B050-9379	74 ACT 11374	8 D Flip Flop
B011-2560	75188 (1488)	Line Diver
B011-2561	75189 (1489)	Line Receiver
B013-9250	TL 7705	Volt Detector (PCB 9)
B019-9052	TL 7705SO	Volt Detector (PCB 3)
B019-3167	SCN 2661	EPCI
B015-6129	MC 2661	EPCI
B011-2541	MC 6840	Prog.Timer
B050-9384	MC 68000	MPU 16 Bit / 10 MHz
B0193169	MC 68230	Parallel Interface Timer
B050-7553	581000P-10	RAM
B017-3742	DS 1210	Controller
B019-7504	DS 1215	Controller / Timer
B010-0554	CD 4016	Analog Switch
B010-0555	CD 4020	14 Bit Counter
B007-3143	CD 4023	Nand
B011-1410	B 7555	Timer
B012-6325	CNY-17/3	Opto Coupler

B017-0448	L 603B	Darlington Array
B050-7627	L 6201	DMOS Driver SMD
B050-8298	TL 5812	Fluor Display Driver
B050-7716	FIP 20X2	Display Modul
B210-1131	FPGD	PCB 3 IC 14 (TCP 1020 A 84)
B210-1141	FPGD	PCB 9 IC 2 (TCP 1020 A 84)
B050-7853	PROM	PCB 4 IC 5 (87 C 51)
B019-3911	PROM	PCB 71 IC 18 (74 S 288)
B050-7316	GAL 20V8	LP 74 / 5 IC 8 M
B210-1121	E-Prom SET	LP 74 / 5 Firmware 1.0 (IC 4M + IC 7M)
B017-0840	AD 574	A / D 12 bit
B051-0479	AD 586	5 V Reference
B050-1809	AD 7545	D / A 12 bit
B017-0838	ADG 201	Analog Switch
B050-9219	OP 07	Amp
B013-0790	OP 07C	Amp
0997-9743	OP 400	Amp
B006-0427	741	Amp
B010-0444	LF 347	Amp
B009-9926	LF 357	Amp
B009-1801	LM 339	Amp
B012-7584	LM 7805	+ 5V
B009-4550	LM 7812	+12V
B011-2591	LM 7912	-12 V
0997-4637	PWR4005-HV	DC / DC Converter
B210-0128	DC / DC	Adapter PCB 1 / 1
B050-2742	2 C5 R15-15	DC / DC Converter
B051-0025	TDA 4918	Switch Power Supply
B017-3738	Clock 4.9152 MHz	
0994-0731	Clock 5.0688 Mhz	
B050-6214	Clock 12 MHz	
B050-9359	Clock 20.0 MHz	
B011-4345	Clock 32.768 MHz	

Sonstige Teile / Other Parts

B019-7514	Battery 3 VOLT 1.8 AH
B007-9898	IC Socket 8 pol.
B006-6564	IC Socket 14 pol.
B007-1778	IC Socket 16 pol.
B018-5898	IC Socket 16 pol. flat
B012-5864	IC Socket 20 pol.
B014-3988	IC Socket 24 pol.
B012-5865	IC Socket 28 pol.
B017-4158	IC Socket 28 pol. flat
B019-1501	IC Socket 32 pol.
B012-5866	IC Socket 40 pol.
B014-7768	IC Socket 64 pol.
B050-9258	Chip Carrier Socket 84 pol.
B050-7655	Netzanschlußstecker / Power socket
B050-7656	Sicherungshalter / Fuse retainer (line)
B050-7622	Spannungswähler / Voltage selector (line)
B015-9818	Sicherungshalter / Fuseholder (PCB 1)
B015-9819	Sicherungshalter / Fuse retainer (PCB 1)
B011-4155	Sicherungshalter / Fuseholder (PCB 8, 9)
B015-5572	Sicherung / Fuse T 2.5 A
B015-5575	Sicherung / Fuse T 5.0 A
B014-6702	Switch 1 pol. PCB 3
B050-6616	Taster / Push Button PCB 3
B013-6915	Drehschalter / Rotary switch (PCB 74 / 5)

Hauben / Covers

B2100-0002	Probenraumdeckel / Sample compartment cover
B2100-0000	Gerätehaube / Cover
B2100-0001	Bodenschale / Bottom cover
B006-5170	Gerätefuß / Feet
B007-5174	Filzscheibe / Filswasher

Kabel / Cables (interal)

B210-1151	Display (34 pol 1100mm to PCB 4)
B210-1201	Multiplier
B210-1202	Optical Encoder
B210-1203	Temperatur
B210-1204	Temperatur sensor
B210-1205	Na - Lampe
B210-1206	Hg - Lampe
B210-1207	Netzschalter / Power switch

Kabel / Cables

B050-6074	Drucker / Printer Centronics
B016-9358	Drucker / Printer Centronics (shielded)
B016-6569	Drucker / Printer seriell 25 / 25 pol
B015-3907	EX 800 seriell 25 / 6 pol
B019-1029	OKI Printer seriell 25 / 25 pol
B018-0242	PC seriell 25 / 9 pol (it was before 25 / 25 pol)

Lampenerweiterung / Lamp Options

B210-0020	Bausatz Na - Lampe / set Na - lamp
B210-0023	Bausatz Hg - Lampe / set Hg - lamp

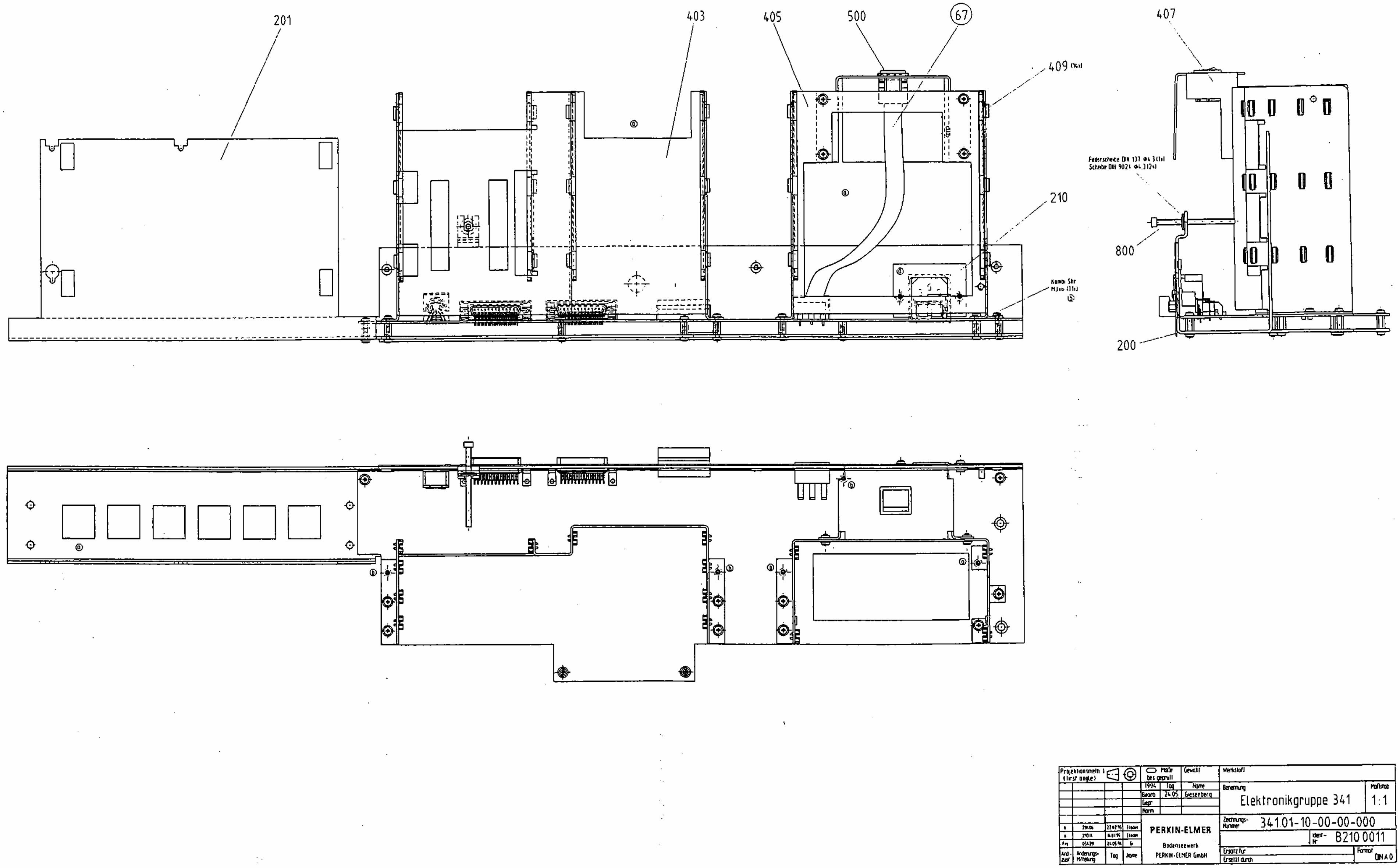
Anderes / Additional

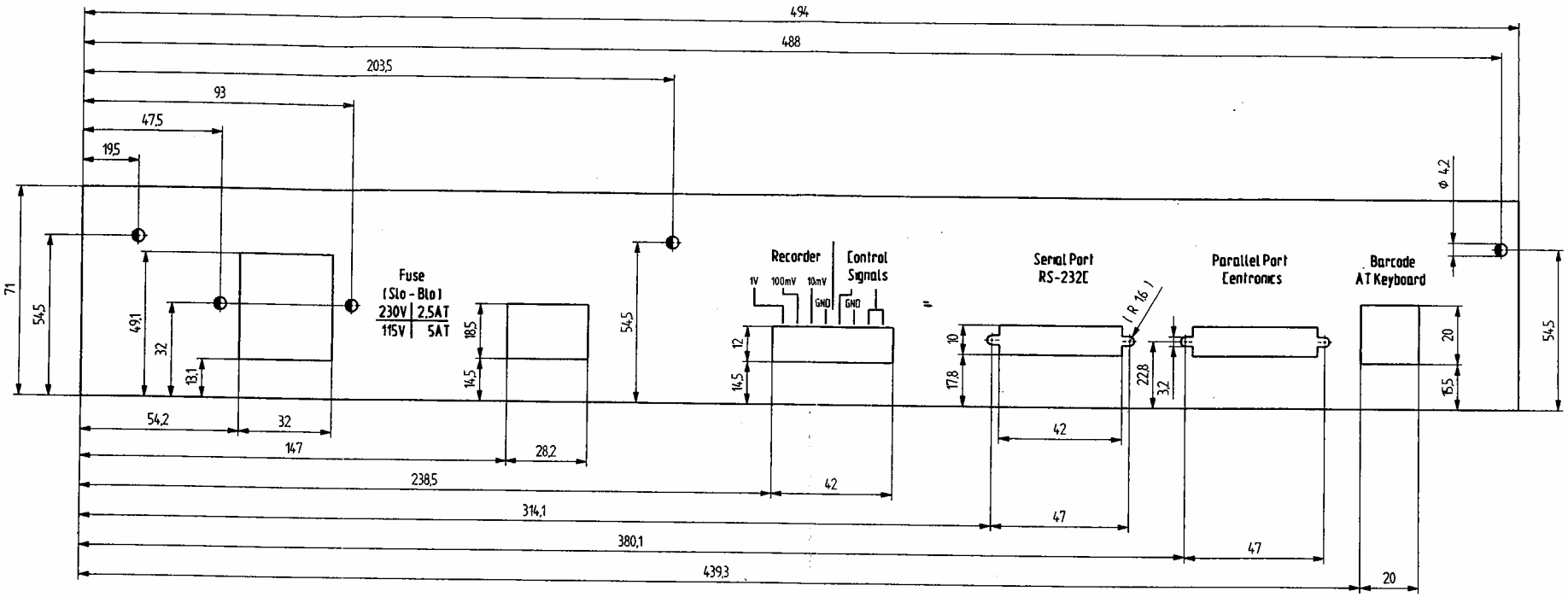
B002-3491	Kupplung / Connector for tube to cell
B005-7375	Überwurfmutter / Nut for connector to Thermostat
B005-9044	Schlauchtülle / Connector for tube to Thermostat
B006-3683	Verschlußnippel / Connection for connector to cell
B006-6082	Schlauch / Tube from rear to Sample compartment
B005-5585	Schlauchtülle / Connector for tube to Sample compartment
B000-5870	Scheibe / Washer
B006-6122	Federscheibe / Springwasher
B000-4254	Mutter / Nut M 12
B210-0007	Staubschutz Hülle / Dust Cover

9. Schaltbilder / Schematics

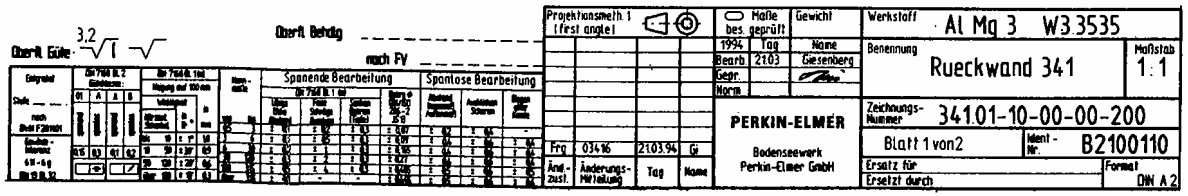
341.01-10-00-00-000	Elektronikgruppe / Electronic unit	
341.01-10-00-00-200	Rückwand / Rear panel	
341.01-71-00-00-000	Mother-Board LP 1	Rev A
341.01-71-00-00-902	Mother-Board PCB 1	Rev A
341.01-71-00-00-000	Mother-Board LP 1	Rev B
341.01-71-00-00-902	Mother-Board PCB 1	Rev B
341.01-73-00-00-000	I / O -Board LP 3	Rev A
341.01-73-00-00-902	I / O -Board PCB 3	Rev A
341.01-73-00-00-000	I / O -Board LP 3	Rev C
341.01-73-00-00-902	I / O -Board PCB 3	Rev C
341.01-74-00-00-000	Display-Board LP 4	
341.01-74-00-00-902	Display-Board PCB 4	
341.01-77-00-00-000	Servo-Control LP 7	Rev A
341.01-77-00-00-902	Servo-Control PCB 7	Rev A
341.01-77-00-00-000	Servo-Control LP 7	Rev C
341.01-77-00-00-902	Servo-Control PCB 7	Rev C
256.02-20-74-00-000	Processor LP 74 / 5	
256.02-20-74-00-902	Processor PCB 74 / 5	
341.01-79-00-00-000	Lamp Unit LP 9	Rev A
341.01-79-00-00-902	Lamp Unit PCB 9	Rev A
341.01-79-00-00-000	Lamp Unit LP 9	Rev B
341.01-79-00-00-902	Lamp Unit PCB 9	Rev B
341.01-65-00-00-000	Kabel Natriumlampe	
341.01-66-00-00-000	Kabel Hg-Lampe	
341.01-75-00-00-000	Dual Sensor PCB 5	
341.01-76-00-00-000	PM-Circuit PCB 6	
287.29-50-01-89-000	Light Barrier Swing AS 70	
341.01-78-00-00-000	Trafo-Board LP 8	

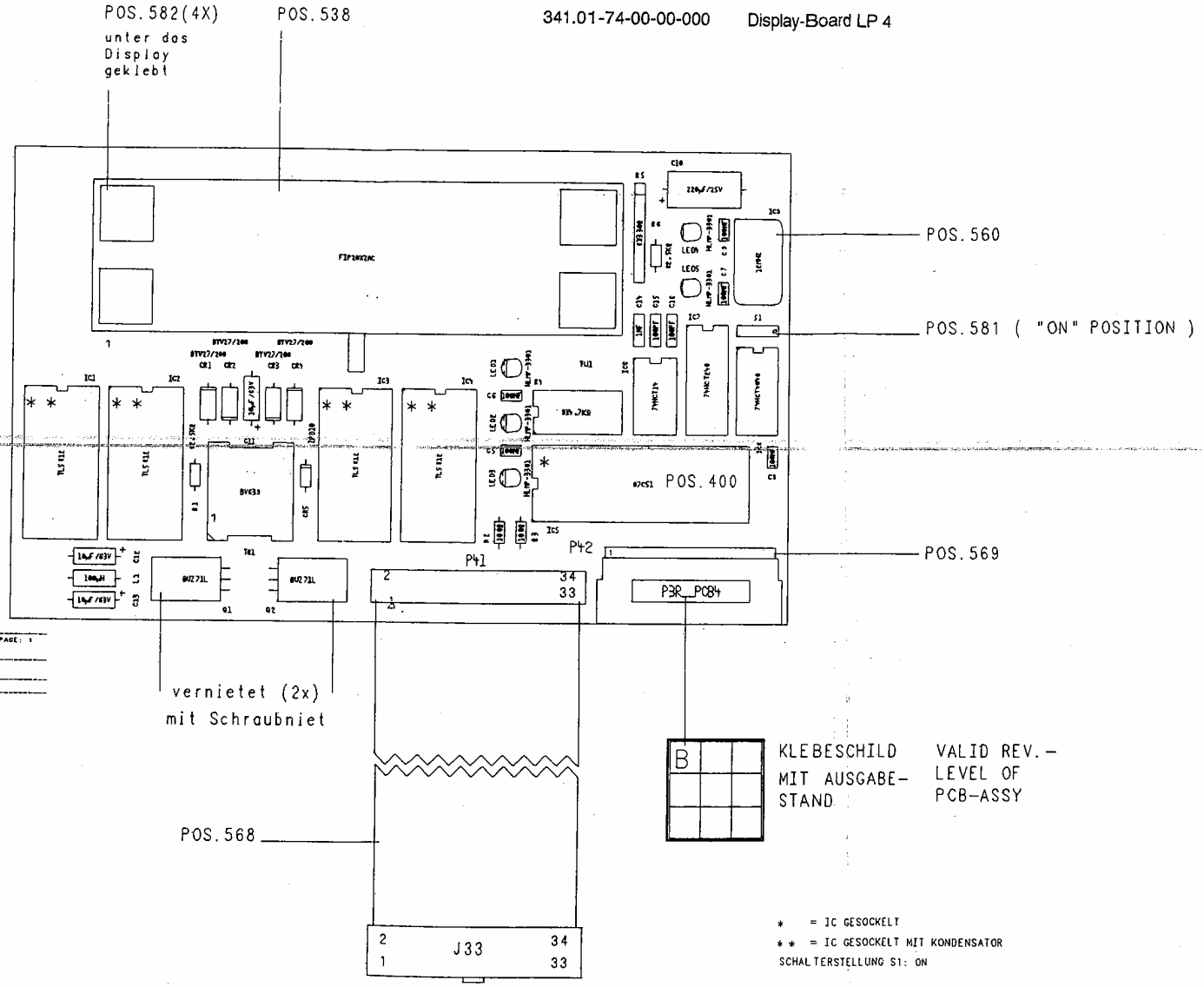
341.01-05-00-00-000	Motorblock / Motor accy
341.01-08-00-00-000	Drehspiegel / Folding mirror
341.01-11-00-00-000	Filterrad / Filterweel
341.01-12-00-00-000	Blende / Apperture
341.01-16-00-00-000	Schwingpolarisator / Polarizer
341.01-09-00-00-000	Küvettenaufnahme
241.01-03-00-00-000	Schneckenradlager


201
403
405
500
67
409 (4x)
210
Kombi Shr M3x6 (3x)
407
Federscheibe DIN 137 Φ4.3 (1x)
Scheibe DIN 9021 Φ4.3 (2x)
800
200
PERKIN-ELMER
Bodenseewerk
PERKIN-ELMER GmbH
Elektronikgruppe 341
1:1
34101-10-00-00-000
B210 0011
DIN A0
Giesenberg


494
488
203,5
93
47,5
19,5
71
54,5
49,1
32
13,1
54,2
32
147
Fuse
(Slo-Blo)
230V | 2,5AT
115V | 5AT
18,5
14,5
28,2
238,5
54,5
Recorder
Control Signals
1V
100mV
10mV
GND
GND
12
14,5
42
314,1
Serial Port
RS-232C
10
17,8
R 16
22,8
3,2
42
47
380,1
Parallel Port
Centronics
47
Barcode
AT Keyboard
Ø 4,2
20
15,5
54,5
20
439,3


1
Gratseite


Oberfl. Güte
3,2
Oberfl. Behdlg
nach FV
Projektionsmeth. 1 (first angle)
Maße bes. geprüft
Gewicht
Werkstoff
Al Mg 3 W3.3535
Benennung
Rueckwand 341
Maßstab
1:1
Zeichnungs-Nummer
341.01-10-00-00-200
Blatt 1 von 2
Ident-Nr.
B2100110
Ersatz für
Ersetzt durch
Format
DIN A2
PERKIN-ELMER
Bodenseewerk
Perkin-Elmer GmbH
Name
Giesenberg
Tag
2103
1994
Bearb
Gepr.
Norm
Frg
03496
2103.94
Gi
Änd.-zust.
Änderungs-Mitteilung



LIST OF MATERIAL of Job P3RBLP4P DATE: 08.02.1994 PAGE: 1
PCB4 DISPLAY BOARD 341 Rev: RB Ident-Number: B2 101 042
Drawing-Number: 341.01-74-00-00-000

Data extracted from Circuit Diagram: PCB4 DISPLAY BOARD
Rev: FRG Ident-No.: B2 101 044 Drawing No.: 341.01-74-00-00-902

Item	Qty	Ident-No.	Description
902	0	B2 101 044	Stromlaufplan PCB4 DISPLAY BOARD Drawing No.: 341.01-74-00-00-902
999	0	B2 101 045	Leiterplattenbestückt PCB4 DISPLAY BOARD 341 Drawing No.: 341.01-74-00-00-999
701	1	B2 101 041	Roh-Leiterplatte PCB4 DISPLAY BOARD 341 Drawing No.: 341.01-74-00-00-201
505	1	B0 186 785	Resnet 8pnip 8x2200hm ,125W ROhm RM8 R5
506	2	B0 060 848	MetRex 10grid 100Ohm .5W Roederst.MK2 R2, R3
507	2	B0 060 918	MetRex 10grid 82.5KOhm .5W Roederst.MK2 R1, R6
508	1	B0 112 889	Resnet 16pdip 8x4.7KOhm .25W Beckmann 898-3 R4
519	3	B0 005 866	ElecCap 15grid 10YF 63V Roederst. EB C11, C13, C15
520	5	B0 114 340	CerCap 2.5grid 100NF 63V Siemens Z5U C7, C8, C9, C5, C6
521	1	B0 069 164	ElecCap 25grid 220YF 25V Roederst. EB C10
522	2	B0 066 448	CerCap 5grid 100PF 100V Valvo K101J15C0C F C13, C14
523	1	B0 507 039	CerCap 5grid 1NF 100V Valvo K102J20C0GFTT C12
529	5	B0 081 382	LED 3.08dia 5082-4655 LEDred HP HLMP-3301 LED4, LED5, LED1, LED2, LED3
530	5	B0 029 211	Isolierscheibe 3.5mm LED4, LED5, LED1, LED2, LED3
531	1	B0 507 152	Indukt 1x100yH V0.37A Siemens B78108-S-1823-J L1
537	1	B0 507 590	TraFer BVB39 TR1
538	1	B0 507 716	VF-Anzeigemodul FIP20X2AC NEC TU1
549	4	B0 173 811	Diode 12grid BYV27/200 CR1, CR4, CR2, CR3
550	1	B0 053 959	ZDiode 10grid ZPD1C ITT CR5
556	1	B0 103 099	IC 20pdip 74HCT240 oct_inv_bus_drl Tex IC7
557	1	B0 568 388	IC 14pdip 74HCT4040 12_stg_bin_count IC6
558	1	B0 190 654	IC 14pdip 74HCT14 hex_schm_trig_inv Mot IC8
400	1	B0 367 853	PROM PCB4 Display V1.0 IC5
559	1	B0 125 866	Sockel 40pol dip IC9
560	1	B0 506 214	QuaOsc 14pdip 12.0MHt VX 8111-1200 C.Jauch IC8
561	4	B0 508 298	IC 20pdip TLS812 Fluor_Disp_Driver IC1, IC3, IC2, IC4
562	4	B0 174 158	Sockel 20pol dip with C=100NF IC1, IC3, IC2, IC4
568	1	B2 101 151	FLACHKABEL 34polig 1100mm long P41
569	1	B0 138 532	Modu2PinHeaderEcoLine_rig.eng. 16pol AMP P42
580	2	B0 186 719	MosFet TO220 BUZ71L n.che.mos.fet Siemens Q1, Q2
581	1	B0 148 702	Switch print_sln_row 1sUM S1
582	4	B0 129 844	Elastikpuffer selbstklebend SJ-5008-SW B1, B2, B3, B4

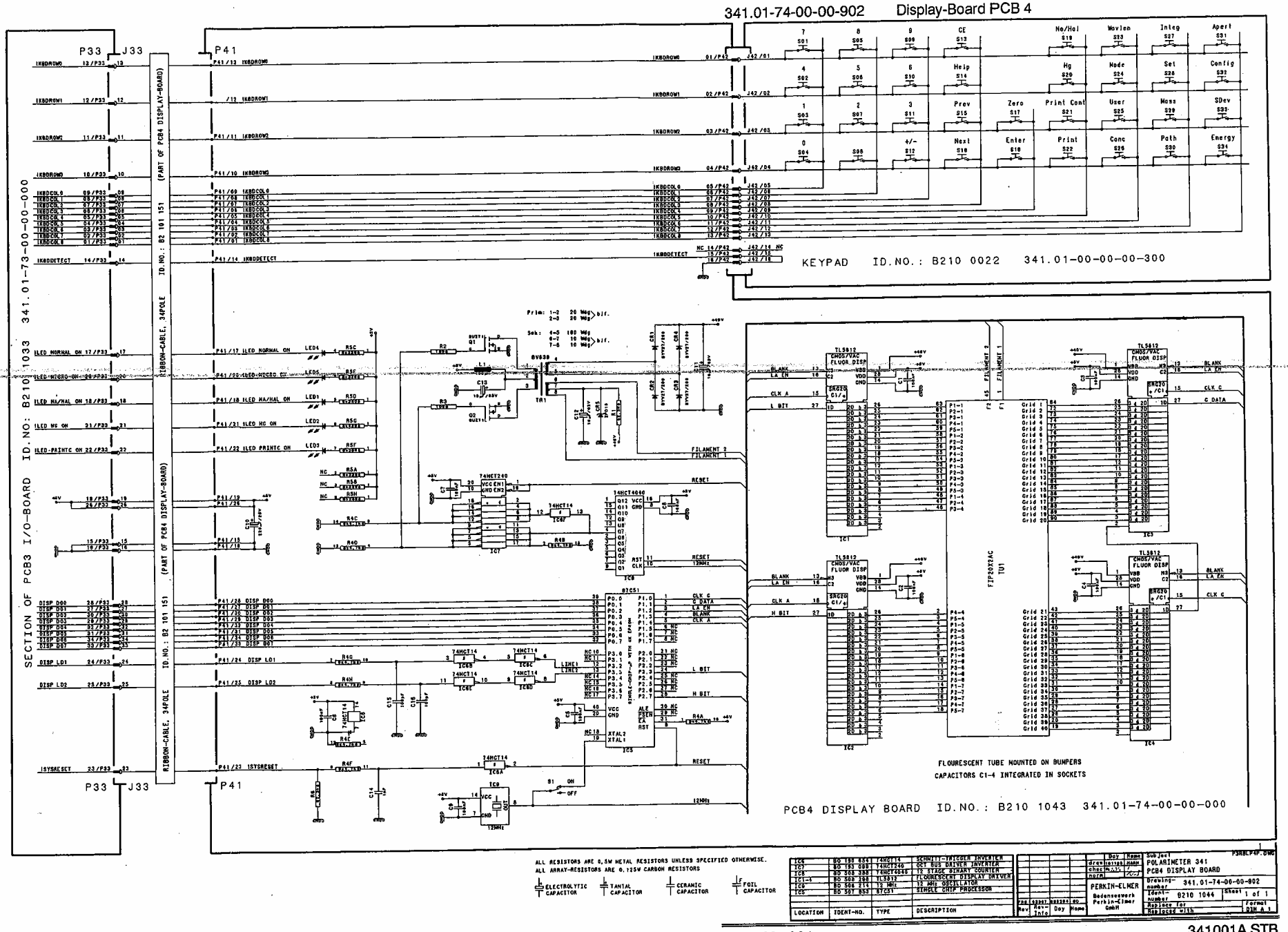
* = IC GESOCKELT

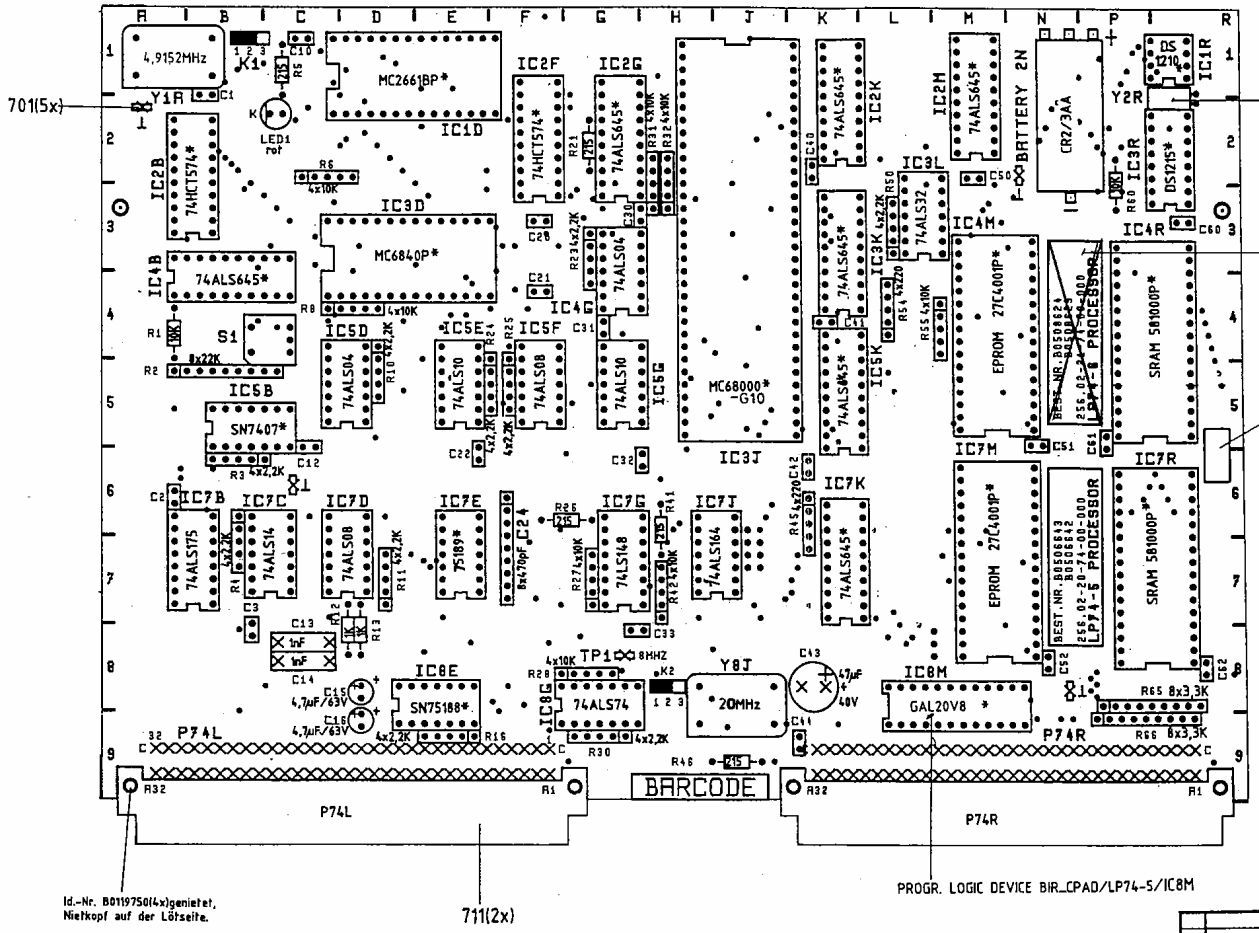
** = IC GESOCKELT MIT KONDENSATOR

SCHALTERSTELLUNG S1: ON

	Day	Name	Subject	P3RBLP4P.ASS
draw	080294	HARN	ASSEMBLY DRAWING P3RBLP4P	
check			PCB4 DISPLAY BOARD 341	
norm				
PERKIN-ELMER			Drawing-number 341.01-74-00-00-000	
Bodenseewerk Perkin-Elmer GmbH			Ident-number B2 101 043	Sheet 1 of 1
			Replace for	Format DIN A 2
			Replaced with	

FRG 03367 080294 GO			
Rev.	Rev-Info	Day	Name


SECTION OF PCB3 I/O-BOARD ID.NO: B210 1033 341.01-73-00-00-000
RIBBON-CABLE, 34POLE (PART OF PCB4 DISPLAY-BOARD) ID.NO.: B2 101 151
RIBBON-CABLE, 34POLE (PART OF PCB4 DISPLAY-BOARD) ID.NO.: B2 101 151
P33 J33
P41
KEYPAD ID.NO.: B210 0022 341.01-00-00-00-300
PCB4 DISPLAY BOARD ID.NO.: B210 1043 341.01-74-00-00-000
FLOURESCENT TUBE MOUNTED ON BUMPERS
CAPACITORS C1-4 INTEGRATED IN SOCKETS
ALL RESISTORS ARE 0,5W METAL RESISTORS UNLESS SPECIFIED OTHERWISE.
ALL ARRAY-RESISTORS ARE 0,125W CARBON RESISTORS
ELECTROLYTIC CAPACITOR
TANTAL CAPACITOR
CERAMIC CAPACITOR
FOIL CAPACITOR
PERKIN-ELMER
POLARIMETER 341
PCB4 DISPLAY BOARD
341.01-74-00-00-902
B210 1044

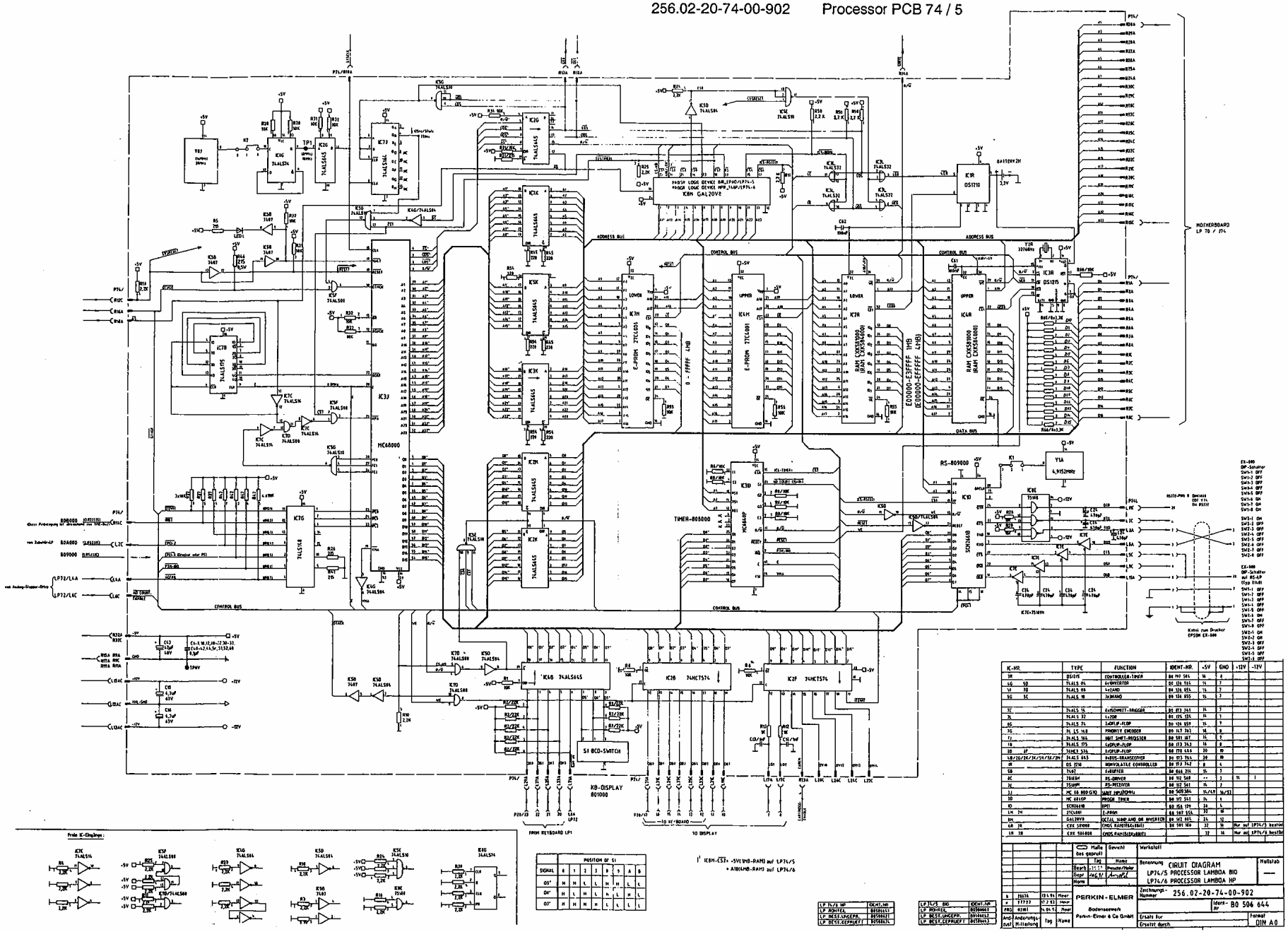


Einbau- und Handhabungsrichtlinien für C-MOS-Schaltkreise

folgende Punkte müssen im Hinblick auf die Verwendung von C-MOS-Schaltkreise unbedingt berücksichtigt werden:

1. Lötwerkzeuge, Lötbad, Werkzeuge und Vorrichtungen, die mit den IC-Beinchen in Berührung kommen können, sind auf Schutzleiterpotential zu legen.
2. IC's dürfen nur in spannungslosen Zustand der Schaltung ein- und ausgesteckt/gelötet werden.
3. Beim Einlöten des IC:auß der -Ug(=VDD)-Anschluß vor dem 0V (VSS)-Anschluß verlötet werden.
4. Ohne anliegende Versorgungsspannung dürfen an den Eingängen keine Spannungen anliegen.
5. Alle nichtverwendeten IC-Stifte müssen entsprechend ihrer logischen Funktion entweder an Masse oder an -Ug liegen.
6. Die IC-Anschlußbeinchen müssen stets - ausser im Betriebsfall - leitend miteinander verbunden werden.
7. ~~Bei Verwendung eines speziellen Lötbades (z.B. Tauch-Lötanlagen mit C-MOS-Schaltkreisen sollen grundsätzlich mit direkter Erdung ausgestattet werden. Über Netzleitungen sollen sämtliche Steckerspitzen kurzgeschlossen werden. An den Kontakten dürfen keine Klebefolien verwendet werden.~~
8. Alle IC-Anschlüsse dürfen für maximal 10 Sekunden einer Temperatur von 265°C ausgesetzt werden im Abstand von 1,59 mm ± 0,8 mm vom IC-Gehäuse.
9. IC's in C-MOS-Technik sollen bei einer Umgebungstemperatur von nicht mehr als 40°C und einer rel. Feuchte von weniger als 50% eingesetzt werden.

				Maße bes. geprüft	Gewicht	Werkstoff	
					Tag Name	Benennung	Maßstab
				Bearb.	10.3.92 Meier	LP74/5 PROCESSOR LAMBDA-BIO	--
				Gepr.	18.6.92 Arnold		
				Norm			
b	28676	13.4.94	Meier	PERKIN-ELMER		Zeichnungs-Nummer 256.02-20-74-00-000	
a	27722	17.2.93	ME	Bodenseewerk			Ident-Nr. B0 506 643
FRG	03107	14.4.92	ME	Perkin-Elmer GmbH		Ersatz für	Format DIN A2
Änd-zust	Änderungs-Mitteilung	Tag	Name			Ersetzt durch	



IC-NR.	TYPE	FUNCTION	IDENT-NR.	+5V	GND	+12V	-12V
3B	DS1215	CONTROLLER-TIMER	B0 197 565	16	8		
4G 5D	74ALS 04	6xINVERTER	B0 324 765	14	7		
5F 7D	74ALS 08	4x2AND	B0 324 685	14	7		
5G 5C	74ALS 10	3x3NAND	B0 324 855	14	7		
7C	74ALS 14	6xSCHMITT-TRIGGER	B0 873 261	14	7		
7A	74ALS 32	4x2OR	B0 325 335	14	7		
6G	74ALS 74	2xFLIP-FLOP	B0 324 859	14	7		
7G	74 LS 148	PRIORITY ENCODER	B0 147 261	16	8		
7J	74ALS 166	8BIT SHIFT-REGISTER	B0 581 167	16	8		
7B	74ALS 175	4xFLIP-FLOP	B0 873 263	16	8		
3B 4F	74HCT 534	8xFLIP-FLOP	B0 710 484	20	10		
4B/2G/2K/3K/5K/7K/2M	74ALS 645	8xBUS-TRANSCEIVER	B0 873 364	20	10		
4B	DS 1210	NONVOLATILE CONTROLLER	B0 873 742	8	4		
5B	74 07	6xBUFFER	B0 868 316	14	7		
8C	75451M	RS-DRIVER	B0 312 568	--	3	14	1
7K	75189M	RS-RECEIVER	B0 312 561	14	7		
1J	MC 68 B50 CP	UART INPUT/OUTPUT	B0 560 384	11/13	1/12		
3D	MC 68150	PROGR TIMER	B0 312 553	14	1		
1D	SCB68488	GPIB	B0 356 179	24	12		
1M 2M	27C4001	E-PROM	B0 587 554	32	16		
5H	GAL20V8	OCTAL NAND AND NOR REGIS	B0 572 665	24	12		
6B 2B	CXK 581000	CMOS RAM(128x8BIT)	B0 591 160	32	16	Nur auf LP74/5 bestück	
6A 3B	CXK 584000	CMOS RAM(512x8BIT)		32	16	Nur auf LP74/5 bestück	

SIGNAL	POSITION OF S1							
	0	1	2	3	4	5	A	B
01'	H	H	L	L	H	H	L	L
04'	H	L	H	L	H	L	H	L
03'	H	H	H	L	L	L	L	L

LP 74/5 HP	IDENT.NR
LP MONTEK	B0586611
LP BEST.LANGEPR.	B0586612
LP BEST.GEPRUEFT	B0586613

LP 74/5 BIG	IDENT.NR
LP MONTEK	B0586661
LP BEST.LANGEPR.	B0586662
LP BEST.GEPRUEFT	B0586663

	Name	Datum	Werkstoff		
	Gez.		Benennung	CIRUIT DIAGRAM	Hallstab
	Bearb.			LP74/5 PROCESSOR LAMBDA BIG	
	Gepr.			LP74/6 PROCESSOR LAMBDA HP	
	Norm				
A 15674	13.4.94 Meier		Zeichnungs-Nummer	256.02-20-74-00-902	
B 17717	07.2.95 Meier				
FNG 61961	24.04.95 Meier		Ident-Nr	B0 506 644	
Änd. Änderungsdat	Tag Name		Ersatz für		Format
			Ersetzt durch		DIN A0

PERKIN-ELMER
Bodenseewerk
Perkin-Elmer & Co GmbH

LIST OF MATERIAL of Job P3RALP9P DATE: 28.06.1994 PAGE: 1
PCB9 LAMP UNIT 341 Rev: A Ident-Number: B2 101 092
Drawing-Number: 341.01-79-00-00-000

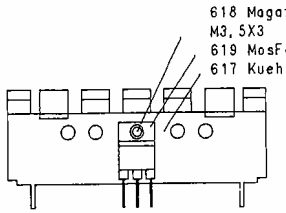
Data extracted from Circuit Diagram: PCB9 LAMP UNIT
Rev: A Ident-No.: B2 101 094 Drawing No.: 341.01-79-00-00-902

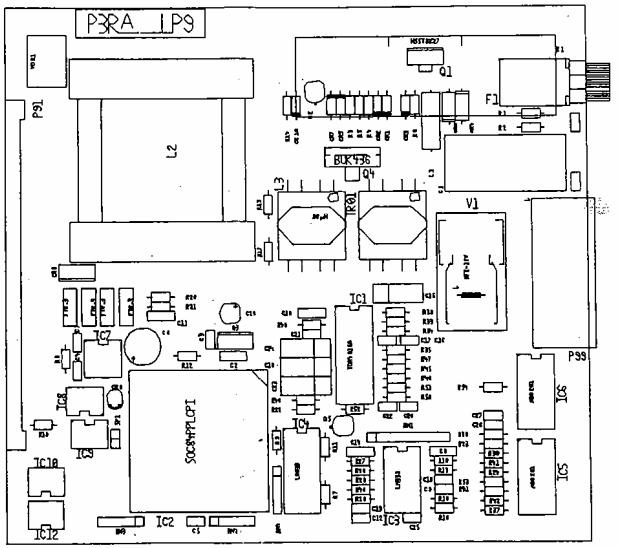
Item	Qty	Ident-No.	Description
902	0	B2 101 094	Stromlaufplan PCB9 LAMP UNIT Drawing No.: 341.01-79-00-00-902
999	0	B2 101 095	Leiterplattenlebenslauf PCB9 LAMP UNIT 341 Drawing No.: 341.01-79-00-00-999
201	1	B2 101 091	Roh-Leiterplatte PCB9 LAMP UNIT 341 Drawing No.: 341.01-79-00-00-201
500	1	B0 091 550	ResNet 5pslp 4x10KOhm .125W ROhm RM4 RN2
501	1	B0 173 738	ResNet 9pslp 8x2.2KOhm .125W RKL9S RN1
502	1	B0 091 548	ResNet 5pslp 4x1KOhm .125W ROhm RM4 RN3
503	1	B0 128 891	ResNet 5pslp 4x100Ohm .125W ROhm RM4 RN4
509	2	B0 060 931	MetRes 10grid 287KOhm .5W Roederst.MK2 R1, R2
510	1	B0 093 754	MetRes 10grid 23.7Ohm .5W Roederst.MK2 R3
511	3	B0 060 848	MetRes 10grid 1000hm .5W Roederst.MK2 R4, R35, R50
512	5	B0 060 872	MetRes 10grid 1KOhm .5W Roederst.MK2 R5, R13, R16, R26, R28
513	2	B0 060 920	MetRes 10grid 100KOhm .5W Roederst.MK2 R6, R14
514	2	B0 060 888	MetRes 10grid 4.64KOhm .5W Roederst.MK2 R7, R31
515	2	B0 060 896	MetRes 10grid 10kOhm .5W Roederst.MK2 R8, R18
516	1	B0 060 855	MetRes 10grid 196Ohm .5W Roederst.MK2 R9
517	1	B0 060 912	MetRes 10grid 46.4KOhm .5W Roederst.MK2 R10
518	2	B0 060 900	MetRes 10grid 14.7KOhm .5W Roederst.MK2 R11, R52
519	3	B0 060 881	MetRes 10grid 2.37KOhm .5W Roederst.MK2 R12, R33, R34
520	2	B0 060 868	MetRes 10grid 8810hm .5W Roederst.MK2 R15, R17
521	1	B0 060 865	MetRes 10grid 5110hm .5W Roederst.MK2 R19
522	2	B0 144 600	MetRes 10grid 10hm .5W Roederst.MK2 R20, R21
523	2	B0 060 813	MetRes 10grid 51.1KOhm .5W Roederst.MK2 R22, R38
524	1	B0 060 894	MetRes 10grid 8.25KOhm .5W Roederst.MK2 R23
525	1	B0 060 869	MetRes 10grid 5.11KOhm .5W Roederst.MK2 R24
526	1	B0 060 898	MetRes 10grid 12.1KOhm .5W Roederst.MK2 R27
527	1	B0 060 910	MetRes 10grid 38.3KOhm .5W Roederst.MK2 R29
528	1	B0 093 749	MetRes 10grid 14.7Ohm .5W Roederst.MK2 R30
529	1	B0 060 890	MetRes 10grid 5.62KOhm .5W Roederst.MK2 R37
530	1	B0 060 883	MetRes 10grid 2.87KOhm .5W Roederst.MK2 R38
531	1	B0 060 911	MetRes 10grid 42.2KOhm .5W Roederst.MK2 R40
532	2	B0 060 882	MetRes 10grid 2.61KOhm .5W Roederst.MK2 R41, R47
533	1	B0 060 875	MetRes 10grid 1.33KOhm .5W Roederst.MK2 R42
534	4	B0 144 608	MetRes 10grid 4.64Ohm .5W Roederst.MK2 R45, R53, R54, R49
535	2	B0 178 543	MetRes 10grid 10MOhm .5W Roederst.MK2 R45, R46
536	1	B0 060 914	MetRes 10grid 56.2KOhm .5W Roederst.MK2 R51
547	1	B0 083 859	FolCap 27.5grid 1MYF 630V MKT 1,0YF 630V 20% C1
548	1	B0 508 213	EleCap 2.5grid 10YF 50V Roederst, EK000AA210HC C28
549	1	B0 176 136	CerCap 7.5grid 220NF 63V Siemens C2
550	8	B0 114 340	CerCap 2.5grid 100NF 63V Siemens Z5U C3, C4, C5, C7, C23, C26, C27, C21
551	1	B0 073 504	TanCap 5grid 22YF 35V Roederst.ETQ C6
552	4	B0 147 690	CerCap 5grid 1YF 50V Siemens C8, C11, C14, C19
553	8	B0 127 461	CerCap 2.5grid 10NF 50V Siemens Z5U C9, C10, C12, C13, C15, C17, C20, C22
554	1	B0 069 173	FolCap 10grid 10NF 250V Wima MKS4 NICHT NEUENTW. C15
555	1	B0 069 183	FolCap 10grid 470PF 400V Wima FKC3 NICHT NEUENTW. C18
556	1	B0 069 179	FolCap 10grid 100PF 400V Wima FKC3 NICHT NEUENTW. C23
557	1	B0 069 185	FolCap 10grid 1NF 400V Wima FKC3 NICHT NEUENTW. C24
563	1	B0 116 406	Induktivitaet 1uH L1
564	1	B0 507 275	Induktivitaet 24mH L2
565	1	B0 510 600	Induktivitaet 96uH L3
571	1	B0 510 046	Trafo BV656 TR01
582	4	B0 034 223	Diode 10grid 1N4148 ITT CR2, CR1, CR5, CR7
583	2	B0 173 811	Diode 12grid BYV27/200 CR4, CR6
584	2	B0 053 967	ZDiode 10grid ZPD22 ITT CR3, CR10
585	1	B0 183 378	Diode to220 MUR850 8A 500V Mot CR8
586	1	B0 073 493	LED 3,18dia 5082-4684 LEDred HP HLMP-1301 CR9
592	1	B0 170 448	NTrsAr 18pdip L603B npn_darl_tra SGS IC4
593	1	B0 139 250	IC 8pdip 7705 res_contr Tex IC7
100	1	B2 101 141	FPGA P341.99-30-00-00-000 BSW IC2
594	1	B0 507 826	Socket 84pol PLCC-PIN IC2
595	1	B0 091 801	IC 14pdip LM339 quad.oper.ampli Nat IC3
596	4	B0 126 325	OptCou 6Dip CNY17-3 Siemens IC6, IC9, IC10, IC12
597	2	B0 170 838	IC 16pdip ADG201 4_cho_multi GEBURNT IC6, IC5
598	1	B0 510 025	IC 20pdip TDA4918A swtich_mode_pow_supply_cont Sie IC1
604	1	B0 089 592	ModulPinHeader_rig.ang.sin.row 10pol AMP P99
605	1	B0 188 278	VGA_Pin_Header_rig.ang. 32pol_ste ERNI 594.001/STV-E P91
611	1	B0 147 769	Modu2PinHeaderEcoLine_strai. 2pol 825433-2 AMP SP1
612	2	B0 172 695	FastenTab 2.8x0.8 Vogt TP2, TP1
613	4	B0 174 159	FastenTab 6.3 AMP TP3, TP4, TP5, TP6
619	1	B0 508 797	HeatSink for BSW BK27 256.02-21-72-00-203 K1
620	1	B0 173 740	MagazinGewindeniet M3x5,5 K1
621	1	B0 183 377	MosFet TO220 IRF830 500V_4,5A RCA Q1
622	1	B0 054 727	PNPTra to18 2N2907A pnp_transistor ITT Q2
623	1	B0 127 584	IC to220 LM340T5 +5V_regulator Nat G3
624	1	B0 114 646	Variet 7.5grid SIOV-S10-K385 Siemens VDR1
625	1	B0 508 315	MosFet SOT93 BUK436-1000B 1000V_3,1A n.cha. Valvo Q4
626	1	B0 507 348	Relay NF2-12V 12V_two_change MATSUSHITA V1
627	1	B0 044 071	NPNTra to18 2N2222A npn_transistor ITT Q5
628	1	B0 114 155	FuseSocket rig.ang. FAS031.3511 F1
629	1	B0 155 568	Fuse 5X20mm T1A slow blow DIN41662 F1

Klebeschild mit
Ausgabestand

A

Valid Revision-
Level of PCB





Achtung: Die in dieser Zeichnung angegebenen Positionsnummern stimmen nicht mit denen der SAP-Stückliste überein.

Caution: The item numbers indicated on this drawing do not correspond to those of parts list generated by SAP-program.

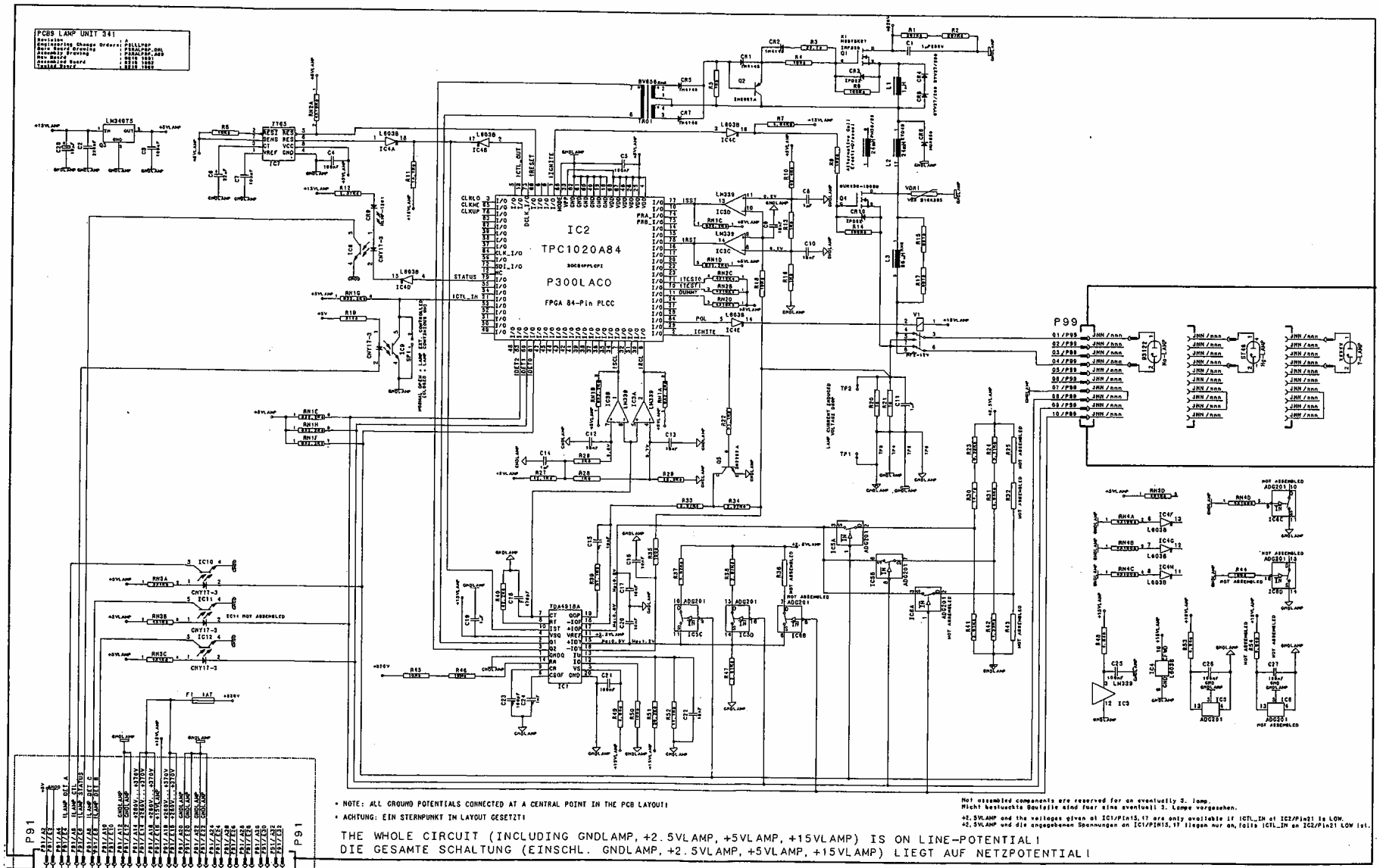
Rev	Rev-Info	Day	Name
FRG	03444	280694	ESTE

	Day	Name
draw	280694	ESTE
chec		
norm		

PERKIN-ELMER
Bodenseewerk
Perkin-Elmer
GmbH

Subject: ASSEMBLY DRAWING P3RALP9P
LP9P LAMP UNIT

Drawing-number 341.01-79-00-00-000
Ident-number B2 101 093 Sheet 1 of 1
Replace for
Replaced with
Format DIN A 2



SECTION OF PCB1 MOTHERBOARD ID.NO.: B2 101 013 341.01-71-00-00-000

ALL RESISTORS ARE 0,5W METAL RESISTORS UNLESS SPECIFIED OTHERWISE.
ALL ARRAY-RESISTORS ARE 0,125W CARBON RESISTORS

ELECTROLYTIC CAPACITOR | TANTAL CAPACITOR | CERAMIC CAPACITOR | FOIL CAPACITOR

LOCATION	IDENT-NO.	TYPE	DESCRIPTION
IC1	80 510 023	TDA4918A	SMPS-IC
IC2	92 101 141	TPC1020A84C	FPGA
IC3	80 051 801	LM339	QUAD COMPARATOR
IC4	80 170 468	L603	OCT HPR DARLINGTON
IC5, 6	80 170 558	ADG201	QUAD SWITCH
IC7	80 126 350	7705	RESET-IC
IC8, 9, 10	80 126 325	CNY17-3	OPTO-COUPLER
IC11	80 126 325	CNY17-3	OPTO-COUPLER

Rev	Rev. Info	Day	Name
A	ersatz 1004841 ATC01		

	Day	Name
drawn		
chec		
norm		

PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH

Subject: POLARIMETER 341 PCB9 LAMP UNIT
P3RALP9P
Drawing-number: 341.01-79-00-00-902
Ident-number: B210 1094
Sheet 1 of 1
Replace for
Replaced with
Format DIN A 1

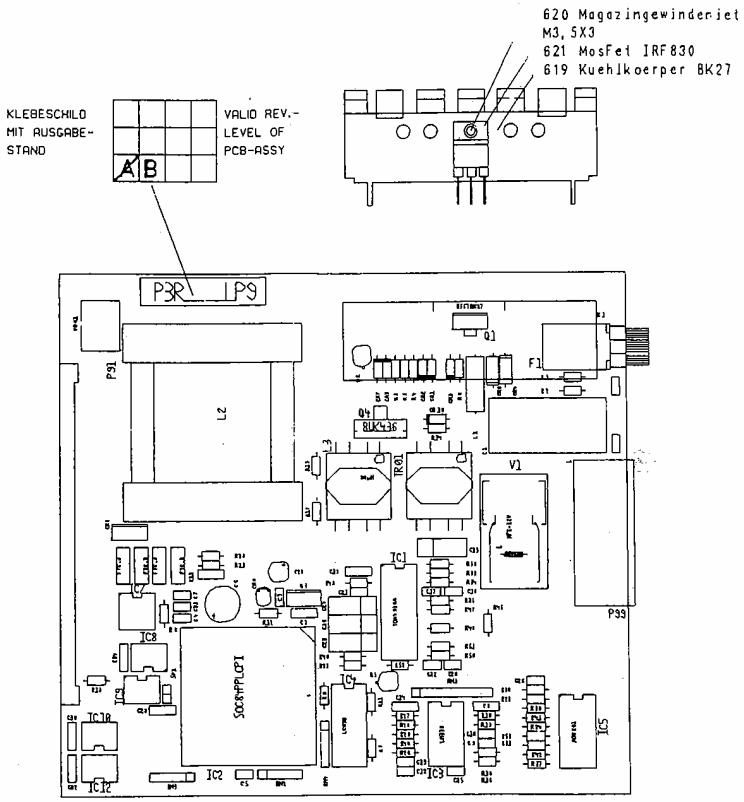
PCB 9 Lamp-Board Modifications

Label	Reason for change	Modification	Date
A	New PCB		28.06.94
B	Lamp ignition	IC 2 FPGA P3RBLACO LAMP (B210-0124)	28.11.94
	Interference to Optocoupler IC 8, 9, 10, 11, 12 inputs and Reset IC 7	1 µF cap(B014-7690) from pin 4 to pin 6 on IC 8, 9, 10, 11, 12 100 nF cap (B011-4340) from pin 2 to pin 4 on IC 7	11.01.95

LIST OF MATERIAL of Job P3RBLP9P DATE: 17.01.1995 PAGE: 1
PCB9 LAMP UNIT 341 Rev: RB Ident-Number: B210 1092
Drawing-Number: 341.01-79-00-00-000

Data extracted from Circuit Diagram: PCB9 LAMP UNIT
Rev: B Ident-No.: B2 101 094 Drawing No.: 341.01-79-00-00-902

Item	Qty	Ident-No.	Description
902	0	B2 101 094	Stromlaufplan PCB9 LAMP UNIT Drawing No.: 341.01-79-00-00-902
998	0	B210 1095	Leiterplattenlebenslauf PCB9 LAMP UNIT 341 Drawing No.: 341.01-79-00-00-999
201	1	B210 1091	Roh-Leiterplatte PCB9 LAMP UNIT 341 Drawing No.: 341.01-79-00-00-201
500	1	B0 091 550	ResNet Spalp 4x10KOhm .125W ROhm RM4 RM2
501	1	B0 173 739	ResNet 9polp 8x2.2KOhm .125W RKL9S RN1
502	1	B0 091 548	ResNet 5polp 4x1KOhm .125W ROhm RM4 RN3
503	1	B0 126 891	ResNet 5polp 4x100Ohm .125W ROhm RM4 RM4
509	2	B0 060 931	MetRes 10grid 287KOhm .5W Roederst.MK2 R1, R2
510	1	B0 093 754	MetRes 10grid 23.7Ohm .5W Roederst.MK2 R3
511	3	B0 060 848	MetRes 10grid 100Ohm .5W Roederst.MK2 R4, R35, R50
512	5	B0 060 872	MetRes 10grid 1KOhm .5W Roederst.MK2 R5, R13, R16, R26, R28
513	2	B0 060 920	MetRes 10grid 100KOhm .5W Roederst.MK2 R6, R14
514	2	B0 060 888	MetRes 10grid 4.64KOhm .5W Roederst.MK2 R7, R31
515	2	B0 060 895	MetRes 10grid 10kOhm .5W Roederst.MK2 R8, R18
516	1	B0 060 855	MetRes 10grid 196Ohm .5W Roederst.MK2 R9
517	1	B0 060 912	MetRes 10grid 46.4KOhm .5W Roederst.MK2 R10
518	2	B0 060 900	MetRes 10grid 14.7KOhm .5W Roederst.MK2 R11, R32
519	3	B0 060 881	MetRes 10grid 2.37KOhm .5W Roederst.MK2 R12, R33, R34
520	2	B0 060 868	MetRes 10grid 681Ohm .5W Roederst.MK2 R15, R17
521	1	B0 060 865	MetRes 10grid 511Ohm .5W Roederst.MK2 R19
522	2	B0 144 600	MetRes 10grid 10hm .5W Roederst.MK2 R20, R21
523	2	B0 060 913	MetRes 10grid 51.1KOhm .5W Roederst.MK2 R22, R39
524	1	B0 060 894	MetRes 10grid 8.25KOhm .5W Roederst.MK2 R23
525	1	B0 060 889	MetRes 10grid 5.11KOhm .5W Roederst.MK2 R24
526	1	B0 060 898	MetRes 10grid 12.1KOhm .5W Roederst.MK2 R27
527	1	B0 060 910	MetRes 10grid 38.3KOhm .5W Roederst.MK2 R29
528	1	B0 093 749	MetRes 10grid 14.7Ohm .5W Roederst.MK2 R30
529	1	B0 060 890	MetRes 10grid 5.62KOhm .5W Roederst.MK2 R37
530	1	B0 060 883	MetRes 10grid 2.87KOhm .5W Roederst.MK2 R38
531	1	B0 060 911	MetRes 10grid 42.2KOhm .5W Roederst.MK2 R40
532	2	B0 060 882	MetRes 10grid 2.61KOhm .5W Roederst.MK2 R41, R47
533	1	B0 060 875	MetRes 10grid 1.33KOhm .5W Roederst.MK2 R45
534	3	B0 144 608	MetRes 10grid 4.640hm .5W Roederst.MK2 R48, R49, R53
535	2	B0 176 543	MetRes 10grid 10MOhm .5W Roederst.MK2 R45, R46
536	1	B0 060 914	MetRes 10grid 56.2KOhm .5W Roederst.MK2 R51
547	1	B0 083 859	FolCap 27.5grid 1MYF 630V MKT 1.0YF 630V 20% C1
548	1	B0 506 213	ElcCap 2.5grid 10YF 50V Roederst. EK000AA210HC C28
549	1	B0 176 136	CerCap 7.5grid 220NF 63V Siemens C2
550	8	B0 114 340	CerCap 2.5grid 100NF 63V Siemens 25U C3, C4, C5, C7, C21, C25, C26, C33
551	1	B0 073 504	TanCap 5grid 22YF 35V Roederst.ETQ C6
552	8	B0 147 690	CerCap 5grid 1YF 50V Siemens C8, C11, C14, C19, C18, C30, C32, C34
553	8	B0 127 461	CerCap 2.5grid 10NF 50V Siemens 25U C9, C10, C12, C13, C16, C17, C20, C22
554	1	B0 069 173	FolCap 10grid 10NF 250V Wima MKS4 NICHT NEUENTW. C15
555	1	B0 069 183	FolCap 10grid 470PF 400V Wima FKC3 NICHT NEUENTW. C18
556	1	B0 069 179	FolCap 10grid 100PF 400V Wima FKC3 NICHT NEUENTW. C23
557	1	B0 069 185	FolCap 10grid 1NF 400V Wima FKC3 NICHT NEUENTW. C24
563	1	B0 116 408	Induktivitaet 1uH L1
564	1	B0 507 275	Induktivitaet 24mH L2
565	1	B0 510 600	Induktivitaet 96uH L3
571	1	B0 510 046	Trafo BV656 TR01
582	4	B0 034 223	Diode 10grid 1N4148 ITT CR1, CR2, CR5, CR7
583	2	B0 173 811	Diode 12grid BYV27/200 CR4, CR6
584	2	B0 053 967	ZDiode 10grid ZPD22 ITT CR3, CR10
585	1	B0 183 378	Diode to220 MUR850 6A 500V Mot CR8
586	1	B0 073 493	LED 3.18dia 5082-4684 LEDred HP HLMP-1301 CR9
592	1	B0 170 448	NTrsAr 18pdip L6038 npn_darl_trs SGS IC4
593	1	B0 138 250	IC 8pdip 7705 res_contr Tex IC7
100	1	B2 100 124	FPGA P341.99-31-00-00-000 BSW IC2
594	1	B0 507 826	Socket 84pol PLCC-PIN IC2
595	1	B0 091 801	IC 14pdip LM339 quad.oper.ampli Nat IC5
596	4	B0 126 325	OptCou 8Dip CNY17-3 Siemens IC8, IC9, IC10, IC12
597	1	B0 170 838	IC 18pdip ADG201 4_cha_multi GEBURNT IC5
598	1	B0 510 025	IC 20pdip TDA4918A g e s t r i c h e n Siemens 7/94 IC1
604	1	B0 089 592	ModulPinHeader_rig.ang.sin.row 10pol AMP P99
605	1	B0 168 278	VGA_Pin_Header_rig.ang. 32pol_a+e ERNI 394.001/STV-E P31
611	1	B0 147 769	Modu2PinHeaderEcoLine_strai. 2pol 825433-2 AMP SP1
612	2	B0 172 695	FastonTab 2.8x0.8 Vogt TP1, TP2
613	4	B0 174 159	FastonTab 6.3 AMP TP3, TP4, TP5, TP6
619	1	B0 508 797	Heat$Ink for BSW 6K27 256.02-21-72-00-203 K1
620	1	B0 173 740	MagazinGewindeniet M3x5.5 K1
621	1	B0 127 584	IC to220 LM340T5 +5V_regulator Nat Q3
622	1	B0 183 377	MosFet TO220 IRF830 500V_4.5A RCA Q1
623	1	B0 054 727	PNPTra to18 2N2907A pnp_translator ITT Q2
624	1	B0 114 648	Varist 7.5grid SIOV-S10-K385 Siemens VDR1
625	1	B0 508 315	MosFet SOT93 BUK436-1000B 1000V_3.1A n.cha. Valvo Q4
626	1	B0 507 348	Relay NF2-12V 12V_two_change MATSUSHITA V1
627	1	B0 044 071	NPNTra to18 2N2222A npn_translator ITT Q5
628	1	B0 114 155	FuseSocket rig.ang. FAS031.3511 F1
629	1	B0 155 568	Fuse 5X20mm T1A slow blow DIN41662 F1

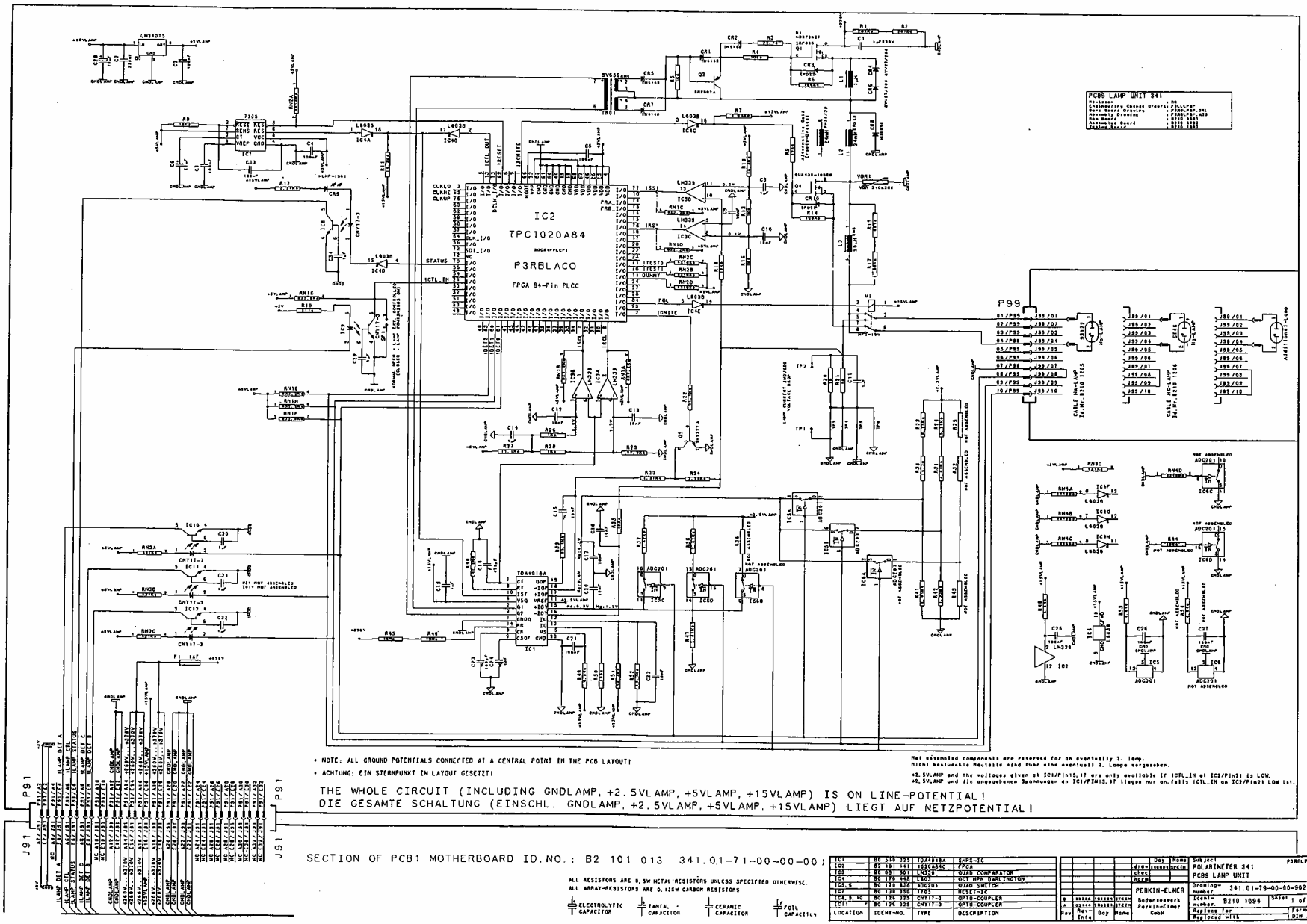


Achtung: Die in dieser Zeichnung angegebenen Positionsnummern stimmen nicht mit denen der SAP-Stückliste überein.

Caution: The item numbers indicated on this drawing do not correspond to those of parts list generated by SAP program.

	Day	Name	Subject
draw	170195	ESTE	ASSEMBLY DRAWING P3RBLP9P
chec			PCB9 LAMP UNIT 341
norm			
PERKIN-ELMER			Drawing-number 341.01-79-00-00-000
Bodenseewerk Perkin-Elmer GmbH			Ident-number B2 101 093 Sheet 1 of 1
			Replace for
			Replaced with
Format DIN A 2			

Rev	Rev-Info	Day	Name
A	29259	170195	ESTE
FRG	03444	280694	ESTE



SECTION OF PCB1 MOTHERBOARD ID.NO.: B2 101 013 341.01-71-00-00-00

ALL RESISTORS ARE 0.5W METAL-RESISTORS UNLESS SPECIFIED OTHERWISE.
ALL ARRAY-RESISTORS ARE 0.125W CARBON RESISTORS

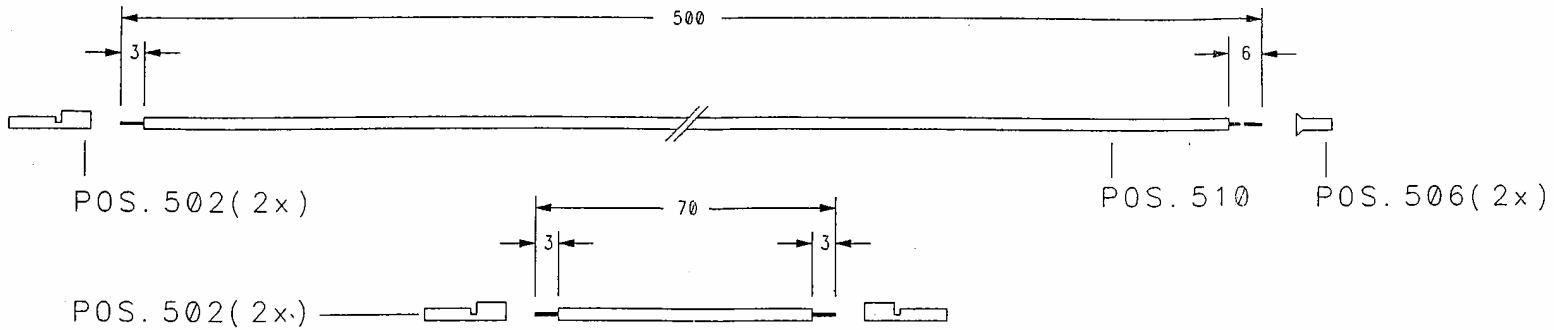
ELECTROLYTIC CAPACITOR | TANTAL CAPACITOR | CERAMIC CAPACITOR | FOIL CAPACITOR

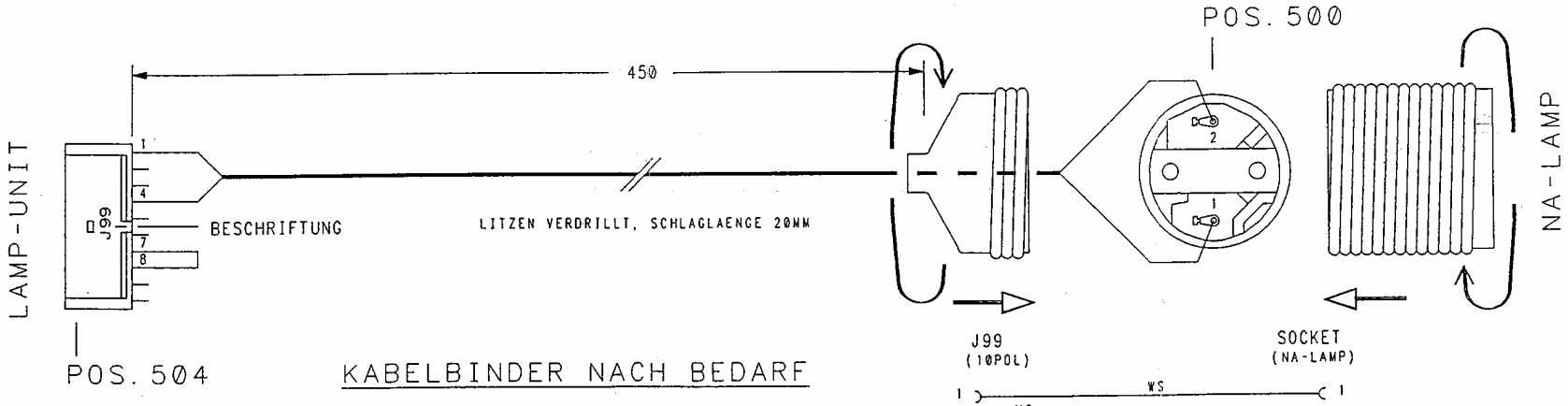
LOCATION	IDENT-NO.	TYPE	DESCRIPTION
IC1	80 510 025	TDA4918A	SMPS-IC
IC2	82 101 141	TPC1020A84C	FPGA
IC3	80 891 601	LM339	QUAD COMPARATOR
IC4	80 176 448	L603	OCT NPN DARLINGTON
IC5, 6	80 170 620	ADC201	QUAD SWITCH
IC7	80 139 356	7705	RESET-IC
IC8, 9, 10	80 124 325	CNY17-3	OPTO-COUPLER
IC11 - 17	80 124 325	CNY17-3	OPTO-COUPLER

Rev	Rev-Info	Day	Name
A	section blocks stream		
B	square boxes		

	Day	Name
drwn		
chck		
norm		

Subject: POLARIMETER 341 / PCB9 LAMP UNIT
P3RBLPAP
PERKIN-ELMER Bodenseewerk Perkin-Elmer GmbH
Drawing-number: 341.01-79-00-00-902
Ident-number: 8210 1694
Sheet 1 of 1
Replace for:
Replaced with:
Format DIN A 1





FILOMATLISTE

LFD NUMMER	LEITUNGS-BEZEICHNUNG	FARBE	LAENGE (MM)	LEITUNGS-ABSCHLUSS VORNE	DRUCKBILD VORNE	N = NORMAL G = GESPIEGELT	DISTANZ VORNE (MM)	DRUCKBILD MITTE (MM)	DISTANZ MITTE (MM)	DRUCKBILD HINTEN	N = NORMAL G = GESPIEGELT	DISTANZ HINTEN (MM)	LEITUNGS-ABSCHLUSS HINTEN
1	AWG 18	WS	500	B0 089 595	J99/1	N	30	-----	---	SOC 1	N	30	B0 017 838
2	AWG 18	WS	500	B0 089 595	J99/4	N	30	-----	---	SOC 2	N	30	B0 017 838
3	AWG 18	WS	70	B0 089 595	J99/7	N	20	-----	---	J99/8	N	20	B0 089 595

ALLGEMEINE LEITUNGSBESCHREIBUNG | DRUCKBILD LEITUNGSANFANG | DRUCKBILD LEITUNGSENDE

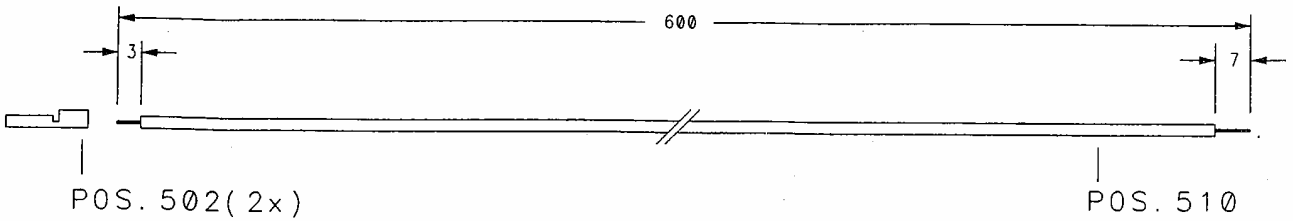
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chec	26.5.94	
norma		

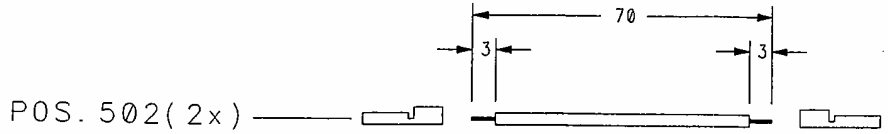
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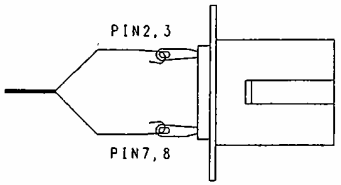
PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH

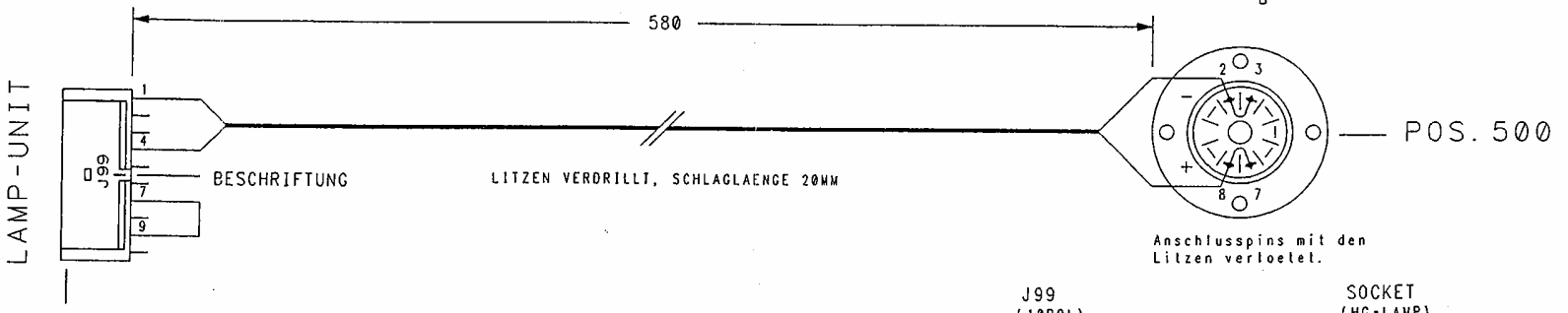
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Ident-number: B210 1205 — Sheet: 1 of 1
Replace for:
Replaced with:
Format: DIN A 3

Rev	Rev-Info	Day	Name
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Frg	93489	120494	GO

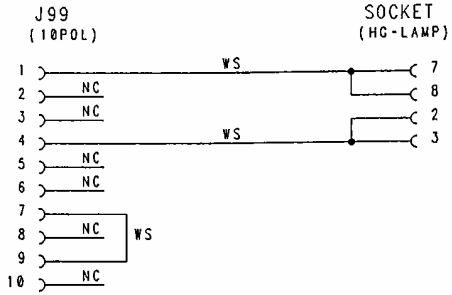








HG-LAMP



FILOMATLISTE

LFD NUMMER	LEITUNGS-BEZEICHNUNG	FARBE	LAENGE (MM)	LEITUNGS-ABSCHLUSS VORNE	DRUCKBILD VORNE	N = NORMAL G = GESPIEGELT	DISTANZ VORNE (MM)	DRUCKBILD MITTE (MM)	DISTANZ MITTE (MM)	DRUCKBILD HINTEN	N = NORMAL G = GESPIEGELT	DISTANZ HINTEN (MM)	LEITUNGS-ABSCHLUSS HINTEN
1	AWG 18	WS	600	B0 089 595	J99/1	N	30	-----	---	SOC 7,8	N	30	verzinnt
2	AWG 18	WS	600	B0 089 595	J99/4	N	30	-----	---	SOC 2,3	N	30	verzinnt
3	AWG 18	WS	70	B0 089 595	J99/7	N	20	-----	---	J99/9	N	20	B0 089 595
ALLGEMEINE LEITUNGSBESCHREIBUNG					DRUCKBILD LEITUNGSANFANG					DRUCKBILD LEITUNGSENDE			

	Day	Name
draw	080494	HARN
chec	26.5.94	
norm		

PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH

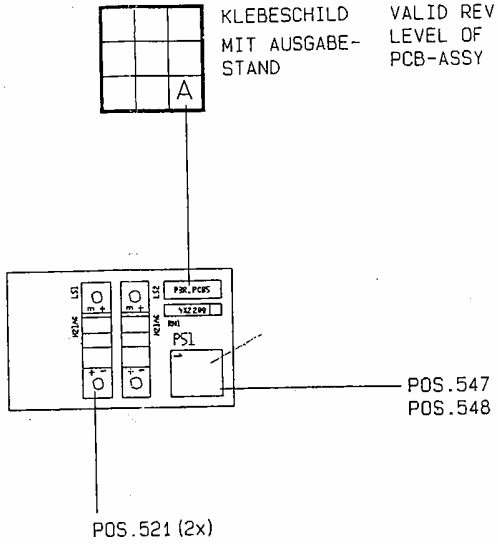
Rev	Rev-Info	Day	Name
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Frg	03409	120494	CO

Subject: KABEL HG-LAMPE P341 — P3R8KAHG.DWG
Drawing-number: 341.01-66-00-00-000
Ident-number: B210 1206
Sheet: 1 of 1
Replace for:
Replaced with:
Format: DIN A 3

LIST OF MATERIAL of job P3RALP5P DATE: 03.03.1994 PAGE: 1
PCB5 DUAL SENSOR 341 Rev: RA Ident-Number: B2 101 052
Drawing-Number: 341.01-75-00-00-000

Data extracted from Circuit Diagram: PCB3 I/O-BOARD
Rev: P1 Ident-No.: B2 101 034 Drawing No.: 341.01-73-00-00-902

Item	Qty	Ident-No.	Description
902	0	B2 101 034	Stromlaufplan PCB3 I/O-BOARD Drawing No.: 341.01-73-00-00-902
999	0	B2 101 055	Leiterplattenlebenslauf PCB5 DUAL SENSOR 341 Drawing No.: 341.01-75-00-00-999
201	1	B2 101 051	Ron-Leiterplatte PCB5 DUAL SENSOR 341 Drawing No.: 341.01-75-00-00-201
500	1	B0 103 131	ResNet 5psip 4x2200hm .125W ROhm RM4 RN1
521	2	B0 107 740	LigBar 20x6.35 H21A6 LightBarrier LS1, LS2
547	1	B0 163 638	Modu2ShroPost_rig.ang.sin.row 826468-4 4pol AMP P51
548	1	B0 115 710	Modu2ShroudedPosts_KeyingPlug_black 926498-1 AMP P51



STECKERCODIERUNG P51:

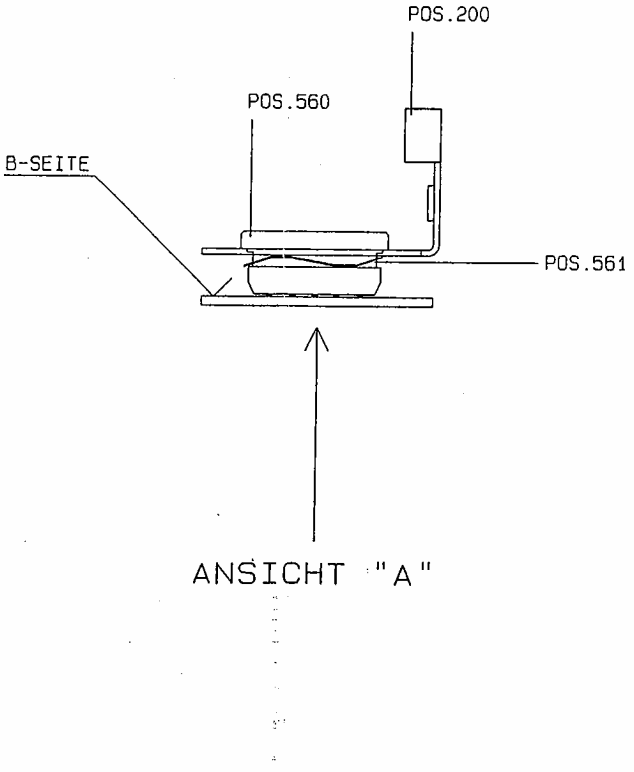
CODIERELEMENT POS.548 AUF PIN 2 AUFGESETZT

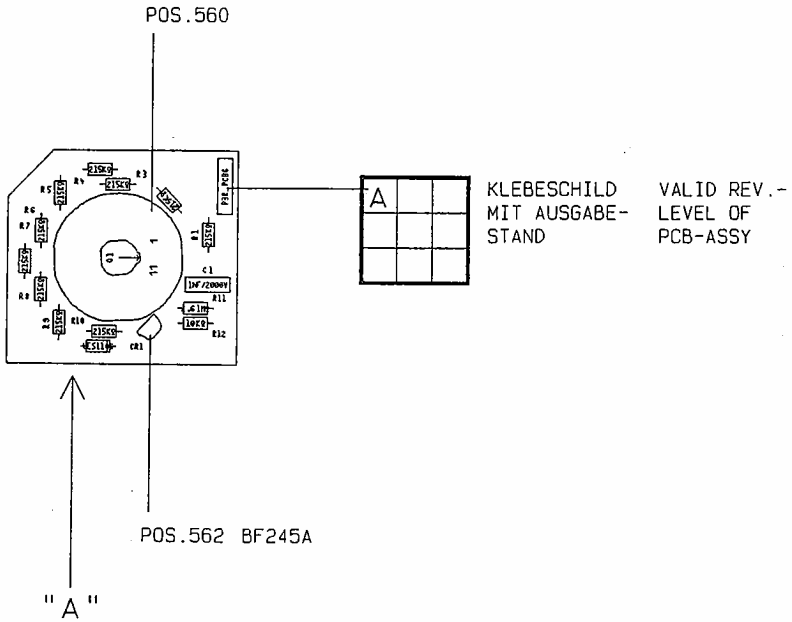
					Day	Name	Subject	P3RALP5P.ASS
				draw	030394	HARN	ASSEMBLY DRAWING P3RALP5P	
				chec			PCB5 DUAL SENSOR 341	
				norm				
				PERKIN-ELMER			Drawing-number	341.01-75-00-00-000
				Bodenseewerk			Ident-number	B2 101 053
FRG	03398	030394	GO	Perkin-Elmer			Sheet	1 of 1
Rev	Rev-Info	Day	Name	GmbH			Replace for	Format
							Replaced with	DIN A 3

LIST OF MATERIAL of job P3RALP6P DATE: 17.05.1994 PAGE: 1
PCB6 PM-CIRCUIT 341 Rev: RA Ident-Number: B2 101 062
Drawing-Number: 341.01-76-00-00-000

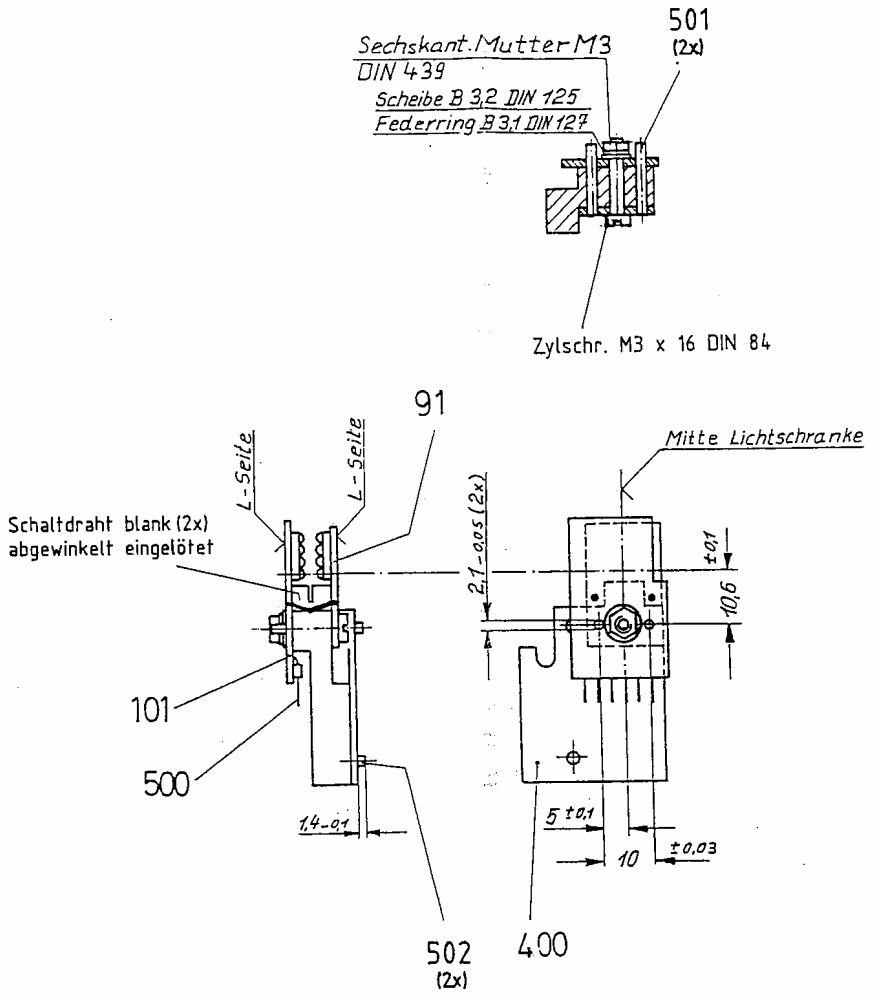
Data extracted from Circuit Diagram: SERVO CONTROL SYSTEM
Rev: FRG Ident-No.: B2 101 074 Drawing No.: 341.01-77-00-00-902

Item	Qty	Ident-No.	Description
902	0	B2 101 074	Stromlaufplan SERVO CONTROL SYSTEM Drawing No.: 341.01-77-00-00-902
999	0	B2 101 065	Leiterplattenlebenslauf PCB6 PM-CIRCUIT 341 Drawing No.: 341.01-76-00-00-999
201	1	B2 101 061	Roh-Leiterplatte PCB6 PM-CIRCUIT 341 Drawing No.: 341.01-76-00-00-201
505	10	B0 060 928	MetRes 10grid 215KOhm .5W Roederst.MK2 R1, R2, R3, R4, R5, R6, R7, R8, R9, R10
506	1	B0 143 570	MetRes 10grid 2.61MOhm .5W Roederst.MK2 R11
507	1	B0 060 896	MetRes 10grid 10kOhm .5W Roederst.MK2 R12
518	1	B0 507 154	CerCap 7.5grid 1NF 2000V Roederstein C1
539	1	B0 138 404	Diode UES1106 400V 2A Unitrode CR1
560	1	B0 077 782	Socket 11pol Photomultiplier 0037.4802-00 Schurter Q1
561	1	B0 100 647	Befestigungsfederring B.NR.635-0005 Schurter Q1
200	1	B2 100 104	PM-HALTEWINKEL 341.01-15-00-00-200 BSW WINKEL
562	1	B0 074 856	MosFet to92 BF245A n.cha.mo.fet Mot Q2

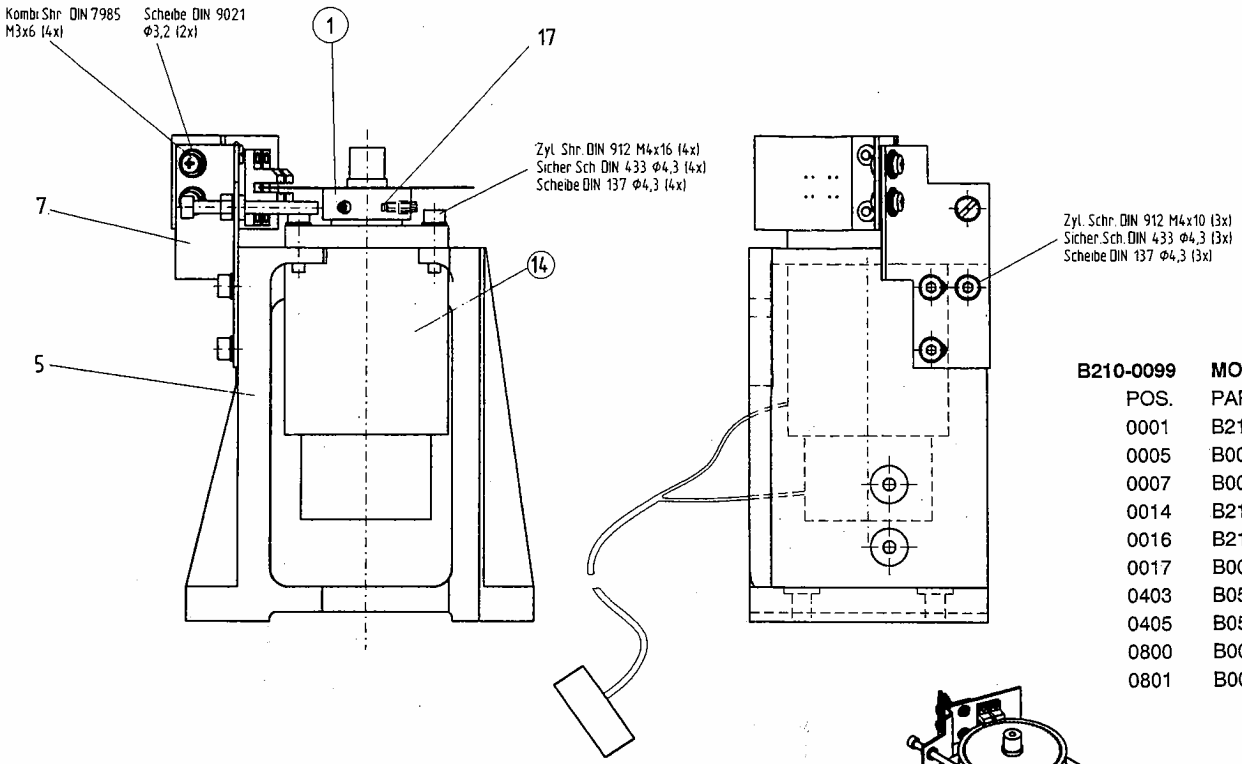


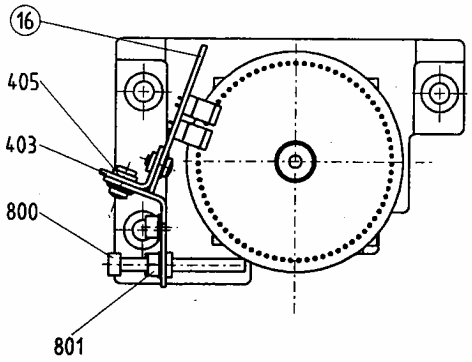


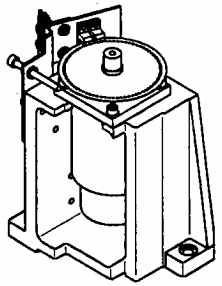
					Day	Name	Subject	P3RALP6P.ASS
				draw	180594	HARN	ASSEMBLY DRAWING P3RALP6P	
				chec	8.6.94		PCB6 PM-CIRCUIT 341	
				norm				
				PERKIN-ELMER			Drawing-number	341.01-76-00-00-000
				Bodenseewerk Perkin-Elmer GmbH			Ident-number B2 101 063	Sheet 1 of 1
FRG	03128	180594	HARN				Replace for	Format
Rev	Rev-Info	Day	Name				Replaced with	DIN A 3



					Maße bes. geprüft		Gewicht	Werkstoff		
						Tag	Name			
					Bearb.	22.6.87	Mayer	Benennung		Maßstab
					Gepr.	6.7.87		Light Barrier Swing AS70		1 : 1
					Norm			Zeichnungs-Nummer	287.29-50-01-89-000	
A	28133	9.9.93	GO	PERKIN-ELMER					Mont.-Nr. BO 173 208	
FRG	2015	15.6.87	MT	Bodenseewerk Perkin-Elmer & Co GmbH				Ersatz für		Format
Änd.-Ref.	Änderungs-Mitteilung	Tag	Name					Ersetzt durch		DIN A4



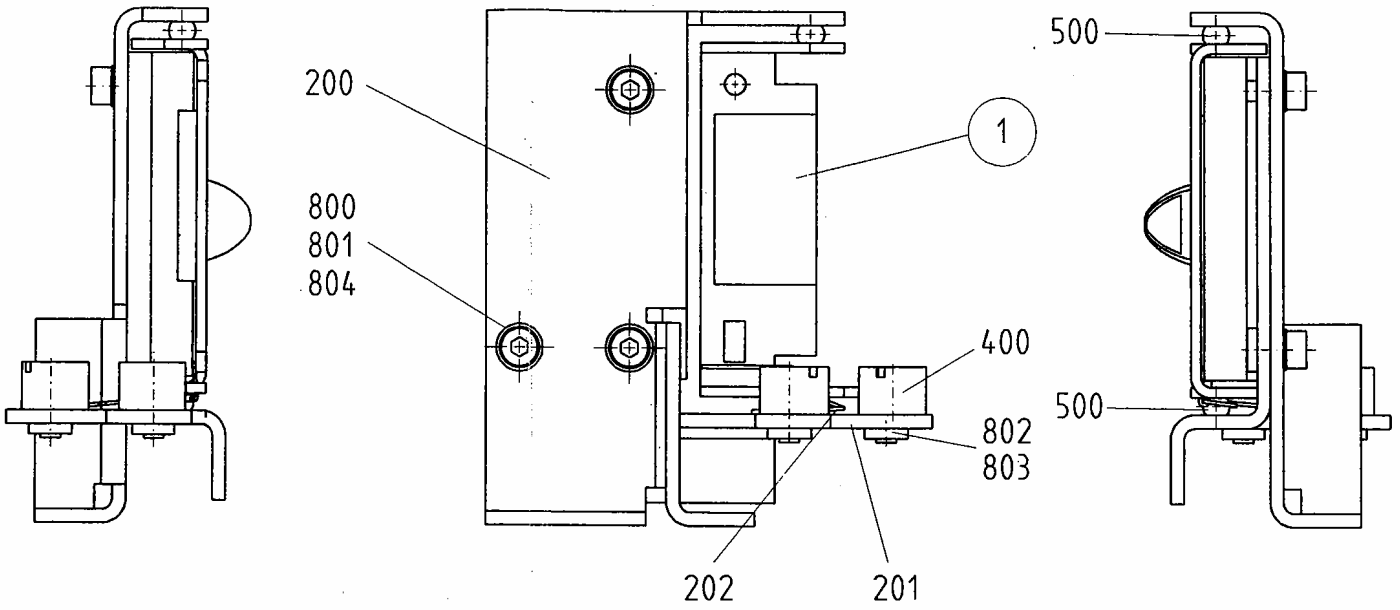




B210-0099 MOTORBLOCK / OPTICAL ENCODER ASSY

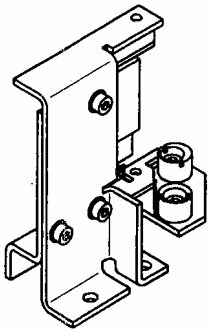
POS.	PART NO	NAME
0001	B210-0100	MOTORRITZEL / MOTOR GEAR (75 HOLES)
0005	B006-5082	MOTORBOCK / MOTOR SUPPORT
0007	B006-5083	WINKEL / BRACKET
0014	B210-1154	SERVOMOTOR WITH PLUG
0016	B210-1053	PCB 5 DUAL SENSOR
0017	B005-3630	DRUCKSCHEIBE / THRUST DISK
0403	B050-5747	PCB-WINKEL 7 PCB BRACKET (LP52)
0405	B050-5958	MUTTERNBLECH / UNDERLAY
0800	B002-9140	ZYLINDERSCHRAUBE / SOCKET HEAD SCREW
0801	B000-4209	SECHSKANTMUTTER / HEX NUT M 4 A2

Projektionsmeth 1 (first angle) | Maße bes. geprüft | Gewicht | Werkstoff
1994 | Tag | Name
Bearb. 11.05 | Siesenberg
Gepr.
Norm
Benennung: Motorblock kpl 341 | Maßstab: 1:1 (1:2)
Zeichnungs-Nummer: 341.01-05-00-00-000
Ident-Nr.: B210 0099
PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH
Ersatz für
Ersetzt durch
Format: DIN A2
Frg 03427 17.05.94 Er
Änd.-Zust. | Änderungs-Mitteilung | Tag | Name



B210-0024 DREHSPIEGEL / MIRROR ASSEMBLY

POS.	PART NO	NAME
0001	B210-0052	DREHSPIEGELHALTER / MIRROR MOUNT ASSY
0200	B210-0056	DREHSPIEGELWINKEL 1 / MIRROR BRACKET 1
0201	B210-0057	DREHSPIEGELWINKEL 2 / MIRROR BRACKET 2
0202	B210-0062	DREHSPIEGELFEDER / MIRROR SPRING
0400	B050-5606	EXZENTER / CAM
0500	B003-9094	KUGEL / BALL 4 MM DIN 5401
0800	B004-8771	ZYLINDERSCHRAUBE / SOCKET HEAD SCREW
0801	B000-7788	FEDERRING / SPLIT LOCK WASHER 4 MM DIN 127
0802	B005-5872	ZYLINDERSCHRAUBE / SOCKET HEAD SCREW
0803	B002-3722	FEDERSCHEIBE / SPLIT LOCK WASHER DIN 137
0804	B000-8268	SCHEIBE / WASHER 4.3 NRST DIN 125



Projektionsmeth 1 (first angle) | Maße bes. geprüft | Gewicht | Werkstoff

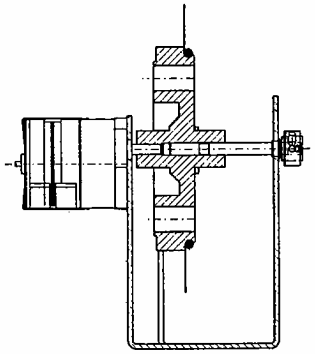
				1993	Tag	Name
				Bearb.	09.12	Giesenberg
				Gepr.		
				Norm		
Frg	03369	17.01.94	Gi			
Änd.-zust.	Änderungs-Mitteilung	Tag	Name			

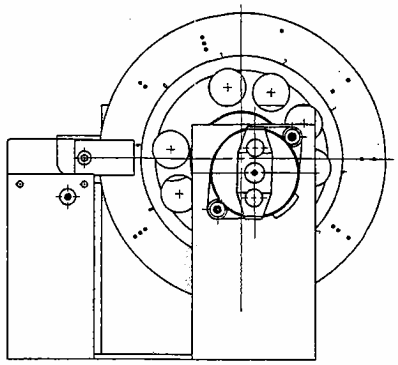
PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH

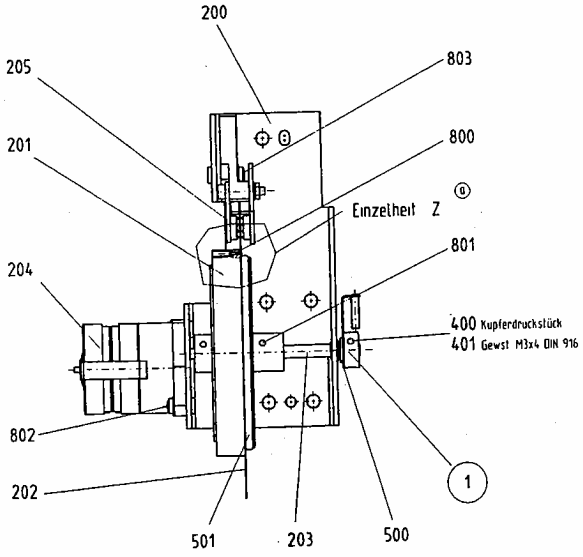
Benennung: Drehspiegel kpl. | Maßstab: 2:1 (1:1)
Zeichnungs-Nummer: 34101-08-00-00-000
Ident-Nr.: B210 0024
Ersatz für | Format: DIN A 2
Ersetzt durch

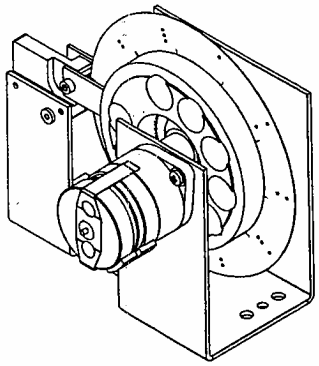
B210-0026 FILTERRAD / FILTER TURRET

POS.	PART NO	NAME
0001	B210-0072	SPIEGELTRANSPORT / MIRROR TRANSPORT
0200	B210-0041	FILTERRADWINKEL / FILTER TURRET BRACKET
0201	B210-0042	FILTERRAD / FILTER TURRET
0202	B210-0043	FILTER CODIERSCHEIBE / FILTER CODING DISK
0203	B210-0045	ACHSE FILTERRAD / FILTER TURRET SPINDLE
0204	B016-6343	SCHRITTMOTOR / STEPPER MOTOR RDM 37 / 6
0205	B017-3208	LIGHT BARRIER SWING AS 70
0500	B004-8736	NYLINERS 5 X 6.2 X 3.2
0501	0990-2166	O-RING ID 72.62 x 3.53 70 SH
0800	B000-7816	ZYLINDERSTIFT / STRAIGHT PIN ISO 2338
0801	B004-5298	GEWINDESTIFT / GRUB SCREW M 3 X 4 DIN 916
0802	B015-8255	KOMBI-SCHRAUBE / COMBI SCREW DIN 7985
0803	B019-0661	KOMBI-SCHRAUBE / COMBI SCREW DIN 7985

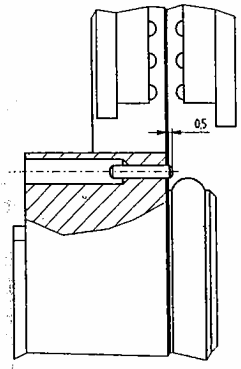




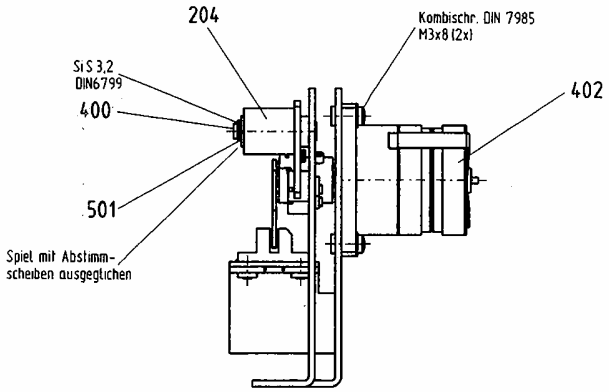


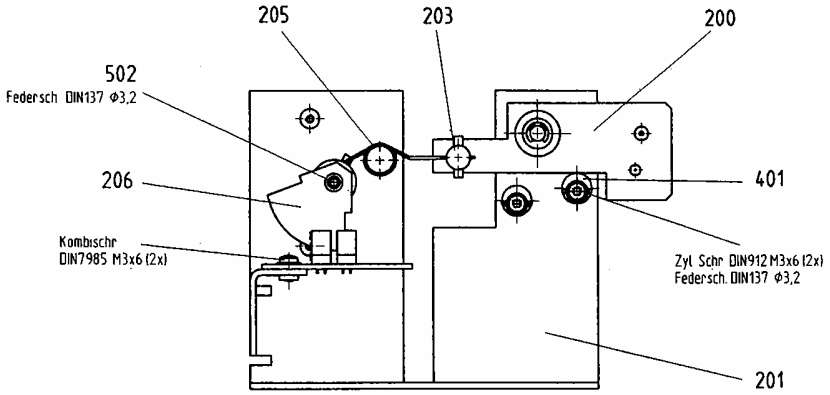


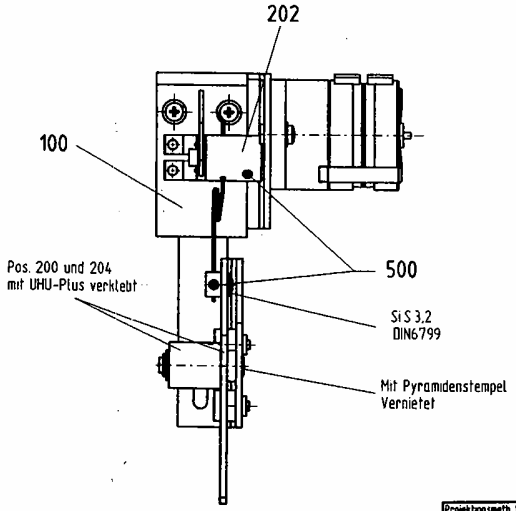
Einzelheit Z M5 1

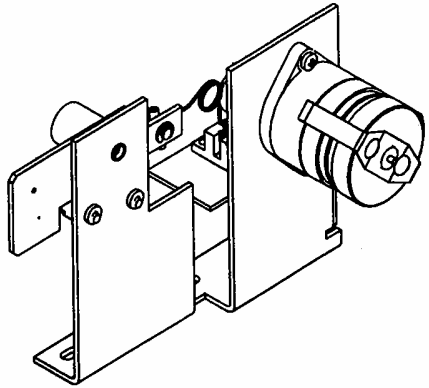


Projektionsmeth. 1 (first angle)				Maße bes. geprüft		Gewicht	Werkstoff		
				1994	Tag	Name	Benennung	Filterradgruppe kpl	Maßstab 1:1
				Bearb	14.01	Giesenberg			
				Gepr	14.01	Rimpler			
				Norm			Zeichnungs-Nummer	341.01-11-00-00-000	
				PERKIN-ELMER				Ident-Nr. B210 0026	
a	28841	9.6.94	Gi						
Frg	03369	17.1.94	Gi	Bodenseewerk			Ersatz für		Format DIN A 1
Änd.-zust.	Änderungs-Mitteilung	Tag	Name	PERKIN-ELMER GmbH			Ersetzt durch		





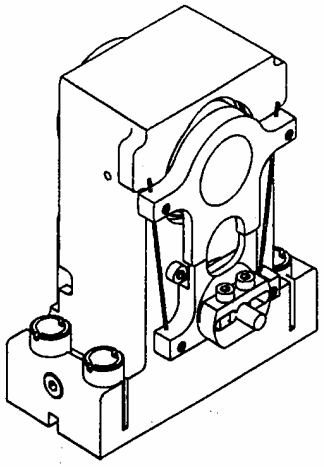




B210-0027 BLENDE / APERTURE

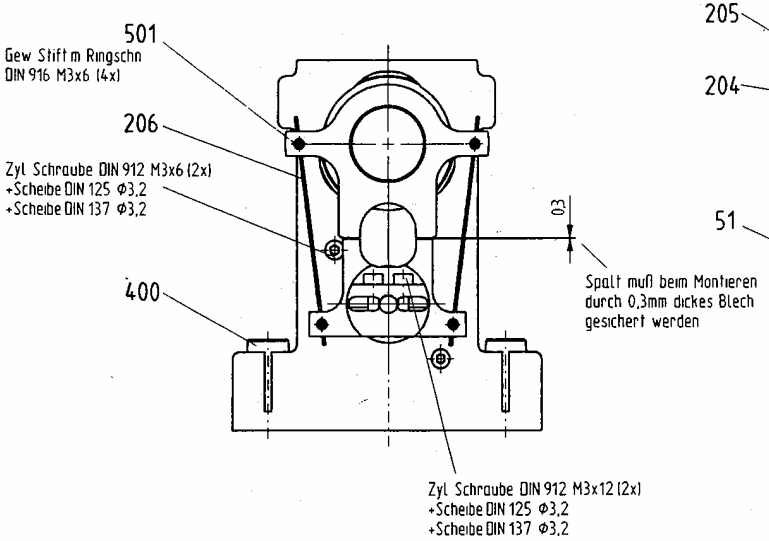
POS.	PART NO	NAME
0100	B210-1053	PCB 5 DUAL SENSOR
0200	B210-0087	BLENDE / APERTURE
0201	B210-0093	WINKEL / MOUNT
0202	B210-0094	NABE / HUB
0203	B210-0095	BOLZEN / BOLT
0204	B210-0096	NABE FÜR BLENDE / APERTURE HUB
0205	B210-0097	BLENDENFEDER / APERTURE SPRING
0206	B210-0098	CODIERFAHNE / CODING SECTOR
0400	B006-2700	LAGERBOLZEN / BEARING BOLT
0401	B050-5606	EXZENTER / CAM
0402	B016-6343	SCHRITTMOTOR / STEPPER MOTOR RDM 37/6
0500	B005-5889	GEWINDESTIFT / SCREW DIN 913
0501	B002-9587	SCHEIBE / WASHER 5.3 NRST DIN 433
0502	B005-5871	ZYLINDERSCHR. / SCREW M 3 X 5 DIN 912

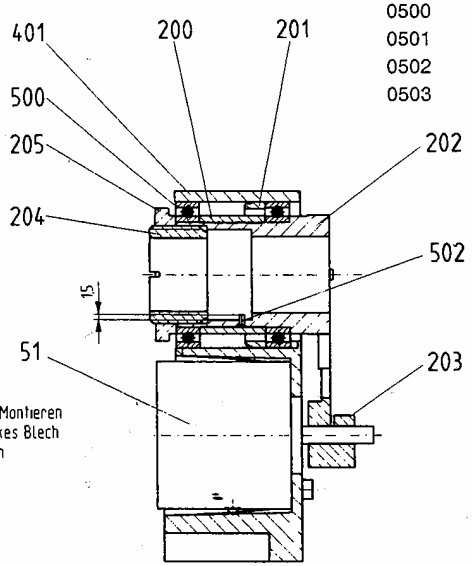
Projektionsmeth 1 (first angle) | Maße bes. geprüft | Gewicht | Werkstoff
1994 | Tag | Name
Bearb | 24.02 | Giesenberg
Gepr
Norm
Benennung: Blende kpl. | Maßstab: 1:1
PERKIN-ELMER
Bodenseewerk Perkin-Elmer GmbH
Zeichnungs-Nummer: 341.01-12-00-00-000
Ident-Nr: B210 0027
Ersatz für
Ersetzt durch
Format: DIN A2
Änd.-zust. | Änderungs-Mitteilung | Tag | Name
Ers | 03393 | 24.02.94 | Gi

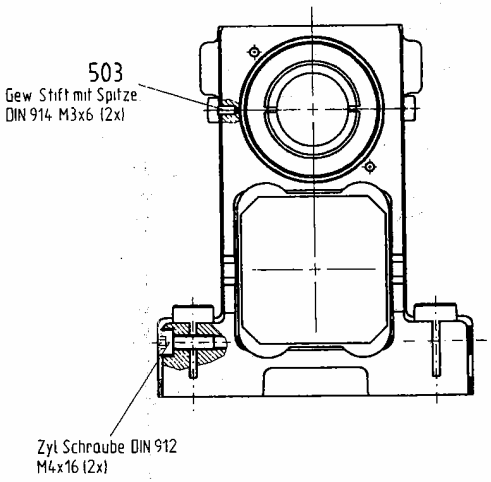


B210-0028 SCHWINGPOLARISATOR / OSCILLATING POLARIZER

POS.	PART NO	NAME
0051	B210-1153	SCHRITTMOTOR / STEPPER MOTOR WITH PLUG
0200	B210-0076	DISTANZRING / SPACER
0201	B210-0077	SPANNHUELSE / COLLAR
0202	B210-0080	FASSUNG / SOCKET
0203	B210-0078	GEGENLAGER / BRACKET
0204	B210-0079	SCHLITZMUTTER / SLOTTED NUT
0205	B210-0082	RAENDELMUTTER / KNURLED NUT
0206	B210-0081	FEDER DRAHT / POLARIZER WIRE
0400	B008-3389	SCHRAUBE / SCREW
0401	B050-6552	LAGERBOCK / SUPPORT
0500	0990-0029	KUGELLAGER / BALL BEARING 30 x 42 x 7
0501	B004-5299	GEWINDESTIFT / GRUB SCREW DIN 916
0502	B002-9045	ZYLINDERSTIFT / STRAIGHT PIN ISO 2338
0503	B005-5873	GEWINDESTIFT / GRUB SCREW M 3 X 6 DIN 914

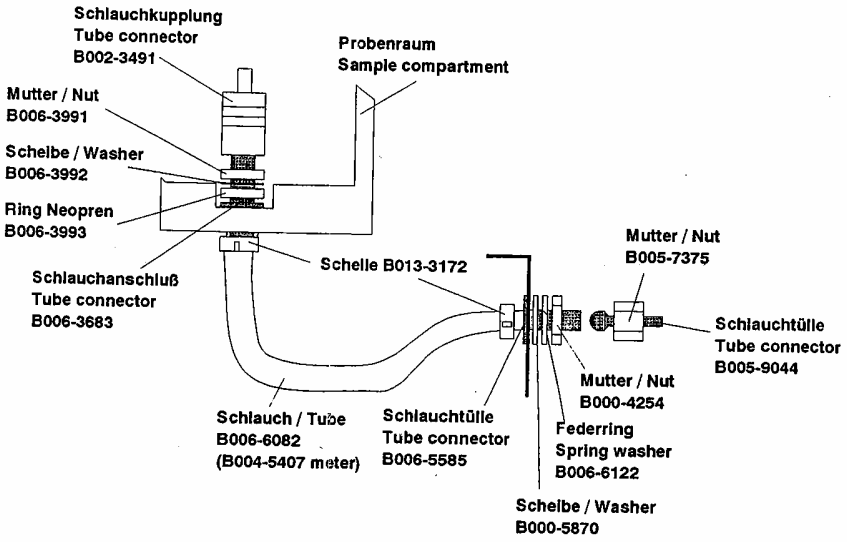






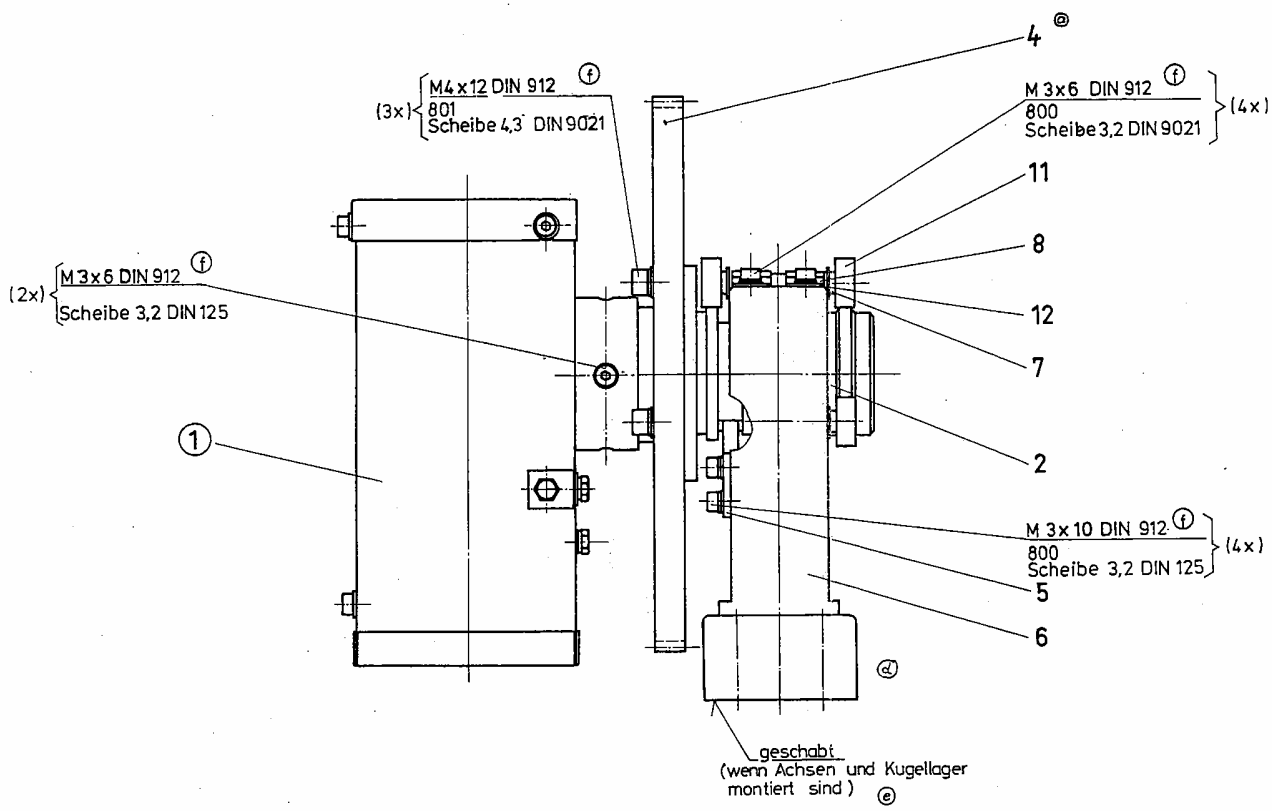
Projektionsmeth 1 (first angle)				Maße bes geprüft		Gewicht	Werkstoff		
				1994	Tag	Name	Benennung		Maßstab
				Bearb	02.02	Giesenberg	Schwingpolarisator 341 mt		1 1
				Gepr	02.02	Remmele			
				Norm			Zeichnungs-Nummer	34101-16-00-00-000	
				PERKIN-ELMER				Ident-Nr. B210 0028	
Frg	03381	4.2.94	Gi	Bodenseewerk Perkin-Elmer GmbH			Ersatz für		Format
Änd.-zust	Änderungs-Mitteilung	Tag	Name				Ersetzt durch		DIN A 2

Polarimeter Wasser Anschluß
Polarimeter water connection



B210-0025 KÜVETTENAUFNAHME

POS.	PART NO.	NAME
0001	**B050-6544**	**KUEVETTENHALTER KPL.**
0001	B050-6542	AUFNAHMEBLECH KPL.
0002	B050-6543	VERTIKALWINKEL KPL.
0202	B050-5997	HORIZONTALWINKEL
0800	B003-2652	SICHERUNGSSCH. 3,2 DIN 6799
0004	**B006-3980**	**SCHWENKARM KPL.**
0001	B006-3983	SCHWENKARM GESCHWEISST
0003	B006-3981	LAGERBOLZEN
0004	B006-3982	SCHEIBE
0005	B006-4294	PROFILGUMMI
0005	**B050-6538**	**TRAEGER KPL.**
0006	**B006-3986**	**DISTANZROHR**
0007	**B006-3987**	**KUEVETTENHALTER**
0009	**B050-6547**	**KUEVETTENSTANGE**
0011	**B006-3991**	**GEWINDERING**
0012	**B006-3992**	**SCHEIBE**
0013	**B006-3993**	**RING**
0014	**B006-3994**	**ISOLIERPLATTE**
0016	**B015-2279**	**DRUCKFEDER**
0017	**B006-3683**	**VERSCHLUSSNIPPEL K 2235**
0018	**B051-0305**	**ADAPTERPLATTE KPL.**
0100	B051-0304	ADAPTERPLATTE
0500	B006-4634	MIKROSCHALTER E 63-30K
0800	B000-7424	ZYLIN.SCHR. M 2 X 8 DIN 84
0801	B002-3725	FEDERSCHEIBE 2,3 DIN 137
0020	**B006-5534**	**ABFLUSSROHR**
0022	**B005-5878**	**ZYLIN.SCHR.M 4 X 16 DIN 912**
0028	**B006-4433**	**PASSKERBSTIFT DIN 1469**
0031	**B002-3612**	**BEF.SCHELLE 1 X 3,2**
0124	**B210-0063**	**HEBELGRUPPE**
0200	**B210-0115**	**BINDSTOPFEN**



B005-9937 SCHNECKENRADLAGER KPL.

POS.	PART NO.	NAME
0001	B005-9936	PM GEHAEUSE KPL.
0002	B001-6673	OPTIKTRAEGER,VOLLST.
0003	B001-6679	SCHNECKENRAD,VOLLST.
0004	B006-8959	SCHRAEGZAHNRAD,KPL.
0005	B001-7471	BEGRENZUNGSLAGER
0006	B007-1661	LAGERBOCK
0007	B001-6671	ACHSE
0008	B001-6779	BLATTFEDER
0011	B000-8790	KUGELLAGER DIN625
0012	B000-7772	SICHERUNGSSCH. DIN6799
0015	B050-7328	LP 55 PM-CIRCUIT U
0800	B000-7616	FEDERRING 3,0 DIN127
0801	B000-7788	FEDERRING 4,0 DIN127

Änd.-zust.	Änderungs-Mitteilung	Tag	Name
f	27554	16.11.92	MN
e	17740	6.4.83	Wos
d	11618	29.1.76	Gn.
c	10120	8.1.74	Lumpp
b	03846	27.9.73	Lumpp
a	09476	30.05.73	Gö
	Fr.Nr.0019004.9.72		

Maße ohne Toleranzangabe | Gewicht | Maße bes. geprüft | Werkstoff

	Tag	Name
Bearb.	26.7.72	
Gepr.	26.7.72	
Norm		

PAE GROUP
BODENSEEWERK PERKIN-ELMER & CO GMBH

Benennung: Schneckenradlager, kpl. | Maßstab: 1:1

Zeichnungs-Nr.: 241.01-03-00-00-000

Ersatz für | Ersetzt durch | Ident.-Nr.: 059937

PERKIN ELMER
Bodenseewerk Perkin-Elmer GmbH Überlingen
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Subj.: Polarimeter 341 Firmware Version 2.10

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PROBLEM:

N/A

PURPOSE:

To provide the Firmware Version 2.10 to FSE

MATERIAL REQUIRED:

B210-1122 Firmware V 2.10 E-Prom set (2 pcs.)

GENERAL:

Extended function and debugging. Communications Protocol for instrument control by a computer.

PROCEDURE:

See Page 2

Approvals	Date	Signature
Prod. Line Manager	12.6.96	
Quality & Reliability		
Author	12.06.96	

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1. What is new in 2.10 ?

The main feature of version 2.10 is the possibility for external control of the polarimeter. Moreover it includes a variety of new functions and modifications, as well as some minor corrections (debugging). The present information sheet describes the major innovations in version 2.10 as compared to the earlier version 1.00.

2. What should be given attention during update?

Version 2.10 is suitable for the update of all polarimeters of the series 341/343. On PCB 74 / 5 Processor the two EPROMs IC 4 M and IC 7 M have to be replaced.

The firmware version 2.10 is downwards-compatible to the earlier version 1.00 without any restrictions.

A configuration option guarantees downwards compatibility to the earlier **electronics versions:**

In case the instrument is equipped with old hardware (PCB 1 Rev. A, PCB3 Rev. A / B or PCB 7 Rev. A), the instrument has to be configurated to **electronics version 1** via test program #81.

Default setting after update or first installation is **electronics version 2** (requires at least PCB 1 Rev. B, PCB 3 Rev. C and PCB 7 Rev. B).

After update from 1.00 to 2.10 the instrument will revert to a „virginal" status!
Before installation: make a note of counter readings (test program #4...#7)
After installation: Restore counter readings and other instrument-specific parameter settings (test program #91...#98). Extended instrument-specific pre-settings are possible (test program #81...#86).

3. New functions

Complete external instrument control via PC or similar via serial RS232 interface. The interface and the communication protocol are described in detail in a separate documentation (not yet released to date).

In the Config menu an additional parameter page provides information on the on-line status and offers the possibility for off-line status.

The HELP key, during on-line operation, indicates "Polarimeter is Online, Entry disabled"

In the Config menu the function "AutoBalance" now may be switched on or off (is functioning from electronics version 2 onwards!)

Fan control is lamp-sensitive, i.e. if Na lamp only is in operation, the right-hand fan will be operating, if Hg lamp or both lamps are in use, both fans will operate (is functioning from electronics version 2 onwards - at electronics version 1 both fans operates!)
- check feasible via test program #28 -

In the Config menu the function "HPLC MODE" now may be switched on or off. On set the Servo-System to energy sensitive control (is functioning from electronics version 2 onwards!)

Mode HPLC set the Servo-system control is energy-sensitive, i.e. if the energy falls below a defined minimum value, the servo-system is stopped automatically. The display show "SERVO DEACTIVATED" (is functioning from electronics version 2 onwards!)
- may be set via test program #98 -

Angle value with sign +/- for direction of rotation, also for positive values
- may be deactivated via test program #84 -

Automatic rounding for SROT/MROT angle values
- may be deactivated via test program #85 -

Detailed analysis report with Energy, SDEV, Aperture
- may be activated via test program #86 -

Variable pre-settings for adaptation of various filter wheel motors
- may be adapted via test programs #82 and #83 -

Endurance test for filter wheel, with special error treatment
- may be called up via test program #27 -

10 additional test programs: #27, #28, #80, #81, #82, #83, #84, #85, #86 and #98

3.1. Test program no 2 and 3 printout

PERKIN-ELMER Polarimeter 341
Serial No. 7004

Test program #2

TEST PROGRAMS AT A GLANCE

	MISCELLANEOUS		HARDWARE DIAGNOSE I
0	Leave test mode	10	Display overview
1	Display test table	11	Display test
2	Print test table	12	Keyboard test
3	Print instrument inspec. Sheet	13	Temperature sensor (cts / deg)
4	Recall Na/Hal-lamp elap. time	14	Energy signal (cts / %)
5	Recall Hg-lamp elap. time	15	Sample lid sensor
6	Recall instrument elap. time	16	Endstop switch left / right
7	Recall measurement counter	17	Ext. Auto Zero input signal
8	Recall temp. sensor offset	18	Ext. Ready output signal
9	System reset	19	Beeper test
	HARDWARE DIAGNOSTICS II		HARDWARE DIAGNOSTICS III
20	CPU test	30	...
21	ROM test	31	...
22	RAM test	32	...
23	Light barrier filter wheel	33	...
24	Light barriers aperture	34	...
25	Rotation Signal (cts / deg)	35	...
26	Lamp power supply positions	36	...
27	Filter wheel test	37	...
28	Ventilator test	38	...
29	...	39	...
	PRE-SETTING I/COMPABILITY		PRE - SETTINGS II
80	Display pre-setting overview	90	Display pre-setting overview
81	Electronic version	91	Set serial number
82	Steps per filter position	92	Set model number
83	Filter motor time-out	93	Set Na/Hal-lamp elap. time
84	Rotation sign (+)	94	Set Hg-lamp elap. time
85	SROT/MROT Rotation rounding	95	Set instrument elap. time
86	Detailed analytical report	96	Set measurement counter
87	...	97	Set national anthem
88	...	98	Set Low Energy limit
89	...	99	Make instrument virginal

Test program #3

INSTUMENT INSPECTION SHEET

Instrument Software Version: 2.10x - released at : 18.01.96

Elap. Time Meter Instrument: 876 hours
Elap. Time Meter Hg-Lamp: 860 hours
Elap. Time Meter Na-Lamp: 867 hours
Measurement Counter: 163 prints (Print Cont. = 1 x Print)

Power Supply for Hg-Lamp: INSTALLED - Position: Front
Power Supply for Na-Lamp: INSTALLED - Position: Back
Temperature Sensor: NONE - Offset: deg. Celsius

Filter Wheel	Position	1 :	578 nm	-	Default : 578 nm
	Position	2 :	546 nm	-	Default : 546 nm
	Position	3 :	436 nm	-	Default : 436 nm
	Position	4 :	365 nm	-	Default : 365 nm
	Position	5 :	[---]		
	Position	6 :	[---]		
	Position	7 :	[---]		
	Position	8 :	[---]		
	Position	9 :	589 nm	-	Default : 589 nm (Na)
	Position	10 :	[OFF]	-	Unchangeable
Pre-Settings	National Anthem:		OFF	-	Default: OFF
	Rotation Sign(+):		YES	-	Default: YES
	Rotation Rounding:		YES	-	Default: YES
	Detailed A.Report:		NO	-	Default: NO
	Low Energy Limit:		5 %	-	Default: 5 %,for HPLC Mode
Compability	Electronic Version:		1	-	Default: 2 (check PCB's!)
	Steps per filter:		60	-	Default: 60 motor steps
	Filter time-out:		10	-	Default: 10 motor steps

Bodenseewerk Date : 05.03.1996 16:58:05

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Inspector

4. Modifications

Parameter monitoring sensitive to the operation mode, i.e. if, during the printing process, a relevant parameter setting is changed, a new printout will be generated taking into account the respective modifications.

Tabular printout protocols for PRINT CONT. and PRINT TABLE completely rewritten; with heading and concentration output specific to operating mode.

Extended functionality of external keyboards. An externally connected keyboard now also supports the CE function (DEL/ENTF key), as well as the numerical block of keys (NUM function and NUM-LED are permanently active).

Extended support of external keyboards. The new keyboard driver now supports "7-Bit" as well as "8-Bit" MF2 keyboards (PC-AT standard) with 5pole DIN or PS/2-plug

The WAVLEN menu skips over unused filter positions.

Changed user guidance: Instead of "Wavelength <->Lamp" the error code is referring to the wavelength, e.g. for 589 nm: "Na-Lamp switched off"

Time display: In the Config menu the display, instead of "TIME/DATE", now is "CLOCK mm/dd/yy hh:mm". The real-time clock is updated continuously.

Automatic software reset
- when deleting an HW error with CE key (until now: switching on/off)
- Test program #9, "Software Reset" may be released after safety check
- in test program #99, after execution of "Make Instrument virginal"

Uniform terminology in user guidance based on periodic system: Hg instead of HG, Na instead of NA

Software driver initialisation for HP DeskJet series was extended so as also to ignore any possible erroneous settings in the printer command field.

Test printouts / test programs were extended comprehensively
- may be called up via test programs #2 and #3 -

5. Debugging

The Checksum calculation for the testprograms #92, #97 and #98 are corrected.

For all Float parameter entries via instrument keyboard rounding tolerances were introduced.

All angle values (and also all derived parameters), after ZERO, are set to the zero point.

The rotation value UROT is now always displayed without ^{o} sign.

The Scroll function (PREV/NEXT) within the sub- menu "User" was corrected

When any lamp default occurs, the respective operating hours counters of the Hg- / Na lamps will stop

Error at bar code input overrun eliminated

With PRINT CONT. the time axis now always starts with "0"

When, during printout, the sample data are deleted (by CE), a new page will be started

Automatic page change (FF) after switchover from PRINT CONT. to PRINT REPORT was corrected

When no printer is connected - display: "No Printer connected", - the sample data are no longer deleted after the PRINTcommand
(If, at the Centronics interface, no printer is detected within 3 s, the data already deleted are restored automatically)

When no printer is connected - display: "No Printer connected", - the error may also be deleted in the test mode with CE or HELP.

6. RS 232C Interface Description

The Interface is descriced in the Operators Manual. This short Interface description is not to replace the Manual. It includes only the most important parts.

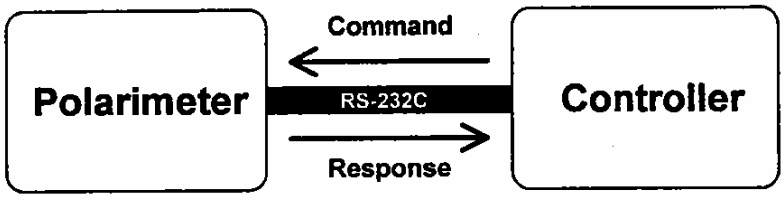
6.1. Introduction

Perkin-Elmer Polarimeter 34X models with Firmware 2.1 or higher are prepared for remote control by an external computer, e.g. a PC. In this document all different Polarimeter models are always simply called "*Polarimeter*", and the external device or computer is always simply called "*Controller*". This document shows and explains the possibilities of remote controlling the *Polarimeter* by an *Controller* via the serial RS-232C interface.

For instance this external device could be simply a PC with *Microsoft Windows™ 3.1*, using the "Terminal"-Software (part of the group "Accessories").

6.2. Configuration

The serial RS-232C interface of the *Polarimeter* has to be connected to the interface of the *Controller* via a standard RS-232C cable (see figurebelow). The interface has a male "CANNON-D" connector with 25 pins.



Pin #	Signal	Significance
02	TxD	Transmitted Data
03	RxD	Received Data
04	RTS	Request To Send
05	CTS	Clear To Send
06	DSR	Data Signal Ready
07	GND	Signal Ground
08	DCD	Data Carrier Detect
20	DTR	Data Terminal Ready

Pin # 01 is not connected to the shield

Interface Port

The RS-232C Interface can be used for connecting a printer, as well as for communication (remote control).

After pressing the *Config*-key and several times pressing the *Next*-key, the instrument shows the following display inside the menu.

```
Printer Port?
SERIAL     | |PARALLEL
```

PARALLEL
If a printer is connected to the Centronics interface the parallel port has to be selected. Then the serial port can be used for a bi-directional communication.

SERIAL
If the printer is connected to RS-232C interface the serial port has to be selected. Then only a uni-directional communication to the printer is possible.

Printer Port	Printer	Communication
PARALLEL	connected to Centronics	possible via RS-232C
SERIAL	connected to RS-232C	not possible!

Communication Parameters

The default data transmission format used is shown below.

BAUD RATE..... 9600 bit/s
DATA BITS 8
PARITY BIT..... NONE
STOP BITS 1

After pressing the *Config*-key and several times pressing the *Next*-key, the instrument shows the following display inside the menu.

```
RS232 Interface...
Modify?    ||NO
```

Select "YES" to enter the submenu and configure the required communication parameters (baudrate and data transmission format) corresponding to the *Controller* as described in the "Polarimeter 341/343 User Documentation".

6.3. Operation

Offline Operation

After power-on or after receiving a "offline" request - via communication interface or manually via the instrument keyboard - the instrument is always in "offline" operation, i.e. the *Polarimeter* is released by a connected *Controller*.

For the Polarimeter applies:

The instrument operation is not limited, and all functions are accessible as described in the standard user documentation.

For the Controller applies:

All instrument parameters are recallable (via GET commands). But commands (e.g. ZERO) or parameter value modifications (via SET commands) remain disabled. Example: The response to a not accepted SET command is always " ERROR: 10 INSTRUMENT_IS_OFFLINE<CR>"

Online Operation

After receiving a "online" request, the instrument switches to "online" operation, i.e. the *Polarimeter* is seized by a connected *Controller.*

For the Polarimeter applies:

The instrument operation is not disabled, but limited. All parameters remain recallable, but modifications of parameter values are disabled: After pressing the *Enter*-key, the entry is aborted and the actual valid (unmodified) value is shown. The *Help*-key shows for all parameters:

```
Polarim. is "online"
   ENTRY DISABLED!
```

After pressing the *Config*-key, the instrument shows the following additional function as first display inside the *Config*-menu.

```
Polarim. is "online"
Offline?     ||NO
```

This function allows the user to switch manually back to "offline" operation, i.e. release the *Polarimeter* from the *Controller.*

If the function is requested by selection of "YES" (with key ¢ or £), the instrument confirms the action by the following display

```
   POLARIMETER IS
      "OFFLINE"
```

For the Controller applies:

The remote control operation is not limited, and all functions are accessible as described in this documentation. All functions initiated by the *Controller*, or parameter values set via *Controller* are shown or are recallable at the instrument.

6.4. Communication Protocol

6.4.1. General Syntax Agreements

The following agreements with the command syntax are made.

Command Types

This *Polarimeter* Communication Protocol distinguishes only three kind of commands (sent by the *Controller*):

direct executable command
executes a function
(e.g. PRINT or ZERO)

GET command
requests a parameter value/-setting/-structure
(e.g. GET COMM or GET WAVLEN)

SET command
sets/adjusts a parameter value/-setting/-structure
(e.g. SET COMM.BAUD or SET WAVLEN).

The response - from *Polarimeter* - to an executable command or to a SET command is usually "OK". A GET command is responded with a single parameter or a parameter structure.

Empty Command

For an empty command "<CR>" the response is always "OK".

Command Abbrevations

The following abbrevations are always supported, but they are not shown in the command syntax within the protocol description.

"S" for "SET"
"G" for "GET"

Note: If additional abbrevations are allowed, they are explained in the corresponding command description.

Parameter Format

The *Polarimeter* accepts many variations for formatting values. Thus the digits in the syntax examples are not strictly necessary. Leading zeros or trailing zeros are allowed. Most parameters are accepted in float format as well as in integer format.

Example: "0010.0" "10.0000" "10." "10" "010"

All this formats may be sent to set the integration time to 10 minutes.

Parameter Separation

To separate different parameters in a structure, a semi-colon " ; " is used. For examples refer to chapter 5.

Note: Trailing semi-colons - after the last parameter value - are not necessary, but permitted.

Command Terminator

The end character (Terminator) of a command or a response is always "Carriage Return" (0D in hexadecimal code). In this document it is always shown as **<CR>**.

Key "Carriage Return": ↵

Reference Tables

The status and error messages always show only a number for the current instrument status or for an error. See Reference Table.

Note: By using the VERBOSE command an additional text string follows the status or error number, separated by one blank sign. This - especially during communication developement - useful message explanation can be activated (SET VERBOSE=ON) or deactivated (SET VERBOSE=OFF). Default is OFF.

6.4.2. Instruction Set

This chapter describes all available commands in detail, e.g. function, syntax and parameter range. The following table shows all available commands at a glance, listed in alphabetical order. The row type shows the classification of the commands (Executable / GET / SET).

Syntax Example for the Function: Select or recall the actual aperture setting

```
Command:    GET APERT<CR>
Response:   OK: APERT=MICRO<CR>

Command:    SET APERT=NORMAL<CR>
Response:   OK<CR>
```

Parameter values : MICRO or NORMAL

Command list

Command	Type
Aperture	G/S
Auto Balance	G/S
Clear Error	E
Communication Parameters Baud Rate - Data Format - Parity - Stop Bits	G/S
Company Name	G/S
Concentration, Sample-	G/S
Energy	G
Enable Communication Parameters	E
Filter Configuration	G
Instrument Configuration Detected Equipment - Instrument-specific data	G
Instrument Identification Model - Software Version - Serial No.	G
Instrument Logbook Elapsed Time Meters - Measurement Counter	G
Integration Time	G/S
Lamp Control Hg Lamp - Na Lamp	G/S
Language	G/S
Mass, Molar-	G/S
Mode, Rotation-	G/S
Offline/Online Operation	E
Pathlength, Cell-	G/S
Print	E
Print Continuous	G/S
Print Format	G/S
Ready Signal Signal Delay - Signal Duration	G/S
Real Time Clock (RTC)	G/S
Recorder Range	G/S
Reset	E
Rotation - Angle	G
Rotation - Result	G
Rotation - All Results	G
Sample Information No. - ID - Name - Comment	G/S
Standard Deviation	G
Status with Status Code Reference Table	G
Temperature, Sample-	G/S
User Factor	G/S

Command list continue

Command	Type
User Offset	G/S
Verbose Function	G/S
Wavelength	G/S
Zero	E

6.4.3. Command Table

Aperture

Parameter values
MICRO or NORMAL

Auto Balance

Parameter values
OFF or ON

Clear Error

Parameter values
—

Communication Parameters

Parameter values

Baudrate [bit/s] :	1200; 1800; 2000; 2400; 4800; 9600; 19200; 38400
Data word length [bit] :	7 or 8
Parity check [type] :	NONE; ODD; EVEN
Stop [bit] :	1 or 2

Notes

COMM is a structure consisting of the four parameters COMM.BAUD, COMM.DATA, COMM.PARITY and COMM.STOP.
All communication parameters may be modified only by access to single parameters of the structure.
The syntax examples for the GET commands shows the default setting.
The abbrevation E for ENABLE is supported.
After every modification of one or more parameters of the communication structure, the above shown ENABLE COMM command must be sent, to make the changes to the structure effective.

Company Name

Parameter values
A string consisting of maximum 40 characters

Notes

All printable ASCII characters (alphanumerics, special characters and national characters) are accepted. ***But don't use a " ; " !***
In this protocol semicolons (;) are exclusively used as parameter separator. Therefore a semicolon will terminate the string.

Concentration, Sample-

Parameter values
0.00001 ... 99.999 g/100ml

Notes
The number format (integer/float) doesn't matter.

Energy

Parameter values
0 ... 100 energy units

Enable

Parameter values
COMM

Notes

Enables all parameters of a structure simutaneously.

Filter Configuration

Access to single parameters of the FILTER structure:

```
Command:    GET FILTER.1<CR>
Response:   OK: FILTER.1=578<CR>
```

Notes

FILTER is a structure consisting of FILTER.1 through FILTER.9.
All filter wheel positions may be recalled separately by access to single parameters of the structure.
The syntax example for FILTER.1 is analogous applicable for FILTER.2 through FILTER.9.
The syntax example for FILTER shows the default setting. For more possible filter types see Wavelength
The displayed filter values [nm] and OFF can be selected by the command WAVLEN (Wavelength)

Instrument Configuration

Parameter values

Temperature Sensor:	p1 = 0 / 1	not detected / detected
Temperature Sensor Offset:	p2 = -3.0 .. 3.0	offset in °Celsius
Hg Lamp Power Supply:	p3 = 0 / 1 / 2	none / front position / back position
Na Lamp Power Supply:	p3 = 0 / 1 / 2	none / front position / back position
Low Energy Limit:	p5 = 0 ... 100	minimum necessary energy units
Electronic:	p6 = 1 / 2	version 1 / version 2 (→ Notes)
Filter Motor Resolution:	p7 = 1 ... 999	motor steps per filter position
Filter Motor TimeOut:	p8 = 1 ... 99	time-out steps
Rotation Sign:	p9 = 0 / 1	only for neg. values / for all values
Spare:	p10 = 0	unused, reserved for later extensions
	p11 = 0	unused, reserved for later extensions
	p12 = 0	unused, reserved for later extensions
	p13 = 0	unused, reserved for later extensions
	p14 = 0	unused, reserved for later extensions
	p15 = 0	unused, reserved for later extensions

Notes

An installed (optional) temperature sensor is detected automatically after power on by the instrument.
Type and position of the installed lamp power supplies are detected automatically after power on by the instrument.
Energy values below the preset limit generate the error message "Low Energy!".
Electronic: PCB1 is the "Motherboard", PCB3 is the "I/O Board", PCB7 is the "Servo Board".
The Electronic version 1 uses PCB1 Rev. A, PCB3 Rev. A or B and PCB7 Rev. A.
The Electronic version 2 uses PCB1 Rev. B, PCB3 Rev. C and PCB7 Rev. B (or later revisions of this PCB's).
For electronic version 1 some functions are disabled e.g. Auto Balance

Instrument Identification

Parameter values

Name:	Model designation, e.g. Polarimeter 341; Polarimeter 343; Polarimeter 341 LC; Polarimeter 343 S
Version:	Software designation, max. 5 digits
Serial Number:	Current number, max. 4 digits

Notes

ID is a structure consisting of the three parameters ID.NAME, ID.VERSION and ID.SERIALNO
All instrument identification parameters may be recalled separately by access to single parameters of the structure.

Instrument Logbook

Parameter values
The response format has the following order:
ETM Instrument; ETM Hg Lamp; ETM Na Lamp; Measurement Counter

Notes

The abbrevation LOG for LOGBOOK is supported.
The elapsed time meters (ETM) are displayed in hours.
The measurement counter counts the executed PRINT commands and/or key strokes. A PRINT CONTinuous sequence is counted as like one PRINT command.

Integration Time

Parameter values
0.1; 0.2; 0.5; 1.0; 2.0; 5.0; 10.0; 20.0; 50.0; 100.0 seconds

Notes

Only one of these fix values is accepted.
The number format (integer/float) doesn't matter.

Lamp Control

Parameter values
OFF or ON

Notes

Only one of these expressions is accepted.

Language

Parameter values
USENGL (US English), UKENGL (UK English), GERMAN, FRENCH*, SPANISH*, ITALIAN*
*... not yet available

Notes

Only one of these expressions is accepted.

Mass

Parameter values
1.0 ... 99999.9 g/mol

Notes

The number format (integer/float) doesn't matter.

Mode

Parameter values
OROT, SROT, MROT, UROT or ZROT

Notes

Only one of these expressions is accepted.
See also commands ALL_RESULTS, ANGLE, RESULT and MODE.

Offline/Online Operation

Parameter values

Notes

The alternative command designations SEIZE and RELEASE (corresponding to ONLINE and OFFLINE) are supported.
An ONLINE command during online operation doesn't have any effects. An OFFLINE command during offline operation is always responded with "ERROR: 10 INSTRUMENT_IS_OFFLINE".

Pathlength

Parameter values
0.1 ... 150.0

Notes

The number format (integer/float) doesn't matter.

Print

Parameter values

Notes

The abbrevation **P** for **PRINT** is supported.
The analysis data may be printed in form of a report or in form of a table.
Every PRINT command initiates a ready signal and is counted by an internal instrument counter Instrument Logbook).

Print Continuous

Parameter values
OFF or ON

Notes

The abbrevation PC for PRINT_CONT is supported.
Only one of these expressions is accepted.
A PRINT_CONT command initiates only one ready signal. This is counted by an internal instrument counter Instrument Logbook).

Print Format

Parameter values
REPORT or TABLE

Notes
Only one of these expressions is accepted.

Ready Signal

Parameter values
0.0 ... 99.9 seconds

Notes
READY is a structure consisting of the two parameters READY.DEL and READY.DUR.
All ready signal parameters may be modified only by access to single parameters of the structure.
The default setting for the ready signal is no delay and 100ms signal duration (READY.DEL=0.0 / READY.DUR=0.1).
The ready signal may be disabled by READY.DUR=0.
The number format (integer/float) doesn't matter.

Real Time Clock (RTC)

Parameter values

Year:	1991 ... 2090 or short form 91 ... 90
Month:	1 ... 12
Day:	1 ... 31
Hour:	0 ... 23
Minute:	0 ... 59

Notes
RTC is a structure consisting of the five parameters RTC.YEAR, RTC.MONTH, RTC.DAY, RTC.HOUR and RTC.MINUTE.
All clock parameters may be modified only by access to single parameters of the structure.
The year is accepted also in short form, e.g. 95 instead of 1995.
The hours are in 24 hours format.
The seconds starts with 0 after setting the minutes.
The number format (integer/float) doesn't matter.

Recorder Range

Parameter values
0.05; 0.5; 5.0; 50.0 ±Ranges

Notes
Only one of these fix values is accepted.
The number format (integer/float) doesn't matter.

Reset

Parameter values

Notes

The response to this command may be garbled.
This command may be useful in case of a hardware error.

Rotation - Angle

Parameter values

Notes

See also commands RESULT and ALL_RESULTS.

Rotation - Result

Parameter values

Notes

The number format for the calculated rotation results is fixed, corresponding to the display on the instrument.
See also commands ALL_RESULTS, ANGLE and MODE.

Rotation - All Results

Parameter values
The response format has the following order:
raw rotation value; OROT; SROT; MROT; UROT; ZROT

Notes

The abbrevation ALL for ALL_RESULTS is supported.
The number format for the calculated rotation results is fixed, corresponding to the display on the instrument.
See also commands ANGLE, MODE and RESULT.

Sample Information

Parameter values

Sample No.:	1 ... 9999
Sample ID:	A string consisting of maximum 40 characters
Sample Name:	A string consisting of maximum 40 characters
Sample Comment:	A string consisting of maximum 40 characters

Notes

All sample info parameters may be modified only by access to single parameters of the structure.

SAMPLE is a structure consisting of the four parameters SAMPLE.NO, SAMPLE.ID, SAMPLE.NAME and SAMPLE.COMMENT.
SAMPLE.NO is incremented automatically with every PRINT command.
SAMPLE.ID, SAMPLE.NAME and SAMPLE.COMMENT are deleted after every PRINT command.
For SAMPLE.ID, SAMPLE.NAME and SAMPLE.COMMENT are all printable ASCII characters (alphanumerics, special characters and national characters) accepted. ***But don't use a ";"!***
In this protocol semicolons (;) are exclusively used as parameter separator. Therefore a semicolon will terminate the string.

Standard Deviation

Parameter values

Status

Parameter values
Status Code Reference Table

Notes

The abbreviation "S" for "STATUS" is supported

The DATA VALID handling

CODE	INSTRUMENT STATUS
1000	MEASUREMENT CONDITION OK
1001	DATA VALID *
1010	SAMPLE LID OPEN
1020	BALANCING IN PROGRESS
1030	FILTER WHEEL MOVING
1040	APERTURE CHANGING
1050	LOW ENERGY
1060	ANALYZER SLEWING (CHANGE INTEG.)
1070	LAMP SWITCHED OFF
1071	HG LAMP SWITCHED OFF
1072	NA LAMP SWITCHED OFF
1080	LAMP IGNITING
1090	not used

Temperature, Sample-

Parameter values
-20.0 ... 190.0 in °Celsius

Notes

The SET command is accepted only, if no sensor was detected.
If a sensor was detected , and the sensor will be disconnected, the response value to the GET command is defined as OFF.
The sensor may be calibrated. The actally evaluated offset value can be recalled. See Instrument Configuration.
The number format (integer/float) doesn't matter.

User Factor

Parameter values
-99999.9 ... +99999.9

Notes

The number format (integer/float) doesn't matter.

User Offset

Parameter values

-99.9999 ... +99.9999

Notes

The number format (integer/float) doesn't matter.

Verbose Function

Function
Set or recall the "verbose" function. By activating this function an additional text string follows the status or error number, separated by one blank sign. This message explanation may be useful - especially during communication developement see Reference Tables

Syntax Example

```
Command:    GET VERBOSE<CR>
Response:   OK: VERBOSE=OFF<CR>

Command:    SET VERBOSE=ON<CR>
Response:   OK<CR>
```

Parameter values
OFF or ON

Notes

Explanation strings have no blanks inside.
Default, every time after switching on the instrument, is OFF.

Examples for:

VERBOSE=OFF	**VERBOSE=ON**
OK: STATUS=1001	OK: STATUS=1001 DATA_VALID
ERROR: 3	ERROR: 3 INPUT_OUT_OF_RANGE

Wavelength

Parameter values
589; 578; 546; 436; 405; 365; 334; 313; 302; 296; 289; 280; 265; 253; USER1; USER2; USER3; NONE; OFF

Notes
The accepted selection (max. 9 filters and OFF) depends on the actual filter configuration (see Filter Configuration) of the instrument. If the filter is not installed, the following error is responded: "ERROR: 13 FILTER_IS_NOT_AVAILABLE"

Zero

Parameter values

Notes
The abbrevation **Z** for **Z**ERO is supported.
If the zero function is just not accepted, the following error is responded: "ERROR: 12 AUTOZERO_NOT_ALLOWED"

Error Messages

Function
If an error was detected by the *Polarimeter*, an error code – optional with text field (Verbose Function) – will be reported to the *Controller*.

Syntax Example

```
Response:  ERROR: 3<CR>
```

or, if the "verbose" function is activated:

```
Response:  ERROR: 3 VALUE_OUT_OF_RANGE<CR>
```

Notes
An error code has the highest priority, and is reported instead of the regular response to a command.

CODE	ERROR DESCRIPTION
1	UNKNOWN COMMAND
2	UNKNOWN PARAMETER
3	VALUE OUT OF RANGE
10	INSTRUMENT IS OFFLINE
11	INSTRUMENT IS BUSY
12	AUTOZERO NOT ALLOWED
13	FILTER NOT AVAILABLE
14	HG LAMP NOT AVAILABLE
15	NA LAMP NOT AVAILABLE
16	TEMP. SENSOR IS INSTALLED
17	TEMP. SENSOR IS DISCONNECTED
19	ENTRY TRUNCATED (TO MAX. 40 CHAR.)
20	FUNCTION NOT SUPPORTED
81	TOO MANY DIGITS
82	INPUT OUT OF RANGE
91	CHECKSUM ERROR: PRE-SETTINGS
92	CHECKSUM ERROR: PARAMETERS
93	PRINTER PAPER IS EMPTY
94	PRINTER IS NOT CONNECTED
95	PRINTER IS OFFLINE
96	PRINTER IS BUSY
101	TIME-OUT: APERTURE MOTOR - NORMAL
102	TIME-OUT: APERTURE MOTOR - MICRO
103	TIME-OUT: FILTER WHEEL - CW
104	TIME-OUT: FILTER WHEEL - CCW
111	TIME-OUT: HG LAMP IGNITION
112	TIME-OUT: NA LAMP IGNITION
113	HG LAMP DEFECTIVE
114	NA LAMP DEFECTIVE
115	TEMPERATUR SENSOR DEFECTIVE
121	FRAMING ERROR: PRINTER
122	OVERRUN ERROR: PRINTER
123	PARITY ERROR: PRINTER
124	FRAMING ERROR: COMMUNICATION
125	FRAMING ERROR: COMMUNICATION
126	PARITY ERROR: COMMUNICATION
127	FRAMING ERROR: BARCODE
128	FRAMING ERROR: BARCODE
129	PARITY ERROR: BARCODE

6.4.4. Communication Examples

Examples for the communication between the *Controller* (Command) and the *Polarimeter* (Response). The examples are commented in the following ***List*** of a supposed communication.

List

Assumption: The default settings of the Polarimeter data transmission comply with the default settings of the Controller. Thus the Controller can immediately initiate message sending with its first command right from power on.

```
Command:   GET ID<CR>
Response:  OK: ID=Polarimeter 341;2.00;1234<CR>
```

An "empty" command is always responded with "OK".

```
Command:   <CR>
Response:  OK<CR>
```

The availability of instrument options may be checked, because it has an effect on the user interaction of the control.

Example: The 1st number is "0" = Since there is no temperature sensor available, the sample temperature must be set (programmed) manually. The 3rd / 4th number is "1"/"2" = both lamp types (Hg and Na) are available and may be controlled.

```
Command:   GETN CONFIG<CR>
Response:  OK: 0;0.0;1;2;5;2;60;10;1;0;0;0;
           0;0;0<CR>
```

The next SET command should switch on the Na lamp, but it generates an error ...

```
Command:   SET LAMP_NA=ON<CR>
Response:  ERROR: 10<CR>
```

Note:During developement of a communication interface it is recommended to activate the "verbose" function of the Polarimeter.

```
Command:   VERBOSE=ON<CR>
Response:  OK<CR>
```

Now the "verbose" function adds an additional text string to the status or error number, separated by one blank sign. (See example below.)
Okay - Let's try the previous SET command again ...

```
Command:   SET LAMP_NA=ON<CR>
Response:  ERROR: 10 INSTRUMENT_IS_OFFLINE<CR>
```

... and without any documentation it's now clear why this error occurs: SET commands are not accepted during "offline" operation. Therefore we first have to seize the Polarimeter by the external Controller ...

```
Command:   ONLINE<CR>
Response:  OK<CR>
```

After receiving the ONLINE command the Polarimeter is from now "seized" by the Controller. A parameter entry via Polarimeter keyboard is now disabled. Remenber: The Polarimeter can only be programmed and controlled by the Controller until the Polarimeter is "released" by a OFFLINE command (see end of this example).

Okay - Let's try the previous SET command again ...

```
Command:   SET LAMP_NA=ON<CR>
Response:  OK<CR>
```

The SET command was accepted, and the Na lamp was switched on.

The bad value "ENABLE" generates the following error response ...

```
Command:   SET LAMP_HG=ENABLE<CR>
Response:  ERROR: 3 VALUE_OUT_OF_RANGE<CR>

Command:   SET LAMP_HG=ON<CR>
Response:  OK<CR>
```

The correct value "ON" was accepted and the Hg lamp was switched on.

Now several parameters of the Polarimeter are recalled and set for a measurement ...

```
Command:   GET MODE<CR>
Response:  OK: MODE=OROT<CR>

Command:   SET MODE=SROT<CR>
Response:  OK<CR>

Command:   SET INTEG=5.0<CR>
Response:  OK<CR>

Command:   GET INTEG<CR>
Response:  OK: INTEG=5.0<CR>
```

Before we set the wavelength, we may check, the availability of installed filters ...

```
Command:    GET FILTER<CR>
Response:   OK: FILTER=578;546;436;365;NONE;
            NONE;NONE;NONE;589<CR>

Command:    SET WAVLEN=589<CR>
Response:   OK<CR>
```

Before the first measurement we recommend to recall the current instrument status ...

```
Command:    GET STATUS<CR>
Response:   OK: STATUS=1030 FILTER_MOVING<CR>
```

The filter wheel is still moving to the selected filter. We recall again the status, till it is ready for measurement ...

```
Command:    GET STATUS<CR>
Response:   OK: STATUS=1020 BALANCING<CR>
```

The instrument is in "Auto Balancing" ...

```
Command:    GET STATUS<CR>
Response:   OK: STATUS=1001 DATA_VALID<CR>
```

Now the instrument is measuring and has valid data available. We will recall the data by ...

```
Command:    GET RESULT<CR>
Response:   OK: RESULT=-2.534<CR>
```

The specific rotation of the sample is "-2.534°". Now we print this result on the printer connected to the polarimeter ...

```
Command:    PRINT<CR>
Response:   OK<CR>
```

We will recall the next result. Again we first take a look to the actual status (assuming the integration time has still not finished) ...

```
Command:   GET STATUS<CR>
Response:  OK: STATUS=1000 CONDITION_OK<CR>
```

... the instrument is just measuring the next result, but in this moment there are no new data available (because the integration interval has not finished). We wait a second and try it again ...

```
Command:   GET STATUS<CR>
Response:  OK: STATUS=1001 DATA_VALID<CR>
```

In the meantime the integration has finished, and new calculated rotation data of the sample are available.

```
Command:   GET RESULT<CR>
Response:  OK: RESULT=-2.535<CR>
```

The measured specific rotation of the sample is "-2.535°". (After receiving this command, the Polarimeter resets the "Data Valid" flag and sets it again, if an integration interval has finished.)

...

```
Command:   OFFLINE<CR>
Response:  OK<CR>
```

The Polarimeter is from now "released" by the Controller. The Polarimeter can only be programmed and controlled via the Polarimeter keyboord until a "online" command (see beginning of this example) is received again.

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