# Eagle 1000 Patient Monitor
## Servicing Instructions

227 468 01 SA(e) Revision G

**GE Medical Systems**
*Information Technologies*

**Caution:**

During repairs/service interventions, observe the protective measures against damage due to ESD.

- ***GE Medical Systems*** *Information Technologies* ***(GEMS IT)*** considers itself responsible for the effects on safety, reliability, and performance of the equipment, only if:

  - assembly operations, extensions, readjustments, modifications, or repairs are carried out by ***GE Medical Systems*** *Information Technologies* ***(GEMS IT)*** or by persons authorized by ***GE Medical Systems*** *Information Technologies*,

  - the electrical installation of the relevant room complies with the applicable national and local requirements, and

  - the instrument is used in accordance with the instructions for use.

- This manual contains service information; operating instructions are provided in the operator's manual of the instrument.

- This manual is in conformity with the instrument at printing date.

- All rights are reserved for instruments, circuits, techniques, and names appearing in the manual.



Printed in Germany

## Contents

## Revision History

This manual is subject to the ***GE Medical Systems*** *Information Technologies* change order service. The revision code, a letter that follows the document part number, changes with every update of the manual. The initial version of the manual has the letter A.

| Part No. | Revision Code | Date | Comment |
|---|---|---|---|
| 227 468 01 | A | 1997-05 | Initial Release |
| 227 468 01 | B | 1997-06 | Updates |
| 227 468 01 | C | 1997-08 | Updates |
| 227 468 01 | D | 1997-12 | Updates |
| 227 468 01 | E | 1998-02 | ECO 063757 |
| 227 468 01 | F | 2001-02 | ECO 065760 |
| 227 468 01 | G | 2003-02 | ECO 068791 |

# 1. General overview of EAGLE 1000

## 1.1 Documentation and nomenclature of Marquette Hellige instrument part numbers

### 1.1.1 Configuration of instrument part number

The instrument part number comprises 8 digits, the first 6 digits determining the instrument type, the last 2 digits the instrument version. The language is determined by configuration, thus having no influence on the part No.

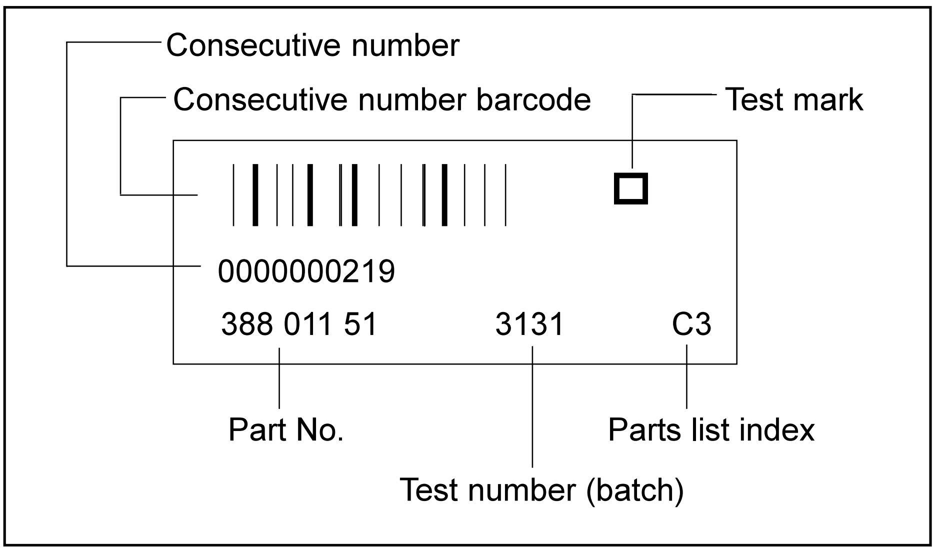
| | | | |
|---|---|---|---|
| E.g. | Instrument Type | Version | |
| | EAGLE 1000 | | |
| | without recorder | 101 123.. | |
| | with recorder | 101 124.. | |
| | | 07 | complete system |
| | | 02 | ECG only |

### 1.1.2 Configuration of the PCB par numbers

**388 xxx yy    Spare part numbers for the operative PCBs.**

The instrument documentation, e.g., reference diagrams, circuit diagrams and parts lists are listed under these part numbers.
The 388 number is located on the barcode label.

Configuration of the barcode labels:



**303 xxx yy Spare part numbers for PCBs tested especially thoroughly**

303 numbers are only given to PCBs where the level of testing applied to 388 PCBs is inadequate for implementation when servicing in the field, or where only a complete set of PCBs can be replaced in the field.
In addition to a barcode label (388 number) 303 part numbers also have an additional label with a 303 number and are to be found in the spare parts list under this number.

**Exchange for defective PCBs**

Where servicing is required exchange PCBs are available for the replacement of some PCBs. When using a exchange PCB, the defective PCB is to be returned to the Freiburg factory. Replacement PCB part numbers are included in the spare parts list.

### 1.1.3 Instrument status documentation (nominal status)

Due to the hardware and software combination unambiguous documentation of the instrument assembly status is necessary, also in the event of repairs.

This documentation comprises the following documents and measures:

**Master Record Index (MRI)**

This document is a component of this instrument documentation.

This document states the combination of permissible hardware and software for a particular instrument version. The permissible PCB Index is given in the “Index” column with each update delivered. Further permissible PCB Indexes are given in the “compatible” column. The PCB Index can be found in the PCB barcode label.

**Product Status Index**

This document is created during manufacture. The Product Status Index documents the hardware/software product status.

# 1.2 Eagle 2000 system overview

These servicing instructions describe the instrument versions with Hellige circular connectors.

**Compact, multi-parameter patient monitor, 12 different models**

| | | | | | | |
|---|---|---|---|---|---|---|
| 101 123 02 | EAGLE 1002 | ECG | | | | |
| 101 124 02 | EAGLE 1003 | ECG Alarm recorder | | | | |
| 101 123 03 | EAGLE 1004 | ECG $SPO_2$ | | | | |
| 101 124 03 | EAGLE 1005 | ECG $SPO_2$ | Alarm recorder | | | |
| 101 123 04 | EAGLE 1006 | ECG | NBP | | | |
| 101 124 04 | EAGLE 1007 | ECG | NBP Alarm recorder | | | |
| 101 123 05 | EAGLE 1008 | ECG $SPO_2$ | NBP | | | |
| 101 124 05 | EAGLE 1009 | ECG $SPO_2$ | NBP Alarm recorder | | | |
| 101 123 06 | EAGLE 1010 | ECG $SPO_2$ | NBP TEMP | | | |
| 101 124 06 | EAGLE 1011 | ECG $SPO_2$ | NBP TEMP | Alarm recorder | | |
| 101 123 07 | EAGLE 1014 | ECG $SPO_2$ | NBP TEMP | 2 x IBP | | |
| 101 124 07 | EAGLE 1015 | ECG $SPO_2$ | NBP TEMP | 2 x IBP | Alarm recorder | |

Table of EAGLE 1000 models (NBP = non-invasive blood pressure, IBP = invasive blood pressure.

# 1.3 System overview

## 1.3.1 Hooking up EAGLE 1000 monitors to PC Central Station SynOpsis 1000

Eagle 1000 monitors version V2.1 and higher can be connected up to the PC Central Station SynOpsis 1000. This involves the hooking up of up to eight monitors via a serial cable with an “OctaBus 1000”. Up to two OctaBus 1000s can be connected up to the Central Station. Each OctaBus is connected to the Central Station PC using a printer port. Alarm release ensues from one of the two OctaBus devices, these being connected appropriately. The OctaBus devices and the Central Station PC monitor controll each others performance and give an alarm when a malfunction is detected. For configuration see figure below.

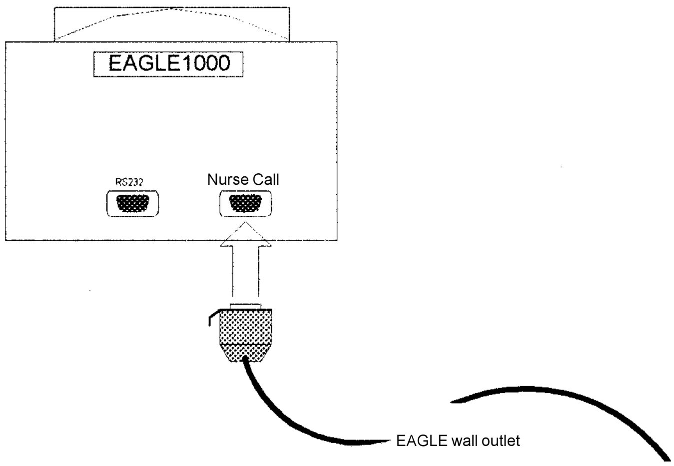



*Figure 1. Connection of EAGLE 1000 with current loop output to “Nurse Call/ Central Station” socket*

### Connection

The Nurse Call socket of Eagle 1000 V2.1 or higher is used for hooking up to the Central Station via the OctaBus. A current loop permits connections over distances of up to 200 m.

Connection to the OctaBus is via an 8-lead cable either from a wall outlet or directly. Refer to the Installation Instructions for more details.

### Central Station PC

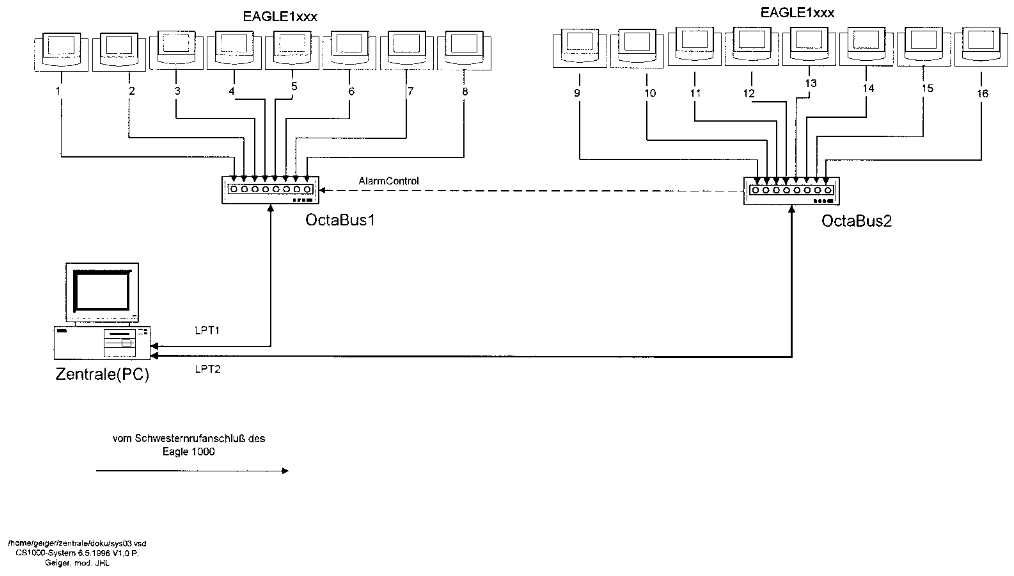



*Figure 2. Connection of "EAGLE 1000" monitors to a PC Central Station "SynOpsis 1000" using 2 "OctaBus" hardware interfaces.*

## 1.3.2 Patient data transfer from EAGLE 1000 via HELAN to SMU using QuickLink

### 1.3.2.1 Introduction

To ensure continuous monitoring it is also necessary to be able to record patients' vital signals during relocation and transportation. However, since during patient transfer there is no connection to the LAN, the trend data are collected and then transferred later as a block.

After taking over patient monitoring on the transport monitor recording of the data begins. No connection is being established with the Gateway. The patient remains anonymous, i.e., his name is not entered into the transport monitor.

Upon arrival at his new destination the patient is hooked up to the destination monitor and the transfer of the trend data initiated by the transport monitor operator. The transport monitor establishes a connection over an IR beam and a terminal server (QuickLink) with the LAN and transfers the data to the Gateway.
In the Gateway the data are stored in a file bearing a file name indicating the ID of the transport monitor used. Assignment of patient data is carried out using the operating routines of the destination monitor. The operator selects the transport monitor ID, to which the transferred patient belonged to. It is now the task of the Gateway to enter the trend data into the database correctly.

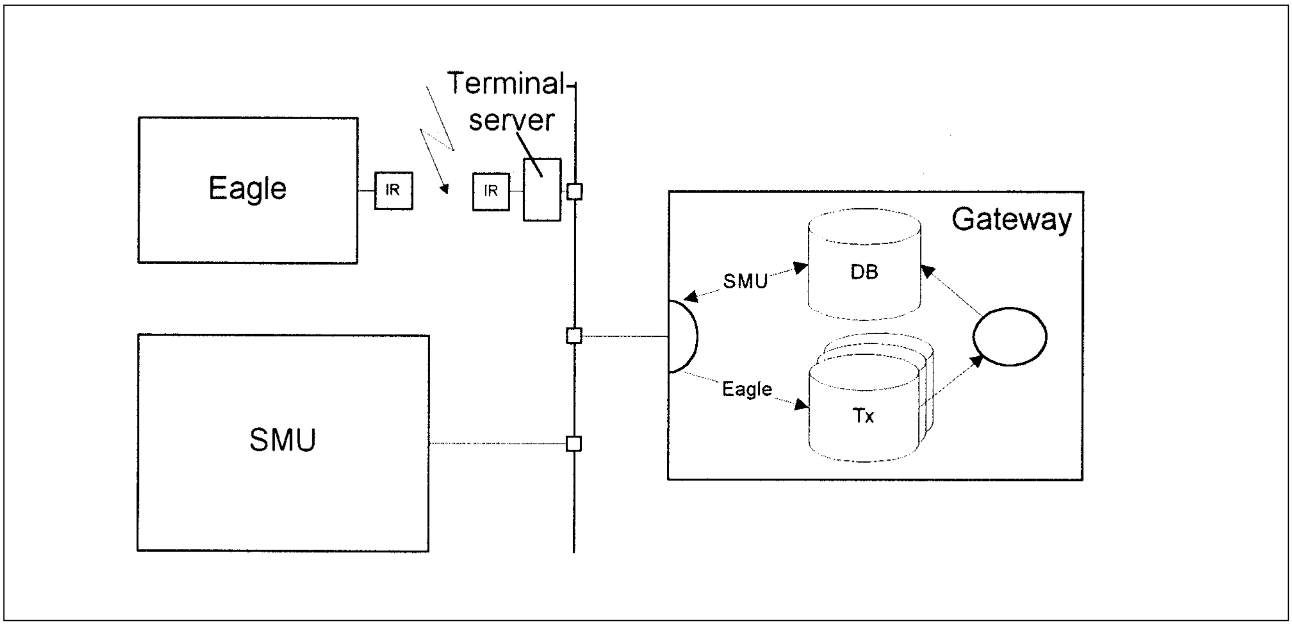



*Figure 3 shows the principle of data transfer. The terminal server comprises "QuickLink", the Gateway comprises "VICOM TR server" or "VICOMport" + "VICOMserver".*

### 1.3.2.2 Data transfer between Eagle and Gateway

Eagle and Gateway will communicate while transferring trend data. Transfer is initiated by the user request function.

The data are first stored in a file and, when data transfer is complete, arranged in proper order. The transport monitor waits for the results of this processing procedure.

If an error occurs in the database during this procedure, all the data in the Gateway are deleted and the entire data must be transferred once more.

When the data transfer is initiated, the time will be sent by the transport monitor real-time clock. From this the Gateway can identify any possible time misalignment of the internal clock of the transport monitor and account for this when the trend data are entered.

Sporadic trend data, e.g., non-invasive blood pressure values, are only transferred for the period of time in which continuous trend data, e.g., ECG, are also available. Earlier or later parameter readings will be ignored.

### 1.3.2.3 Connection to the LAN

The QuickLink Station is connected to a Multiport or an SMX using twisted-pair wiring.

The Multiport can lead to the LAN using BNC or AUI wiring.

The SMX 008 leads to the LAN using AUI wiring, the SMX 009 to the LAN using BNC wiring.

## Configuration with BNC, AUI or twisted pair (TP)

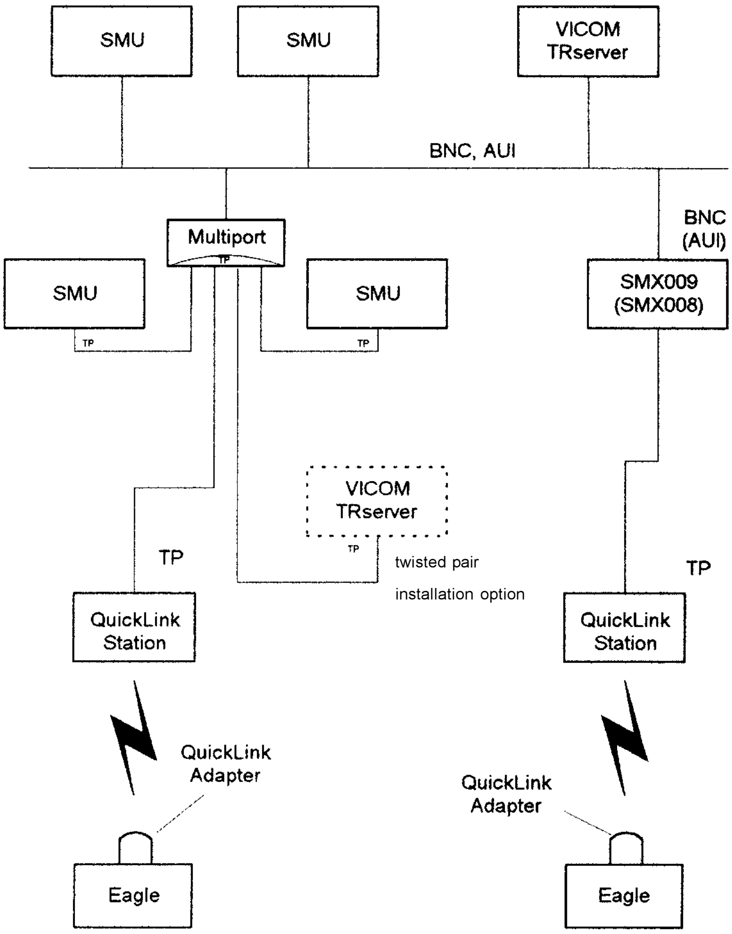



*Figure 4. QuickLink - LAN connection*

### 1.3.2.4 EAGLE 1000 - QuickLink - HELAN - Examples of the link to networks

#### 1.3.2.4.1 Functional structure overview

The link of Eagle 1000 to the networks via QuickLink enables the transfer of patient data acquired during patient relocation and transportation for continuous and uninterrupted analysis.

A QuickLink adapter connected to the RS 232 interface of the Eagle 1000 sends the transportation data using IR to a QuickLink Station. The QuickLink Station acts as a terminal server and is the communication partner to the HELAN network.

The data transferred onto the HELAN are stored on a server which acts as a Gateway (VICOM TRserver or VICOMport in connection with VICOMserver).

This is where the patient data and the measured values recorded during transportation are made available for complete documentation on any patient monitor or on a clinical information system.

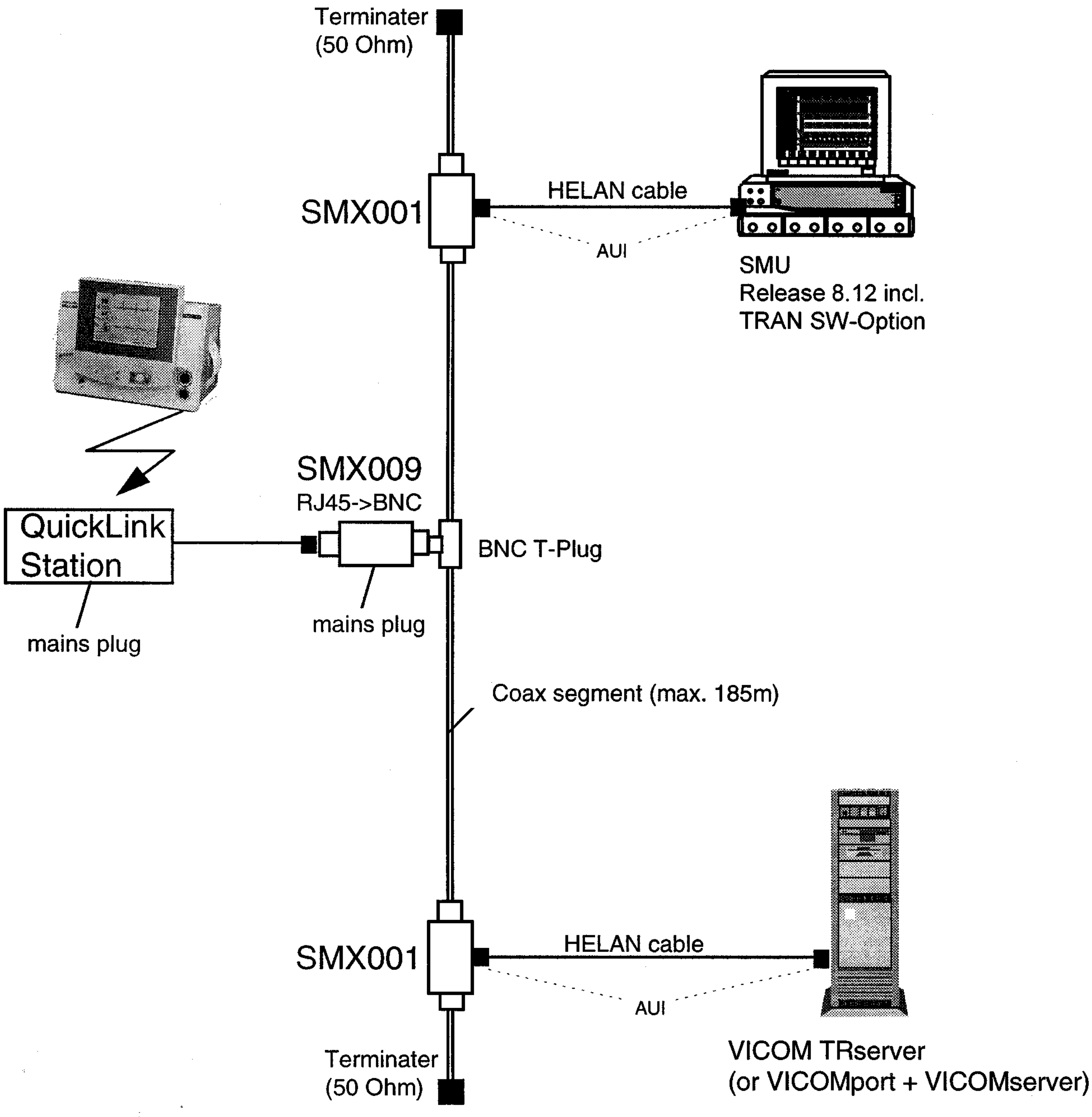
#### 1.3.2.4.2 Main components for the installation of QuickLink:

| Part Number | Device | Description |
|---|---|---|
| 216 135 01 | QuickLink Adapter | IR-Interface, connectable to Eagle 1000 |
| 216 134 01 | QuickLink Station | Station to receive IR signal from QuickLink adapter incl. RJ45 connection (Twisted Pair) |
| 216 107 01 | SMX 001 | Transceiver for AUI |
| 216 133 01 | SMX 005 | Transceiver for RJ45 (Twisted Pair) |
| 930 117 40 | SMX 006 | Multiport Repeater (12 x RJ45) |
| 930 117 39 | SMX 007 | Multiport Repeater (24 x RJ45) |
| 930 117 76 | SMX 008 | Repeater RJ45 to AUI |
| 930 117 77 | SMX 009 | Repeater RJ45 to BNC (CheaperNet) |
| 101 130 01 | VICOM TRServer R.2.0 | Patient data transfer within HELAN |
| 101 131 01 | VICOMport R.2.0 | Link of HELAN to VICOM Server |
| 101 132 01 | VICOMserver R.2.0 | Database for HELAN and interface to other networks |

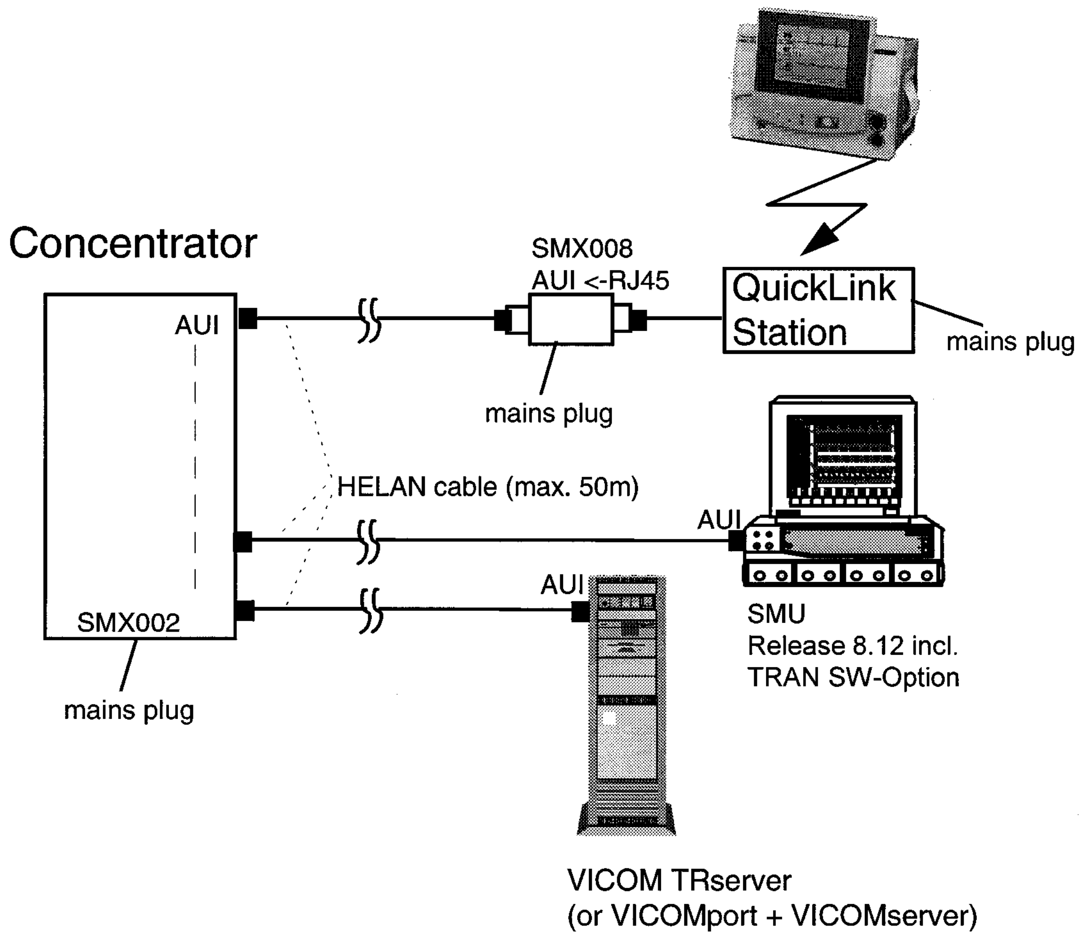
### 1.3.2.4.3 EAGLE 1000 - QuickLink

**Network link - HELAN CheaperNet**

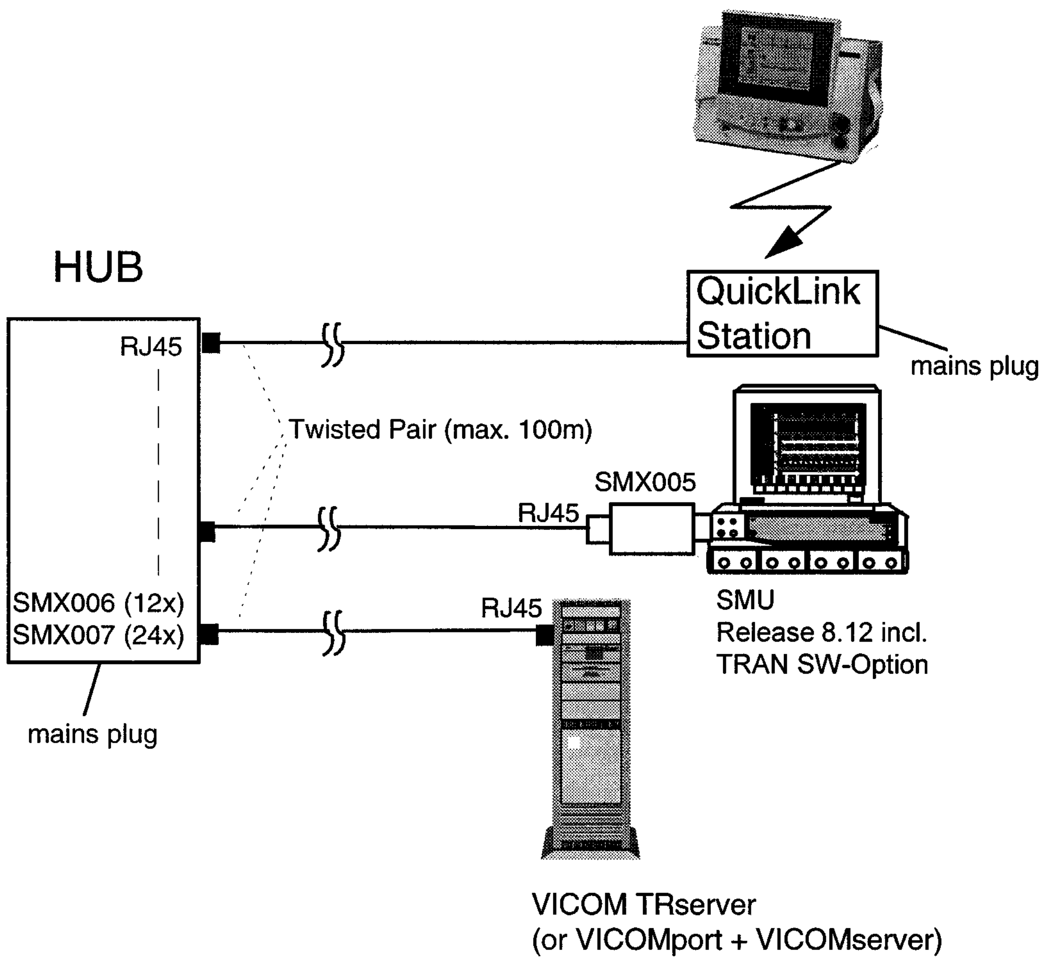
SMX 008 + SMX 001 can be used in place of SMX 009 + BNC T-Plug.



### 1.3.2.4.4 Network link - HELAN Concentrator



### 1.3.2.4.5 Network link - HELAN Twisted Pair



# 2. System overview

## 2.1 Technical specifications

### 2.1.1 System interfaces

**Interface for “Nurse Call” and Central Station**

* output for control signal in the case of alarm or warnings for connection of an Isolation Relay 303 444 77, short-circuit-proof
* trigger output (digital impulse, width 1 ms, 0 V to 9.5 to 14.5 V)
* 20 mA current loop output to connect OctaBus to PC Central Station SynOpsis with V2.1 or higher version

**“RS 232” interface**

* RS 232/V24 interface for connection of QuickLink to HELAN, available from V 2.0 or higher

### 2.1.2 Display

* size: 6-inch diagonal (14 cm)
* type: monochrome liquid-crystal display
* resolution: 320 by 240 pixels

**Waveform display**

* 3 channels
* sweep speed of 25 mm/s
* erase-bar mode

### 2.1.3 Monitor functions

**Operating modes**

* test, monitoring enabled/disabled, service mode, data transfer (download)

**Alarm system**

* text on display, alarm LED, “Alarms OFF” LED, audible alarm signal (can be disabled via softkey or from the defaults menu)

**Data storage in case of line failure or empty battery**

* at least 5 minutes

## 2.1.4 Power supply

* from the power line, monitor design in IEC protection class I

**Potential equalization**

* potential equalization connection according to DIN 42 801(measurement in or at the heart) or connection for function ground (interference elimination during general cardiological examinations)

**Rated voltage range from 95 to 240 V AC**

* operating voltage range from 85 to 264 V, 49 to 65 Hz
* rated current from 0.15 to 0.3 A

**Internal power supply (rechargeable battery)**

* automatic toggling from line to battery operation and vice versa
* integrated charge circuit with automatic adaption of charge characteristics
* fast battery charging to 80% of its capacity within 3.5 hours, afterwards
* normal charging to 100% of its capacity within 8 hours, afterwards
* continuous trickle charging by means of charge pulses to prevent the “memory effect”

**Charge balance**

— measurement of the charge and load current
— compensation for battery self-discharge
— graphic indication of battery capacity

**Alarms**

— warning when battery provides power for only 5 minutes of operation (without recorder)
— automatic switch-off at 10.0 V to prevent overdischarging

**Capacity of the rechargeable battery**

— 2000 mAh, 12 volts

**Charging indicator**

— LED

**Operating time**

— approx. 3 hours (typical operating time with fully charged battery at 23 °C, at a battery temperature of 60 °C the capacity may be reduced to 70%)
(min. 2 hours at 25 °C ambient temperature and new, fully charged battery)

## 2.1.5 Operation and storage

**Operational readiness**

- after approximately 5 seconds

**Operating position**

- vertical (free circulation of air under the unit and ventilation openings must not be obstructed)

**Environmental conditions**

*Operation*

* ambient temperature between +10 °C and +40 °C
* battery charging temperature between +10 °C and +40 °C
* relative humidity between 30% and 75%, no condensation
* atmospheric pressure between 700 and 1060 hPa

*Storage*

* ambient temperature between -30 °C and +60 °C
* relative humidity between 10 and 100%, no condensation
* atmospheric pressure between 500 and 1060 hPa

**Dimensions**

| | |
|---|---|
| width | 262 mm |
| height | 215 mm |
| depth | 160 mm |
| weight | 2 kg to 4.4 kg (depending on monitor model) |

## 2.1.6 ECG and heart rate

**ECG signal inputs**

Electrode connection for simultaneous transfer of 2 ECG signals: ECG 1 and ECG 2 via lead selector (7 standard lead configurations each).
Signal inputs for 3-lead and 5-lead patient cables with connections for electrode leads; buffer amplifier with protective circuit and HF filter; floating input circuit (isolated patient connection of the CF type, IEC); overvoltage protection for all inputs, detection of pacing pulses, monitoring of electrode-to-skin contact impedance (specifications without leads):

- differential input impedance for DC > 65 MOhms, for f<=100 Hz > 6 MOhms
  common-mode input impedance referred to RL
  for DC > 10 GOhms, for f<=100 Hz > 50 MOhms

- overrange limit (e.g. for polarization voltages) for differential signals >0.6 V, for signals referred to RL > 1.0 V
- common-mode rejection referred to RL for f<= 50 Hz approx. 80 dB RL referred to chassis >110 dB
- patient leakage current (rms values): under normal conditions <0.005 mA, in fault condi tion (e.g. patient in contact with mains voltage) <0.020 mA
- quiescent input current <40 nA
  non-destructive load for electrode connections referred to RL ± 50 V, referred to chas-sis ± 1000 V
- pulse-voltage resistance of all electrode connections and of the RL-connection referred to chassis (either polarity, e.g. defibrillation, electrocautery) 5000 V

**Signal processing**

The signal in channel 1 is processed. All specifications refer to a signal free of inter ference.

Amplification, QRS detection, digitization, display

- HR measuring range 15 to 300 bpm, error ± 1 BPM (EC 13)
- ECG cut-off frequency >=100 Hz
- differential signal range ± 4.5 mV
- ECG resolution 0.005 mV
- sampling rate 1000/1200 Hz
- noise below 0.04 mV
- time constant for ECG transfer 0.3 s (0.5 Hz)
- HR averaging for displayed value: weighted average from the most recent RR intervals
- display update interval: 2 seconds
- trigger sensitivity 0.25 mV to 0.30 mV for pulse width of 40 ms
- max. rate stabilization of 6 seconds for RR interval change of 95%
- alarm delay 4 seconds
- asystole alarm 4 seconds
- 3 signal sizes for monitor display in freeze mode or else on the recorder trace: 5 — 10 — 20 mm/mV
- 1-mV calibration signal on waveform and recorder trace
- detection of pacing pulses (these specifications refer to an ECG signal free of inter-ference)
  — pulse duration $d_p$ >approx. 0.2 ms, <40 ms
  — pace marker independent of polarity
  — pulse amplitude $a_p$ ±10 to ±700 mV
  — over/undershoot $a_o$ ±1 mV
  — time constant $t_o$ 25 to 100 ms

- alarm limits adjustment range: 20 to 250 BPM
- trigger output on Nurse Call connection nominally 12 V 1 ms, delay max. 25 ms, tolerance 9.5 V to 15.5 V

- rate measurement
  derivation of trigger pulses from the ECG signal or from the pressure waveform or from the $Sp0_2$ signal with automatic adaption of the trigger threshold or blanking of pacing pulses; calculation of the mean rate; 3-digit display on the monitor screen

### 2.1.7 Oxygen saturation $Sp0_2$

**Signal input**

Connection for one $Sp0_2$ probe, isolated from ground, floating input circuit (isolated patient connection of the CF type, IEC).
Used in conjunction with the approved probes, the module is protected from voltages generated by defibrillation discharges and electrocautery.

**Signal processing**

- dual-wavelength pulse oximeter
- $Sp0_2$ measuring range 1 to 100%
- PR measuring range 20 to 250 BPM
- resolution 1% $Sp0_2$
- deviations from actual value (% $Sp0_2$ = 1st standard deviation) in combination with:
  - standard finger probe (DS 100A)
    between 70 and 100%: ±3 digits
  - disposable probe for adults (D25)
    between 70 and 100%: ±2 digits
  - disposable probe for children (OXI D20)
    between 70 and 100%: ±2 digits
  - disposable probe for babies (J-20)
    between 70 and 95%: ±2 digits
  - disposable probe for neonates (N-25)
    between 70 and 95%: ±2 digits

  unspecified between 0 and 69% $Sp0_2$

**Plethysmogram**

accuracy of the pulse rate measurement
±3 pulses/min between 20 and 150 pulses/min
±2% between 150 and 250 pulses/min

## 2.1.8 Non-invasive blood pressure

### Signal input

Single-lumen tubing system, type CF signal input (IEC 601-1), patient is electrically not connected to the system, thus the system is protected from defibrillation discharges and electrosurgery voltages).

### Signal processing

Oscillometric method:
stepwise pressure decrease, zero pressure reference prior to each measurement
Two measuring modes: adult
neonate

| | | mmHg |
|---|---|---|
| adult | systolic | 25 to 255 |
| | diastolic | 10 to 220 |
| | mean | 18 to 255 |
| neonate | systolic | 20 to 155 |
| | diastolic | 5 to 110 |
| | mean | 10 to 130 |

The specifications are met for pulse rates between 40 and 240 BPM (adult/neonate).

### Safety circuits

Redundant monitoring of the cuff pressure by means of a second independent pressure sensor; cuff deflation immediately on exceeding max. cuff pressure, on detection of faults during a measurement and on power loss.

### Max. cuff pressure

| | |
|---|---|
| adult | 300 mmHg |
| neonate | 160 mmHg |

### Special features

When the cuff is properly applied the module recognizes in the adult mode whether the cuff matches the selected range. If the wrong cuff is applied, the measurement is interrupted.

**Cuff inflation pressure**

adult 160 mmHg
neonate 100 mmHg

**Adaptive cuff inflation pressure**

After a measurement the inflation pressure of the subsequent measurement depends on the previous measuring result: it is either 1.8 times the previous mean pressure or 15% above the previous inflation pressure (whichever is less).

**Measurement cycles**

Selectable intervals for automatic measurement cycles:
2, 5, 10, 15, 30, 60 minutes

**Measuring accuracy**

$P_{sys}/P_{dia}$ <= 8 mmHg, 1st standard deviation
- error limits for cuff pressure via the pressure transducer ±3 mmHg

**Measurement duration**

adult: 90 seconds max.
neonate: 70 seconds max.
typical duration for undisturbed measurement: 30 seconds

**Technical inspection, calibration**

Technical inspection must be carried out once a year, calibrations every two years (refer to section 3 “Maintenance and technical inspection”).

## 2.1.9 Invasive blood pressure

**Signal inputs**

2 connections which are both isolated from ground (type CF according to IEC 601-1) for pressure transducers with ohmic strain-gauge bridge, diagonal resistance of 200 Ohms to 10 kOhms with a sensitivity of 0.005 mV/mmHg per V of supply voltage:

- supply voltage for transducer:
  5 volts DC

At 50 and 60 Hz:

- differential input impedance > 100 kOhms, real component 500 kOhms
- common-mode input impedance > 100 kOhms
- common-mode rejection > 60 dB up to 60 Hz

### Connections

- direct connection for measurement of one pressure
- connection via adapter for measurement of two pressures

### Display

- pressure waveform with 25 mm/s sweep for both channels
- pressure waveform for the following pressure sites: arterial (ART1, ART2), pulmonary artery (PA), venous (VEN), left-atrial (LAP), intracranial (ICP) for ART, PA and LAP the systolic, diastolic and mean values can be displayed
- display update interval: 2 seconds

### Signal processing

### Pressure

- measuring range -30 to +300 mmHg
- resolution 0.25 mmHg, internal
- cut-off frequency 12 Hz
- accuracy ±2 mmHg ±1% of actual value
- zero drift < ±0.1 mmHg/°C
- 5 minutes to warm up for full accuracy

### Zero balancing

- automatic compensation of the transducer value for a zero pressure in both channels, every channel to be zeroed is checked for absence of pulse signals
- balancing initiated after key press > 2 seconds
- balancing range ±100 mmHg
- storage of the balancing value for 5 minutes after power failure or when monitor is switched off
- deviation < ±1 mmHg
- initiation only when signal modulation < ±1 mmHg

## 2.1.10 Temperature

### Signal input

Input isolated from ground (type CF according to IEC 601-1) for connection of a temperature probe from the Marquette HELLIGE accessory range (these probes conform to the YSI 400 or Exacon 4000 series; as these probes have jack plug contacts which are accessible when not connected, they were additionally tested with 1500 $V_{rms}$ 50 Hz in physiological saline according to IEC 601-1)

### Signal processing

Together with two test readings and a correction value the temperature reading is processed for regular self-tests and for fine-balancing by multiplexing in a common amplification circuit:

- measuring range 0 to 44 °C
- error limits for module without probe: between 0 and 25 °C ±0.2 °C, between 25 and 44 °C ±0.1 °C
- display update interval: 2 seconds
- 5 minutes to warm up for full accuracy

### Functional safety

Continuous self-tests prevent display of values outside the calibration error limits; when service screen is called up the test values of 38.8 °C ±0.1 °C and 4.0 °C ±0.2 °C are displayed.

### Technical inspection, calibration

Calibration tests must be carried out on the monitor every two years (refer to section 3 “Maintenance and technical inspection”), technical inspection once a year.

### 2.1.11 Trend

* storage of parameter values
* tabular trend, NBP table depending on NBP intervals
* graphic trend for each parameter
* storage of trend values every 20 seconds or after NBP measurement
* display of trends via softkeys
* automatic display of a time scale and of reference lines (labelled)
* zoom function for selection of other trend periods (graphic: 45 minutes, 3 hours, 24 hours; tabular: 1 minute, 5 minutes, 15 minutes)
* trend memory can be cleared with a softkey, or the memory is cleared automatically when the monitor is switched off for more than 5 minutes

## 2.2 Functional description of PCBs and subassemblies

### 2.2.1 Eagle 1000 configuration and functional groups

see diagram "Functional groups"

The basic Eagle 1000 patient monitor version comprises the large PCB ECG Monitor installed in the system on the front side of an L-shaped metal plate. In addition to the ECG input circuit, the instrument control system is also located on this PCB.

The keypad, display screen, battery and the PCB Power Supply are connected to it. Also connected are the ECG input socket and the two rear panel outputs "RS-232" and "Nurse Call".

The keypad and CRT have conductor foil connections and care must be taken when connecting them up and sharply bending them avoided.

The battery is installed in the bottom side of the L-shaped metal plate.

The power supply is located inside the rear panel of the system next to the power supply socket.

The recorder, if there is one, is mounted on the base plate and connected to the PCB ECG Monitor.

In the models with additional features the PCB ECG Monitor also acts as a mother-board. The PCB Oximeter, the PCB for non-invasive blood pressure and the PCB for temperature or for temperature and 2 invasive blood pressures can be added to this board.

In conformity with “Cardiac floating” there is a high-impedance isolating transformer referred separately to the ECG input module, the PCB Oximeter, the PCB module for temperature and the PCB module for 2 invasive blood pressures. Both pressure measuring components are electrically connected. These PCBs are insulated from the non-floating components of the system and each other by spacing and insulating foil.

**Warning: It is thus important that when disconnecting or replacing PCBs in the system to ensure PCBs and circuits are correctly installed and the insulating foil positioned accordingly.**

## 2.2.2 PCB ECG Monitor

The PCB ECG monitor appears as a block diagram in the PCB circuit diagrams. The circuits are arranged so that (viewing Eagle 1000 from the rear) the floating ECG Processing is located in the left-hand third, in the remainder all the other functions:

| **Floating** | **Non-Floating** |
|---|---|
| | x Display Controller |
| x ECG Controller | |
| | x Interface Output |
| x ECG Filter | x Controller |
| | x Power Supply (instrument, battery, floating) |
| x ECG Input | x Interface Input |

This means that ECG Processing and the Central System signal processing and system controller are implemented on this PCB. The description of each is given below, indicating the connected modules and their functions.

The PCB plugs and sockets are shown in the S-Plan of the system plans and are allocated as listed below. This allocation is useful in finding the pin configuration in the P circuit diagrams of the PCB ECG Monitor.

| Name | Connection | Denotation | Page | P-Plan Subtitle |
|---|---|---|---|---|
| AA | Conductor Foil | Display | 9 | Display |
| AB | | For Optrex LCD only | 9 | Display |
| AC | Cable | Battery | 6 | Power |
| AD | Cable | PCB Power Supply | 6 | Power |
| AE | Cable | LCD Backlight | 9 | Display |
| AF | Flat cable | Recorder | 8 | Interface_Out |
| AG | Flat cable | PCB Non-Invasive Blood Pressure | 5 | Interface_In |
| AH | Flat cable | PCB Oximeter (Sp02) | 5 | Interface_In |
| AI | | Debugging Connector only | 7 | Control |
| AJ | Stackable Connector | PCB Press/Temp | 5 | Interface_In |
| AK | Flat cable | ECG Input | 2 | ECG_Input |
| AM | Conductor Foil | Membrane Keypad | 5 | Interface_In |
| AN | Flat cable | RS 232 External Port | 8 | Interface_Out |
| AO | Flat cable | Nurse Call Adapter | 8 | Interface_Out |

### 2.2.3 System power supply

see diagram “System Power Supply”

The power supply is in protection class I with a protective ground terminal. A primary-regulated wide-range power supply unit, delivering 15.5 V DC, precludes the necessity of a power toggle switch. This unit also acts as a charger for the 12-V system battery. All control functions are regulated on the PCB ECG Monitor. A charge controller measures the battery current across a resistance referred to zero, activates the front panel charge indicator and communicates with the processor. Should the output voltage of the power unit fail to reach 15.5 V, the battery will not be charged to full capacity.

The battery meets the temporary high current demand of the recorder and the PCB Non-Invasive Blood Pressure as well as current peaks and is also essential for retaining data.

As the battery continuously is discharged, this is indicated by an 11.5V comparator, which triggers the warning display “Battery” blinking and the audible alarm signal sounding. When the charge drops below 10 V after storing the data the 10V comparator switches off the system to protect the battery.

Otherwise, the system is switched on and off with the appropriate button on the front panel, which, just like the 10V comparator, exerts an effect via the processor on the ON/OFF interface with its FET switch.

A 5V analog voltage +5VREF is generated with a linear controller from the battery voltage supplied when it is switched on. A switching controller generates the 5V digital voltage from the battery voltage supplied when it is switched on. Apart from this the battery voltage supply is used directly and unregulated for oscillators and other components requiring a power supply.

## 2.2.4 Floating system power supply and signal flow

**Power supply**

see diagram “Floating system supply and signal flow”

The floating system is supplied from a central 100-kHz oscillator on the PCB ECG Moni tor. This delivers the supply voltage stabilized on a HF transformer, i.e., individual power fluctuations on some PCBs are not fully compensated. The individual floating components receive power via the primary HF transformers connected in parallel. Isolation is effected in these floating transformers. These each generate ±7.5V ±5%. In turn, in each case a linear +5V ±2% analog/digital voltage is obtained from these voltages.

**Signal flow**

see diagram “Floating system supply and signal flow”.

Apart from the non-invasive blood pressure all patient input circuits are high-impedance-floating circuits. In terms of signals, these are isolated in both directions via optoelectronic couplers. All other circuit components are not isolated and referred to circuit zero. Furthermore, there is a separate ground contact to enable potential equalization.
The non-invasive blood pressure input is isolated by means of a non-electronic patient input.

## 2.2.5 Signal exchange with the processor

see “Processor block diagram”

The processor on the PCB ECG Monitor comprises a controller with a separate 32kHz quartz crystal, watch dog, RAM and EPROM. The controller is in communication with all of the following units.

The keypad is used to enter data, the beeper to give alarms and acknowledgment sig nals. The recorder interface leads to the integrated recorder and the CPU interface to the liquid-crystal screen.

The RS 232 interface acts as a system output, it is mainly used for sending signals to the QuickLink to output data to the HELAN after patient relocation and transportation.

The Nurse Call interface leads to the nurse call adapter. A nurse call system can be connected by means of the nurse call relay for the Eagle 1000. From Version 2.1 and higher, a 20 mA current loop is available to connect the Eagle to an OctaBus of a SynOp-sis Central Station.

The patient data inputs are entered via three serial interfaces:
The QSPI interface allows the transfer of ECG, temperature and the two invasive blood pressures via the 16 “Qued Processor Interface” signals. One chip select signal each is generated for each of the three signal groups. A clock signal synchronizes the transfer of the two “Master In - Slave Out” and “Master Out - Slave In” signals.

The PCBs Oximeter and Non-Invasive Blood Pressure are each connected separately via an asynchronous interface. This has both an Rx and a Tx cable as well as a reset cable. Another EC.Syn signal is provided for the oximeter (Sp02), another RESETB signal for the non-invasive blood pressure (NBP).

## 2.2.6 Display

see “Display block diagram”
All of the elements shown apart from the block “display” are located on the PCB ECG Monitor.

The LCD display is controlled by an LCD controller. This works together with an external 3.6MHz oscillator and external display RAM. The control of the LCD controller is effected via the CPU interface.

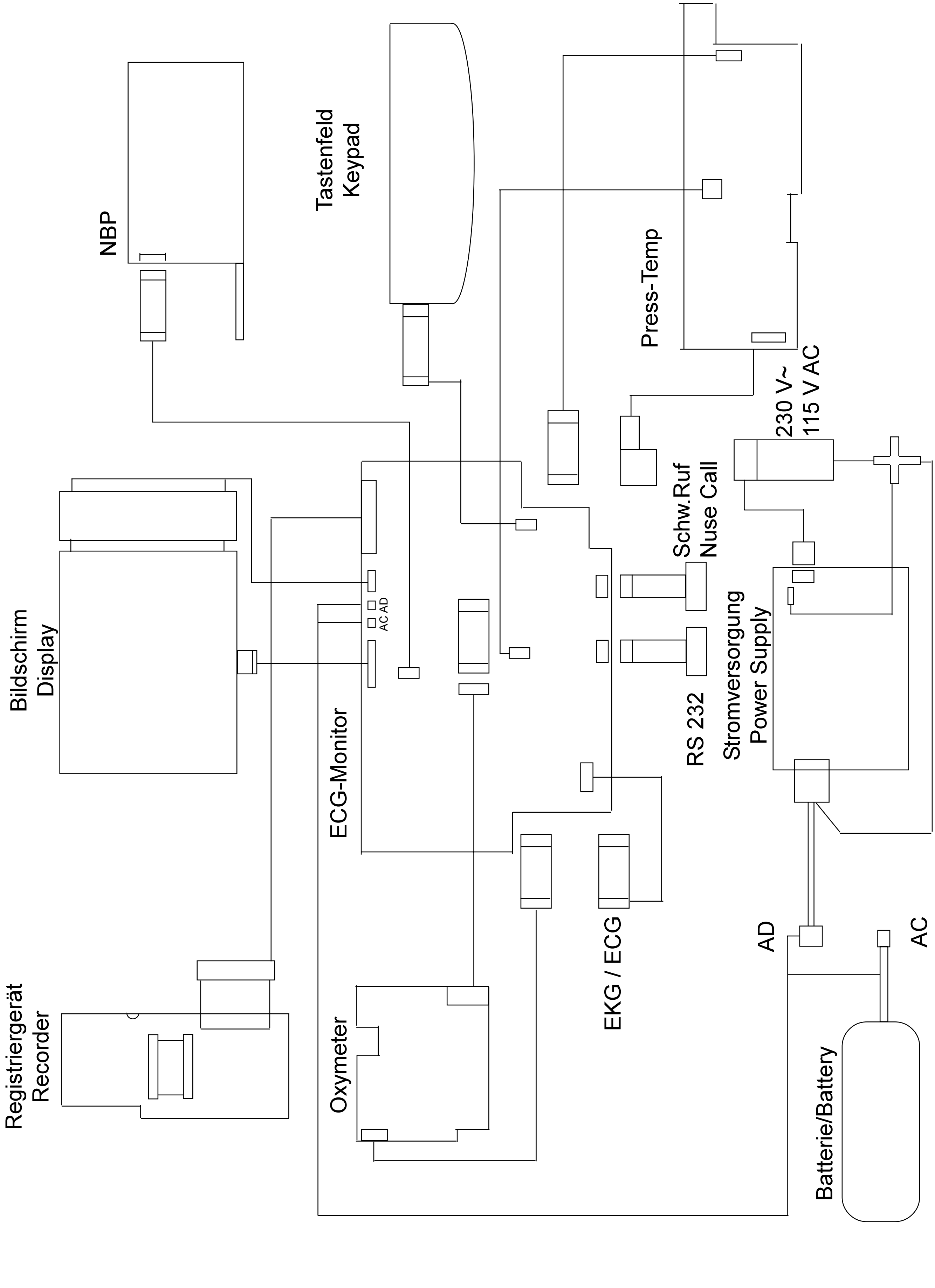
The LCD display is controlled by a -23V power supply. This voltage is acquired from the battery voltage supply. The contrast on the PCB ECG Monitor must be adjusted.

The display has a reverse video feature which is supplied with 300 V AC at 30 to 40 Hz from a CCFT supply. In open-circuit operation this is approx 565 V.

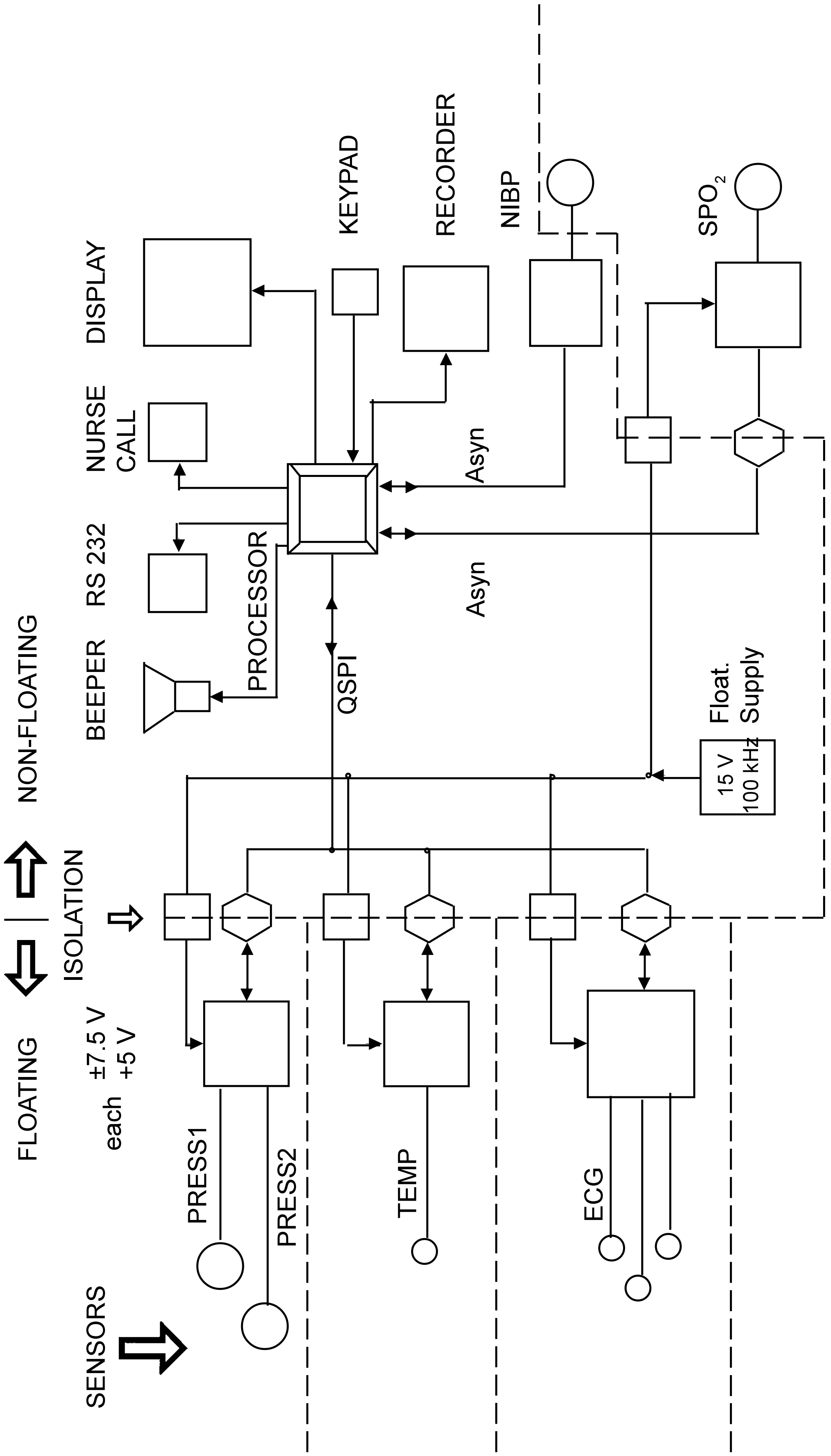
**Warning: Avoid contact with this voltage where it is exposed on the PCB ECG Monitor.**

## 2.2.7 Block diagrams

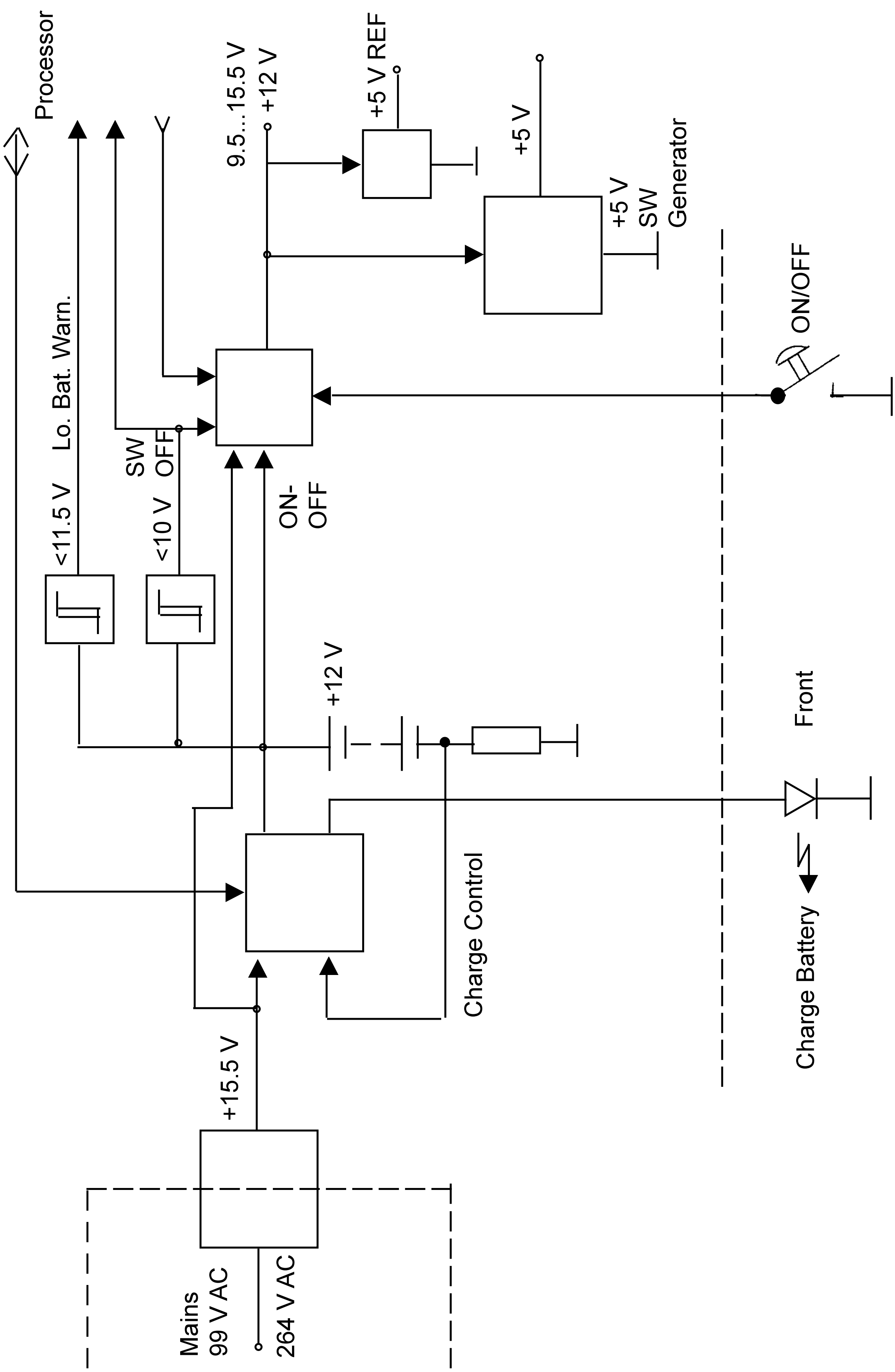
### 2.2.7.1 Functional groups



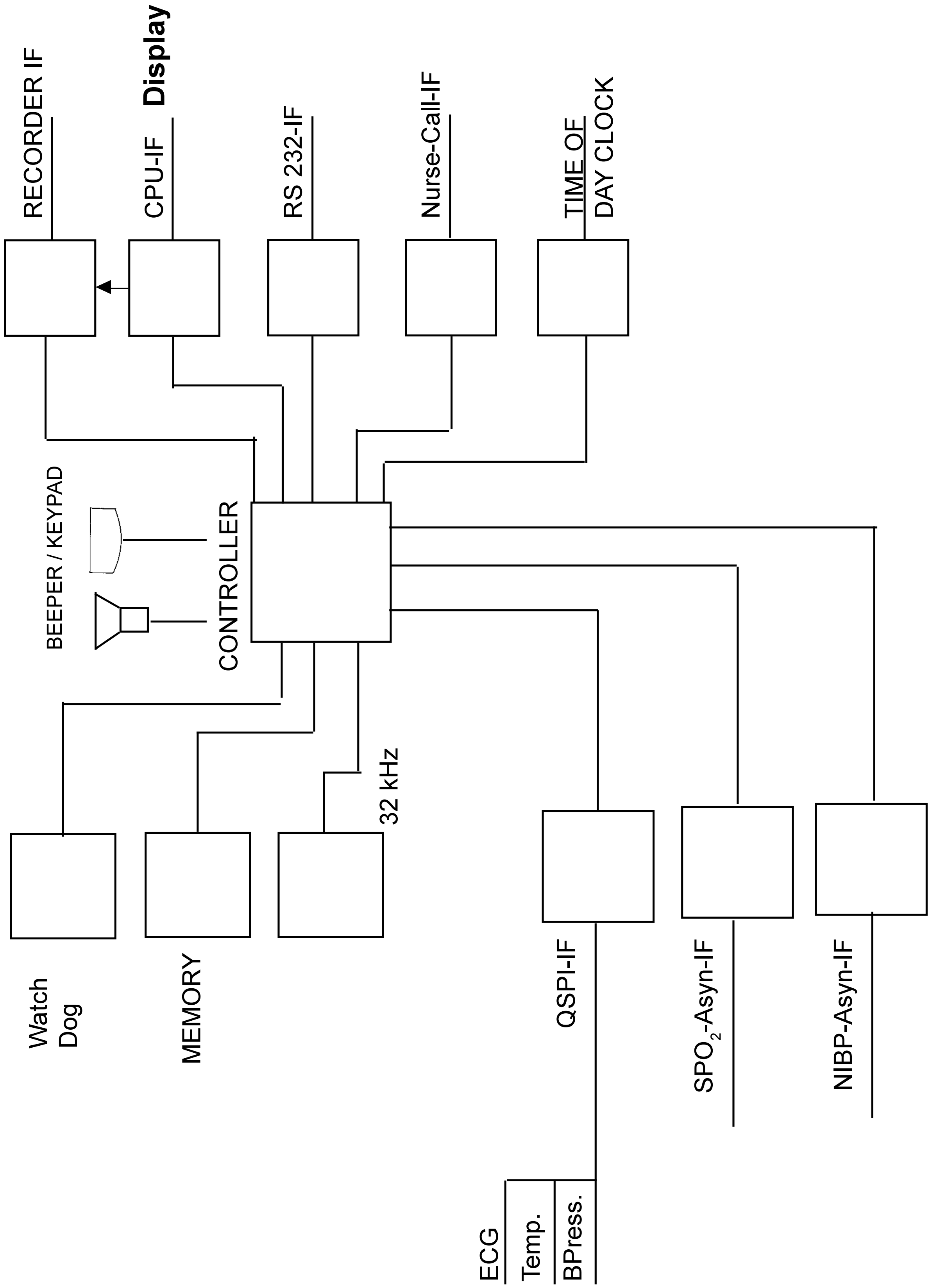
### 2.2.7.2 Floating system supply and signal flow



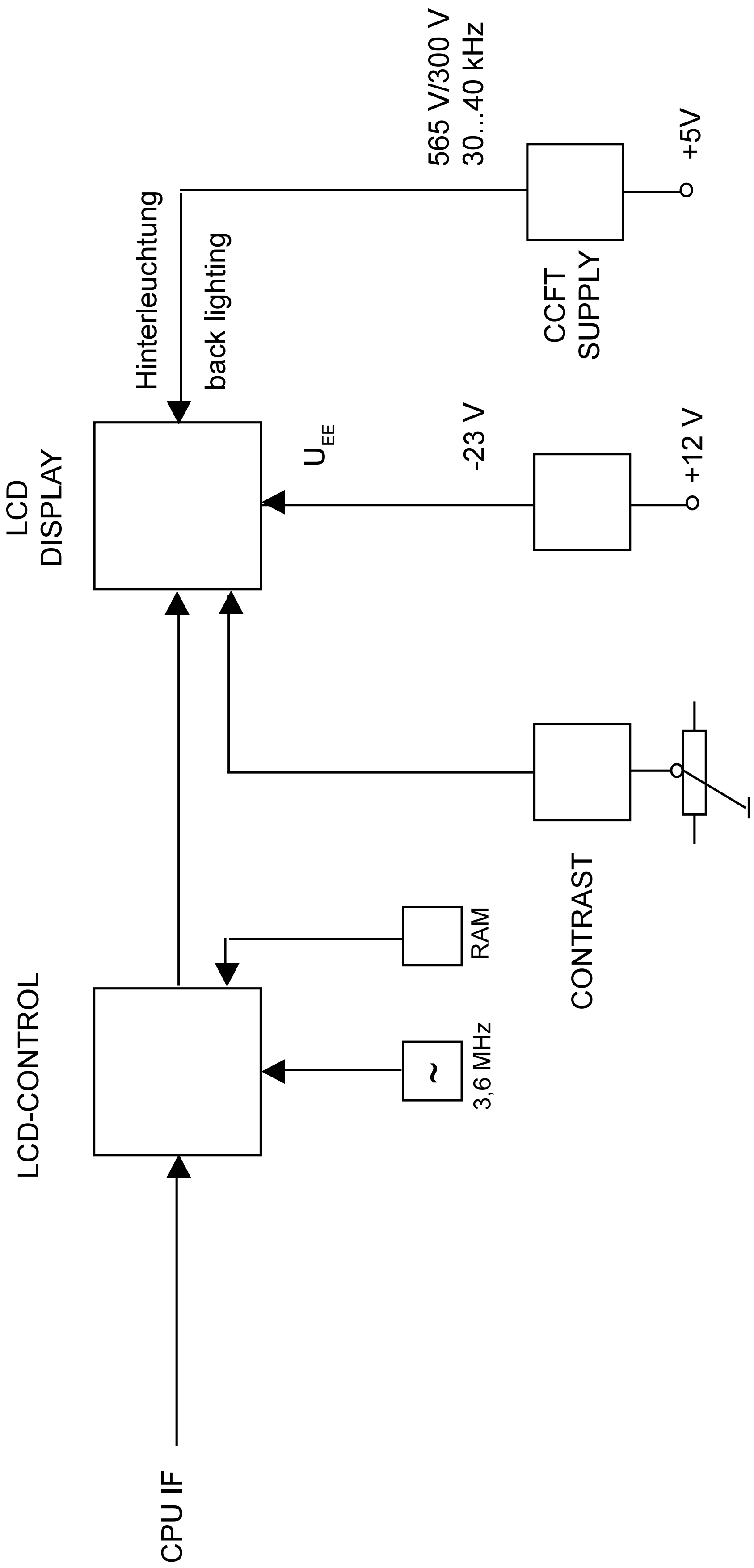
### 2.2.7.3 System power supply



### 2.2.7.4 PROCESSOR block diagram



### 2.2.7.5 DISPLAY block diagram



## 2.2.8 ECG signal preprocessing

### 2.2.8.1 Functional description

The block diagram “ECG/Pace Preprocessing” shows the functional setup.

**ECG input**

In the Eagle 1000 ECG signal acquirement and processing takes place in one of the remaining functional groups electrically separated from the others on the motherboard. The functions of this component comprise analog processing of the ECG signals and a QRS detector to monitor the cardiac rhythm.

All control functions are monitored by a processor, which exchanges data and commands with the ECG circuit via the optoelectronic coupler.

Before it becomes operative the ECG circuit must be initialized. This is effected by the processor in accordance with the selected accessories. The processor receives ID signals called LET1, LET2 and LET3, identifying the nature of the connected accessories and, hence, determines which ECG leads are available and which connections need to made to the patient.

For this reason, the lead selector is preset to identify the patient cables used and to test whether all the electrode leads are connected correctly. Every disconnected (electrode) lead produces an error signal which is evaluated by the processor so that such electrodes are not used for ECG monitoring.

**ECG signal transfer**

If fully operational electrodes are correctly connected to the EAGLE 1000, the ECG signal is first amplified to 1.1 V per 1 mV as an analog signal, then transferred as a digital signal via the optoelectronic coupler.

During analog signal amplification signal transfer is interrupted in the event of pacemaker pulses and the arithmetic mean value is transferred as a baseline in place of the ECG signal. The digital data are generated 1000 times a second from each of the transferred amplitude values.

ECGs up to max. ±4.5 mV are digitized completely.

Three-lead patient cables provide only one ECG lead (lead I, II or III) on channel 1, connecting a five-lead cable enables EAGLE 100X to provide one lead each on two channels. The options are leads I, II, III, AVR, AVL, AVF, V.

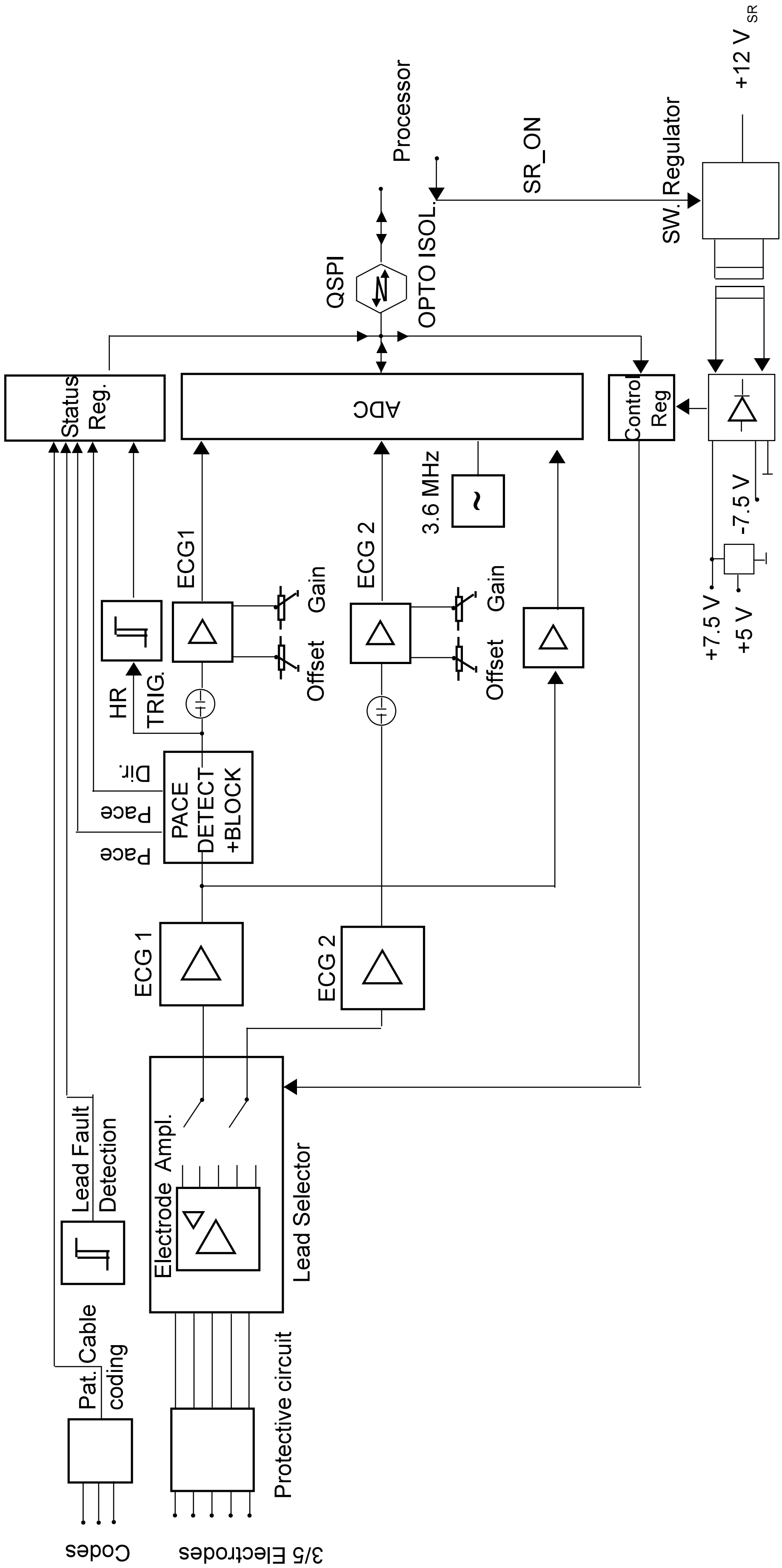
### Heart rate monitoring

A QRS detector in the ECG circuit detects the beats. This detector filters and triggers the signal components typical of QRS from the channel 1 ECG signals when their amplitude is greater than a threshold value arising in the prior amplitudes.
The processor receives a signal for every beat detected by the ECG circuit, calculates the heart rate from these and triggers an alarm when the heart rate is outside the programmed limits.

### Pacing detection

Signal segments with a steep rising or falling edge are suppressed as long as their amplitude exceeds a value of 6 mV. This suppression is limited to a time period of about 50 ms. During this period the baseline is recorded and a pacing-pulse message is passed on to the processor, which puts a marker for this event on the display.

## 2.2.8.2 ECG/Pace Preprocessing

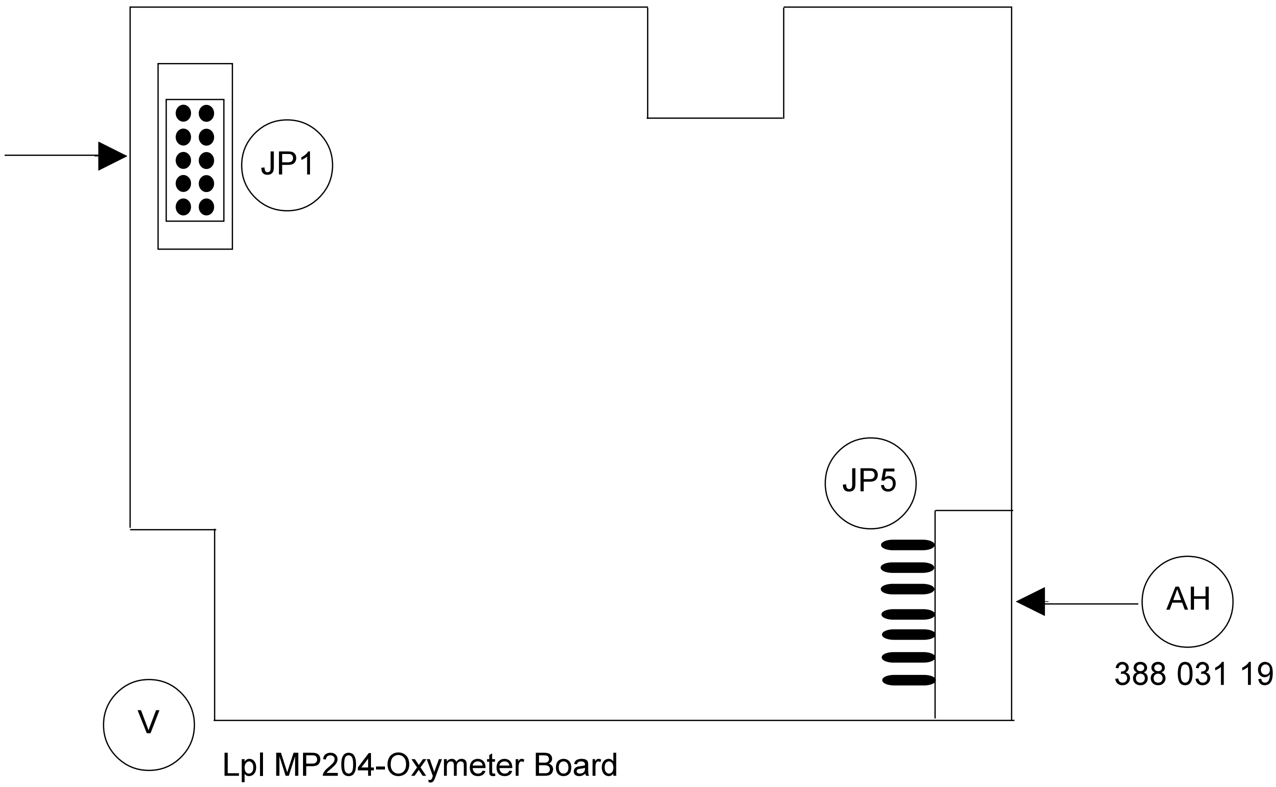


## 2.2.9 PCB MP 204 Oximeter 930 117 26

### 2.2.9.1 Function

The PCB Oximeter acquires and automatically processes the $SpO_2$ signal. Via an inter nal asynchronous connection it passes the data on oxygen saturation and pulse rate on to the PCB ECG Monitor. The entire PCB Oximeter is floating (CF). The floating separati-on for power supply and communication is located on the PCB ECG Monitor.

### 2.2.9.2 Figure of pcb MP204 Oximeter




Lpl MP204-Oxymeter Board
930 117 26

### 2.2.9.3 Pin assignment

**Sensor interface connector pin assignment (JP1)**

Pin 1: Anodes (detector)
Pin 2: no connection
Pin 3: no connection
Pin 4: Cathode (detector shield) shield
Pin 5: ground (RCAL return)
Pin 6: RCAL
Pin 7: -LED
Pin 8: no connection
Pin 9: +LED
Pin 10: ground

**Host interface pin assignment (JP5)**

Pin 1: VCC (+5V)
Pin 2: ground
Pin 3: ground
Pin 4: +7.5V
Pin 5: ground
Pin 6: -7.5V
Pin 7: unused
Pin 8: TX Transmit data (output from module)
Pin 9: RX Receive data (input to module)
Pin 10: CTS_ Clear to send (input to module, active low)
Pin 11: RESET_ (Reset input, active low)
Pin 12: ground
Pin 13: ECG sync input, active high
Pin 14: ground

## 2.2.10 Non-invasive blood pressure module

### 2.2.10.1 Function

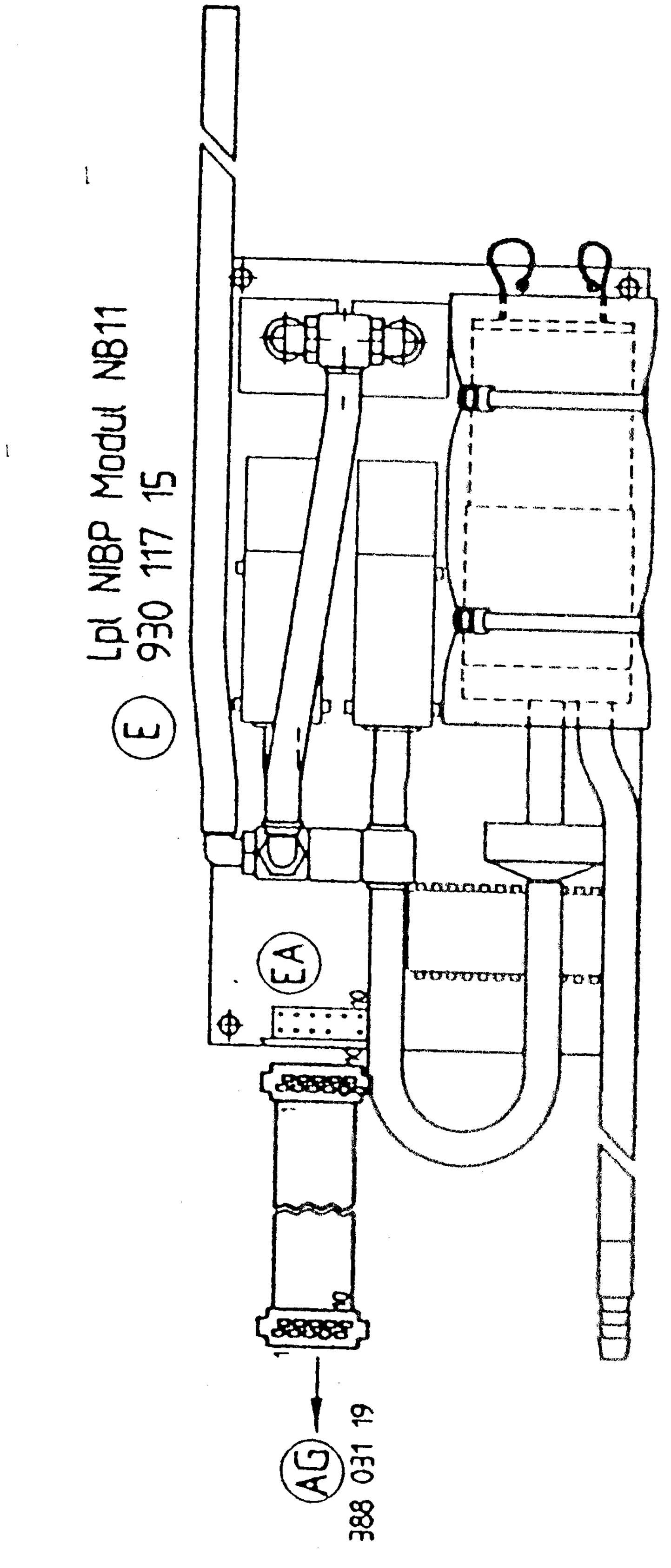
The PCB NBP acquires and automatically processes the non-invasive blood pressure signal. Via an internal asynchronous connection it passes the non-invasive blood pressure data on to the PCB ECG Monitor. From here it receives a reset signal as well as a separately controlled pump power supply for safety reasons. The PCB is not electrically isolated as isolation is effected by the pneumatic signal input.

**Warning: For safety requirements, when replacing the PCB it is important to use the flat strip cable of correct length to match the version used.**

### 2.2.10.2 Figure of PCB NBP Module NB11: 930 117 15

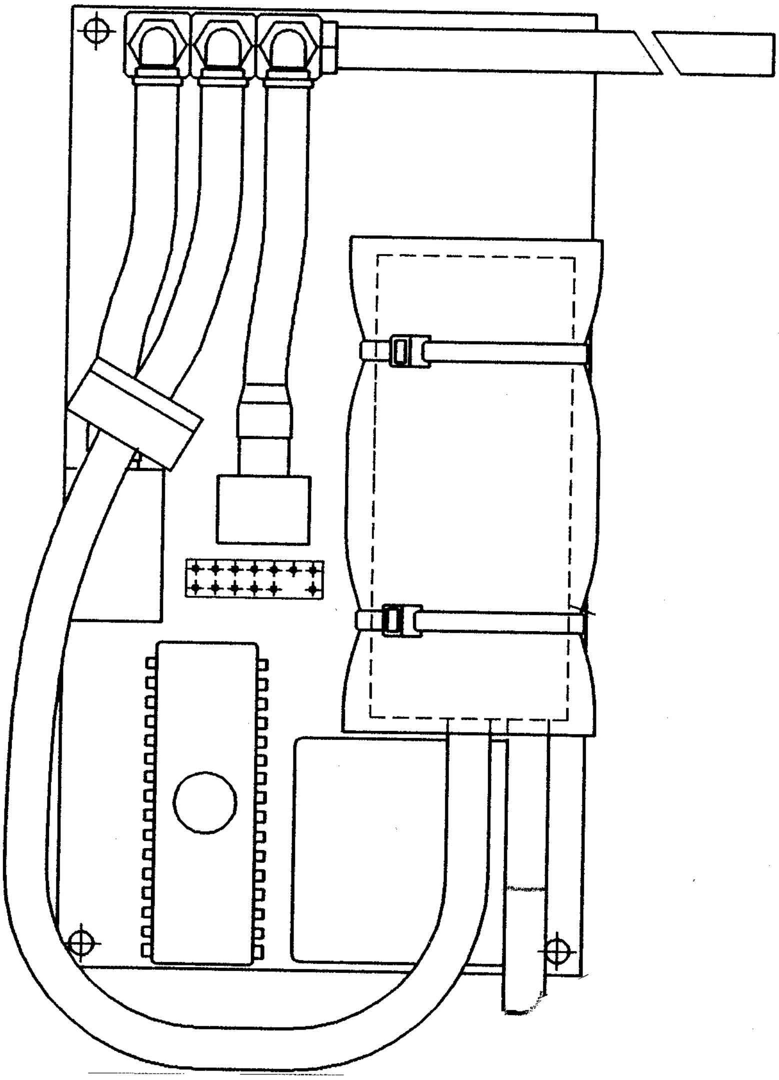
Use wire set 383 273 30

PCP NBP Module NB11



### 2.2.10.3 Figure of PCB NBP 2000 Module 930 117 93 or 388 032 60

Use wire set 383 273 65



### 2.2.10.4 Pin assignment

NBP pin connections to PCB ECG Monitor

Plug-in connector 2 rows of 5 pins

| | | |
|---|---|---|
| 1 | +7 $V_p$ | Pump power supply, host-controlled |
| 2 | +7 $V_p$ | Pump power supply, host-controlled |
| 3 | + 7V | Power supply for PCB NBP |
| 4 | GND | |
| 5 | GND | |
| 6 | GND | |
| 7 | KEY | Plug coding |
| 8 | RESET | Reset, host-controlled |
| 9 | Rx | Receive |
| 10 | Tx | Transmit |

## 2.2.11 PCB Press-Temp 388 031 75/PCB Temp 388 032 04

**General information**

The PCB PRESS-TEMP enables measurement of the two electrically isolated parameters temperature (one temperature) and invasive blood pressure (two pressures,both isolated together). These parameters are connected along with the ECG to the processor by means of a QSPI interface. The signals are isolated by optoelectronic couplers.

The power supply is fed in via one HF transformer each for PRESS and TEMP from a common oscillator, which also supplies power to the ECG circuit and the $SpO_2$ module.

See block diagram “Floating system supply and signal flow”.
The PCB is equipped with precision components (and an adjustment program in the case of TEMP) so that a **potentiometer adjustment is not required.**

The individual floating measurement circuits are shielded on both sides of the PCB by a metal cover. For PCBs which do not have an insulating cover over the two floating parts the PCB is underlayed with a sheet of insulating foil. These insulation precautions are important for safety reasons!

### 2.2.11.1 PRESS module

The circuit is described in the block diagram “Press block diagram”.

**Power supply**

The floating power supply for PRESS uses an HF transformer connected in parallel with the other floating transformers. The corresponding oscillator delivers a closed-loop controlled transformer output voltage, which may vary somewhat depending on the load, from the unregulated battery voltage. This supplies the amplifier and the connection detector with ±7.5 V.

The ADC and digital circuit are supplied by a voltage controller with a stabilized 5 V, in the form of an analog and a decoupled digital power supply. When the 5V power supply drops below 4.75 V an error signal interrupts the chip select to ADC so that no incorrect parameter readings can be transferred.

**Probe detection**

Each PRESS channel is assigned an ID by means of a resistor coding system which, even in operation via an adapter, informs the system which channel the probe is connected to or whether two probes are connected up. This is transmitted to the pro
cessor by a probe ID amplifier as an analog signal via the ADC.

If no probe is connected, this is detected by the probe connection comparator and dis ables the 5V power supply to save power. The processor is informed of this by the MISO signal being reset to zero (optoelectronic coupler under continuous current).

### ADC operation

The ADC receives all the information and transfers the parameter readings via a bidirectional serial interface. Although this provides a clock to operate the interface functions, it does not provide the clock for conversion. This is obtained as a local asyn chronous signal from a 4MHz oscillator, whose output is divided into two times 2 MHz.

### PRESS amplifier

An integrated precision instrument amplifier acts as an amplifier for the pressure signaling each channel, which amplifies the signal by a factor of approx. 200 and has an earthed neutral over ¼ of the ADC range. A signal feedback to the input capacitors maintains the common mode rejection.

### 12 Hz filter

Downline from the amplifier there is one 12V low-pass filter each. This filter is a Bessel low-pass Grade II filter so that jumps in pressure are transferred exactly as registered.

## 2.2.11.2 Temp module

The circuit is shown in the block circuit diagram “Temperature block diagram”.

### Power supply

The floating power supply for TEMP uses an HF transformer connected in parallel with the other floating transformers, from the unregulated battery voltage. The corresponding oscillator delivers a closed-loop controlled transformer output voltage, which may vary somewhat depending on the load. This supplies the amplifier and the connection detector with ±7.5 V.

The ADC and digital circuit are supplied by a voltage controller with a stabilized 5 V, in the form of an analog and a decoupled digital power supply. When the 5V power supply drops below 4.75 V an error signal interrupts the chip select to ADC so that no incorrect parameter readings can be transferred.

### Probe detection

If no probe is connected, this is detected by the probe connection comparator with 3 threshold values, which differ between Hellige and Marquette front panel connectors,and disables the 5V power supply to save power. The processor is informed of this by the MISO signal being reset to zero (continuous current to optoelectronic coupler).

### ADC operation

The ADC receives all the information and transfers the parameter readings via a bidirectional serial interface. Although this provides a clock to operate the interface functions, it does not provide the clock for conversion. This is obtained as a local asynchronous signal from a 4MHz oscillator, whose output is divided into two times 2 MHz.

### TEMP amplifier

An integrated precision instrument amplifier acts as an amplifier for the temperature signal, which alternately receives the measurement signal from the temperature half-bridge, two control values and a reference value for offset correction from the precision resistor network via a multiplexer. The multiplexer is controlled along with the ADC of the serial interface by a PAL.

## 2.2.11.3 Internal interfaces

### Mechanical interfaces

The PCB PRESS-TEMP is plugged into the PCB ECG Monitor mechanically. The floating power supply, i.e., the oscillator connections and the QSPI signal paths to the processor are via this plug-through connector. This is located at the middle of the floating section of the PCB.

### Electronic interfaces

Internal communication is mediated by a QSPI interface.

| | | |
|---|---|---|
| JJ/1 | SCLK | Serial clock |
| JJ/2 | MOSI | Master Out Slave In signal |
| JJ/3 | PCS2_ | Chip select PRESS |
| JJ/4 | PCS3_ | Chip select TEMP |
| JJ/5 | MISO | Master In Slave Out signal |
| JJ/6 | - | |
| JJ/7 | +5 V | |
| JJ/8 | GND | |
| JJ/9 | +12 VH | Transformer power supply |
| JJ/10 | SR_VSW | Transformer power switch |

### 2.2.11.4 Interfaces to peripherals

**Mechanical interfaces**

There is an interface for the patient connections of the three connectable probes (2 x PRESS, 1 x TEMP).

**PRESS:**
The measurement input to the two pressure amplifiers is connected floating to the front panel via the elbow plug-in connector P1 top right along the shortest path via ferrite toroidal cores.

The single pressure input of the system with HELLIGE connectors only permits one pressure transducer to be connected directly to PRESS1. Two invasive pressures can be measured by inserting an adapter bearing two transducer interfaces to this system input. This can be affixed to the system using a Velcro strip.

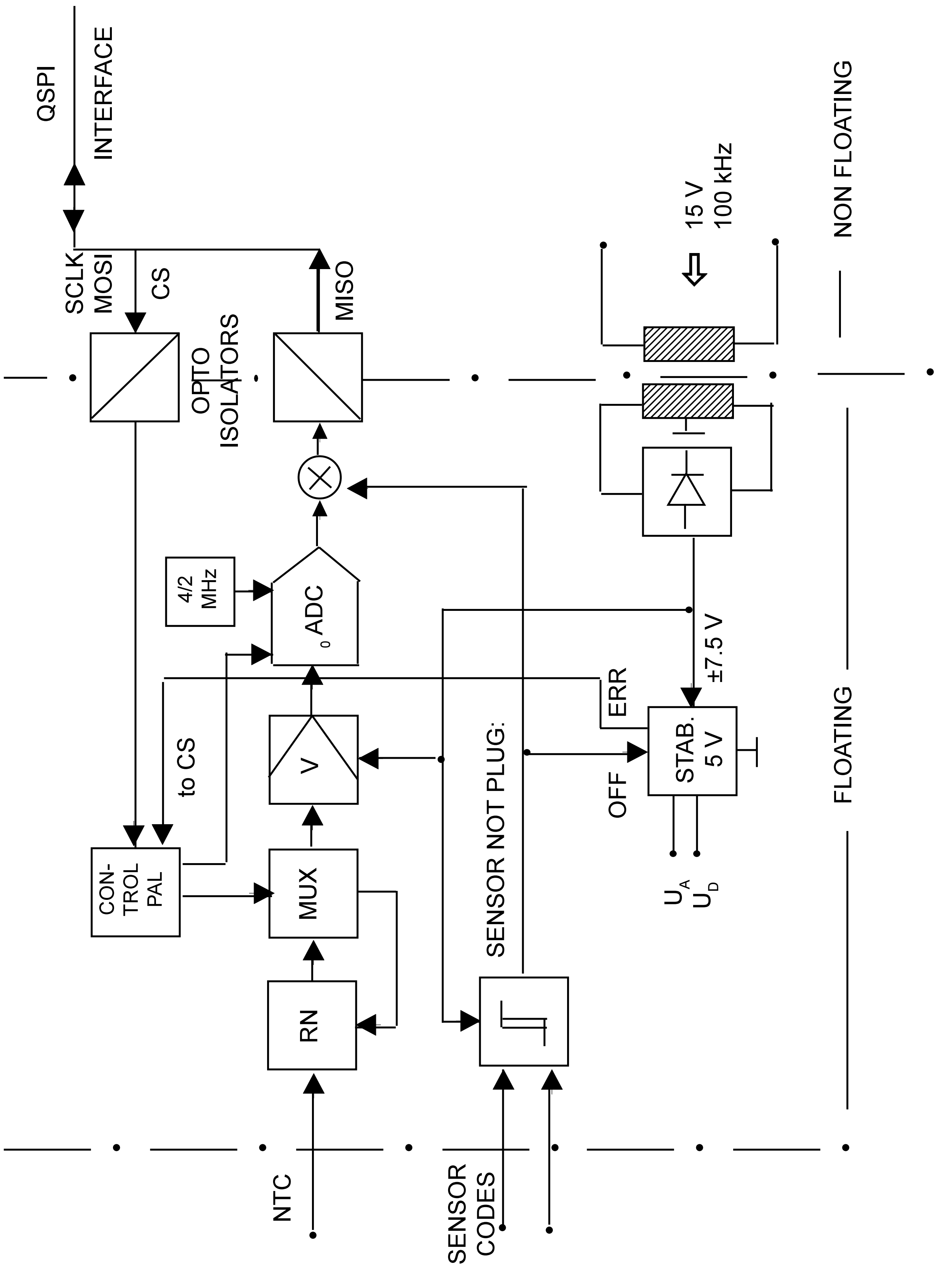
**TEMP:**
The measurement input to the temperature amplifier is connected floating to the front panel on the other opposite side via the coded left-hand plug-in connector and ferrite toroidal cores.

**Electronic interfaces**

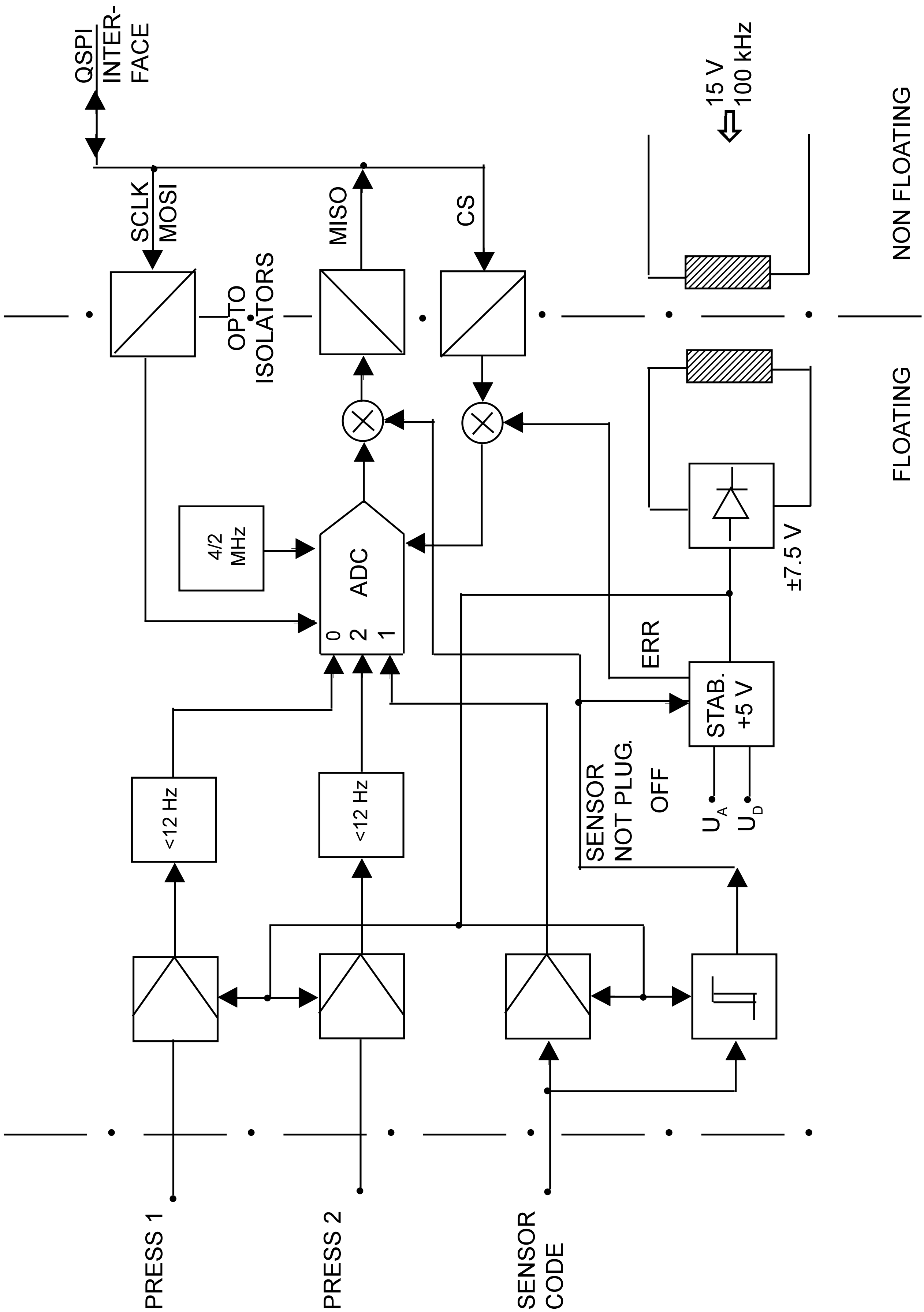
**PRESS:**
The PRESS channels are identified by resistor coding, even when an adapter is interposed in systems with a Marquette Hellige connector. Data transfer is on channel 1 of the ADC.

**TEMP:**
In model versions with Marquette Hellige round connectors the jack plug socket is scanned for the position of the normally closed contact to detect the presence of the probe (voltage at T/8 $3/4U_z$ = 3.53 V (from D7) connected and $1/4U_z$ = 1.18 V disconnected against approx.$1/2U_z$ = 2.46 V as the threshold at the comparator.

## 2.2.11.5 TEMPERATURE BLOCK DIAGRAM



### 2.2.11.6 PRESS BLOCK DIAGRAM



## 2.2.12 Recorder 50 Part No. 218 111 12

### Construction

The Recorder 50 is a compact module comprising a drive and drive electronics. The drive essentially comprises 2 shells in which the DC motor-transmission-speedo unit, rubber cylinder, thermal-array printhead, paper container with paper feed flap are assembled. The complete drive electronics is located on the PCB Recorder 50 in the drive.

### 2.2.12.1 Function

The circuit setup is shown in the circuit block diagram “Recorder block diagram” The two main recorder components are the printhead and the motor for paper advance.

The printhead power supply comes from the through-connected battery voltage, increased to +22 V by a transformer.

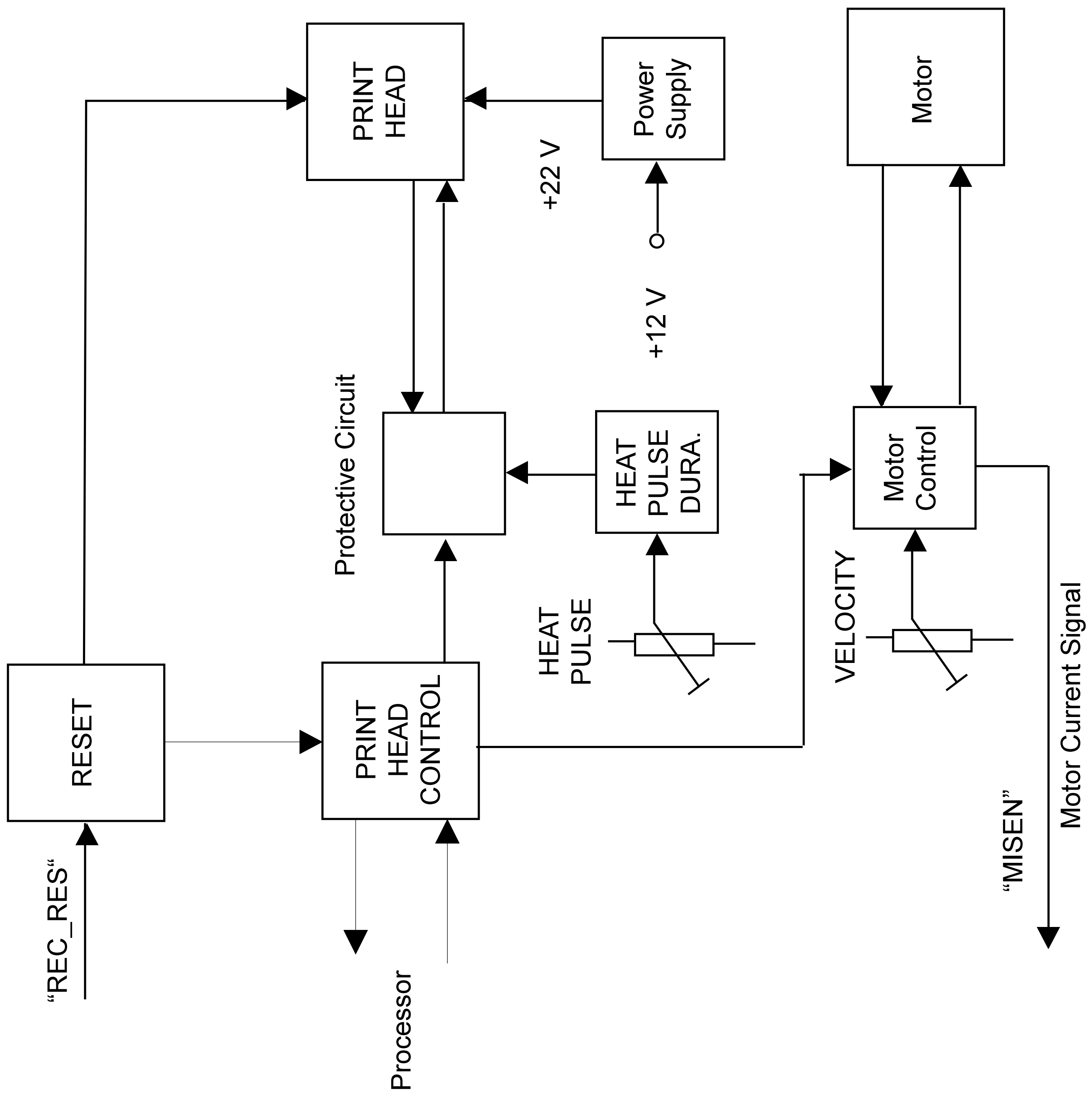
The printhead controller acts on the printhead and the motor indirectly. It can be reset by the host processor or by the printhead electronics.

The printhead controller acquires its data from the host processor and returns relevant information. It acts on the printhead via a protective circuit which measures the print head temperature and processes this. This protective circuit also receives information on the requested heating pulse duration, which can be adjusted, and which can be modified in accordance with the printhead temperature.

The Eagle 1000 uses only one motor speed, 25 mm/s. This is preset by the motor controller and can be adjusted.

The motor current signal “MISEN”, which is passed on to the host processor, is used to protect the motor.

### 2.2.12.2 Recorder block diagram



### 2.2.12.3 Internal interfaces

**Mechanical interfaces**

- 30-lead flat strip cable with cased socket housing to printhead
- 4-lead male multipoint connector with coding to the motor

**Electronic interfaces**

Printhead interface

The thermal-array printhead is connected with a 30-lead flat strip cable to the PCB DIGITAL. Serial loading of data ensues via the KDATA cables, using the clock signal KCLOCK into the printhead shift register. Parallel data is transferred to the printhead latch register with the KLATCH signal. The heating period is controlled by the KSTRB cable.

The printer controller receives an analog signal, which varies according to the temperature of the printhead, via cables TERM1 and TERM2.

Via signals delivered by the VDD1 cable when not printing the thermal-array printhead is put into power save mode.

The remaining leads are used to supply voltage to the printhead. Refer to P-Plan PCB Recorder for pin assignment.

**Motor interface**

The motor is connected to the male multipoint connector on the printer controller via a 4-lead plug-in socket. The motor is connected between +22V and Motor+, the speedo generator between MOTGEN- and MOTGEN+.
Refer to P-Plan PCB Recorder for pin assignment.

### 2.2.12.4 Interfaces to peripherals

#### Mechanical interfaces

The interface for peripherals comprises a 38-cm flat strip cable soldered to the PCB with a 34-pin Berg female connector. The connector is coded at Pin 25

| | | | |
|---|---|---|---|
| AA/1 | GND | | |
| AA/2 to 9 | D_REC_0 - D_REC_7 | 8-bit databus | Input |
| AA/10 | GND | | |
| AA/11 | DATSTRB_ | Data strobe | Input |
| AA/12 | GA | Sampling value/alphanumeric change-over | Input |
| AA/13 | SELCHAN | Waveform channel selection | |
| Input | | | |
| AA/14 | MARKER_ | Marker triggering | Input |
| AA/15 | RASTER | Raster activation | Input |
| AA/16 | SD | One/two-channel toggling | Input |
| AA/17 | REC_RES | Reset | Input |
| AA/18 | GND | | |
| AA/19 | GRAPHR | Waveform sample acknowledgment | Output |
| AA/20 | ALPHAR | Text and control character acknowledgment | Output |
| AA/21 | PVALARM_ | Motor overcurrent and checksum alarm | Output |
| AA/22 | MISEN_ | Motor current alarm direct | Output |
| AA/23 | OVLOAD_ | Overtemperature alarm | Output |
| AA/24 | GND | Logic ground | Input |
| AA/25 | COD | Connector coding | |
| AA/26 | +5V | 5V power supply | Input |
| AA/27 to 30 | GNDR | Ground | Input |
| AA/31 to 34 | +12V | 12V power supply | Input |

# 2.2.13 PCB Power Supply 930 117 41

## 2.2.13.1 Function and pin assignment

The PCB Power Supply comprises a primary clock-rated wide-range power supply unit with an output voltage separated by a transformer. Thus a voltage selector is not necessary. The power supply unit fullfills leakage current requirements according to IEC 601 and UL 544. It is tested according to IEC, UL and CSA.

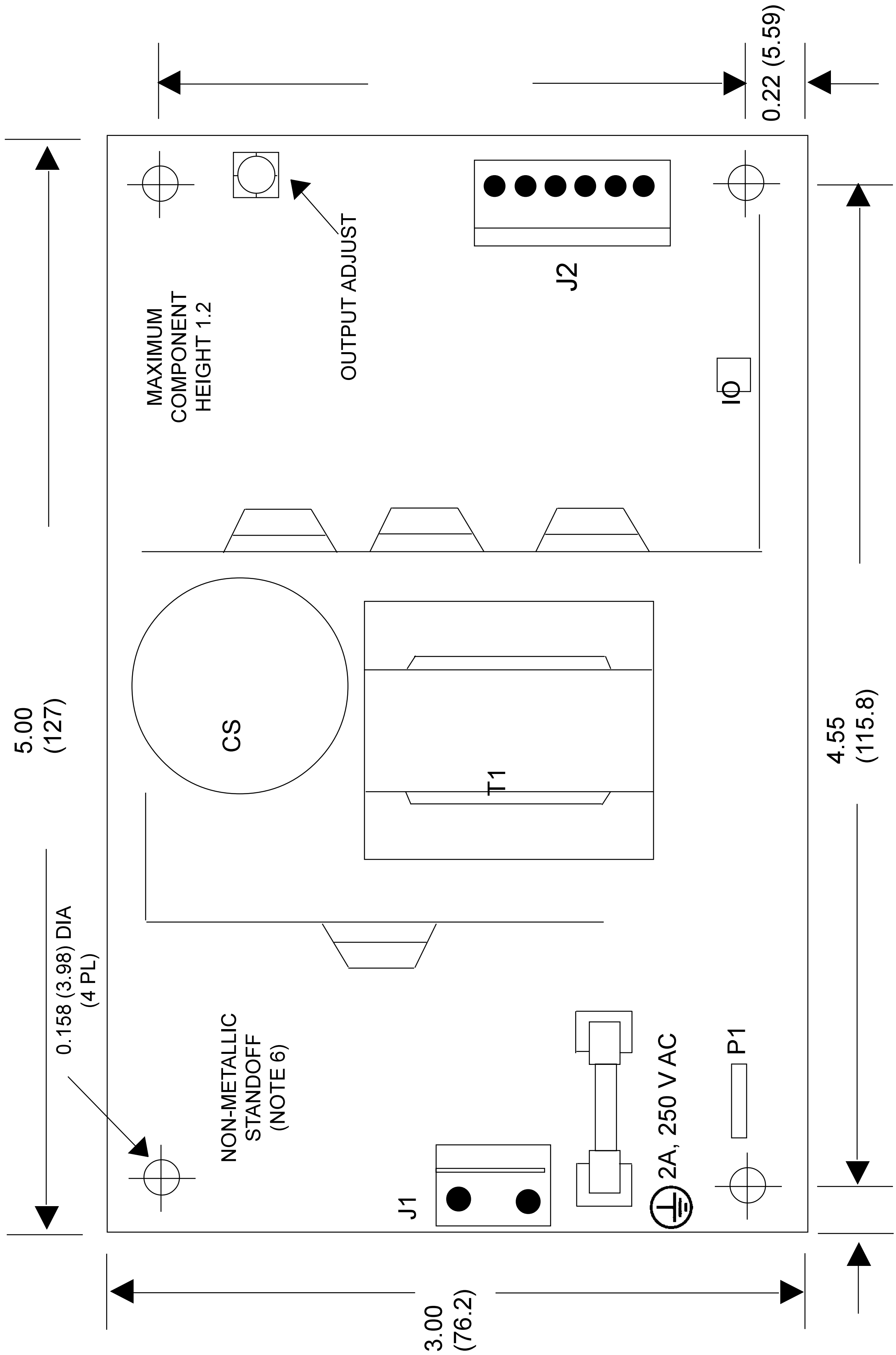
| PIN CHART | |
|---|---|
| J1 | |
| Pin 1 | AC Live |
| Pin 2 | AC Neutral |
| J 2 | |
| Pin 1 | +Vout |
| Pin 2 | +Vout |
| Pin 3 | +Vout |
| Pin 4 | Return |
| Pin 5 | Return |
| Pin 6 | Return |
| P1 | |
| Pin 1 | Safety Earth Ground |

“AC” = 95 to 240 V AC rated voltage (85 to 264 operating voltage)
Frequency 49 to 65 Hz

Dielectric strength 1500 V AC

“+Vout“ = +15.5 V under load
(+15.6 V in idling mode)

### 2.2.13.2 Figure of PCB Power Supply 930 117 41



## 2.2.14 Membrane keypad

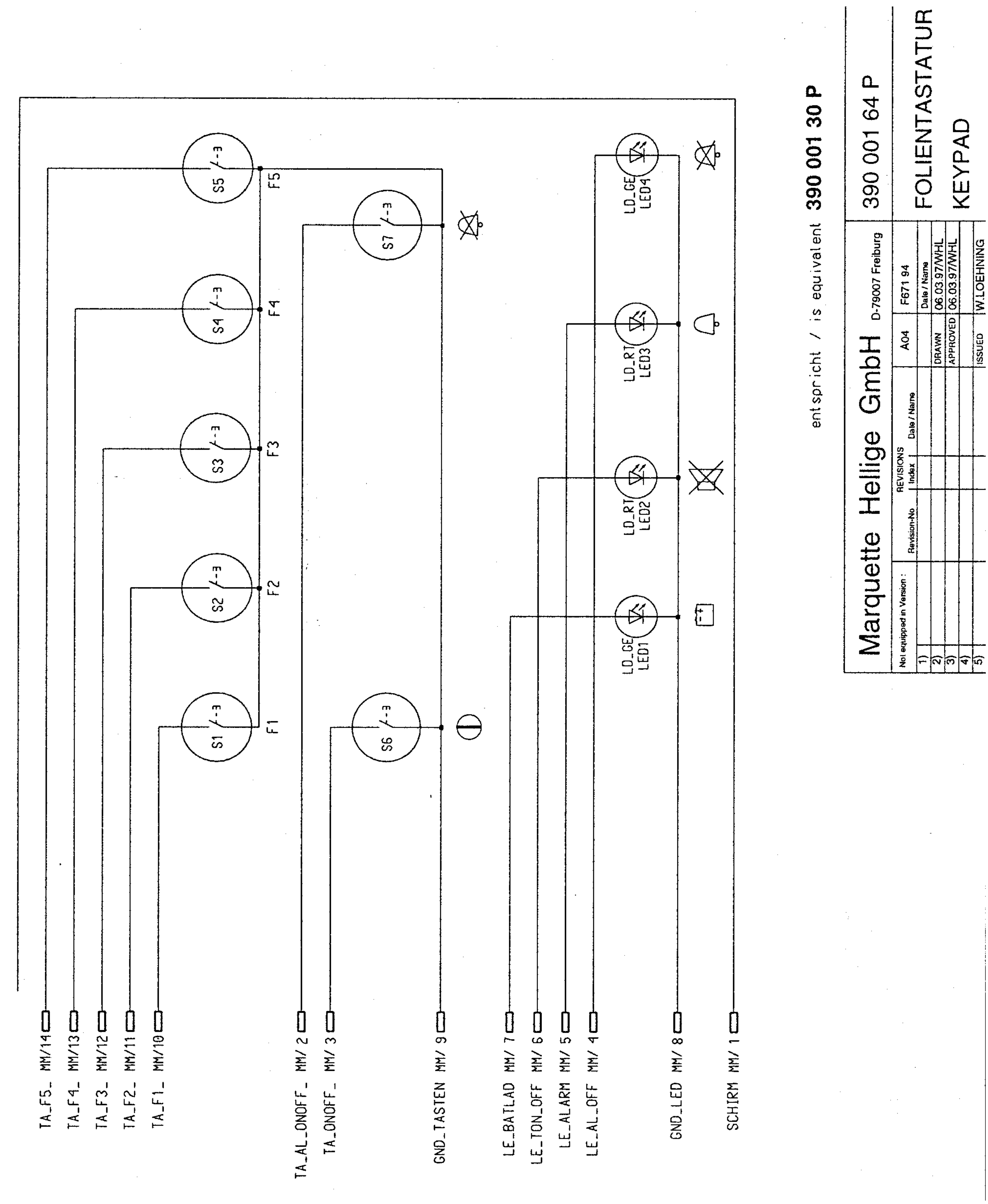
The proper function of the membrane keypad can partly be tested by operating routines listed below under “Test”.

### 2.2.14.1 Pin assignment

Pin assignment of keypad connector F at socket AM of the PCB ECG Monitor.

| Pin | Denotation | Signal | Test |
|---|---|---|---|
| 1 | Screen | | |
| 2 | Alarm On/Off key | TA_AL_ONOFF_ | Actuate in alarm situation |
| 3 | System On/Off button | TA_ONOFF_ | Switch on, switch off |
| 4 | LED Alarm Off | LE_AL_OFF | Without having an alarm, press alarm key |
| 5 | LED Alarm | LE_ALARM | Initiate alarm situation |
| 6 | LED Sound Off | LE_TON_OFF | In alarm situation menu 2 x Next Menu, press audible alarm signal ON/OFF |
| 7 | LED Charge Battery | LE_BATLAD | Disconnect / reconnect mains plug |
| 8 | Ground for LED | GND_LED | Test a LED |
| 9 | Ground for keys | GND_TASTEN | Test a key |
| 10 | F1 key | TA_F1_ | Test directly in menu and in level 2 |
| 11 | F2 key | TA_F2_ | dto. |
| 12 | F3 key | TA_F3_ | dto |
| 13 | F4 key | TA_F4_ | dto |
| 14 | F5 key | TA_F5_ | dto |

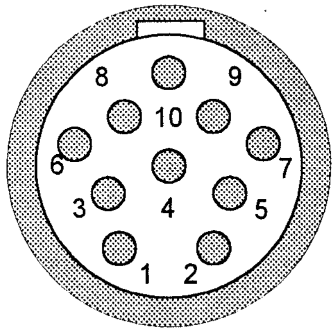
## 2.2.14.2 Membrane keypad 390 001 30 and 390 001 64, circuit diagram



# 2.3 Pin configuration of panel connectors

## 2.3.1 Socket ECG 303 444 28

Marquette Hellige input socket, circular version
Green mark on plug

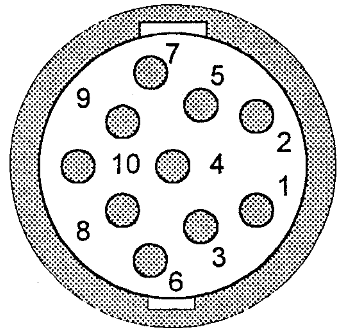


Front view

| | 5-Lead Cable | 3-Lead Cable |
|---|---|---|
| 1 | Input R | R |
| 2 | Input C | L |
| 3 | Input F | F |
| 4 | Input N | --- |
| 5 | Input L | --- |
| 6 | Ident Cable Connected | Ident Cable Connected |
| 7 | GND floating | GND floating |
| 8 | --- | --- |
| 9 | Ident 5-Lead Cable | --- |
| 10 | Screen | Screen |

## 2.3.2 Socket $SpO_2$ 303 444 29

Marquette Hellige input socket, circular version
Blue mark on plug

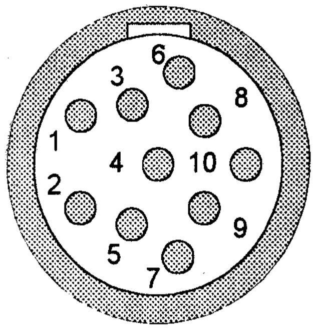


Front view

| | On device |
|---|---|
| 1 | Anode Photodetector |
| 2 | nc |
| 3 | nc |
| 4 | Cathode Photodetector |
| 5 | GND |
| 6 | R(cal) |
| 7 | LED - (Red LED Cathode, IR_LED Anode) |
| 8 | nc |
| 9 | LED + (Red LED Anode, IR_LED Cathode) |
| 10 | GND Screen |

## 2.3.3 Socket PRESS 303 444 30

Marquette Hellige input socket, circular version
Red mark on plug

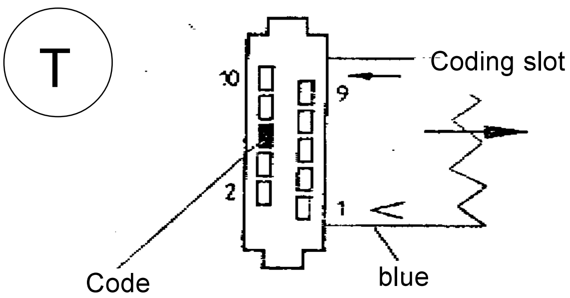


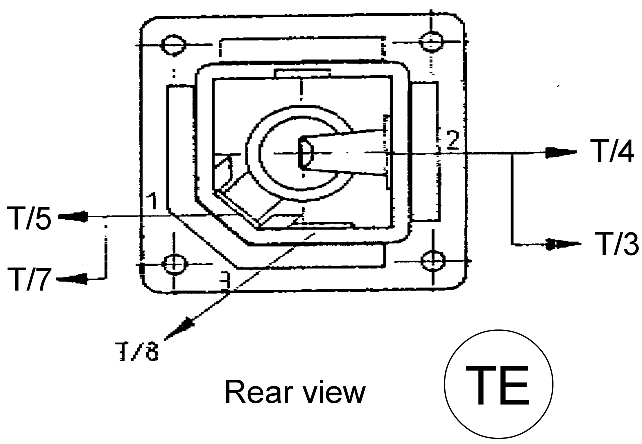
Front view

| | On device | On Press Distributer |
|---|---|---|
| 1 | pos. Signal PRESS1 | pos. Signal PRESS 1 |
| 2 | neg. Signal PRESS 1 | neg. Signal PRESS 1 |
| 3 | pos. Signal PRESS 2 | --- |
| 4 | Ident to PRESS Distributor | Ident “Wrong Probe” |
| 5 | neg. Signal PRESS 2 | --- |
| 6 | pos. excitation voltage | pos. excitation voltage |
| 7 | neg. excitation voltage | neg. excitation voltage |
| 8 | Ident “Probe Press 1 Connected” | Ident “Probe Connected” |
| 9 | GND “BP” | --- |
| 10 | Screen | Screen |

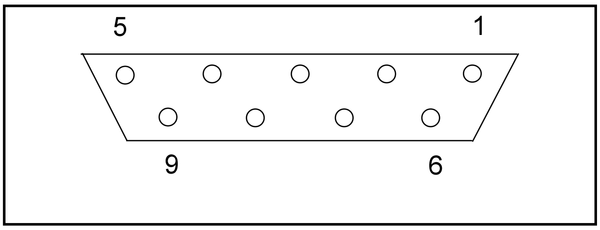
## 2.3.4 Socket Temperature (TEMP) 303 444 31

| 10-Pin Connector<br>T to PCB | | Socket<br>TE to System | Signal |
|---|---|---|---|
| 1 | ----\ | | GND_AT |
| | T/1 to T/2 | | |
| 2 | ----/ | | NTC Pulldown |
| 3 | ---------------- | 2 | NTC Input |
| 4 | ---------------- | 2 | NTC Input |
| 5 | ---------------- | 1 | GND_AT |
| 6 | | | Coding |
| 7 | ---------------- | 1 | GND_AT |
| 8 | ---------------- | 3 | Plug-in contact detection by break contact jack |
| 9 | ----\ | | Plug-in contact detection threshold value |
| | T/9 to T/10 | | |
| 10 | ----/ | | Reference plug-in contact detection threshold value |



# 2.3.5 Socket on the rear panel of the Eagle 1000




## RS 232 Connector

1 +12.5V ±3V <100mA short circuit-proof

2 RxD

3 TxD

4 (-12V “V24”)

5 GND

6 -

7 Connected to Pin 1

8 Nurse Call*
to 10V ±3.5V <50mA short circuit-proof

9 -

## Nurse Call Connector

1 to 12.5V ±3V <100mA short circuit-proof

2 ECG Trigger (Delay max. 25ms,
Pulse +12.5V ±3V <15mA 1 ms)
3 Alarm (ALARM_open Collector
max. 20V, max. 20mA load)

4 -

5 -

6 TxD_20mA Current Loop*

7 GND

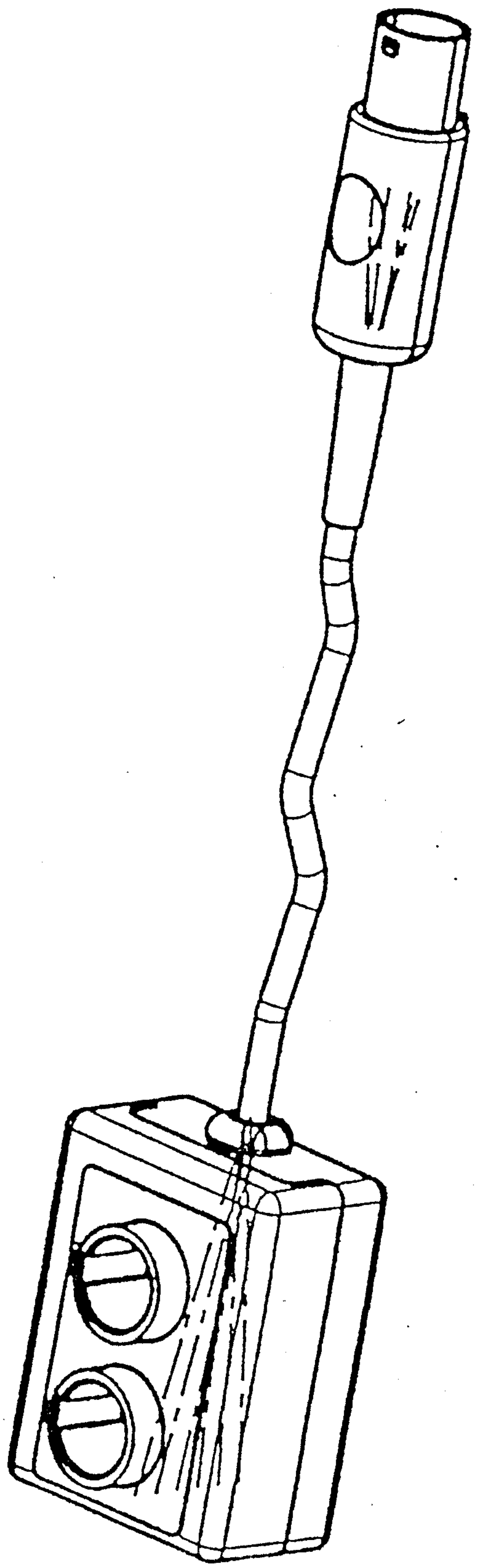
8 Nurse Call
to +10V ±3.5V <50mA short circuit-proof

9 Pause Alarm (KUE_open Collector)

* for V2.1 or higher

## 2.3.6 2-Port Press Adapter 220 102 01

For pin assignment refer to “PRESS” as well as PCB Press Distributer 388 032 12 P



# 2.4 Complete circuit diagram and mechanical diagrams

## 2.4.1 Systems without a recorder 101 123 ..

### 2.4.2 Systems with a recorder 101 124 ..

### 2.4.3 Complete wiring circuit (S-Plan)

**Please refer to the appendix**

## 2.5 Master Record Index (MRI)

**Please refer to the appendix**

# 3. Maintenance and technical inspection

- **Maintenance intervals**

  The manufacturer recommends monitor is inspected once **annually.**
  The inspection involves a **Visual Inspection, Checkout Procedures** and **Safety Analysis Tests.**

- **Intervals for Calibration Check of the measuring systems**

This tests are required in Germany and have to be performed according domestic laws. Accuracy tests of the measuring systems for temperature and non-invasive blood pressure have to be performed **every 2 years**.

**Important!** The following inspections should only be performed by persons with adequate training and experience.

**Notes!** According the following check out procedures, the current function and safety of the equipment will be checked.

They serve the experienced technician when inspecting the monitor.
A knowledge of how to operate the monitor in compliance with the operator's manual is assumed.

The tests are based on the test equipment described below. Where possible, the tests should be carried out using the customer's accessories to detect any defective accessories automatically.

Using test equipment other than those named below may require changes in the tests and tolerance specifications.

The suggested tubing fittings to check the NI blood pressure parameter must be adapted accordingly for use with other manometers and cuffs.

These checklists were compiled with an Eagle 1015 Vers. 2.0, which has the maximum number of possible options of the Eagle 10.. series.
When testing an Eagle 10.. with less options, the corresponding tests should not be carried out.

## 3.1 Visual check

**Check that**

- fuse links have the rating proclaimed by the manufacturer;
- safety labels and inscriptions on the device are clearly legible;
- the mechanical condition will allow the device to be put to further use;
- any soiling has no effect on safety of operation.

# 3.2 Checkout Procedures

**Note:** The F keys F1-F5 change their function depending on the selected menu.
When the following testing instructions refer to such a text this is displayed in square brackets **[....]**.
The numbers given in parentheses **(..)** of operating controls and socket connections refer to the diagram on the front and rear panels of the monitor in the user's manual.

## 3.2.1 Recommended testing/calibration equipment and accessories:

For monitor models 10112301 - 10112307
10112401 - 10112407

| | | |
|---|---|---|
| 1X | Multiparameter simulator | Lionheart |
| **ECG** | | |
| 1X | 3-lead patient cable | 223 287 01 |
| 1X | 3-lead patient trunk cable | 223 288 01 |
| 1X | Set of electrode leads | 384 011 34 |
| **Invasive blood pressure** | | |
| 1X | Blood pressure simulation cable | Lionheart with Hellige connector |
| 1X | Dual transducer cable | 220 102 01 |
| **Non-invasive blood pressure** | | |
| 1X | Digital pressure manometer Diptron 3 plus<br>Measuring range 500 mmHg<br>Accuracy 0.04% FS | |
| Parts for the pneumatic circuit comprising: | | |
| 1m | Tubing | 822 046 30 |
| 1X | Fastening coupling | 929 166 35 |
| 1X | Coupling | 929 166 34 |
| 2X | T-piece | 929 167 02 |
| 1X | Pumpball with deflation valve, connecting nipple 3 mm - 5mm | |
| 1X | Connecting tubing | 216 118 01 |
| 1X | Blood pressure cuff | 217 319 04 |
| **SpO2** | | |
| 1X | SpO2 simulator | 408 610 - 001 |
| 1X | Simulator cable SPO2 | 223 417 01 |
| 1X | Finger probe | 701 240 21 |
| 1X | Connection cable for SpO2 probe | 303 443 58 |
| **Temperature** | | |
| 1X | Temperature simulator | 220 104 01 |

**Miscellaneous**
1X Isolation relay 303 444 77
1X RS232 cable as depicted

## 3.2.2 Test preliminaries

Connect the monitor to the poweroutlet and switch it on.

The F keys are the 5 keys below the LCD display with F1 to the left and F5 to the right.

1. Actuate buttons F1 and F5 simultaneously to display the monitor defaults menu. Note down the customer’s settings in the monitor defaults menu or make a hard copy with the printer.

   **Caution!** After completing the test, reactivate the customer’s settings.

2. Enable the factory settings by activating the menu option Factory Settings and pressing F5 **[Enter]**.

   To save and execute this setting press the following keys:

   F3 ------------------------> **[EXIT]**
   F1 ------------------------> **[Apply and Save]**

   Now retrieve the monitor defaults menu and adjust the following settings:

   - enabling the required language
   - enabling the function alarm printout
   - enabling the function Alarms OFF “perman.”

   To save and execute the settings proceed as before and press the F3 key **[EXIT]** followed by F1 **[Apply and Save]**.

## 3.2.3 Operating control and indicator performance checks

Check that the keys F1 to F5 are functioning correctly.
The yellow battery LED should be permanently illuminated, when the power plug is disconnected the LED gets dark.
Press the key **(8)** (Silence Alarm), the yellow LED **(9)** should be on.

## 3.2.4 ECG performance check

### 3.2.4.1 Patient cable identification

Connect the 3-lead patient cable to the monitor.
Press the F1 key **[ECG]** and then press the **[Channel 1]** key. It should only be possible to select leads I, II and III.

Connect up the 5-lead patient cable and hold down the **[Channel 1]** key.
It should now be possible to select from:
I, II, III, AvR, AvL, AvF and V.

### 3.2.4.2 ECG Simulator settings

Switch on the simulator.
Connect up 5-lead patient cable with the following correct electrode configuration and program the appropriate settings:

IEC cable
red ----------> RA
yellow ----------> LA
green ----------> LL
black ----------> RL
white ----------> C/V1

Amplitude 1mV
Heart rate (RATE) 60

### 3.2.4.3 Analysis of the ECG signal, HR value and QRS beep

Select the various leads for **[Channel 1]** and **[Channel 2]**, all possible leads should be available.
The ECG waveforms must be noise-free.

The heart rate of 60 bpm +/-2 bpm appears on the display.
In the main menu actuate the F5 **[Next Menu]** button, until you reach the menu op tion **[QRS/Pulse Beep]**. Enable function by pressing the F3 key **[QRS/Pulse Beep]**.
When **[HR Source ECG]** is enabled an acoustic impulse will be triggered after every QRS complex.
Now disable the acoustic impulse.

Enable the square wave impulse function on the ECG pulse generator. Select Lead II for [Channel 1] and [Cheannel 2]. The square wave impulse waveform should correspond to the amplitude of the displayed 1 mV reference pulse (only valid for the above-mentioned pulse generator).

### 3.2.4.4 Testing alarm limits, recorder start, audible alarm activation

Select lead I for channel 1 and lead II for channel 2.
Enable the device monitoring system, the yellow indicator **(9)** must be disabled.
Switch the ECG pulse generator to a heart rate of 180.

The HR alarm should appear on the screen, the alarm sounds, the red LED **(7)** illuminates and the recorder starts an alarm printout of approx. 20 s duration.

Starting from Main Menu, press the F5 **[Next Menu]** button 2 times and actuate F2 **[Alarm Tone ON]** for **[Alarm Tone OFF]** to appear.
The audible alarm should now be silenced, the LED **(6)** illuminated.

Press the Silence Alarm button **(8)** once, the red LED **(7)** goes off. Press the **button (8)** again, the yellow LED illuminates, and the message “Alarms OFF” appears on the screen.

The alarm recording must contain the following information.
2 ECG waveforms, 1mV reference pulse, leads selected, date, time of day, ECG sensitivity, filter setting and vital value block.

Set the HR on the multifunction pulse generator to 60/s.
Enable the audible alarm with 2 times button F5 **[Next Menu]** and pressing F2
**[ Alarm Tone OFF ]** for **[ Alarm Tone ON ]** to appear.

### 3.2.4.5 Testing the input amplifier offset

Power off the ECG pulse generator.
Select sensitivity 5mm/mV, 10mm/mV and 20mm/mV in sequence. The baseline offset should not exceed 4mm.

### 3.2.4.6 Testing pacing detection

Multifunction simulator settings:
Enable simulator.
Connect an external resistance of 10kohm (1%) to the simulator between the BNC connector (HI LEVEL OUT) and V4 port and select simulator setting Pace and 2mV.

Switch channel 1 of the monitor to lead II. Select display sensitivity 5mm/mV.

Black bars should now be superimposed over the pacemaker pulses.

#### 3.2.4.7 Testing the lead fail detection

Reset HR on the simulator to 60.
Reactivate monitoring with the silence audible alarm button **(8)**, yellow LED goes off.
Select lead V for channel 1.
Detach the electrodes LA, LL, RA and C one after the other but only one. After detaching each separate electrode the message “Lead Fail” appears and an intermittent alarm signal can be heard.

### 3.2.5 NI blood pressure performance check

#### 3.2.5.1 Leakage test

Cuff, pressure manometer, tubing, T-piece and pumpball are to be connected up as shown in diagrams “Pneumatic Circuit for NBP Performance Check”.

The cuff should be rolled up tightly, preferably around a piece of PVC tubing of external diameter 12cm.

Press F1 and F5 simultaneously.
Press F3 and F4 simultaneously. Ensure the bulb control is open.
Keep F5 depressed until mano mode is displayed on the screen.

Using the pumpball inflate to 220 mmHg and wait for about 30 s. From now on, the drop down of pressure must be less than 4 mmHg/min.

#### 3.2.5.2 Testing display errors

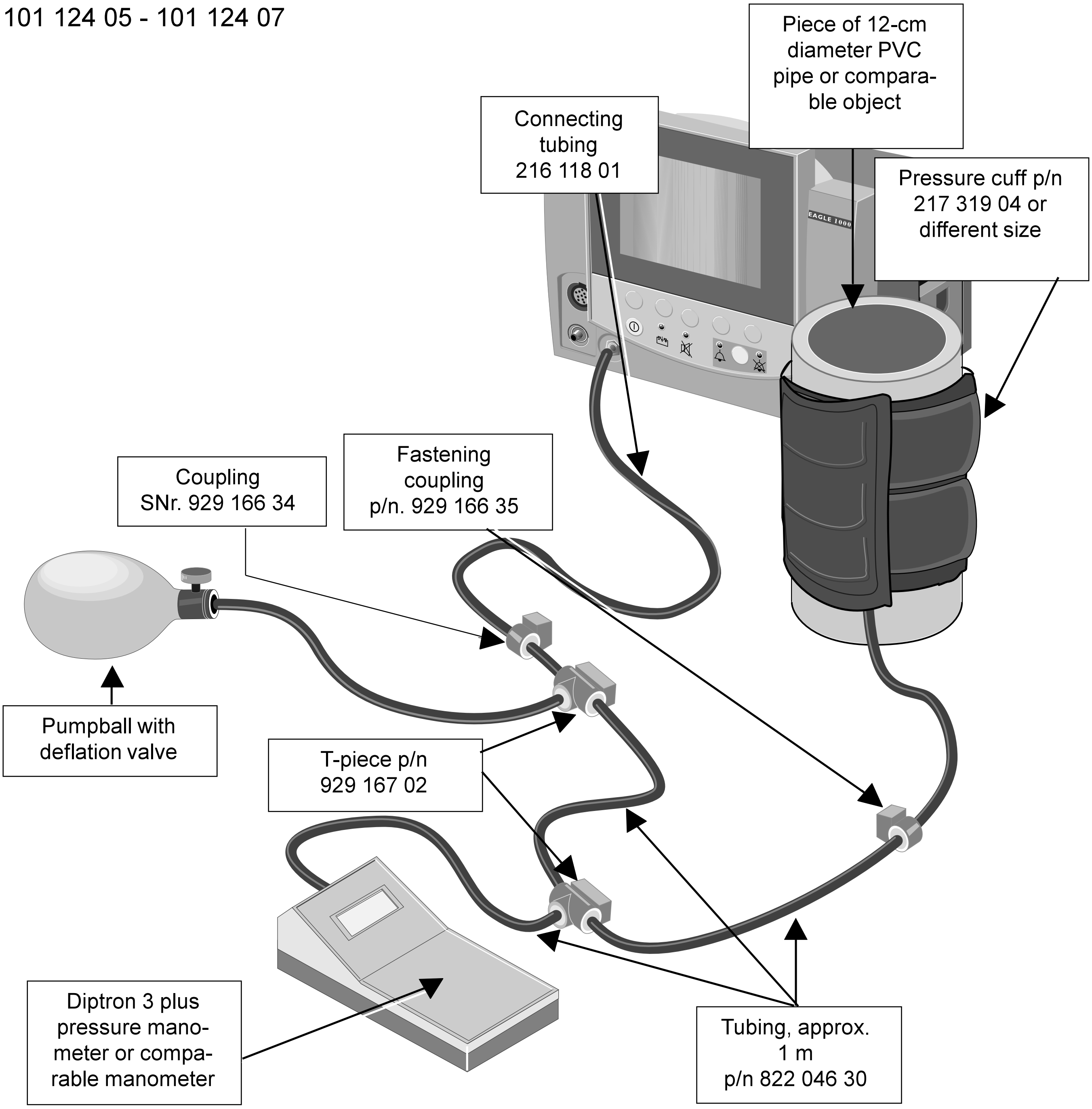
Increase pressure and then deflate. Test the tolerance of the displayed values with the following pressures:

50 mmHg, 100 mmHg, 150 mmHg, 200 mmHg, 250 mmHg

The displayed value for the Eagle 1000 has to be within the tolerance limits of +/- 3 mmHg.
When using a pressure manometer other than the one recommended its error tolerance limits are to be taken into account.

## Pneumatic Circuit for NBP Performance Check

NI Blood pressure for instrument version:
101 123 05 - 101 123 07
101 124 05 - 101 124 07



#### 3.2.5.3 Testing the deflation pressure threshold

At the adult setting (“Adult” appears on the manometer mode screen):
Increasing the pressure to approximately 300 mmHg the cuff will be deflated automatically.

At the baby setting (“Baby” appears on the manometer mode screen):
To activate the baby mode terminate the manometer mode by pressing F3 and F4 simultaneously.
Select parameter NIP in the main menu and in the submenu toggle from **[Adult]** to **[Baby]** with the F2 button.
Now reactivate the manometer mode.

Increase the pressure with the pumpball, at approximately 160 mmHg the cuff will be deflated automatically.

Quit the manometer mode by pressing F3 and F4 simultaneously.

#### 3.2.5.4 Dynamic blood pressure measurement

Apply cuff on yourself and measure blood pressure. Sys, Map and Dia parameter readings are measured and assessed for their plausibility.

### 3.2.6 SpO2 performance check

#### 3.2.6.1 Simulator setting

Test the SpO2 parameter with the marquette SpO2 simulator as follows:
- Switch simulator power switch to off.
- Connect connector cable up between simulator and bedside monitor.
- Set SpO2 to 95.5% using the white Nellcor scale.
- Set pulse rate to 100 bpm.
- Select mode on Nellcor.
- Activate power switch.

#### 3.2.6.2 Monitor settings

- Activate pulse frequency display by pressing F2 **[SpO2]**, followed by F3 until **[HR Source Pulse]** appears on the screen.

#### 3.2.6.3 Displaying waveforms and parameter readings

- A sinus wave SpO2 waveform should appear on the screen.
- An SpO2 parameter reading of 92%-95% should be displayed.
- The pulse rate displayed should lie between 96 and 104 bpm.

### 3.2.6.4 Testing display accuracy of SpO2 and pulse rate

Check displayed values on the LCD screen using the following simulator settings:

| **Simulator value SpO2** | **Value displayed** |
|---|---|
| 95.5% | 92% - 99% |
| 90.6% | 87% - 94% |
| 85.5% | 82% - 89% |

| **Simulator value pulse rate** | **Value displayed** |
|---|---|
| 70 bpm | 66 bpm - 74 bpm |
| 100 bpm | 96 bpm - 104 bpm |
| 160 bpm | 155 bpm - 165 bpm |

Activate interference test on the simulator by pressing key and keep it pressed, the SpO2 value must remain displayed on the screen.
Disconnect the SpO2 plug from the monitor. The message “No $SpO_2$” passive appears, accompanied by an intermittent audible alarm signal.
Press **(8)** button, alarm is silenced.
Connect up finger probe and check it is working correctly.

## 3.2.7 Invasive blood pressure performance check (Vers. 2.0 and higher)

**Comment:** This test is to be applied to both blood pressure channels. For devices with rounded connectors use the dual transducer cable.
Activate “Alarms OFF”, LED **(9)** should be illuminated.

Preparing the multifunction simulator:

Plug pressure simulator cable into simulator input “Blood Pressure 1” (120/80).

**Settings:**
Polarity -----------> pos.
Sensitivity -----------> 5uV/V
mmHg -----------> 0

Connect up simulator to monitor and press F3 **[NIP/PRESS]** in the main menu, followed by selecting **[Mode INVASIVE]** with F4 and perform zero adjustment. Select the following pressure values and check display is within tolerance limits.

| | |
|---|---|
| 200 mmHg | +/- 6 mmHg |
| 100 mmHg | +/- 4 mmHg |
| 30 mmHg | +/- 3 mmHg |

Set simulator to “wave” and activate pressure waveform on the monitor. A pulsating pressure waveform displaying the following digital values should appear on the screen:

| | |
|---|---|
| Systolic value | approx. 120 mmHg |
| Diastolic value | approx. 80 mmHg |
| Mean pressure | approx. 93 mmHg |

### 3.2.8 Temperature performance check (Vers. 2.0 or higher)

Plug the temperature simulator into the Eagle 1000, select the different positions and check them according the following list:

| Positions on simulator | Displayed value |
|---|---|
| 43.8°C | 43.7°C - 43.9°C |
| 38.8°C | 38.7°C - 38.9°C |
| 30.0°C | 29.9°C - 30.1°C |
| 4.0°C | 3.8°C - 4.2°C |
| open | Probe |
| short | Probe |

### 3.2.9 RS232 performance check (Vers. 2.0 or higher)

With infrared transmitter plugged in check transfer of patient data to QuickLink.
When no infrared transmitter is plugged in the RS232 interface can be tested separately.

**Enter Service Menu on Monitor:**
Press F1 and F5 simultaneously.
Press F3 and F4 simultaneously.

**Prerequisites:**
PC with RS232 port and Windows 3.11

RS232 interface cable configured as follows:

| 9-pin Sub D male | | 9-pin Sub D female |
|---|---|---|
| 2 | --------------> | 3 |
| 3 | --------------> | 2 |
| 5 | --------------> | 5 |

Activate terminal emulation on PC.

**Program following settings on PC:**

Initiate the “Terminal” program from the “Accessories” window.
Select the menu option Settings and from this the submenu Data Transfer and adjust the parameters as follows:

| | |
|---|---|
| Baud rate | 9600 |
| Data bits | 8 |
| Stop bits | 1 |
| Parity | none |
| Protocol | none |
| Interface | interface used COM1 or COM2 |

Exit menu with “OK”.Call up the Settings menu and then the submenu Terminal Settings, the “Local Echo” option must be disabled.

Exit menu with “OK”, the window with the Terminal bar is enabled and the cursor blinks in the left-hand corner of the window.
Enter a series of numbers with the PC keyboard, no characters should appear on the screen.

**Program following settings on the Eagle Monitor:**

Keep F3 depressed until RS232 Test is displayed on the screen.

Enter another series of numbers with the PC keyboard, these should now appear on the screen.
To exit the service menu press F3 and F4 buttons on the monitor simultaneously.

## 3.2.10 Nurse call output performance check

Initiate monitoring, LED **(9)** is off.
Connect nurse call relay, exceed adjusted HR alarm limit, monitor gives an alarm signal. The nurse call relay should switch in.
Check trigger output on nurse call connector pin 7 (GND) Pin 2 (Signal), for active ECG trigger signal a positive pulse of pulse width 1ms and amplitude 9.5-14.5V should be measured.
For devices of version 2.1 and higher, the following additional test needs to be performed: Devices connected to a PC Central Station SynOpsis 1000 must be checked for correct transfer of ECG waveforms, vital signs and audio alarm signals.

## 3.2.11 Testing condition of battery

The condition of the battery is determined by discharging, fully recharging (12 h), and subsequent discharging. If the operating life is less than 1.5 h, the battery should be replaced.
The battery generally needs replacing every 3 years. More information is given at 4.3 “Battery management“.

## 3.2.12 Backup battery for the clock

The lithium battery used to run the clock has a service life of approx. 5 years. The cut-off voltage is 2.5 V at 0.005 mA. If, after the instrument has been switched off for about a minute, the time and the date do not appear on the configuration screen or on the recording, the lithium battery is completely depleted and must be replaced immediately.
In the case of a cyclic startup failure refer to 4.6 Troubleshooting tips.

# 3.3 Calibration check of the measuring system

This tests are required in Germany and have to be performed according domestic laws. The measurement systems for non invasive blood pressure and temperature have to be checked every 2 years for their accuracy according the following procedure:

## 3.3.1 Technical Inspections of the Measuring System

The measuring system for noninvasive blood pressure and temperature must be inspected every two years.

For these inspections, the following devices should be used:
For NIBP – digital manometer Diptron 3 plus (measuring range: 500 mmHg)
For TEMP – temperature simulator 220 104 01

**Conditions:** Please note that the measurement standards used for these inspections must provide an adequate degree of accuracy. These measurement standards must be traceable to a national or European standard.

Proceed as follows to perform the technical inspections of the measuring system:

- **NIBP**

The conditions stated above must be fulfilled and the functional test for NIBP as per 3.2.5 must be completed.

Step 1: Leakage Text
Step 2: Testing display errors

- **TEMP**

The conditions stated above must be fulfilled and the functional test for TEMP as per 3.2.8 must be completed.

# 3.4 Safety Analysis Test

## 3.4.1 General introduction

The suggested Safety Analysis Tests refer to the international standard IEC 601-1.
The test are generallay performed with Safety Testers, on most of them, the measuring circuits according IEC 601 are already implemented.

The following is a general description of the tests. For the handling of your Safety Tester follow the user manual.

The tests may be performed under normal ambient conditions of temperature, humidity and pressure and with line voltage. The leakage currents correspond to 110 % of rated voltage for the tested unit. Most Safety Testers take this into account, otherwise the measured values have to be calculated.
In countries like Germany adequate tests according DIN VDE 0751 may be performed.

## 3.4.2 Recommended Test Equipment

- Safety Tester for measurements according to IEC 601.
- Testing connector according to the following drawings.

## Testing connector for measuring patient leakage current

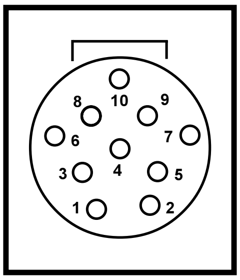
The following wiring of testing connectors is recommended for the technical inspection of module input type BF (body floating) and type CF (cardiac floating).
The catalog numbers of the Marquette Hellige components are given below.

When making the connectors observe the following configurations:
The diagrams of the plug inserts in this document are always as viewed from the inside of the connector shell.

- Testing connector for the temperature input

| | | |
|---|---|---|
| 1 x | 2-pin jack plug | 91530000 |
| 1 x | Telephone socket or<br>matching isolated plug connection for testing case | 91534800 |

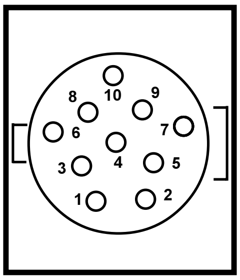
The two jack plug poles are short-circuited with one another and connected to the telephone socket.




- Testing connector for ECG input

| | | |
|---|---|---|
| 1* | Connector | 91541378 |
| 10* | Contact pins | 91541394 |
| 1* | Telephone socket or<br>matching isolated plug connection for testing case | 91534800 |

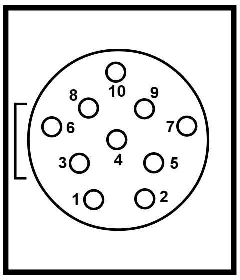
Short-circuit all 10 contact pins with one another and connect to telephone socket.




- Testing connector for SaO2 input

| | | |
|---|---|---|
| 1* | Connector | 91541871 |
| 7* | Contact pins | 91541394 |
| 1 * | Telephone socket or<br>matching isolated plug connection for testing case | 91534800 |
| 6* | 10 kohm resistor | 92184443 |

Connect pin 10 directly to the telephone socket.
Connect pins 1,4,5,6,7,9 via 10 kohm resistor to telephone socket.




- Testing connector for PRESS input

| | | |
|---|---|---|
| 1* | Testing connector parts | 91541376 |
| 7* | 1 kohm resistor | 92184430 |
| 9* | Contact pins | 91541394 |
| 1* | Telephone socket or<br>matching isolated plug connection for testing case | 91534800 |

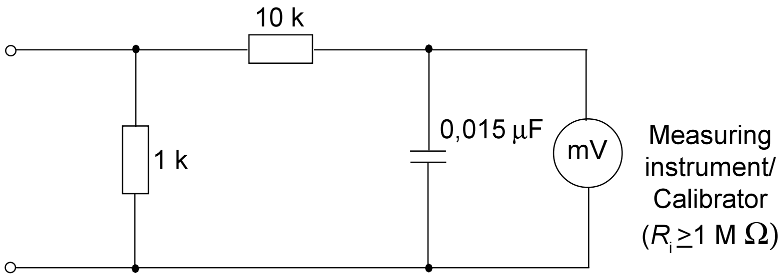
Connect pins 7 and 10 directly to telephone socket.
Connect pins 1,2,3,4,6,8,9 separately via 1 kohm resistor to telephone socket.

### 3.4.3 Protective Earth Resistance Test

This test determines whether the monitor has a power ground fault.
- The protective earth resistance from power connector to any grounded exposed metal surface is measured.
- Specs. of test circuit: AC current source 50 Hz/60 Hz of at least 10 A up to 25 A with limited output voltage of 6 V.
- If resistance is greater than 100 mOhm, the unit fails this test.

### 3.4.4 Leakage Current Measurement

To perform the suggested measurements, the unit under test has to be separated from any interconnection to a system. If the unit is part of a system, extended tests according to IEC 601-1-1 have to be performed. If the unit is connected to a SynOpsis also proceed 3.4.4.3. The following diagram shows the Measuring Circuit [**M**] required for leakage current. The reading in mV corresponds to µA (leakage current). The Safety Testers generally work with this Measuring Circuit [**M**] and the displayed values are already converted to leakage current.




#### 3.4.4.1 Enclosure Leakage Current Test

This test is performed to measure leakage current from chassis to ground during normal conditions (N.C.) and single fault conditions (S.F.C.).
In all cases, the leakage current is measured from any exposed conductive parts to ground, the unit under test has to be switched on.

Connect the unit under test to your Safety Tester.

- During **normal conditions (N.C.**), referrfing to the electrical diagram, measurements have to be done under the following conditions:

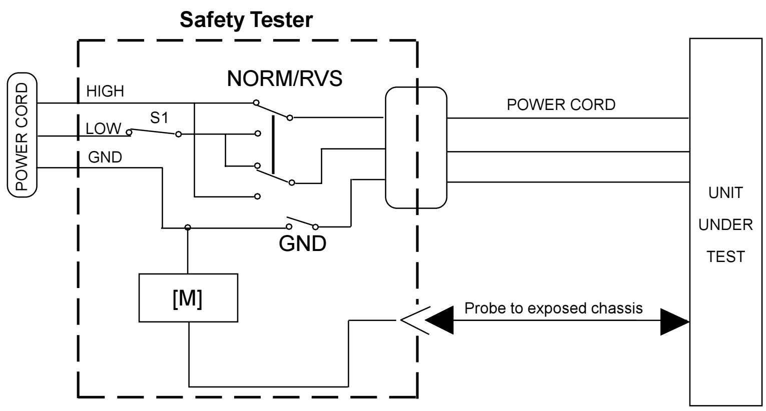
* Polarity switch NORM and RVS
* GND switch GND closed
* S1 closed

- During **single fault conditions** (S.F.C.), referring to the electrical diagram, the measurements have to be done under following conditions:
* Polarity switch NORM and RVS
* GND switch GND open
* S1 closed

Test has failed if the measured values are greater than:

| N.C. | S.F.C. |
|---|---|
| 100 µA | 500 µA |
| | 300 µA (U.S. requirements) |

**Electrical diagram for Enclosure Leakage Current Test**




### 3.4.4.2 Patient Leakage Current Test

This test performs a leakage current test under single fault conditions (S.F.C.) depending on domestic power outlet with 115 or 230 V ac as source into the floating inputs.

- The following signals have a separate floating input and have to be tested separately.
  ECG
  $SpO_2$
  Temp
  IBP (Blood Pressure 1 and 2 together)

In all cases, the leakage current is measured from input jack of unit under test to ground.

For testing the ECG input, a patient cable or test plug, with all leads or pins connected together, is used. For testing SpO2-, Temp- and IBP-input, test plugs are used.

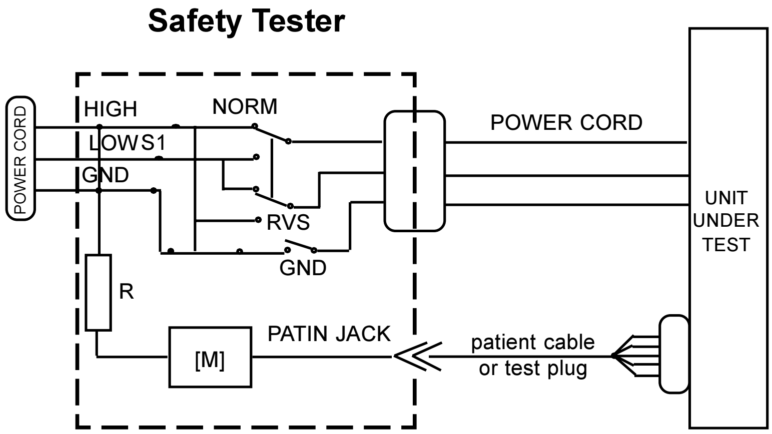
Connect the unit under test to your Safety Tester.

- Referring to the electrical diagram, measurements have to be done under the following conditions:

* Polarity switch NORM and RVS
* GND switch GND closed

Test has failed if the measured values are greater than 50 µA

### Electrical Diagram for Patient Leakage Current Test




For protection of the test person, the following values of resistor R may be used:

| | |
|---|---|
| Typ BF | 22 kOhm (120 to 130 V) |
| | 47 kOhm (220 to 240 V) |
| Typ CF | 100 kOhm (220 to 240 V) |

### 3.4.4.3 Enclosure Leakage Current Test (System)

If the Eagle is connected to SynOpsis the enclosure leakage current has to be measured additional according chapter 3.4.4.1.
Doing this measurement, the Eagle needs to be connected (hard wired) to SynOpsis.

# 4. Instrument service

## 4.1 Service mode tests

Using F3 // F4 call up the service mode from the configuration mode, the latter with F1 // F5.

Key test with short press, actuate key function by pressing key for about 2 seconds. Quit service mode with F3 // F4.

Instrument configuration is identified as display is generated on the service screen, do not quit prematurely.

Key F1 / Print

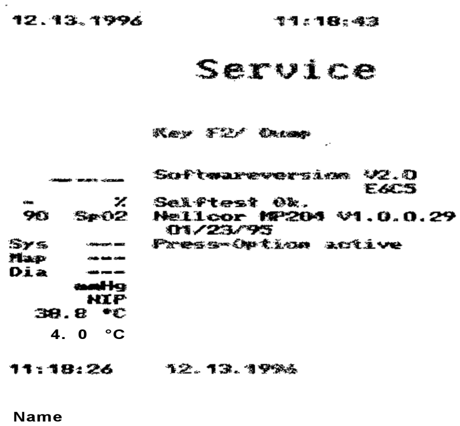
Printhead test

The entire screen should show diagonal lines

Key F2 /Dump

Screen printout

In the case of TEMP the control values are shown.




Key F3 / RS 232 Enables interface to be tested

Key F4 / -

Key F5 / Mano Measurement of a steady pressure in NBP

# 4.2 Instrument performance

## 4.2.1 Start-up performance

After switching on, the software performs a start-up self-test. There is an internal and an external test. Only in the event of a malfunction, in the case of the internal test, whenever still possible, a corresponding error screen appears and an audible technical malfunction alarm signal is activated**.**

**Internal test:**
- CPU test, internal watch dog test, LCD RAM test, RAM test, ROM CRC test and EPROM test

**External test:**
- output beep (audible alarm signal test)
- output chessboard pattern on the screen
- output software version on the screen
- external watch dog test with time base test
- afterwards the power up screen appears on the display

## 4.2.2 Operating performance

During normal operation important system data are checked every 5 seconds. In the event of an error this activates a warm start and the audible technical malfunction alarm signal is activated.

## 4.2.3 Performance in the event of a malfunction

**during start-up**
After switching on, the software performs a start-up self-test. In the event of an error, whenever still possible, one of the following messages appears on the error screen and the audible technical malfunction alarm signal is activated:
“Error in RAM”, “Error in ROM” “Error in permanent memory” (EEPROM) “Error in time base” “Exception error during start-up” “Permanent start-up**/**shutdown error” and “QSPI error”.
There is now no alternative but to switch the instrument off.
In the case of a cyclic startup failure refer to 4.6 Troubleshooting tips.

**during normal operation**
During normal operation the working memory and backing storage are checked every 5 seconds by means of the checksum. If a malfunction is detected, this triggers a warm start.
In the event of exceptions (deviations from normal processor operation, e.g., bus error, address error, illegal command, division by zero, etc.) this also triggers a warm start.

**Warm start**
During a warm start the system is reinitialized and the configuration data are loaded. They are stored in the RAM (in normal memory and backing memory) and in the EEPROM and are protected in both cases by a checksum. Provided the checksum is correct, the data will be downloaded from the RAM. If the test fails, testing continues in the sequence indicated above. If the data on the EEPROM are also defective, the fac
tory default data are loaded. In the event of repeated start-up/shutdown (more than twice within 20 seconds) the error screen will appear, see above.

## 4.3 Battery management

**Battery connection**

After disconnecting and reconnecting the battery the instrument has to be started up without a power input until the battery is depleted. Otherwise, the battery is considered depleted and, depending on the actual charge, strongly overcharged.

**Battery replacement**

When the operating time of the instrument with a full battery is only less than 1.5 hours it has to be replaced. The charging time to 80% capacity is approx. 3.2 hours, to 100% approx. 12 hours.

Battery test for version V2.1 and higher
Discharge battery (switch on instrument without power line) until the audible alarm signal sounds and the flashing message “Battery” appears. When this event occurs the battery display reading is saved and after the plugging in of the power line can be seen in the service screen. If the value is greater than 40 %, for instruments which have not been in use for a long period, the battery can be formed by charging and depleting the battery again. Otherwise, the battery has exceeded its service life and must be replaced.

When starting up the instrument after disconnecting the battery from the PCB ECG Monitor it must be operated without power input until the battery is depleted. Otherwise, depending on the actual battery charge, battery overcharging may occur.

* A new battery should be depleted and charged 3 times to achieve full capacity.

* To maintain the battery capacity for a long time the battery should be depleted and charged at least once a month.

**Backup battery for the clock**

The lithium battery used to run the clock has a service life of approx. 5 years. The cut-off voltage is 2.5 V at 0.005 mA. If, after the instrument has been switched off for about a minute, the time and the date do not appear correctly on the configuration screen or on the recording, the lithium battery is completely depleted and must be replaced immediately.
In the case of a cyclic startup failure refer to 4.6 Troubleshooting tips.

# 4.4 Safety information

## 4.4.1 Insulating foil

The insulating foil in the instrument serves to isolate the floating components, i.e., to ensure the required air gaps. This foil is thus of great significance from a viewpoint of safety and must, under all circumstances be put back into the instrument when it is being reassembled. Pieces of insulating foil are located. (Where the pcb is equipped).

x under the PCB ECG Monitor
x under the PCB Oximeter
x under the PCB Press/Temp in the case of PCBs Press/Temp or Temp without isolating foil around the PCB
x twice round the PCB PRESS/TEMP or
x around the pcb Temp
x around the power unit

## 4.4.2 High voltage

On the PCB ECG Monitor upper right when looking at the reverse side, next to the buzzer is the CCFT supply for the LCD Reverse Video. In stand-by mode this generates 565 V AC at 30 to 40 kHz. Sparking as a result of contact with this voltage causes un pleasant burns! It is thus important to exercise caution when touching this PCB.

## 4.4.3 ESD protection

All instrument PCBs bear semiconductors which must be protected from electrostatic discharge. When working on open instruments and when handling PCBs it is thus im portant to observe the ESD safety precautions. It is especially important that service technicians always establish contact between the PCB and ground before touching a component or a cable.

When working on an open device or on PCBs use an ESD protective underlay. This should be connected to a non-fused earth conductor potential. During battery operation the instrument non-fused earth conductor connector must be connected to the ESD protective underlay. The service technician must be connected to the ESD protectiveunderlay via an armband. Use an ESD protective travel bag to transport PCBs.

## 4.5 Eagle 1000 servicing information

**Note:** Refer to section 6 for the spare parts list. With regard to spare part and replacement part numbers please refer to section 1.1.2.

**Important:** After servicing is complete the instrument must be tested as outlined in sections 3.2 (Performance check) and 3.4 (Safety Analysis Tests). After working on PCB NBP and PCB Press/Temp or PCB Temp the technical inspections of the measuring values / calibration are to be performed as described in section 3.3.

### 4.5.1 Service repair kit

| | |
|---|---|
| Goosenecked tweezers | |
| Pozidrive screwdriver | |
| Type “Pozidrive”, sizes 1 and 2 | for 2.5 to 3 and 4 mm screws |
| Slotted head screw screwdriver 6 mm | for battery screws |
| Offset screwdriver 2.5 mm | for instrument adjustment |
| Socket wrench 5.5 mm | for hexagonal spacers |
| Claw spanners 5 mm, 6 mm and 8 mm | for hexagonal bolts to Sub-D socket, spacer |
| Knife | to detach keypad |
| Petrolether | for keypad installation (remove adhesive) |
| Alcohol | for display and keypad installation (degreases) |
| Loctite 242 | to secure the battery screws |
| ESD packaging | for PCBs |
| ESD underlay with ESD armband | |

### 4.5.2 Opening the instrument

**Preliminaries**

Before doing any servicing switch off the instrument and disconnect the power plug.

Lay the instrument with the front panel face down on a piece of strong paper on an even surface.

**Remove the QuickLink adapter if there is one**

Undo the four screws which hold the cover and remove it.

Disconnect the plug on the instrument RS 232 port.

Undo the two countersunk head screws which hold the QuickLink adapter together with the instrument RS 232 connector socket.

**Remove instrument cover**

Undo the 2 fastening screws on the rear panel cover plate and remove it.

To remove the instrument cover undo the 4 screws on the instrument baseplate, 3 on the rear panel and one under the handle. Remove cover. In instruments with a recorder pull the metal plating on the recorder side slightly outward.

*In* instruments *version V2.0 or higher* with opening above the sockets on the rear panel unscrew the two sockets for RS 232 and Nurse Call on the rear panel and push them into the inside of the instrument.

Undo the 3 screws on the rear panel and fold this out to the back side. Disconnect the plug coming from the power unit to the PCB ECG Monitor. *For instruments V2.0 or higher* the rear panel can now be removed.

## 4.5.3 Removing and reinstalling assemblies

**Power unit**

The power unit bears an additional primary fast-acting fuse, whose rating is printed on the PCB. To remove the board disconnect the contacts to the protective earth, the line filter and to the PCB ECG Monitor. Undo the spring catches on the spacers and remove the PCB Power Supply.

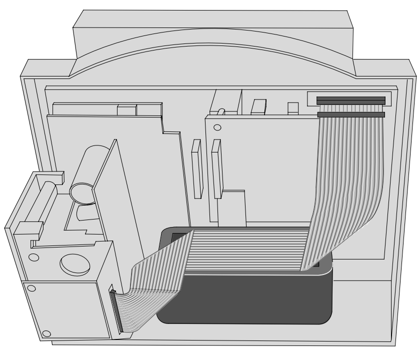
When reinstalling the new PCB the insulating envelope must once again be positioned under the PCB on the spacers, with the opening facing toward the RS 232 and Nurse Call sockets. Make sure that the connection to the PCB ECG Monitor is to the right-hand connector “15VPS”.

**Recorder**

To remove the recorder undo the 3 countersunk head screws on the instrument base and disconnect the flat strip plug-in connector on the PCB ECG Monitor.

There are spare parts available to repair the recorder. For quick repair we recommend to exchange subassemblies.

When reinstalling the recorder care must be taken to lay the flat strip cable correctly over the battery.



**Battery**

To remove the battery disconnect the plug-in connector on the PCB ECG Monitor coming from the battery.

*In instruments V2.0 or higher* undo the two screws on the aluminum board over the battery, exposing the battery.

When reinstalling the battery place the two washers under the battery so that the flat strip cables to the RS 232 and Nurse Call are not pinched (ensure that this is avoided).

Place the aluminum plate above the battery and insert both screws, so that their tips come out at the bottom of the battery. Now place the battery upon the screw sockets to meet the screw threads.

**Attention! Fasten screws only after the threads have met. Otherwise battery isolation might be destroyed resulting in a short circuit!**
**Put loctite on the screw ends to avoid loosening after screwing on.**

When removing the battery in instruments prior to V2.0 the two cable grips must be cut open and the battery freed from the adhesive surfaces on the instrument baseplate.

*When reinstalling the battery 2 new cable grips and 2 pieces of 1 mm thick “Scotch Mount” double-sided polystyrene adhesive tape are required to ensure that the two flat strip cables do not get pinched under the battery*.

When reinstalling the battery ensure that the battery connection to the ECG input side emerges from the battery block on the left-hand side and is plugged into the left-hand socket “BATT” on the PCB ECG Monitor.

When putting the instrument back into operation it should not be power-line operated until the battery is depleted; otherwise, the battery would be overcharged.

**PCB Oximeter for $SpO_2$**

When removing this module disconnect the plug coming from the panel socket after cutting the cable grip. Hold on to the hexagonal supports (8 or 6 mm) with spring catches with a spanner and undo the 3 screws. Disconnect the flat strip cable to the PCB ECG Monitor.

For safety reasons, when reinstalling the module make sure the insulating foil “Isolation PCB $SpO_2$“ is inserted under the PCB. Use a new cable grip to attach the cable leading to the panel socket.

Caution! The end of the cable grip must point toward the PCB for it not to get into the recorder gear drive.

**PCB NBP Module**

To remove this module disconnect the flat strip cable to the PCB ECG Monitor. Disconnect the tubing coming from the front panel plate. Undo the 4 fastening screws. Remove the PCB.

When reinstalling the module make sure that the tubing to the front panel plate cannot be pinched by the instrument cover. Ensure that the correct part No. of the flat strip cable matches the PCB part No. as the length of the cable is relevant with regard to safety!

**PCB PRESS/TEMP or PCB TEMP**

To remove this module disconnect the flat strip connectors from the sockets TEMP and PRESS. Undo the two nuts with the 5.5 mm socket wrench. Undo the two posidrive screws. Pull out the PCB vertically to the PCB ECG Monitor from the middle male multi point pass through connector.

For safety reasons, when reinstalling the PCB ensure that in versions without an insulat *ing wrapping around the floating components the insulating foil is put back under the PCB*.

**PCB ECG Monitor**

To remove this PCB disconnect the remaining plug-in connectors. These are:

- that from the input socket ECG
- the foil strip contact to the display under the grip recess. This requires undoing the securing mechanism by lifting the plug frame at the right and at the left and carefully pulling out the foil strip cable
- the 4-pin socket to display back lighting
- the keypad contact to the membrane keypad next to the EPROM on the right-hand side. Undo securing mechanism in the direction of the keypad cable.
- the flat strip cable to the Nurse Call socket
- the flat strip cable to the RS 232 socket
- the flat strip cable to PCB Oximeter $SpO_2$
- the flat strip cable to PCB NBP

Undo the posidrive screws and the hexagonal bolts with tapholes, depending on the instrument model. The hexagonal bolts with threaded pipes remain where they are.

For safety reasons, when reinstalling this PCB insert the insulation foil under the ECG input module. Do not put a kink in the foil strip cable.

**Attention: After replacing the PCB ECG Monitor activate the service mode to initialize the PCB.**

**Filter screen and display**

**Caution!**
The filter screen at the front is stuck to the LCD display! Both components may be damaged during their removal. For this reason proceed as follows:

To remove the filter screen undo the two plastite posidrive screws and the hexagonal spacers on the instrument baseplate next to the foil strip cable to the display and pull the baseplate through the upper slits. When removing the baseplate be careful not to damage the display foil strip cable and the cable to the backlight circuit. Using a blunt object press firmly on both sides beyond the PCB Display on the filter screen until this becomes free after about 30 seconds.

Now you can pull the display away towards the front after removing the 4 Plastite Philips screws (display 930 117 17) or the 4 M3x6 screws (display 20003727-00x).
When mounting a display with a flex foil cable, fold the cable such that only about 5 cm (2 inches) protrude into the device through the aperture in the enclosure. Do not break the cable, as this would cause a defect.

Screw the display in firmly first of all, turning the self-cutting screws in the direction they were turned when being loosened until they “click in” to avoid cutting a second thread when being tightened.

Before sticking the metal frame of the display and the filter screen degrease with alcohol or loctite adhesive remover. Then remove the protective foil from the display. Avoid contamination with dust or fluff. Stick a new adhesive frame onto the metal frame of the display. Place the filter screen into the recess in the casing and press down firmly.

**Membrane keypad**

To remove the keypad detach it with a knife applied at the corner adjacent to the filter screen without damaging the filter screen or the edge of the casing.

Before reinstalling the keypad remove any old adhesive with petrolether. Degrease the housing recess. Remove the protective foil from the new membrane keypad. Insert the keypad cable through the slit in the casing. Place the keypad precisely in the casing recess and press down firmly. Avoid putting a kink into the keypad cable as this would lead to a malfunction!

**Sockets for signal inputs**

**Circular connectors:**
To remove the sockets undo the 2 posidrive plastite screws in each case from the in side.

When reinstalling each socket insert the wide lug upwards. In the case of the temperature input socket direct the connections inwards and upwards. First of all, turn the self-cutting screws in the direction they were turned when being loosened until they “click in” to avoid cutting a second thread when being tightened.

For instruments with sockets not attached by screws, the front panel should be replaced when they are renewed, in this case field replacement is not recommended.

## 4.5.4 Adjustment procedures

**PCB ECG Monitor**

**ECG ADJUST**

OFFSET_1, OFFSET_2:

1 Connect a 5-lead patient cable to the Eagle 1000 and short circuit the ECG inputs.
2 Switch the Eagle 1000 on.
3 Select DISPLAY in the menu (accessed with the “Next Menu” key). Select “Channel 2 ECG and “Channel 3 OFF”.
4 Select ECG in the menu (accessed with the “Prev Menu”. Select leads “Channel_1 II” and “Channel_2 II”.
5 Press “mm/mV” several times so that 5, 10, 20, 5... appear consecutively. Adjust Channel 1 with **R518** and Channel 2 with **R549** so that when pressing the “mm/mV” key several times steps disappear in the zero line on the screen.

GAIN_1, GAIN_2

Have the instrument BIO_TEK Multiparameter Simulator “LIONHEART at hand.

1 Connect a 5-lead cable to the Eagle 1000 and the ECG inputs to the “LIONHEART” simulator. Switch on the simulator and select ECG AMPLITUDE 1.0 mV. Select square wave.

2 Switch on the Eagle 1000. Select the configuration menu by pressing the F1 and F5 keys simultaneously. Select muscle filter “Off” and line filter “Off”. After selecting “Exit” select “Apply and save”.

3-4 As described above under offset.

5a) Eagle 1000 without recorder:
In the “ECG” menu set softkey “mm/mV” to 10. Measure the 1-mV marker on the screen. Adjust this amplitude of the square wave edge on the screen using **R517** for channel 1 and **R530** for channel 2. Provided the adjustment has been carried out correctly, after actuating “Freeze” the amplitude of the square wave edges is 10 mm.

5b) Eagle 1000 with recorder:
In the “ECG” menu set softkey “mm/mV” to 10. Select “Print”. Adjust 10 mm amplitude of the square wave edge using R517 for channel 1 and R530 for channel 2 in the recording.

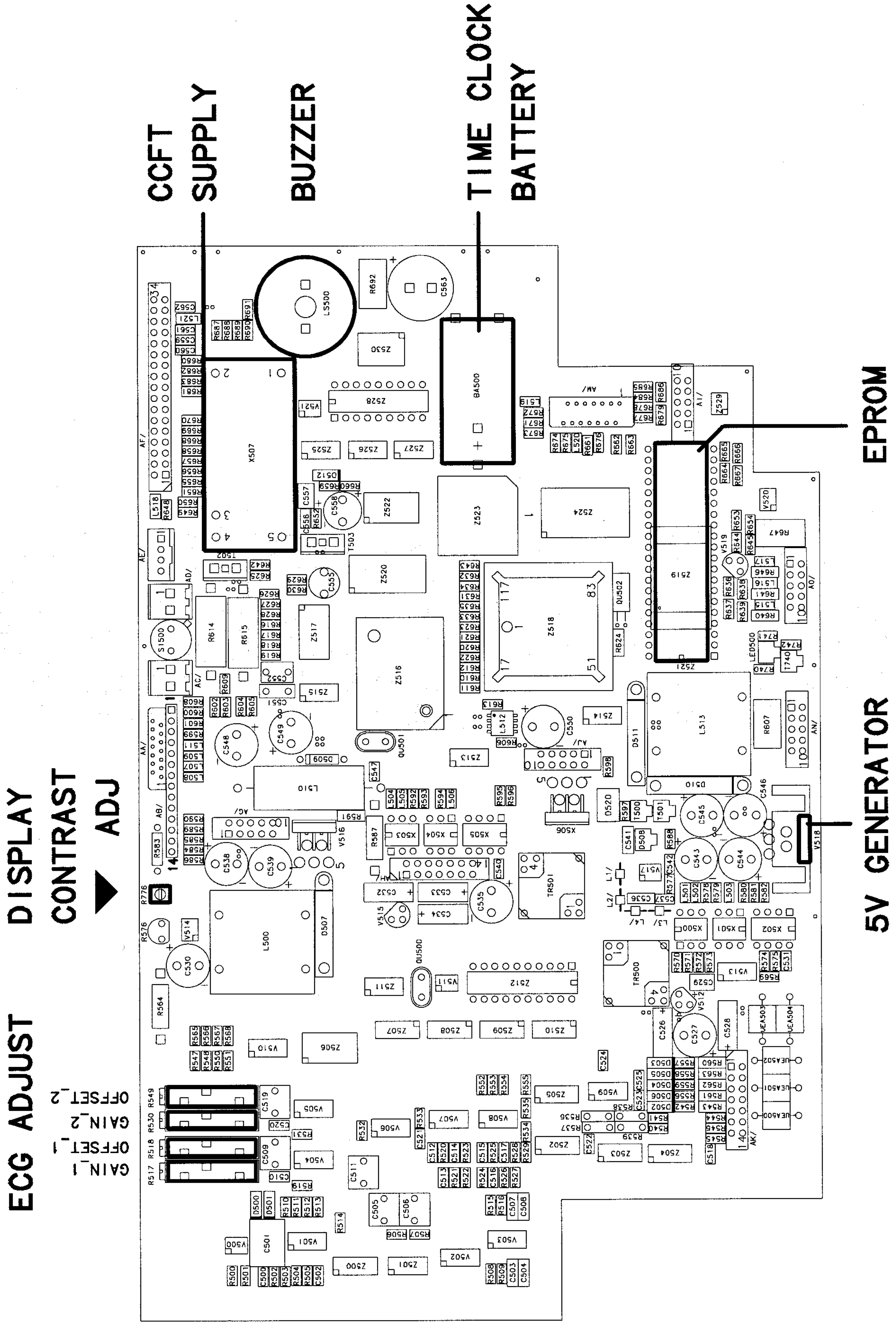
**DISPLAY ADJUST**

**Adjustment procedure for HOSIDEN display 930 117 17 or 2009071-001**
CONTRAST ADJUSTMENT
Select DISPLAY in the menu (can be called up with the “Next Menu” key). Press “Contrast“- until the darkest setting has been attained. Using R776 adjust the contrast so that the display image is still just visible.

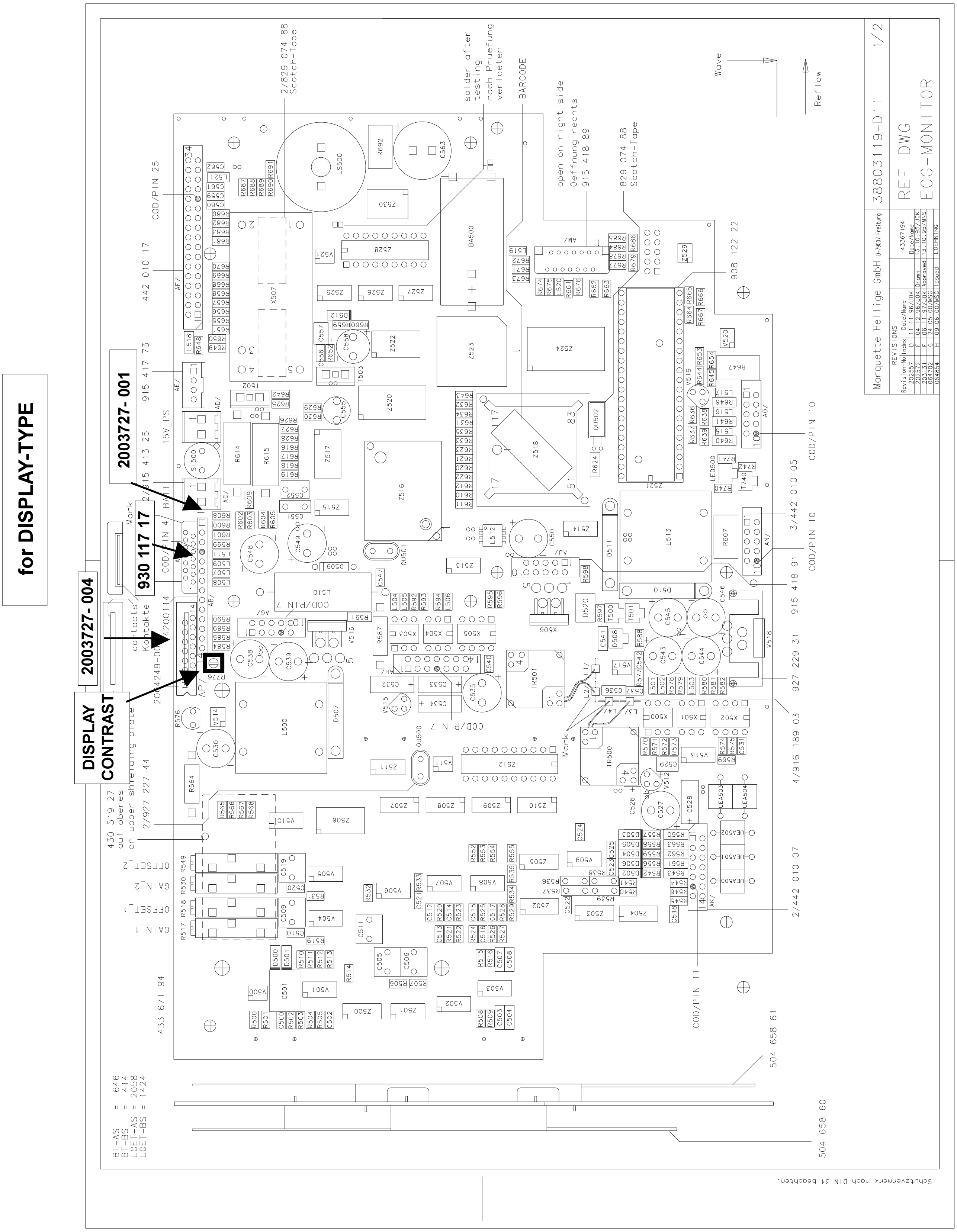
DISPLAY CONTRAST SETTING
Keep “Contrast+” depressed until the background noise viewed on the screen vertically disappears. When the contrast setting is increased further this leads to bloom on the display.

**Adjustment procedure for HITACHI SP14Q002-A1 display 2003727-001 or -004**
Press F1 and F5 together and write down the actual monitor defaults. Set status for DEFAULTS to on, then press ENTER. Now press EXIT and APPLY and SAVE.
Switch unit off and on again, now you have the manufacturer default contrast of the display. With R776, adjust for best contrast when looking straight to the front to the display.
After this is done, check the monitor defaults with the written down defaults and change them back if necessary.

## 4.5.4.1 Location of the adjustment devices on PCB ECG Monitor Index G to I



## Location of the adjustment devices on PCB ECG Monitor from Index J



## 4.5.5 Recorder service

### Motor adjustment

| What to adjust or to check? | What to measure with? | How Test mode | Where to turn? | How big and exact? | What else to consider? |
|---|---|---|---|---|---|
| Motor speed | Check measurements of grid printout with ruler | Press Softkey Print for a moment | Speed adjuster R 503 | <1 % | V = 25 mm/s for Eagle 1000 |

### Heating time adjustment

| What to adjust or to check? | What to measure with? | How Test mode | Where to turn? | How big and exact? | What else to consider? | printhead legend |
|---|---|---|---|---|---|---|
| Heating time | Connect oscilloscope to MP 2/1 and MP 1/1 (GND) | Press Softkey Print for a moment | Heating time adjuster R 504 | referred to printhead temperature 22 °C:<br>450 µs ±1 %<br>550 µs ±1 % | Adjustment made at 25 mm/s. **Caution:** printhead warms up during printing | <br>‘R520’<br>‘R650’ |

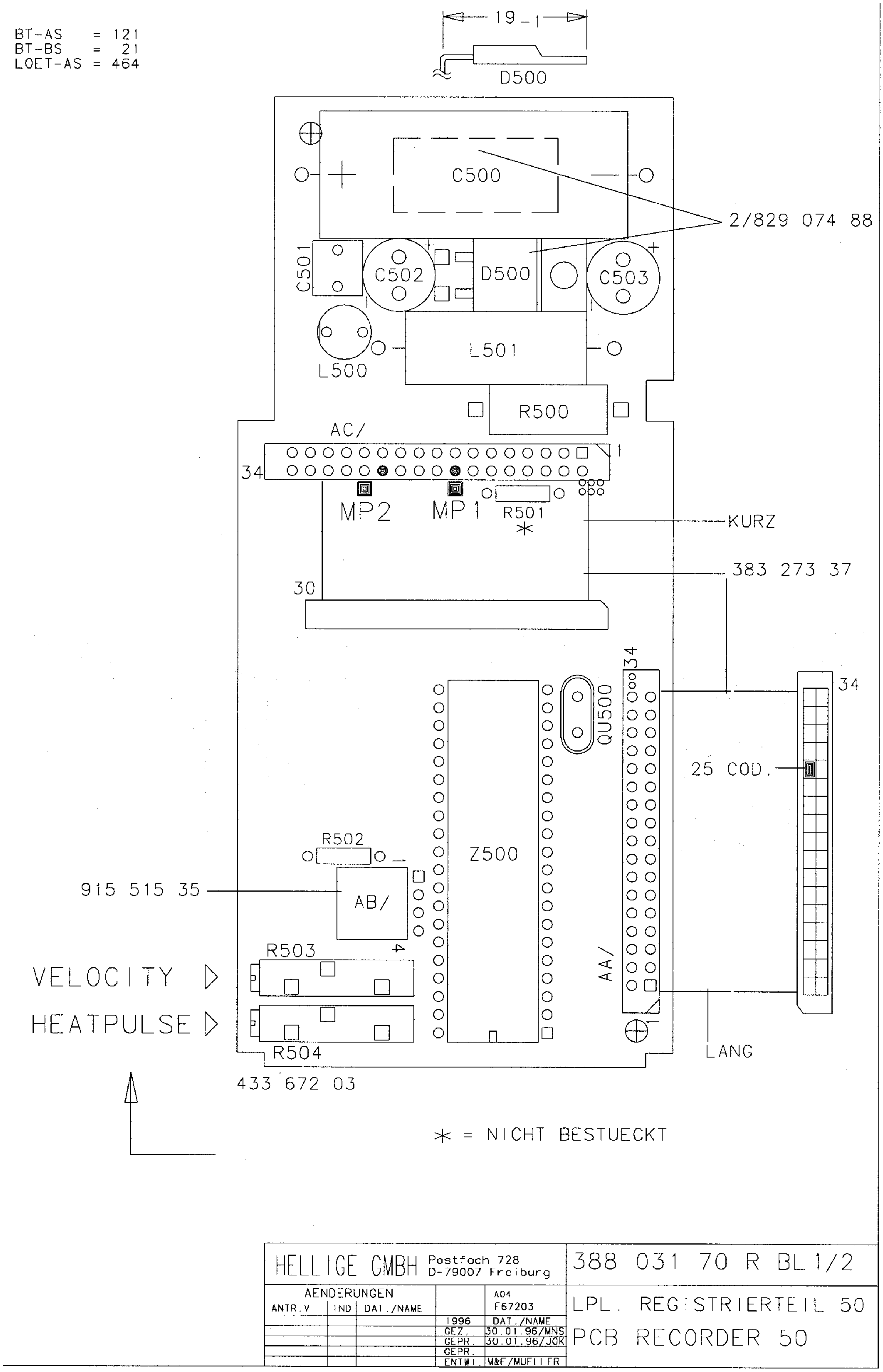
### Checking the +22 V supply voltage

| What to adjust or to check? | What to measure with? | How Test mode | How big and exact? | What else to consider? |
|---|---|---|---|---|
| +22 V power supply | Voltmeter | Between +22 V and GND (C 500) | +22 V ±5 % | Recorder disabled |

### Overtemperature protection

There is a protective circuit which protects the printhead from being overloaded. At a substrate temperature exceeding approx. 58 °C the printhead switches off.

## Location of the Recorder 50 adjustment items



### 4.5.6 PCB Press-Temp 388 031 75, PCB Temp (partly equipped PCB Press-Temp)

In the event of a malfunction this PCB should be replaced.

In the earliest instruments, instead of the two insulating envelopes around the PCB, there is a piece of insulating foil under the PCB Press-Temp, which needs to be rein stalled.

**Press**

Adjustment: not envisaged

**Temp**

Adjustment: not envisaged

Test:

The two control values measured internally appear in the service display image. If these lie outside the tolerance limits, no temperature measurement is made by the probe.

| | | | | |
|---|---|---|---|---|
| Rated values | 38.8 °C | ±0.1 °C | Cutoff tolerance | ±0.2 °C |
| | 4.0 °C | ±0.2 °C | | ±0.2 °C |

## 4.6 Troubleshooting tips

**Instrument cannot be switched on**
(in battery mode no image on screen and no beep when actuating “On” button.)

- Battery completely depleted, not connected, or defective: *connect up to mains for charging; otherwise, check battery plug is O.K. and inserted correctly, if necessary, replace battery*
- Battery fuse SI 500 on PCB ECG Monitor defective: *inspect and, if necessary, replace it after dealing with the cause*
- Membrane keypad not plugged in correctly, or defective: *plug in correctly or replace if required*
- Display contrast is too weak, not plugged in correctly, or defective: *adjust contrast and set it correctly; other wise, plug in display-foil connector correctly, if necessary, replace*
- EPROM not plugged in correctly: *plug in correctly or replace if required*
- PCB ECG Monitor defective: *replace PCB.*

**Cyclic start up failure**

- If a cyclic start up is performed after switching on the unit (with a beep and a squared pattern, with indication of version no., followed by the watchdog test with timeout), and a normal screen does not appear, the backup battery may be depleted or not connec-ted properly, so that its voltage falls below 2.5 V.

In this case the lithium battery BA 500 must be replaced or connected correctly and a reset of the SRAM must be performed by proceeding exactly as follows:

* Disconnect mains power
* Connect watchdog Z530 pin 1 (and no other one) to GND for 1 s (thus R 347 will limit the short circuit current, and the voltage +5VSRAM will fall to below 0.5 V for a short time).

**Battery does not charge during line-power operation**
(yellow LED bearing battery symbol is not illuminated)

- Power input carries no voltage or power line defective: *switch on mains or replace power line if required*
- Fuse triggered at mains input : *remedy cause, replace fuse with appropriate type*
- Connector on PCB Power Supply not plugged in correctly: *plug in connector correctly*
- Fuse triggered on PCB Power Supply: *remedy cause, replace fuse with appropriate type*
- Power unit does not deliver 15.5 V at the output despite correct power supply: *after disconnecting the PCB ECG Monitor check voltage and power handling capacity, replace power unit if necessary*
- Power unit and battery plugs have been inserted into each others sockets on PCB ECG Monitor: *reconnect as printed on PCB*
- Defective battery: *replace battery*
- Charging controller defective: *replace PCB ECG Monitor*

**Display image unsatisfactory**

- Contrast too low: *actuate F5 key "Next Menu" until you can call up "Display", press this and keep "Contrast+" depressed until the required contrast is attained*
- Insufficient contrast: *adjust contrast on PCB ECG Monitor*
- Disturbing background noise: *press "Display" key and keep "Contrast" depressed until the background noise disappears*
- back light not plugged in: *plug in connector onto the PCB ECG Monitor correctly*
- back light power supply defective (CCFT supply does not deliver a voltage of approx. 300 V at 5 mA, 30 to 40 kHz when back light is connected): *replace PCB ECG Monitor*
- back light defective: *replace LCD Graphics Display*

**No printout or instrument does not printout correctly**

- No paper feed, recorder not hooked up: *plug in connector*
- No or irregular paper feed: *check recorder cogs and replace if necessary. Caution! 9.5 mm diameter cog is affixed with epoxy resin! If necessary, use Eagle 1000 recorder mechanical or electronic repair kits*
- Despite paper feed, no printout due to an operating error: *chart paper inserted wrong side up, insert as described in the Operator's Manual*
- No 12 VR or +5 V supply voltage at connector: *check voltage*
- Despite checking the above items, no printout or printout defective: *perform printhead test in service mode. If necessary, replace printhead or recorder electronics*

**No ECG display**

- Leads selected are not suitable: *select isuitable leads n ECG menu*

- When using a 5-lead cable channel 2 fails to show an ECG: *actuate “Next Menu” to access DISPLAY menu, select “ECG” for channel 2*

- Contact problems with patient lead, or it is defective: *check patient cable and connector contacts, if necessary, replace*

- Contact problems with ECG input, or it is not plugged in properly: *check socket and plug onto the PCB ECG Monitor, if necessary, replace*

- PCB ECG Monitor is defective: *replace PCB*

**Other ECG problems**

- Lead fail detection doesn’t work proper: *replace overvoltage arrester, if necessary, replace PCB ECG Monitor*

- SWITCHING REGULATOR does not supply sufficient amplitude, supply voltage not attained: *remove PCB Oximeter and PCB PRESS/TEMP, or PCB TEMP. If error persists, replace PCB ECG Monitor*

- ECG fails to trigger: *establish suitable amplitude through electrode contact, electrode positioning and/or lead selection, establish sufficient absence of hum (check hum amplitude in configuration without line filter), if necessary, replace PCB ECG Monitor*

- Pacing pulses with appropriate data and amplitude >10 mV (see Technical specifications) are not detected: *check as above, if necessary, replace PCB ECG Monitor, for stimulation of pacing pulses with patient simulator „Lionheart“ see Paragraph 3.2.4.6*

**Measurement by $SpO_2$ disabled or unreliable**

- Problem with probe: *check probe application, avoid artifacts due to movement, com*pare pulse rate measurements with ECG heart rate measurements (when the signal is too weak they deviate significantly from one another), check connector contacts, if neces*sary, replace probe*

- Problem with Eagle 1000: *check $SpO_2$ panel socket and replace, if necessary; otherwise, replace PCB $SpO_2$; in the event of a problem at the interface*, *replace PCB Oximeter wire set*

- “SWITCHING REGULATOR” does not supply sufficient amplitude, supply voltage not attained: *if there is no overloading due to the PCB Oximeter, PCB Press/Temp or theECG circuit, this is defective and the PCB ECG Monitor must be replaced*

- $SpO_2$ interface on PCB ECG Monitor defective: *replace this PCB*

**Measurement of non-invasive blood pressure disabled or unreliable**

- Cuff unsuitable or defective: *check that the cuff being used has the recommended size, (children, adult, neonate) and is in good condition*

- Tubing between instrument input and PCB is pinched as soon as the instrument casing is put on, or leaks: *lay tubing appropriately, if necessary, replace*

- Component on PCB defective (pump, valve, electronics): *replace PCB*

- PCB NBP wire set not plugged correctly or defective: *plug in correctly or replace it*

- NBP interface for non-invasive blood pressure on PCB ECG Monitor is defective: *replace this PCB*

- Signal transmission on PCB ECG Monitor defective: *replace this PCB*

**No measurement by TEMP**

- Temperature probe defective: *check the cable and the plug, if necessary, replace probe*

- One of the two control temperatures is incorrect: *from “Configuration” access the “Service Mode” with F3 and F4 and read the control temperatures displayed. If the upper value deviates from 38.8 °C by more than 0.1 °C, the lower value from 4 °C by more than 0.2 °C, it is no longer possible to make an accurate measurement and probe value output is disabled (> 0.2 °C internal deviation for both values). The PCB PRESS/TEMP, or PCB TEMP must be replaced*

- The socket is not correctly inserted or is defective: *plug in flat strip cable correctly, if necessary, replace it.*

- Power supply from PCB ECG Monitor is too weak: *provided there is no overloading due to the temperature or Press module, PCB Oximeter, or the ECG circuit, the PCB ECG Monitor should be replaced*

- Signal transmission on PCB ECG Monitor defective: *replace this PCB*

**No measurement by PRESS**

- Pressure transducer or cable defective: *inspect transducer membrane, subject to pressure, check cable, if necessary, replace transducer (or cable, if connectable)*

- When using the “Lionheart” simulator it is not possible to display a pressure signal on the display, although the socket and power supply are O.K. and plugged in correctly: *replace PCB PRESS/TEMP*

- Signal transmission on PCB ECG Monitor defective: *replace this PCB*

# 4.7 QuickLink test

## 4.7.1 Technical inspections

The following procedures may be done to check parts of a complete system of Eagle 1000, QuickLink and VICOM Server. To check a complete System follow the chapter 4.2.6 “Maintenance and checkout procedures”.

## 4.7.2 Tools required

Pozidrive screwdriver
Eagle 1000, QuickLink adapter and QuickLink Station
(Test with QuickLink Station without HELAN connection is possible as long as this is not to be tested itself. An SMX_08 or SMX_09 can serve as the simplest HELAN simulation — without TCP/IP and Download Test.)

PC with Windows and the program “terminal.exe” from the range of programs available under Windows or corresponding DOS interface program (if required, “V24.exe” is available from Marquette Hellige Service.)

Configure the two connection cables mentioned below under “QuickLink test: RS-232connections” with 9-pin Sub-D connectors so that only the four or three wires, respectively, are wired.

If necessary, connect a commercially available PC adapter, 9-pin male to 25-pin female, to the PC serial interface.

RS-232 setting on PC:
8 bits, no parity, 9600 baud, 1 stopbit, no handshake, local echo off.

## 4.7.3 Testing QuickLink adapter leading to QuickLink Station and HELAN

**Test preliminaries:**

1 Place Eagle 1000 with a QuickLink adapter on QuickLink Station with appropriate infrared window alignment. Unscrew the QuickLink adapter cover. Disconnect plug connector on infrared adapter. Connect 4-wire RS-232 cable to infrared adapter and to PC.

2 Switch on PC, start Windows, start “terminal.exe” program. If PC is not equipped with Windows, start “V24.exe” under DOS. Carry out RS-232 configuration as above.

3 Connect QuickLink Station up to power supply and wait for 15 seconds until booting is complete. It makes a difference here whether HELAN is hooked up or not. Reboot after each system change.

**Performance check without HELAN**

4a Press the Enter key (carriage return is transmitted). The response to this must be the prompt “boot>”.

This tests the connection from the QuickLink adapter to the QuickLink Station.

5a Enter character “l” for “load” and press the Enter key. Then press the Enter key a second time after a pause of approx. 5 seconds. This should call up the prompt “username>”.

This partially tests the performance of the QuickLink Station.

**Performance check with HELAN:**

“Terminal.exe” program hints: “show server” shows addresses, “help” shows com mands. The text under “help” can be distorted due to the processing speed of Windows.

4 Press the Enter key. This should call up the prompt “username>“.

5 Enter a series of characters, e.g. “test” and press the Enter key. This should call up the prompt “local_1>”.

6 Entering “show server” shows the corresponding IP address. This must be either 172.16.1.x or 172.16.2.x or 172.16.3.x or 172.16.4.x.

7 Entering “show port” must call up Gateway address 172.16.0.1 as the “preferred service”.

This completes the configuration test.

**Performance check with HELAN and Gateway:**

8 Still in “local_1>“ enter the command “ping 172.16.0.1”. This should activate a periodic process on the network.

This completes the testing of the QuickLink Station, as well the performance of the HELAN and of the TCP/IP.

9 Download test on the HELAN:
Enter “lo” for “logout” and press the Enter key, press the Enter key again after a pause of approx. 5 seconds. This should call up the prompt “username>”.

10 Enter “eagle1” (in lower case letters) and press the Enter key. This should call up the prompt “local_1>”. Enter the command “rl” (remote login) and press the Enter key. The Gateway should now give the message “connection closed”.

Due to timeout “Io” must be entered and the Enter key pressed within 10 s. This should call up a large “S” for “Start”.

This shows that the Gateway software for QuickLink functions.

## 4.7.4 Testing QuickLink adapter leading to Eagle 1000

**Test preliminaries:**

1 Unscrew the QuickLink adapter cover. Disconnect plug connector on infrared adapter. Switch on Eagle 1000.

Voltage test: check that a DC voltage of 8 to 12 V at the Pin_7 referred to Pin_5 on the pin side of the flat band cable in the exposed QuickLink adapter. This is about 3.3 V less than at the RS-232 output of the Eagle 1000.

Connect **3-wire** RS-232 cable (**zero modem!**) to the connector leading to the Eagle 1000 and to the PC.

2 Switch on PC, start Windows, start “terminal.exe” program. If PC is not equipped with Windows, start “V24.exe” under DOS. Carry out RS-232 configuration as listed above.

3 On the Eagle 1000 press F1 and F5 keys simultaneously to activate the “Configura tion” mode. Then press F3 and F4 keys simultaneously to activate the “Service” mode. Afterwards press the F3 key for 2 seconds to activate the RS-232 test.

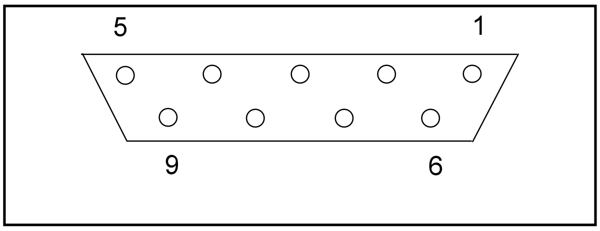
**Performance test:**

4 Enter a character into the PC, this should appear on the screen as long as the Eagle 1000 is in the RS-232 testing mode. Every character entered via the PC keyboard is displayed on the screen. The character of CR appears as CRLF.

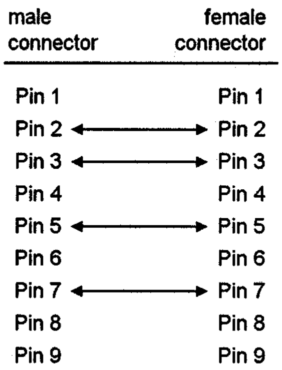
This completes the tests for the QuickLink adapter leading to the Eagle 1000 as well as its RS-232 output.

## 4.7.5 QuickLink test: RS-232 connections

Female socket



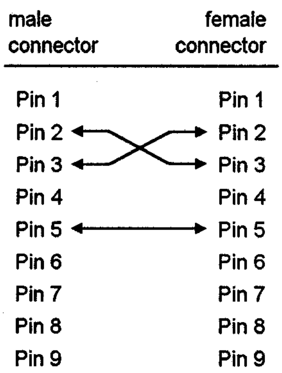

### Cable for testing internally QuickLink adapter leading to QuickLink Station




If necessary, use 9-pin male to 25-pin female adapter

Use the 4 connections indicated only

### Cable for testing internally QuickLink adapter leading to Eagle 1000




If necessary, use 9-pin male to 25-pin female adapter
Use the 3 connections indicated only

(In zero modem Pin 2 and Pin 3 are swapped round)

Adapter 9-pin male > 25-pin female
Pin 2 > Pin 3, Pin 3 > Pin 2, Pin 5 > Pin 5

## 4.7.6 Maintenance and checkout procedures

These procedures should be performed **every year**. A visual inspection, functional check-out and safety analysis test has to be done. For the visual inspection follow paragraph 3.1. The functional checkout is done by proceeding a data transfer.

Note, the Quick Link has no electrical ground connection, so, the Safety Analysis Test has to be performed by proceeding the Enclosure Leakage Current Test.

This test is performed to measure leakage current from chassis and exposed metal parts to ground during normal conditions (N. C.) and single fault conditions (S.F.C.).
In any case, the leakage current has to be measured from front-and backpanel and the metal shield of the Twisted Pair connector to ground.

Connect the unit under test to your Safety Tester.

With Quick Link, the position of the ground switch GND does not matter.

- During normal conditions (N.C.), referring to the electrical diagram, measurements have to be done under the following conditions:

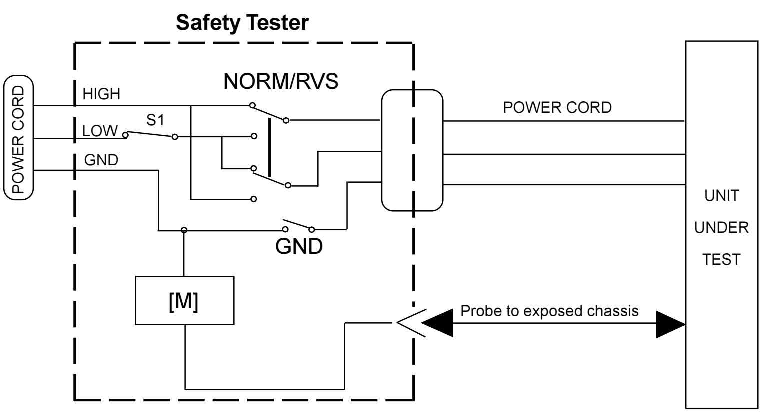
| | | |
|---|---|---|
| * | Polarity switch | NORM and RVS |
| * | S 1 | closed |

- During single fault conditions (S.F.C.), referring to the electrical diagram, the measurements have to be done under the following conditions:

| | | |
|---|---|---|
| * | Polarity switch | NORM and RVS |
| * | S 1 | open |

Test has failed if the measured values are greater than:

| N.C. | S.F.C. |
|---|---|
| 100 µA | 500 µA |
| | 300 µA (U.S. requirements) |



# 5 PCB R-Plan, P-Plan

## 5.1 PCB ECG Monitor 388 031 19  (V2.0)

## 5.2 PCB ECG Monitor 388 031 19 I (V2.01)

## 5.3 PCB Recorder 50: 388 031 70

## 5.4 PCB Press/Temp 388 031 75

## 5.5 PCB Temp 388 032 04

## 5.6 PCB Press Distributer 388 032 12

## 5.7 Isolation relay Eagle 1000: 388 032 14

**Please refer to the appendix**

# 6. Sparparts List

### Parts for Power Supply

| | |
|---|---|
| 929 165 76 | Mains input connector incl. filter and fuse holder |
| 912 084 50 | Fuse T 2A |
| 303 444 09 | Accu for ECG Monitor |
| 930 117 41 | Power Supply 115/230VAC 15,6VDC |

### Parts for recorder

| | |
|---|---|
| 384 017 23 | Kit recorder-mechanic Eagle 10XX, complete without printhead and pcb. |
| 384 017 22 | Kit recorder electronic Eagle 10XX, incl. printhead and pcb. recorder 50 |
| 480 159 56 | Gear 17 mm diameter |
| 480 159 57 | Gear 14,5 mm diameter |
| 480 159 65 | Gear 9,5 mm diameter |
| 303 440 12 | Thermal printhead, if not available, use 2005674-001 |
| 2005674-001 | Thermal printhead, if 30344012 not available |
| 432 518 30 | Cover for paper compartment, order label seperately |
| 430 514 51 | Label for Cover |

### Plugs and Connectors

| | |
|---|---|
| 303 444 28 | Socket ECG complete with wiring |
| 303 444 29 | Socket SpO2 complete with wiring |
| 303 444 30 | Socket IBP complete with wiring |
| 303 444 31 | Socket TEMP complete with wiring |
| 383 273 66 | Socket nurse call/RS232 complete for field service |
| 929 166 32 | Pneumatic Connector Rectus BPNI |
| 383 273 30 | Cable for pcb.NIBP NB11 |
| 383 273 65 | Cable for pcb. NIBP2000 |

### Mechanical parts

| | |
|---|---|
| 384 017 24 | Frontpanel assy. Eagle 1000 with round plugs, keypad and filter screen + adhesive frame have to be ordered separately. |
| 390 001 30 | Keypad Eagle 10XX light green |
| 390 001 64 | Keypad Eagle10XX grey |
| 419 070 82 | Filter screen Eagle 1000 |
| 428 195 21 | Backpanel cover plate Eagle 10XX |
| 423 203 20 | Adhesive frame for filter screen |
| 423 203 24 | Covering disk as blind socket |
| 504 658 43 | Top cover Eagle/Dash 1000 for units without recorder |
| 504 658 45 | Top cover Eagle/Dash 1000 for units equipped with recorder |
| 924 017 09 | Adhesive rubber foot |
| 923 096 86 | Cable Strap |
| 2003701-001 | Metal Frame for holding Hitachi LCD display |

**Pneumatic parts for NIBP**

| | |
|---|---|
| 929 167 51 | Check valve |
| 929 166 32 | Pneumatic connector Rectus BPNI |

**Adhesive stickers**

| | |
|---|---|
| 423 203 28 | Adhesive label round size for Eagle without NIBP |
| 423 203 33 | Adhesive label for NIBP input |
| 430 518 48 | Adhesive label ECG/SpO2 input |
| 430 518 49 | Adhesive label IBP/TEMP input |
| 430 518 50 | Adhesive label TEMP input |
| 430 518 53 | Adhesive label ECG input |
| 430 518 57 | Adhesive label blank left side |
| 430 519 24 | Adhesive label blank below display |

**Printed Circuit Boards and Display**

| | |
|---|---|
| 303 445 10 | Pcb. ECG-Monitor Eagle 1002-1009 vers.1.01 obsolete, use 30344521 |
| 389 004 15 | Pcb. ECG-Monitor Eagle 1002-1009 vers.1.01 (Exchange) obsolete, use 30344521 |
| 303 445 20 | Pcb. ECG-Monitor Eagle 1002-1015 vers.2.0 |
| 389 004 20 | Pcb. ECG-Monitor Eagle 1002-1015 vers.2.0 (Exchange) |
| 303 445 21 | Pcb. ECG-Monitor Eagle/Dash 1000 vers.2.1 |
| 389 004 27 | Pcb. ECG-Monitor Eagle/Dash 1000 vers.2.1 (Exchange) not for use with Graphic Display 2003727-004 |
| 2004448-001 | Pcb. ECG-Monitor Eagle/Dash 1000 vers.2.1 (Exchange) for Graphic Display 2003727-004 |
| 303 445 12 | Pcb. Press-Temp Eagle/Dash 1000 |
| 389 004 19 | Pcb. Press-Temp Eagle/Dash 1000 (Exchange) |
| 303 445 13 | Pcb. Temp Eagle/Dash 1000 |
| 303 444 65 | Pcb. SpO2 incl. shielding for Eagle/Dash 1000 |
| 930 117 15 | Pcb. NIBP module NB11 |
| 930 118 16 | Pcb. NIBP module NB11 (exchange) |
| 930 117 93 | Pcb. NIBP 2000 module obsolete, use 38803260 |
| 388 032 60 | Pcb. NIBP 2000 module |
| 930 117 17 | LCD Graphic Display (Hosiden HLM8619-010500) |
| 2009071-001 | LCD Graphic Display (Hosiden HLM8619-010500) |
| 2003727-001 | LCD Graphic Display (Hitachi SP14Q002-A1 with special cable wiring) |
| 2003727-004 | LCD Graphic Display (Hitachi SP14Q002-A1 with flex cable wiring) |

**Miscellaneous**

| | |
|---|---|
| 91208437 | Fuse T 4 A TR5 |
| 92916698 | Battery 3V 0,8Ah |
| 22746801 | Service Manual Eagle1000 with Hellige plug system |

**EPROM Software**

| | |
|---|---|
| 443 309 02 | Eprom EAGLE 1000 V 1.01 |
| 443 309 03 | Eprom EAGLE 1000 V 2.0 |
| 443 309 04 | Eprom EAGLE 1000 V 2.01 |
| 443 309 05 | Eprom EAGLE 1000 V 2.1 |

| | |
|---|---|
| **216 134 01** | **Quick Link Station** |
| 216 134 02 | Exch. Quick Link Station (216 134 01) |
| 303 444 91 | Case |
| 303 445 04 | Power Cord |
| 911 007 90 | Signal lamp green |
| 919 203 01 | Connection Cable to Transceiver, Twisted Pair, length 2 m |
| 930 117 72 | IRDA-Adapter infrared RS 232 |

# 7. Miscellaneous, Notes

# Appendix

Complete circuit diagram and mechanical diagrams

Systems without a recorder 101 123 ..

Systems with a recorder 101 124 ..

Complete wiring circuit (S-Plan)

Master Record Index (MRI)

PCB R-Plan, P-Plan

PCB ECG Monitor 388 031 19 Index F (V2.0)

Lpl EKG-Monitor 388 031 19 Index J (V 2.1)
PCB ECG Monitor 388 031 19 Index J (V2.1)

Lpl Registrierteil 50: 388 031 70 Index B
PCB Recorder 50: 388 031 70 Index B

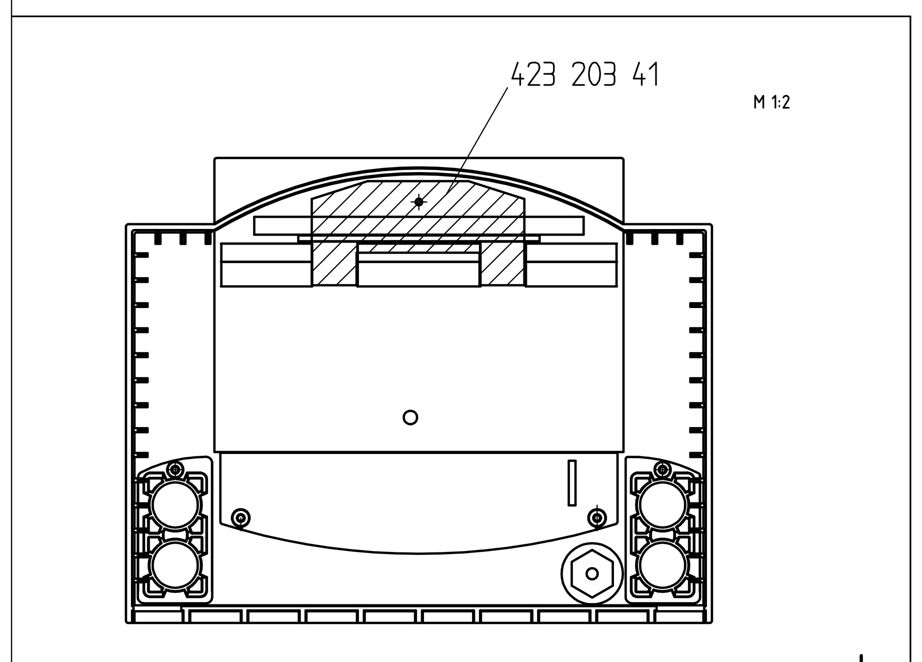
Lpl Press/Temp 388 031 75 Index E
PCB Press/Temp 388 031 75 Index E

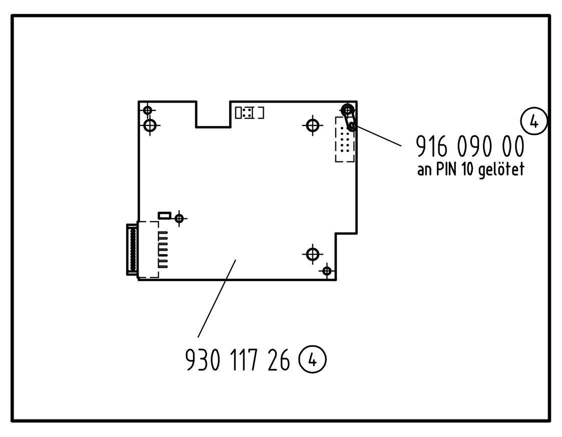
Lpl Temp 388 032 04 Index E
PCB Temp 388 032 04 Index E

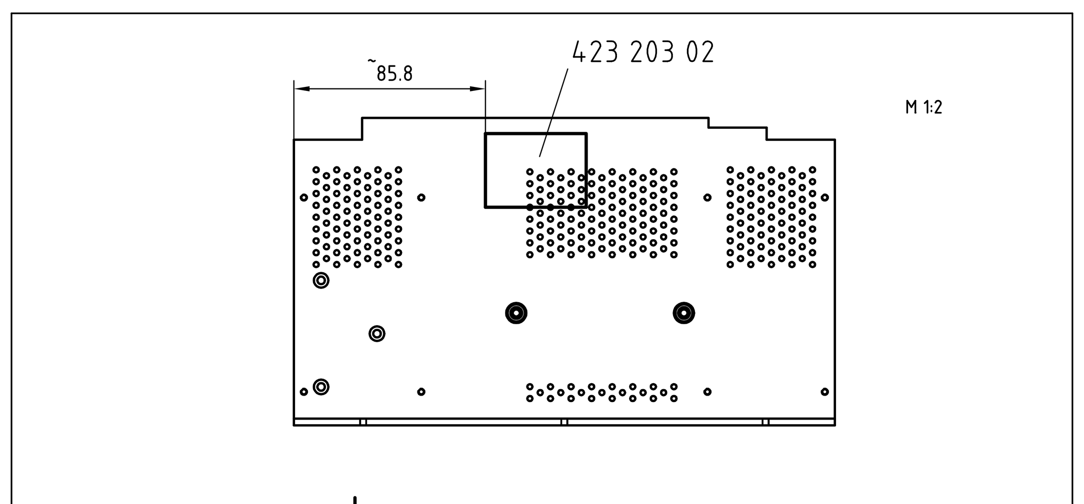
Lpl Press Verteiler 388 032 12 B
PCB Press Distributor 388 032 12 B

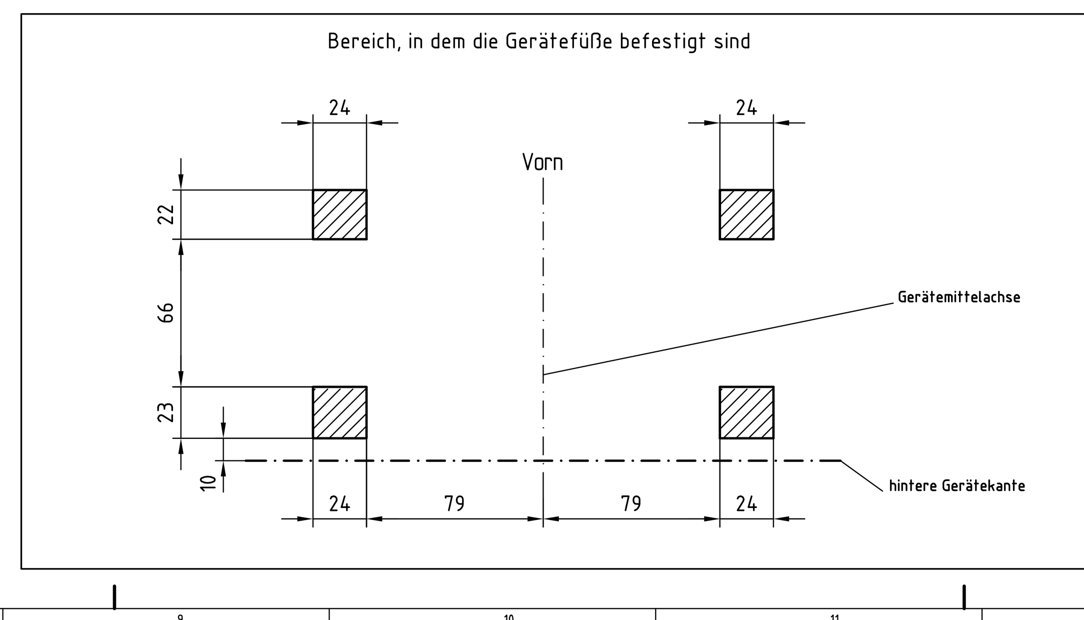
Trennrelais Eagle 1000: 388 032 14
Isolation relay Eagle 1000: 388 032 14

Achtung: Abdeckung durchsichtig gezeichnet !!


| | | |
|---|---|---|
| 1 | 303 444 30<br>388 031 75<br>430 518 49 | nur in Variante 07 |
| 2 | 303 444 31 | nur in Variante 06; 07 |
| | 430 518 50<br>388 032 04 | nur in Variante 06 |
| 3 | 383 273 65<br>388 032 60<br>423 203 33<br>803 009 00<br>804 096 00<br>927 228 48<br>927 230 01<br>929 166 32 | nur in Variante 04; 05; 06; 07 |
| 4 | 303 444 29<br>383 273 29<br>423 203 22<br>423 203 31<br>423 203 32<br>430 518 48<br>430 520 21<br>504 658 62<br>504 658 63<br>801 776 35<br>801 776 49<br>803 083 02<br>804 034 00<br>916 090 00<br>927 230 30<br>930 117 26 | nur in Variante 03; 05; 06; 07 |

Hierzu Drahtsatz 383 273 29 4
Hierzu Drahtsatz 383 273 65 3
Hierzu Drahtsatz 383 273 32

Isolierung (423 203 02) auf Bodenblech, unter Kühlkörper der Leiterplatte geklebt

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

Werkstoff - Material

Rohteil

| Änd.Index Revision | kommt vor numbers | ECO No. | Änderungsbeschreibung - Change Description | Datum - Date | Name |
|---|---|---|---|---|---|
| d | 2x | 064805 | 2003701-001; 2003727-001/-004 hinzu; Dokument-Nr. neu | 27.06.00 | Koch |

Freimaßtoleranz - Tolerance

| Projektion | Format | Maßstab - Scale | Oberfläche - Finish | | Datum - Date | Name |
|---|---|---|---|---|---|---|
| | A0 | 1:1 | | Entworfen-Drawn | 28.08.97 | A.Wendler |
| | | | | Geprüft-Approved | 28.08.97 | A.Wendler |
| | | | | Geprüft-Approved | | |

File Name: 10112402-D06__ZM01

Dokument Bezeichnung - Document Description: doc mech dwg ZM01

Dokument Nr. - Document No.: 10112402-D06

| Zeichn.Art/Blatt Nr. | Teil Bezeichnung - Part Description | Teil Nr. - Part Number |
|---|---|---|
| ZM/01 | EKG-Monitor EAGLE 10.. | 101 124 .. |


| Änd.Index Revision | kommt vor numbers | ECO No. | Änderungsbeschreibung – Change Description | Datum – Date | Name |
|---|---|---|---|---|---|
| f | - | 064854 | Hitachi-Display 2003727-004 hinzu | 03.08.00 | Koch |
| e | - | 064702 | Hitachi-Display 2003727-001 hinzu | 29.05.00 | G.Kaltenbach |
| d | - | 202930 | 930 117 93 ersetzt durch 388 032 60 | 12.06.97 | G.Kaltenbach |
| c | - | 202848 | Verdrahtung v. Lötösen geändert | 22.04.97 | G.Kaltenbach |
| b | - | 202706 | neue Lpl NIBP 2000 – 930 117 93 | 04.03.97 | G.Kaltenbach |
| a | - | 202557 | Lpl Temp, 388 032 04, neu hinzu | 08.11.96 | G.Kaltenbach |

| 1 | 2 | 3 | 4 |
|---|---|---|---|

Diese Tabelle definiert die gültigen Konfigurationen des EAGLE 1000 Version 2.1
This table defines the valid configurations of the EAGLE 1000 Version 2.1

| Komponente<br>Component | | | Sach-Nr.<br>Part No. | Index<br>(Prod.) | Referenz<br>Reference | kompatibel<br>compatible<br>(Service) | in Variante<br>in variant |
|---|---|---|---|---|---|---|---|
| EKG-<br>Monitor | Lpl EKG-Monitor<br>Austausch-Nr.<br>Ersatzteil Nr. | PCB ECG MONITOR<br>Replacement No.<br>Spare part No. | 388 031 19<br>2004448-001<br>303 445 21 | J | | H, I | 02...07 |
| Netzteil<br>Power Supply | Lpl NFS40<br>Lpl SNP9548 | PCB NFS40<br>PCB SNP9548 | 930 117 41<br>930 117 41 | A1<br>B | | A | 02...07 |
| PRESS-<br>TEMP | Lpl Press-Temp<br>Austausch-Nr.<br>Ersatzteil Nr. | PCB PRESS_TEMP<br>Replacement No.<br>Spare part No. | 388 031 75<br>389 004 19<br>303 445 12 | E | | D | 07 |
| TEMP | Lpl Temp<br>Ersatzteil Nr. | PCB TEMP<br>Spare part No. | 388 032 04<br>303 445 13 | E | | D | 06 |
| Oximeter<br>Board | Lpl MP204 Oxim.<br>Ersatzteil Nr. | PCB MP204 Oxim.<br>Spare part No. | 930 117 26<br>303 444 65 | C | | B | 03,05...07 |
| NIBP-<br>Modul | Lpl NIBP 2000 | PCB NIBP 2000 | 388 032 60 | H | | B1, C1, D, E, F, G<br>930 117 93 B,<br>930 117 15 A | 04...07 |
| Recorder | Lpl Registrierteil<br>Ersatzteil Nr. | PCB Recorder<br>Spare part No. | 388 031 70<br>384 017 22 | B<br>inkl. Druckkopf/incl. print head | | | 101 124 02...07 |
| Display | LCD Modul<br>LCD Modul<br>LCD Modul | | 930 117 17<br>2003727-001<br>2003727-004 | verwendet/used in PCB EKG-Monitor A ... H<br>verwendet/used in PCB EKG-Monitor I<br>verwendet/used in PCB EKG-Monitor J | | | 02...07 |

Netzteil / Power Supply:

**Remarks Index A : Computer-Products Netzteil NFS40-7915**
**Index A1 : Computer-Products Netzteil mit geändertem Widerstand R1**
**Index B : Skynet-Netzteil SNP 9548-M entsteht aus (930 117 88)**

Oximeter Board:

Index C entspricht/is equivalent : MP204P Revision A/1...A/7, A (siehe/see CPU Label)

NIBP-Modul:

Remarks: NIBP2000 38803260 G enthält/contains SW V1.3. (Version G ist/is update von/of F)
Softw. update von/of 93011793B, 38803260 B1/C1/D/E auf/to SW V1.3 führt zu/leads to: 93011793B1, 38803260 B2/C2/D1/E1
Remarks: NIBP2000 38803260 H enthält/contains SW V1.4. (Version H ist/is update von/of G)
Softw. update von/of 93011793B, 38803260 B2/C2/D1/E1 auf/to SW V1.4 führt zu/leads to: 93011793B2, 38803260 B3/C3/D2/E2


Marquette Hellige GmbH
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D-79111 Freiburg


Werkstoff - Material

Rohteil

| Änd.Index Revision | kommt vor numbers | ECO No. | Änderungsbeschreibung - Change Description | Datum - Date | Name |
|---|---|---|---|---|---|
| w | -- | 064818 | neuer Index 38803119,38803175,38803204,neues Display | 25.10.00 | G.Kaltenbach |
| v | -- | 064702 | neuer Index 388 031 19, neues Display | 24.05.00 | G.Kaltenbach |
| u | -- | 064288 | Korrektur NIBP2000 Index H | 18.02.00 | G.Kaltenbach |
| t | -- | 061765 | Rev. G für 388 032 60 | 18.08.99 | T.Kaltenbach |

| Freimaßtoleranz - Tolerance | Projektion | Format | Maßstab - Scale | Oberfläche - Finish | | Datum - Date | Name |
|---|---|---|---|---|---|---|---|
| | | A4 | | | Entworfen-Drawn | 03.06.96 | A.Malkmus |
| | | | | | Geprüft-Approved | 03.06.96 | H.Schlosser |
| | | | | | Geprüft-Approved | | |

File Name: 10112302-D03__SZ02

Dokument Bezeichnung - Document Description: doc schem SZ02

Dokument Nr. - Document No.: 10112302-D03

Zeichn.Art/Blatt Nr.: SZ/02

Teil Bezeichnung - Part Description: EAGLE 1002
101 123 02...07,EAGLE 1002,.04,.06,.08,.10,.14
101 124 02...07,EAGLE 1003,.05,.07,.09,.11,.15

Teil Nr. - Part Number: 101 123 02 ... 07
(Version 1.01, 2.0, 2.01, 2.1)

Im MRI (Blatt 3) sind die Unterschiede zur ersten Geräte-Version 1.0 erläutert.
Beim Software- und/oder Hardware-Update sind aus dem gültigen MRI die zugelassenen Änderungsstände zu entnehmen (Sachnummer oder Index). Fertigungdbedingt kann es innerhalb einer Version mehrere gültige Änderungszustände geben, welche in der Spalte "kompatibel mit" aufgeführt sind.

## Erklärung der Hardware-Updates:

| | |
|---|---|
| Lpl.EKG-Monitor 388 031 19 C | (neues Layout (RT Index B) ) |
| Lpl.EKG-Monitor 388 031 19 B1,C1 | (neues EPROM Z522 mit SW Rel. 1.01 (44330901 wird ersezt durch 44330902). Aus Lpl.Index B wird B1 und C wird C1. Eine Aufarbeitung auf D ist nicht möglich.. |
| Lpl.EKG-Monitor 388 031 19 D | (neues Layout (RT Index C), neues EPROM Z521 mit SW Rel. 1.01 Sach. Nr. 443309 02. Lpl. mit Index D dürfen nicht durch Lpl. mit Index B1 oder C1 ersetzt werden. |
| Lpl.EKG-Monitor 388 031 19 E,C2 | (R571 geändert wegen Kauterfestikeit) |
| Lpl.EKG-Monitor 388 031 19 F | (neues EPROM Z521 mit SW Rel. 2.0 Sach.Nr.44330903. Eine Aufarbeitung auf G ist nicht möglich. |
| Lpl.EKG-Monitor 388 031 19 G | (neues Layout Index D, neues EPROM Z521 mit SW Rel.2.01 Sach.Nr. 443 309 04).Lpl. mit Index G dürfen nicht durch Lpl. mit Index A,F ersetzt werden. Lpl.hat Marquette-Stecker und RS232-Stromausgang. |
| Lpl.EKG-Monitor 388 031 19 H | (neues EPROM Z521 mit SW Rel. 2.1 Sach.Nr. 443 309 05) |
| Lpl.EKG-Monitor 388 031 19 I | (Stiftleiste für Display 2003727-001 hinzu) |
| Lpl.EKG-Monitor 388 031 19 J | (neues Layout Index E, Buchse für Display 2003727-004 hinzu) |
| Lpl.Press-Temp 388 031 75 D | (neue Isolierung) |
| Lpl.Press-Temp 388 031 75 E | (R5 geändert; R114 neu wegen Temperaturmessung) |
| Lpl.Temp 388 032 04 D | (neue Isolierung) |
| Lpl.Temp 388 032 04 E | (R5 geändert; R114 neu wegen Temperaturmessung) |
| Lpl.NIBP2000 930 117 93 A | (neues Modul ersetzt 930 117 15 A) |
| Lpl.NIBP2000 930 117 93 B | (neue SW V1.2 Pumpenansteuerung Neo-Mode) |
| Lpl.NIBP2000 388 032 60 B | (ersetzt 930 117 93) |
| Lpl.NIBP2000 388 032 60 C | (Schaltungsänderung durch PAR,R52 20k-4k7, R107/108 OR und R511 10k hinzu) |
| Lpl.NIBP2000 388 032 60 D | (Schaltungsänderung Z9,Z11,Z12 und Z18 ändern sich) |
| Lpl.NIBP2000 388 032 60 E | (Schaltungsänderung R19, R84) |
| Lpl.NIBP2000 388 032 60 G | (neue SW V1.3) |
| Lpl.NFS40 930 117 41 A | (Computer-Products NFS40-7915) |
| Lpl.NFS40 930 117 41 A1 | (mit geändertem Wid R1 1M Ohm 921 009 00) |
| Lpl.SNP9548 930 117 41 B | (Skynet SNP-9548-M) |

## Update der Version 1.0 nach 1.01

Zum Ändern der Produkt-Software EAGLE 1000 in Release 1.01 (EPROM Sach.Nr. 443 309 02) ist die Lpl.EKG-Monitor 388 031 19 Index E,D,B1.C1.C2 zugelassen.

## Update der Version 1.01 nach 2.0

Zum Ändern der Produkt-Software EAGLE 1000 in Release 2.0 (EPROM Sach.Nr.443 309 03) ist die Lpl.EKG-Monitor 388 031 19 Index F zugelassen. Neue Gebrauchsanweisung wegen Bedienungsänderung PRESS/TEMP und Quick-Link notwendig.

## Update der Version 2.0 nach 2.01

Zum Ändern der Produkt-Software EAGLE 1000 in Release 2.01 (EPROM Sach.Nr. 443 309 04) ist die Lpl. EKG-Monitor 388 031 19 Index G zugelassen. (Marquette-Stecker-Erkennung,Uhrzeit und Fahrenheit)

## Update der Version 2.01 nach 2.1

Zum Ändern der Produkt-Software EAGLE 1000 in Release 2.1 (EPROM Sach.Nr. 443 309 05) ist die Lpl. EKG-Monitor 388 031 19 Index H zugelassen. (Zentralenleistung, Portugiesisch)

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

Werkstoff - Material

Rohteil

| Änd.Index Revision | kommt vor numbers | ECO No. | Änderungsbeschreibung - Change Description | Datum - Date | Name |
|---|---|---|---|---|---|
| p | --- | 064818 | neuer Index 38803119,38803175,38803204,neues Display | 25.10.00 | G.Kaltenbach |
| o | --- | 064702 | neuer Index 388 031 19, neues Display | 24.05.00 | G.Kaltenbach |
| n | --- | 061765 | SW für NIBP Index G | 24.08.99 | T.Kaltenbach |
| m | --- | 203167 | Netzteil hinzu | 25.11.97 | A. Malkmus |
| l | --- | 203159 | Korrektur NIBP 2000 Index E | 13.11.97 | A. Malkmus |
| k | --- | 203121 | Korrektur NIBP 2000 Index D | 10.10.97 | A. Malkmus |
| j | --- | 202987 | Korrektur NIBP 2000 Index C | 20.07.97 | A. Malkmus |

Freimaßtoleranz - Tolerance

Projektion | Format: A4 | Maßstab - Scale | Oberfläche - Finish

| | Datum - Date | Name |
|---|---|---|
| Entworfen-Drawn | 13.06.96 | M&E Malkmus |
| Geprüft-Approved | 13.06.96 | H.Schlosser |
| Geprüft-Approved | | |

File Name
10112302-D04__SZ03

Dokument Bezeichnung - Document Description
doc schem SZ03

Dokument Nr. - Document No.
10112302-D04

Zeichn.Art/Blatt Nr.
SZ/03

Teil Bezeichnung - Part Description
EAGLE 1002
101 123 02...07,EAGLE 1002,.04,.06,.08,.10,.14
101 124 02...07,EAGLE 1003,.05,.07,.09,.11,.15

Teil Nr. - Part Number
101 123 02...07
(Version 1.01, 2.0, 2.01, 2.1)

Schutzvermerk nach DIN 34 beachten

| 1 | 2 | 3 | 4 |
|---|---|---|---|

The differences to the first version 1.0 are described in the MRI (Sheet 3). The approved revision status of software and/or hardware updates can be taken from the currently valid MRI (Part No. or Index). Depending on manufacture, within any one version there may be several valid revision statuses, listet in the column "compatible with".

## Explanation of hardware updates:

PCB ECG-Monitor 388 031 19 C (new layout (RT Index B) )

PCB ECG-Monitor 388 031 19 B1,C1 (new EPROM Z522 with SW Rel. 1.01 Part No.443 309 02)
Change PCB, Index B to B1 and C to C1. An update to Index D is not posible.

PCB ECG-Monitor 388 031 19 D (new layout (RT Index C),new EPROM Z521 with SW Rel. 1.01 Part no. 443 309 02)
PCB with Index D should not replaced by PCB with Index B1 or C1.

PCB ECG-Monitor 388 031 19 E,C2 (R571, 572 changed HF surgery noise).

PCB ECG-Monitor 388 031 19 F (new EPROM Z521 with SW Rel. 2.0 Part no.443 309 03). An Update to Index G is not posible.

PCB ECG-Monitor 388 031 19 G (new EPROM Z521 with SW Rel. 2.01 Part no. 443 309 04). PCB with Index G will not replaced HW with Marquette-Connectors and RS 232-Current-loop.

PCB ECG-Monitor 388 031 19 H (new EPROM Z521 with SW Rel. 2.1 Part no. 443 309 05).
PCB ECG-Monitor 388 031 19 I (new Connector for Display 2003727-001).
PCB ECG-Monitor 388 031 19 J (new layout Index E, new Connector for Display 2003727-004).

PCB PRESS-TEMP 388 031 75 D (new Isolation)
PCB PRESS-TEMP 388 031 75 E (R5 changed, R114 new, temperature measurement)
PCB TEMP 388 032 04 D (new Isolation).
PCB TEMP 388 032 04 E (R5 changed, R114 new, temperature measurement).

| | | | |
|---|---|---|---|
| PCB NIBP | 930 117 93 | A | (new modul replaces 930 117 15 A) |
| PCB NIBP | 930 117 93 | B | (new SW V1.2 for pump driver Neo-mode). |
| PCB NIBP | 388 032 60 | B | (replaces 930 117 93). |
| PCB NIBP | 388 032 60 | C | (replaces R52 10k to 4k7, new R107/108 0R and R511 10k). |
| PCB NIBP | 388 032 60 | D | (changes for Z9, Z11, Z12 and Z18). |
| PCB NIBP | 388 032 60 | E | (changes for R19, R84). |
| PCB NIBP | 388 032 60 | G | (new SW Version 1.3). |
| PCB NFS40 | 930 117 41 | A | (Computer products NFS40). |
| PCB NFS40 | 930 117 41 | A1 | (with Resitor R1 1M Ohms 921 009 00). |
| PCB SNP 9548 | 930 117 41 | B | (Skynet SNP-9548-M). |

## Updating Version 1.0 to 1.01

To update software EAGLE 1000 Release 1.01 only PCB ECG-Monitor with Index E, D, C1, C2, B1 is admissible.

## Updating Version 1.01 to 2.0

To update product software EAGLE 1000 Release 2.0 only PCB ECG-Monitor with Index F is admissible.
A new user manual with PRESS/TEMP and Quick-Link is necessary.

## Updating Version 2.0 to 2.01

To update product software EAGLE 1000 Release 2.01 only (EPROM part no. 443 309 03)
the PCB ECG-Monitor with Index G is admissible. (New: Marquette connectors, time, and temperature in Fahrenheit)

## Updating Version 2.01 to 2.1

To update product software EAGLE 1000 Release 2.1 only (EPROM part no. 443 309 05)
the PCB ECG-Monitor with Index H is admissible. (New: Central communication, portuguese)

Marquette Hellige GmbH
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| Änd.Index Revision | kommt vor numbers | ECO No. | Änderungsbeschreibung - Change Description | Datum - Date | Name |
|---|---|---|---|---|---|
| p | --- | 064818 | new Index 38803119,38803175,38803204,new Dispaly | 25.10.00 | G.Kaltenbach |
| o | --- | 064702 | Correction PCB ECG-Monitor | 24.05.00 | G.Kaltenbach |
| n | --- | 061765 | Rev. G for PCB NIBP | 24.08.99 | T.Kaltenbach |
| m | --- | 203167 | Power supply added | 25.11.97 | A.Malkmus |
| l | --- | 203159 | Correction PCB NIBP 200 Index E | 13.11.97 | A.Malkmus |
| k | --- | 203121 | Correction PCB NIBP 200 Index D | 10.10.97 | A.Malkmus |
| j | --- | 202987 | Correction PCB NIBP 200 Index C | 29.07.97 | A.Malkmus |

Werkstoff - Material

Rohteil

Freimaßtoleranz - Tolerance

| Projektion | Format | Maßstab - Scale | Oberfläche - Finish | | Datum - Date | Name |
|---|---|---|---|---|---|---|
| | A4 | | | Entworfen-Drawn | 13.06.96 | M&E Malkmus |
| | | | | Geprüft-Approved | 13.06.96 | H.Schlosser |
| | | | | Geprüft-Approved | | |

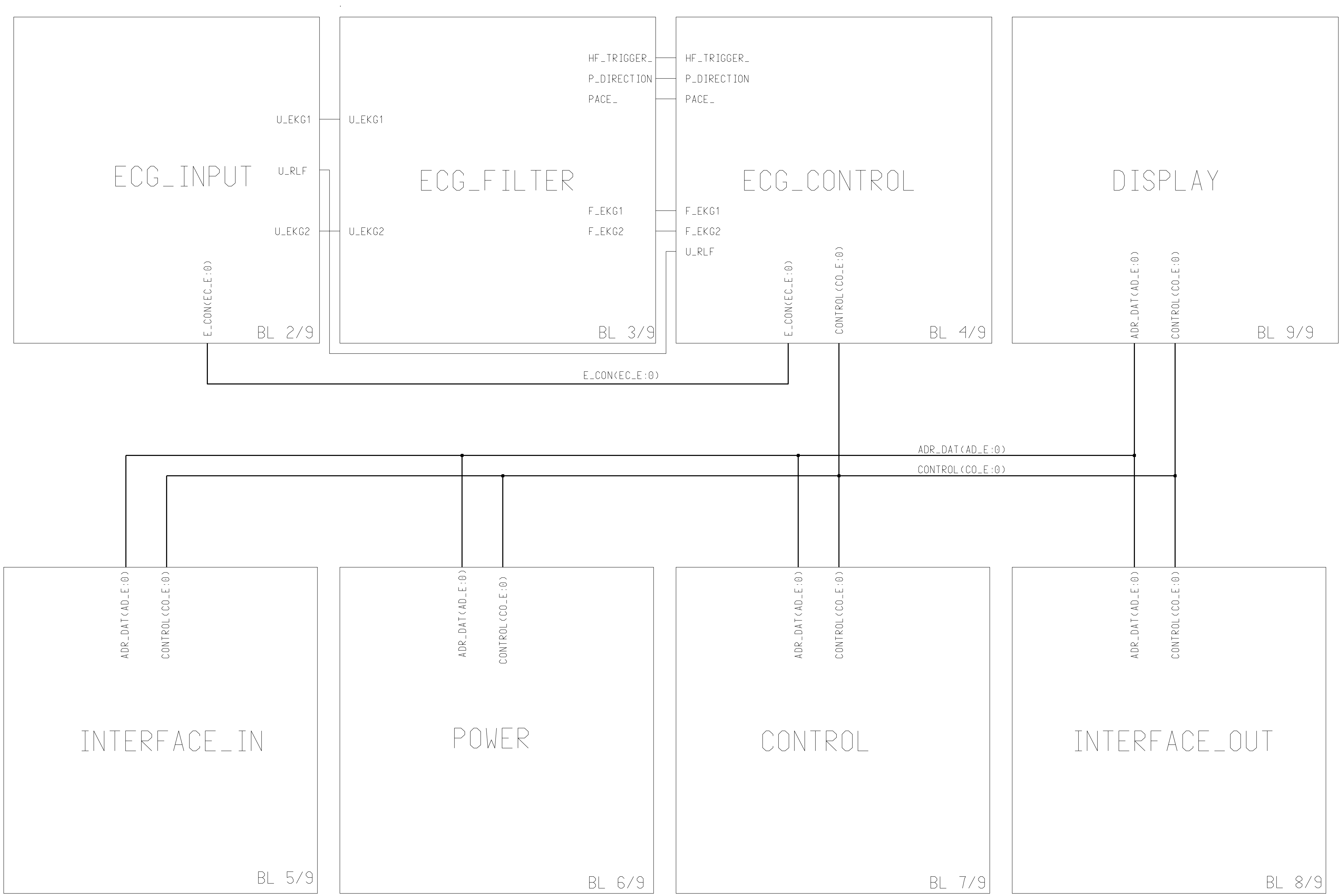
File Name
10112302-D05__SZ04

Dokument Bezeichnung - Document Description
doc schem SZ04

Dokument Nr. - Document No.
10112302-D05

| Zeichn.Art/Blatt Nr. | Teil Bezeichnung - Part Description | Teil Nr. - Part Number |
|---|---|---|
| SZ/04 | EAGLE 1002<br>101 123 02...07,EAGLE 1002,.04,.06,.08,.10,.14<br>101 124 02...07,EAGLE 1003,.05,.07,.09,.11,.15 | 101 123 02...07<br>(Version 1.01, 2.0, 2.01, 2.1) |

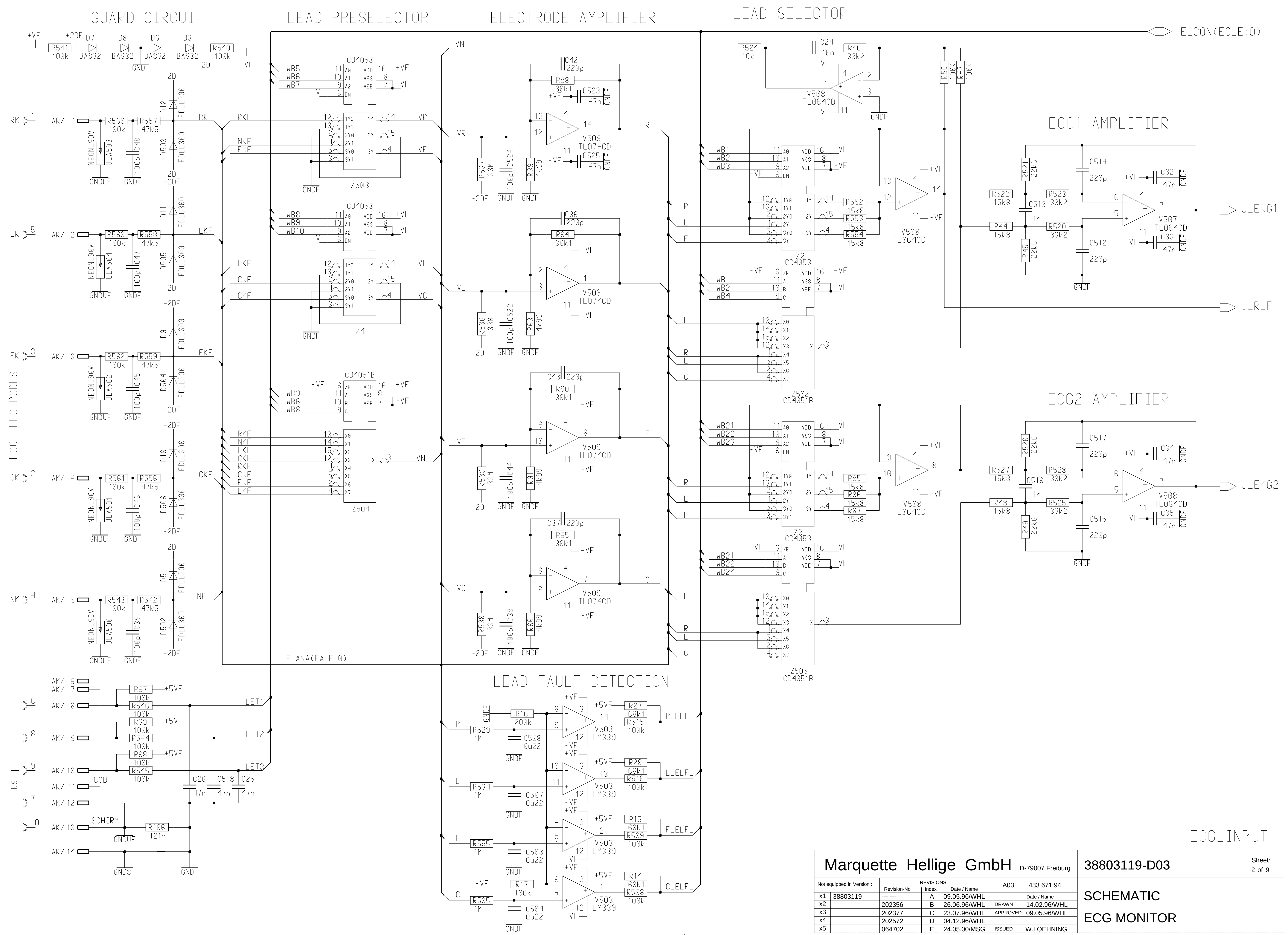
| A | B | C | D | E |
|---|---|---|---|---|




Schutzvermerk nach DIN 34 beachten

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Marquette Hellige GmbH D-79007 Freiburg | | | | | | 38803119-D02 | Sheet: 1 of 9 |
| Not equipped in Version : | REVISIONS Revision-No | Index | Date / Name | A03 | 433 671 94 | SCHEMATIC | |
| x1 | 38803119 | 202572 | A | 04.12.96/WHL | | Date / Name | |
| x2 | | 064702 | B | 24.05.00/MSG | DRAWN | 14.02.96/WHL | |
| x3 | | | | | APPROVED | 09.05.96/WHL | ECG MONITOR |
| x4 | | | | | | | |
| x5 | | | | | ISSUED | W.LOEHNING | |

DATE
DIR



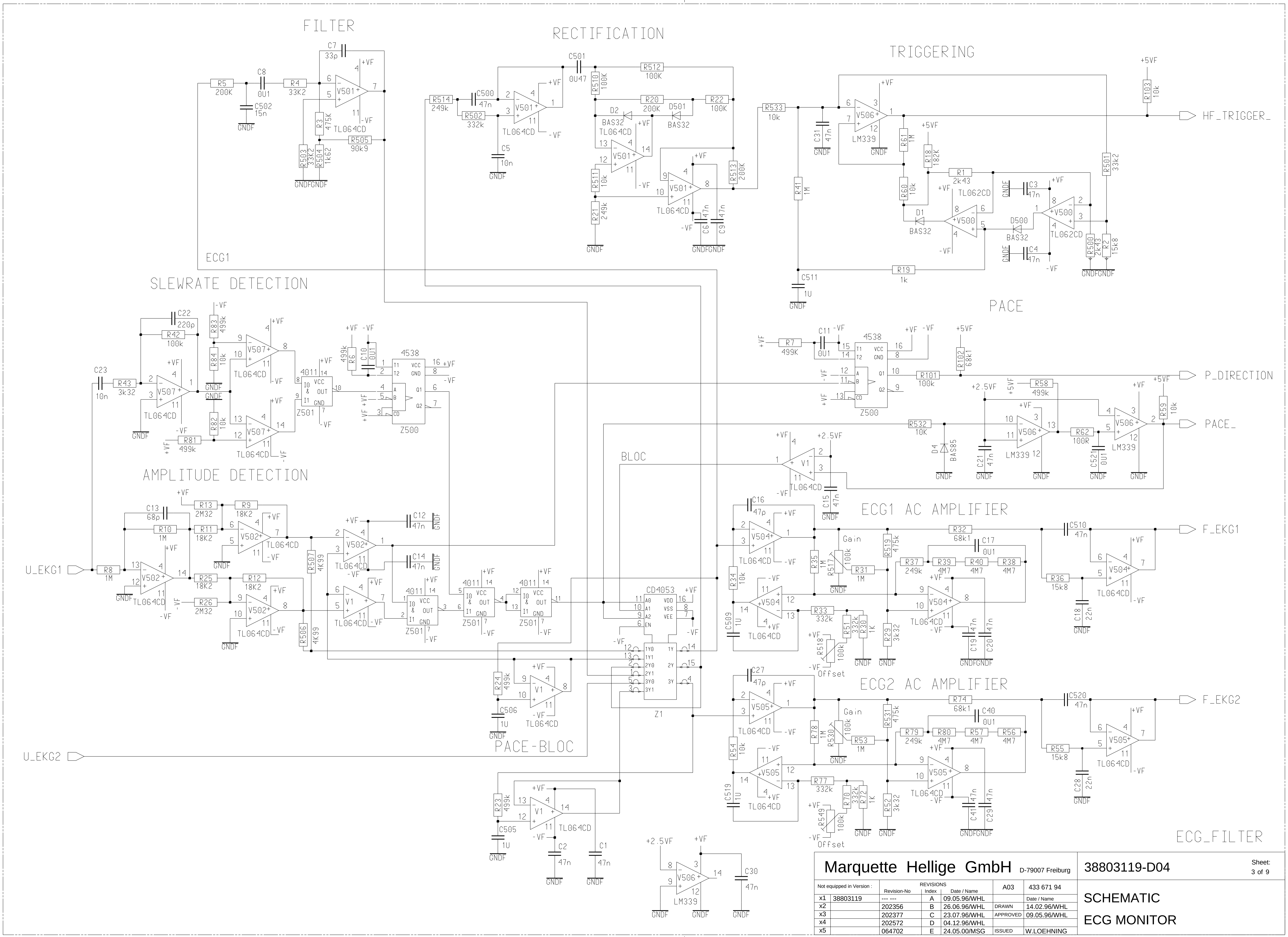

ECG_INPUT

**Marquette Hellige GmbH** D-79007 Freiburg — 38803119-D03 — Sheet: 2 of 9

| Not equipped in Version: | | Revision-No | Index | Date / Name | | |
|---|---|---|---|---|---|---|
| | | | | | A03 | 433 671 94 |
| x1 | 38803119 | --- --- | A | 09.05.96/WHL | | Date / Name |
| x2 | | 202356 | B | 26.06.96/WHL | DRAWN | 14.02.96/WHL |
| x3 | | 202377 | C | 23.07.96/WHL | APPROVED | 09.05.96/WHL |
| x4 | | 202572 | D | 04.12.96/WHL | | |
| x5 | | 064702 | E | 24.05.00/MSG | ISSUED | W.LOEHNING |

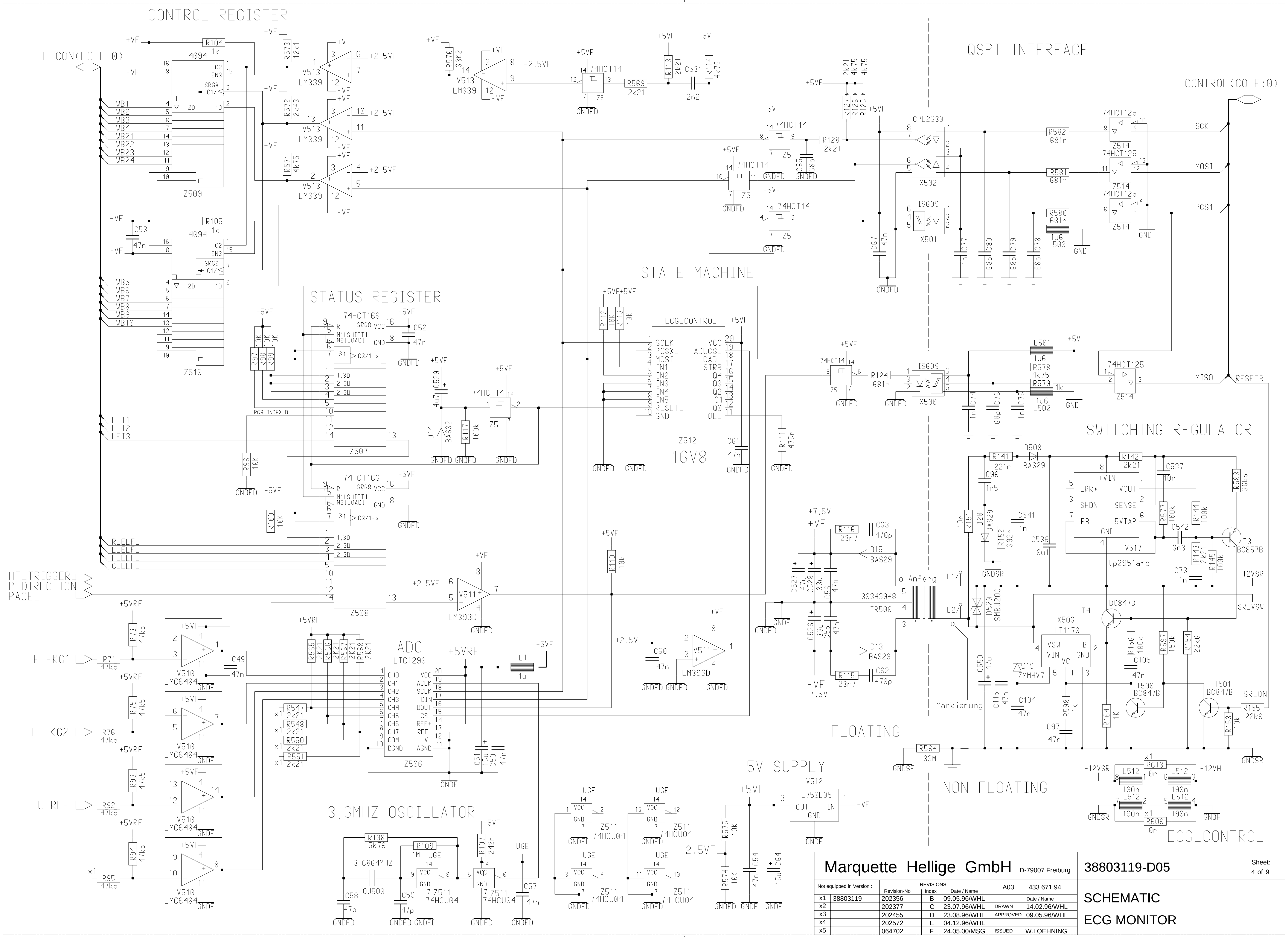
SCHEMATIC

ECG MONITOR




| Marquette Hellige GmbH D-79007 Freiburg | | | | | | 38803119-D04 | Sheet: 3 of 9 |
|---|---|---|---|---|---|---|---|
| Not equipped in Version : | REVISIONS Revision-No | Index | Date / Name | A03 | 433 671 94 | | |
| x1 | 38803119 | --- --- | A | 09.05.96/WHL | | Date / Name | SCHEMATIC |
| x2 | | 202356 | B | 26.06.96/WHL | DRAWN | 14.02.96/WHL | |
| x3 | | 202377 | C | 23.07.96/WHL | APPROVED | 09.05.96/WHL | ECG MONITOR |
| x4 | | 202572 | D | 04.12.96/WHL | | | |
| x5 | | 064702 | E | 24.05.00/MSG | ISSUED | W.LOEHNING | |

DATE
DIR




Marquette Hellige GmbH D-79007 Freiburg

38803119-D05

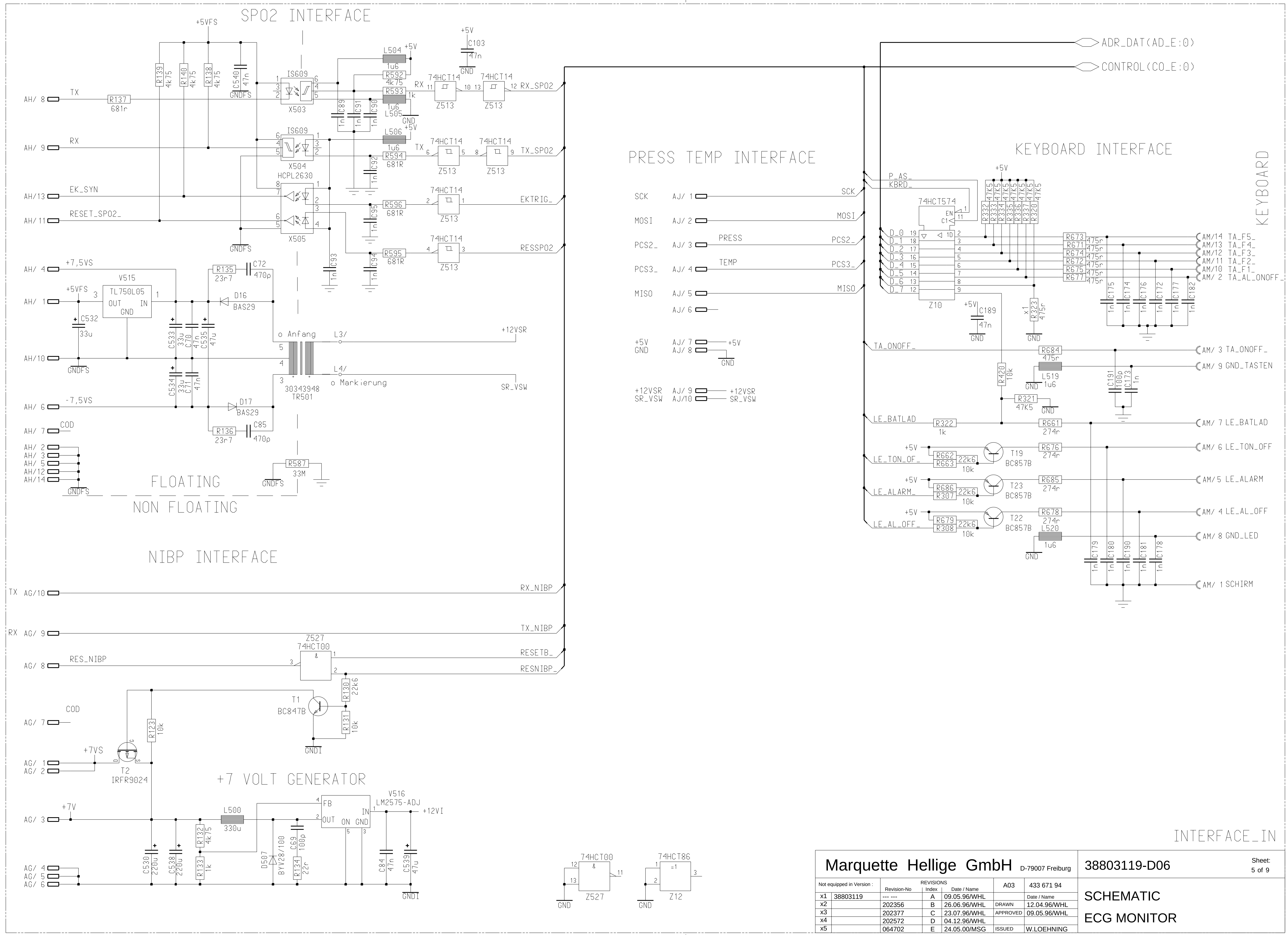
Sheet: 4 of 9

| Not equipped in Version: | | Revision-No | Index | Date / Name | | |
|---|---|---|---|---|---|---|
| x1 | 38803119 | 202356 | B | 09.05.96/WHL | | Date / Name |
| x2 | | 202377 | C | 23.07.96/WHL | DRAWN | 14.02.96/WHL |
| x3 | | 202455 | D | 23.08.96/WHL | APPROVED | 09.05.96/WHL |
| x4 | | 202572 | E | 04.12.96/WHL | | |
| x5 | | 064702 | F | 24.05.00/MSG | ISSUED | W.LOEHNING |

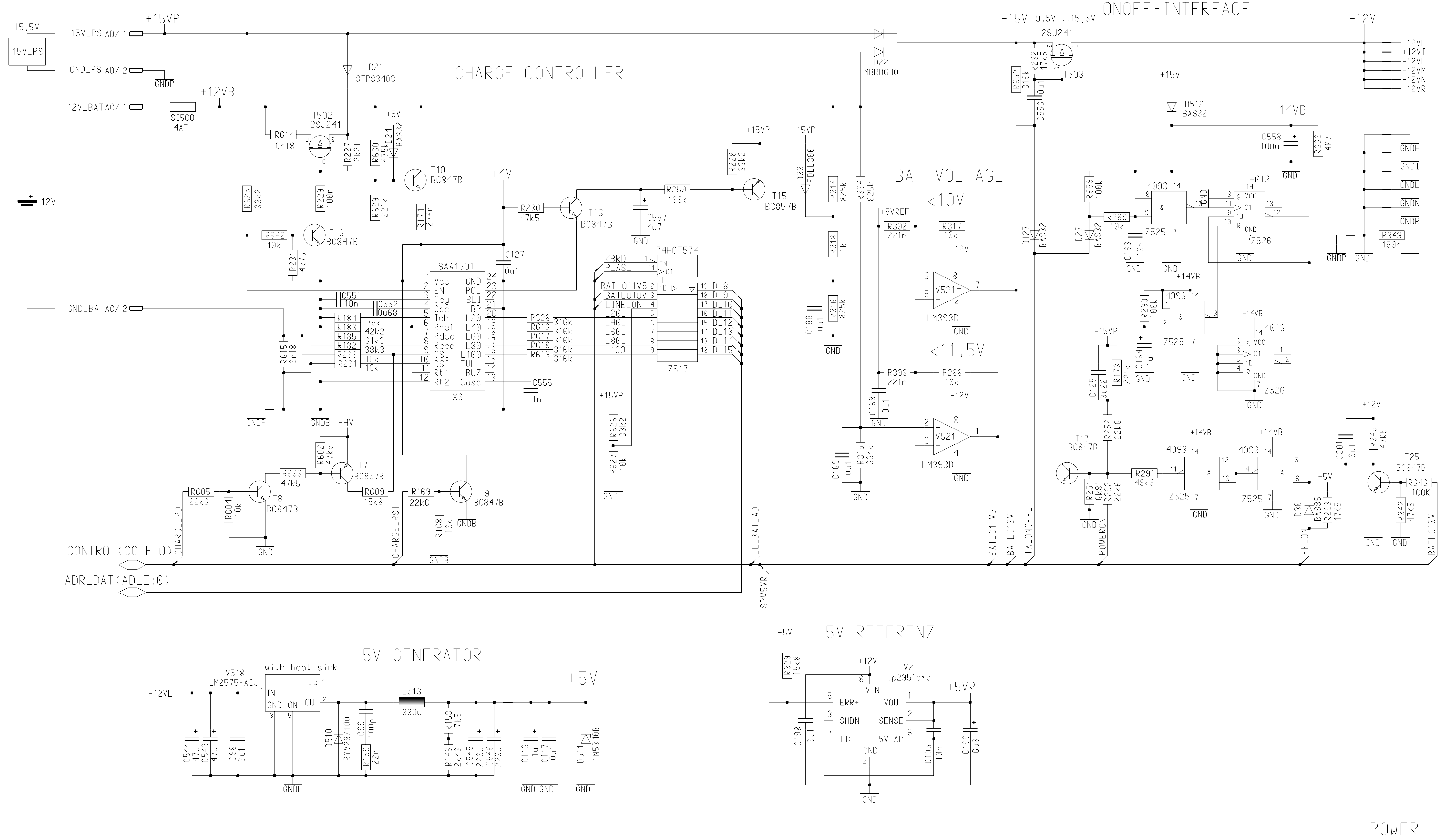
REVISIONS A03 433 671 94

SCHEMATIC

ECG MONITOR



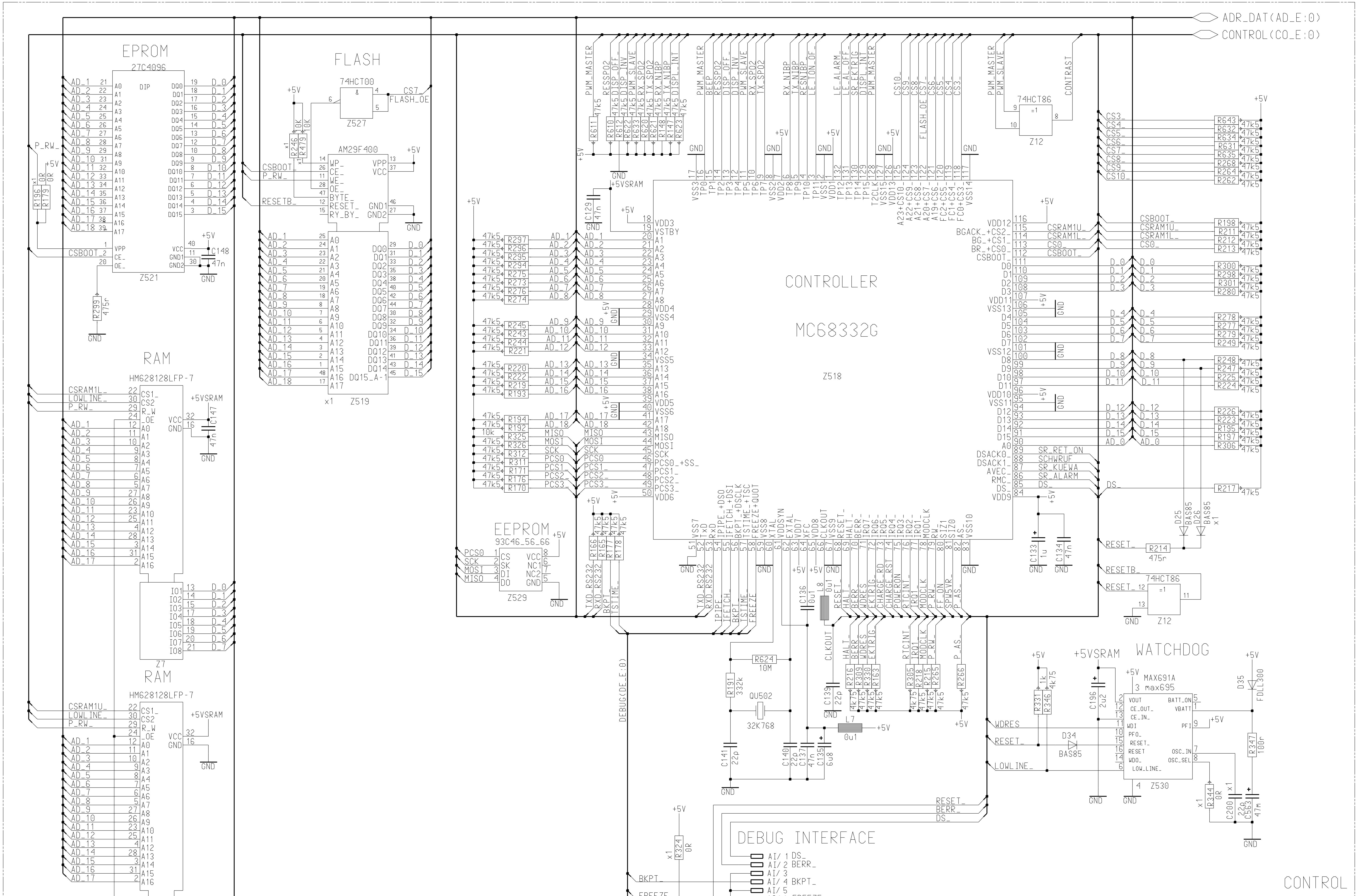
SPO2 INTERFACE
PRESS TEMP INTERFACE
KEYBOARD INTERFACE
KEYBOARD
NIBP INTERFACE
+7 VOLT GENERATOR
FLOATING
NON FLOATING
ADR_DAT(AD_E:0)
CONTROL(CO_E:0)
RX_SPO2
TX_SPO2
EKTRIG_
RESSPO2
RX_NIBP
TX_NIBP
RESETB_
RESNIBP_
AH/ 8 TX
AH/ 9 RX
AH/13 EK_SYN
AH/11 RESET_SPO2_
AH/ 4 +7,5VS
AH/ 1 +5VFS
AH/10 GNDFS
AH/ 6 -7,5VS
AH/ 7 COD
AH/ 2 AH/ 3 AH/ 5 AH/12 AH/14
IS609 X503
IS609 X504
HCPL2630 X505
74HCT14 Z513
V515 TL750L05
TR501 30343948
o Anfang L3/ +12VSR
o Markierung L4/ SR_VSW
D16 BAS29
D17 BAS29
R587 33M
Schutzvermerk nach DIN 34 beachten
AG/10 TX
AG/ 9 RX
AG/ 8 RES_NIBP
AG/ 7 COD
AG/ 1 AG/ 2 +7VS
AG/ 3 +7V
AG/ 4 AG/ 5 AG/ 6 GNDI
Z527 74HCT00
T1 BC847B
T2 IRFR9024
V516 LM2575-ADJ
L500 330u
D507 BYV28/100
+12VI
SCK AJ/ 1
MOSI AJ/ 2
PCS2_ AJ/ 3 PRESS
PCS3_ AJ/ 4 TEMP
MISO AJ/ 5
AJ/ 6
+5V AJ/ 7
GND AJ/ 8
+12VSR AJ/ 9
SR_VSW AJ/10
P_AS_
KBRD_
74HCT574 Z10
AM/14 TA_F5_
AM/13 TA_F4_
AM/12 TA_F3_
AM/11 TA_F2_
AM/10 TA_F1_
AM/ 2 TA_AL_ONOFF_
AM/ 3 TA_ONOFF_
AM/ 9 GND_TASTEN
AM/ 7 LE_BATLAD
AM/ 6 LE_TON_OFF
AM/ 5 LE_ALARM
AM/ 4 LE_AL_OFF
AM/ 8 GND_LED
AM/ 1 SCHIRM
T19 BC857B
T23 BC857B
T22 BC857B
74HCT00 Z527
74HCT86 Z12
INTERFACE_IN
Marquette Hellige GmbH D-79007 Freiburg
38803119-D06
Sheet: 5 of 9
Not equipped in Version: REVISIONS A03 433 671 94
x1 38803119 --- --- A 09.05.96/WHL
x2 202356 B 26.06.96/WHL DRAWN 12.04.96/WHL
x3 202377 C 23.07.96/WHL APPROVED 09.05.96/WHL
x4 202572 D 04.12.96/WHL
x5 064702 E 24.05.00/MSG ISSUED W.LOEHNING
SCHEMATIC
ECG MONITOR




| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803119-D07 | Sheet: 6 of 9 |
|---|---|---|---|---|---|---|
| Not equipped in Version : | REVISIONS | | | A03 | 433 671 94 | |
| | Revision-No | Index | Date / Name | | Date / Name | SCHEMATIC |
| x1 38803119 | 202356 | B | 26.06.96/WHL | | | |
| x2 | 202377 | C | 23.07.96/WHL | DRAWN | 14.02.96/WHL | |
| x3 | 202572 | D | 04.12.96/WHL | APPROVED | 09.05.96/WHL | ECG MONITOR |
| x4 | 064702 | E | 24.05.00/MSG | | | |
| x5 | 064854 | F | 08.06.00/MSG | ISSUED | W.LOEHNING | |

Schutzvermerk nach DIN 34 beachten

DATE
DIR




Marquette Hellige GmbH D-79007 Freiburg

38803119-D08

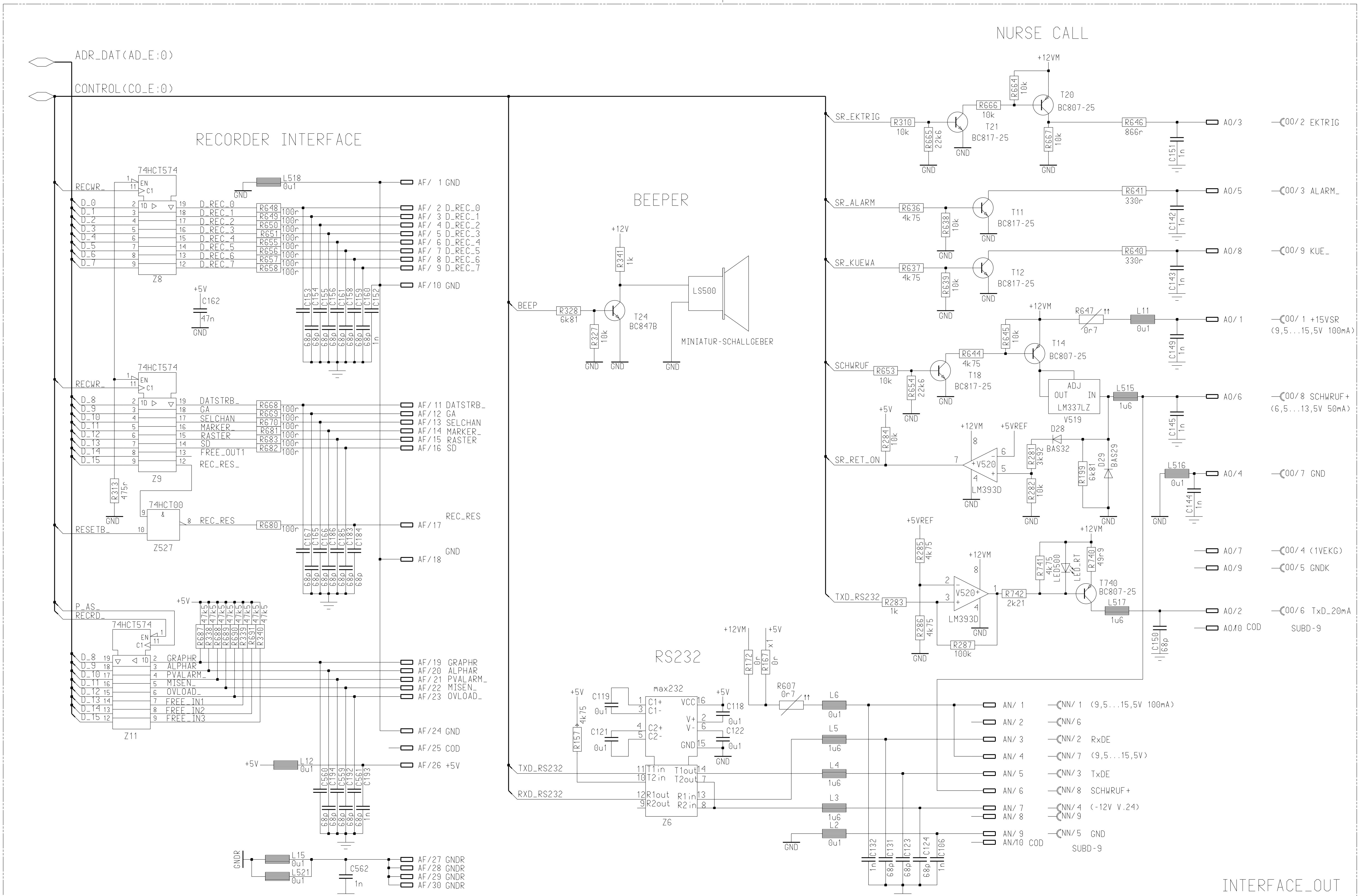
Sheet: 7 of 9

| Not equipped in Version : | Revision-No | Index | Date / Name | A03 | 433 671 94 |
|---|---|---|---|---|---|
| x1 38803119 | --- --- | A | 09.05.96/WHL | | Date / Name |
| x2 | 202356 | B | 26.06.96/WHL | DRAWN | 14.02.96/WHL |
| x3 | 202377 | C | 23.07.96/WHL | APPROVED | 09.05.96/WHL |
| x4 | 202572 | D | 04.12.96/WHL | | |
| x5 | 064702 | E | 24.05.00/MSG | ISSUED | W.LOEHNING |

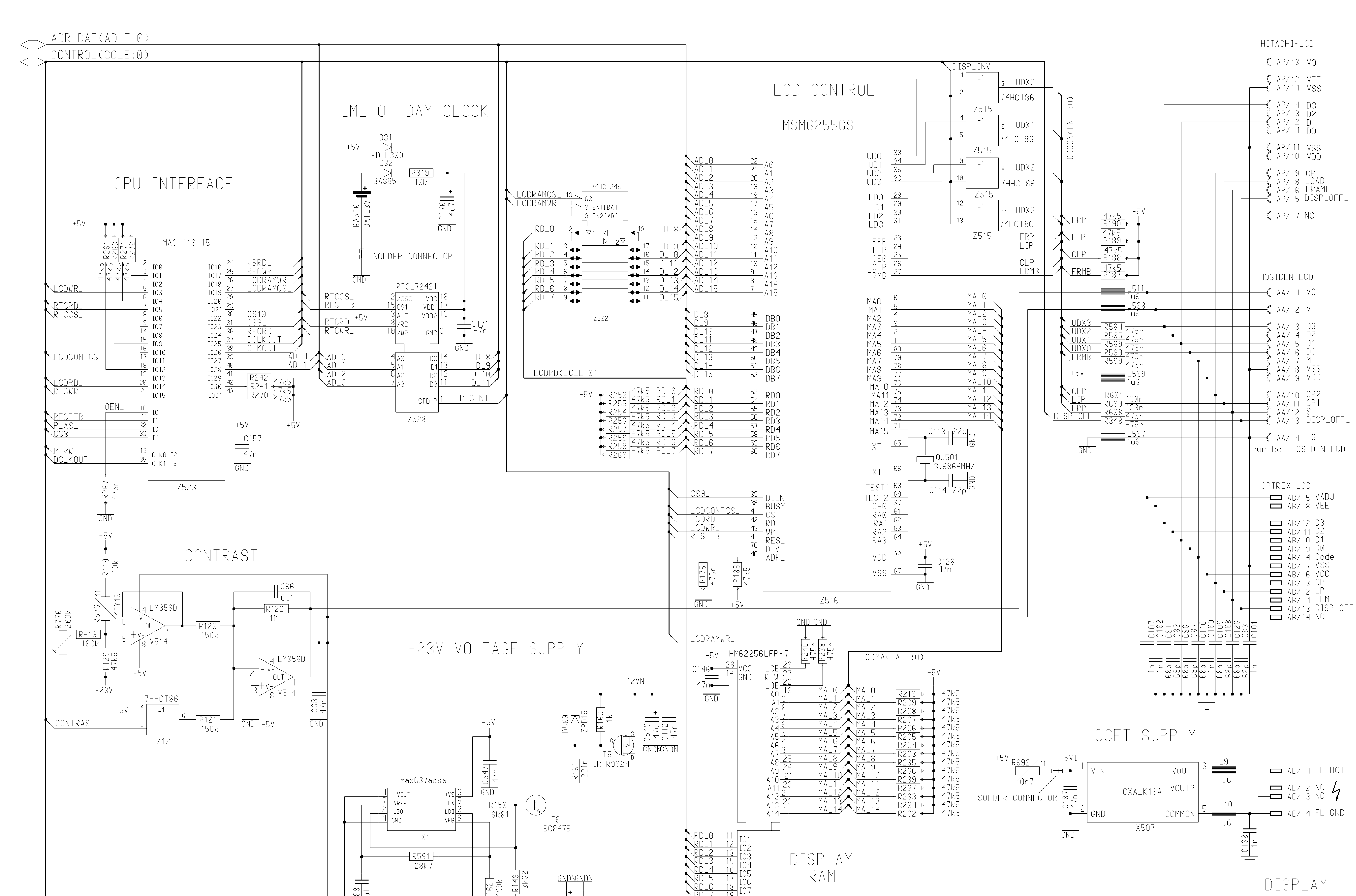
SCHEMATIC

ECG MONITOR

DATE
DIR




| Marquette Hellige GmbH D-79007 Freiburg | | | | | | 38803119-D09 | Sheet: 8 of 9 |
|---|---|---|---|---|---|---|---|
| Not equipped in Version : | | REVISIONS Revision-No | Index | Date / Name | A03 | 433 671 94 | |
| x1 | 38803119 | --- --- | A | 09.05.96/WHL | | Date / Name | SCHEMATIC |
| x2 | | 202356 | B | 26.06.96/WHL | DRAWN | 14.02.96/WHL | |
| x3 | | 202377 | C | 23.07.96/WHL | APPROVED | 09.05.96/WHL | ECG MONITOR |
| x4 | | 202572 | D | 04.12.96/WHL | | | |
| x5 | | 064702 | E | 24.05.00/MSG | ISSUED | W.LOEHNING | |



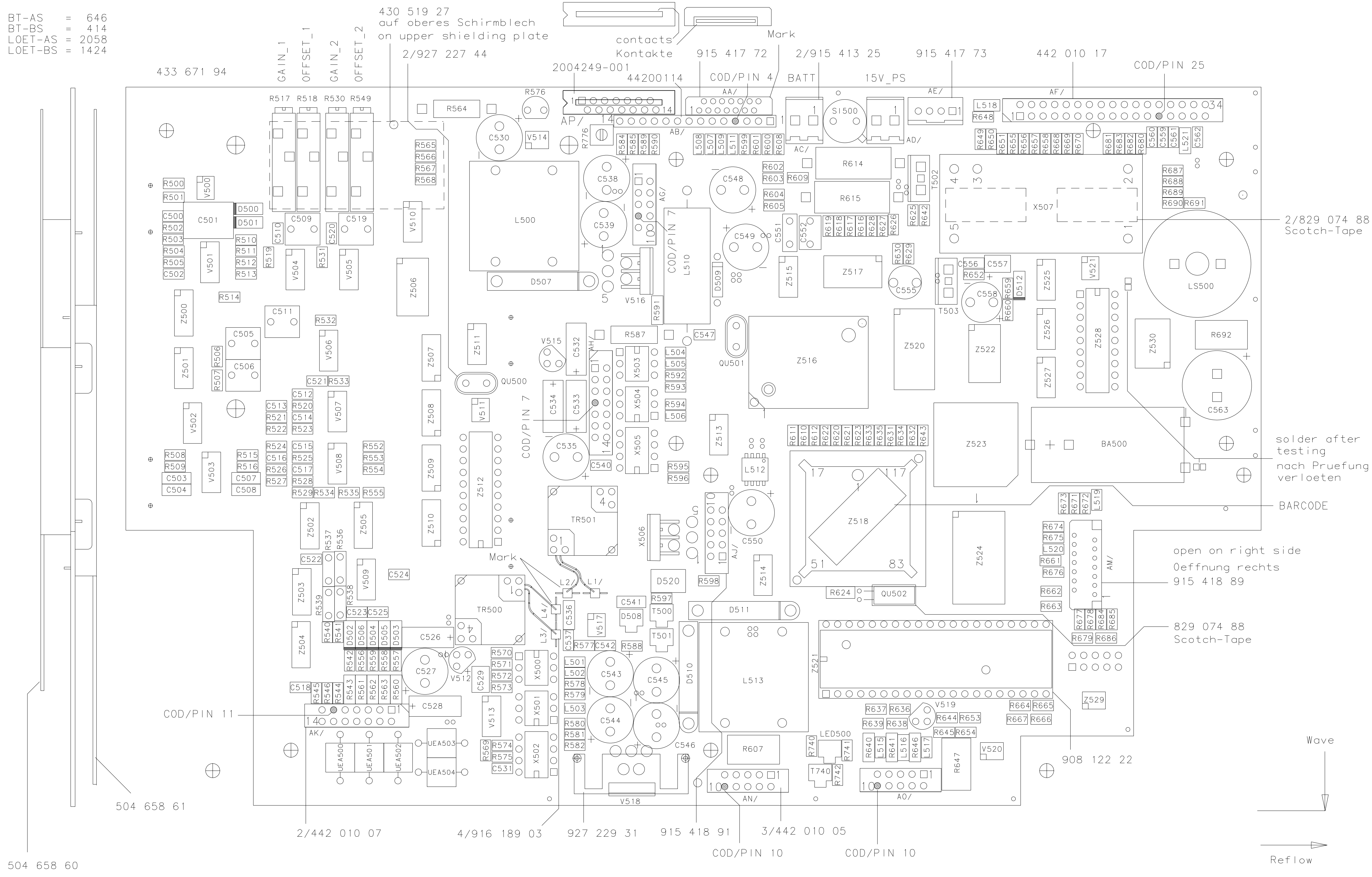

| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803119-D10 | Sheet: 9 of 9 |
|---|---|---|---|---|---|---|
| Not equipped in Version : | REVISIONS Revision-No | Index | Date / Name | A03 | 433 671 94 | |
| x1 | 38803119 | 202356 | B | 26.06.96/WHL | | Date / Name |
| x2 | | 202377 | C | 23.07.96/WHL | DRAWN | 14.02.96/WHL |
| x3 | | 202572 | D | 04.12.96/WHL | APPROVED | 09.05.96/WHL |
| x4 | | 064702 | E | 24.05.00/MSG | | |
| x5 | | 064854 | F | 05.06.00/PHG | ISSUED | W.LOEHNING |

SCHEMATIC

ECG MONITOR

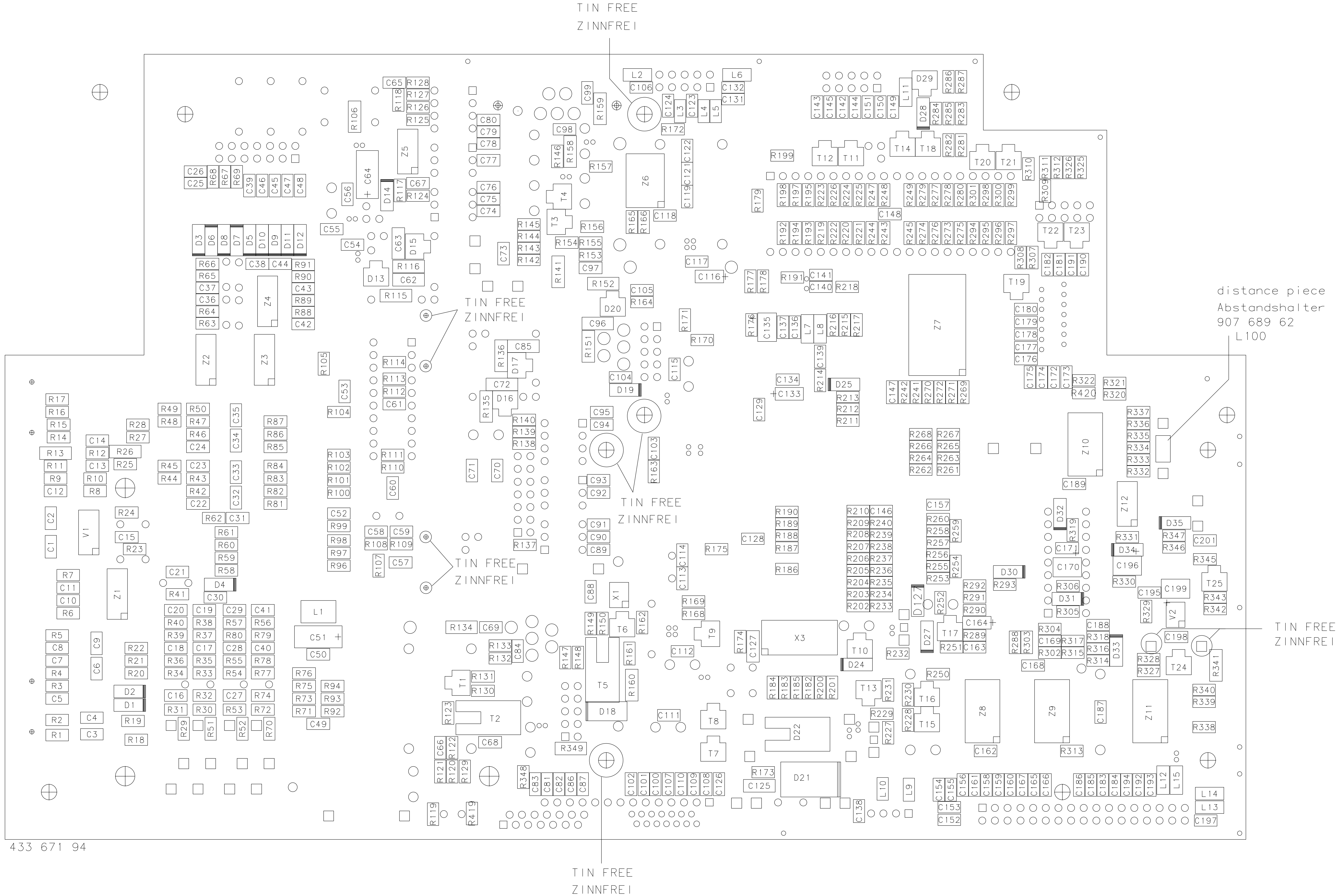


DATE
DIR



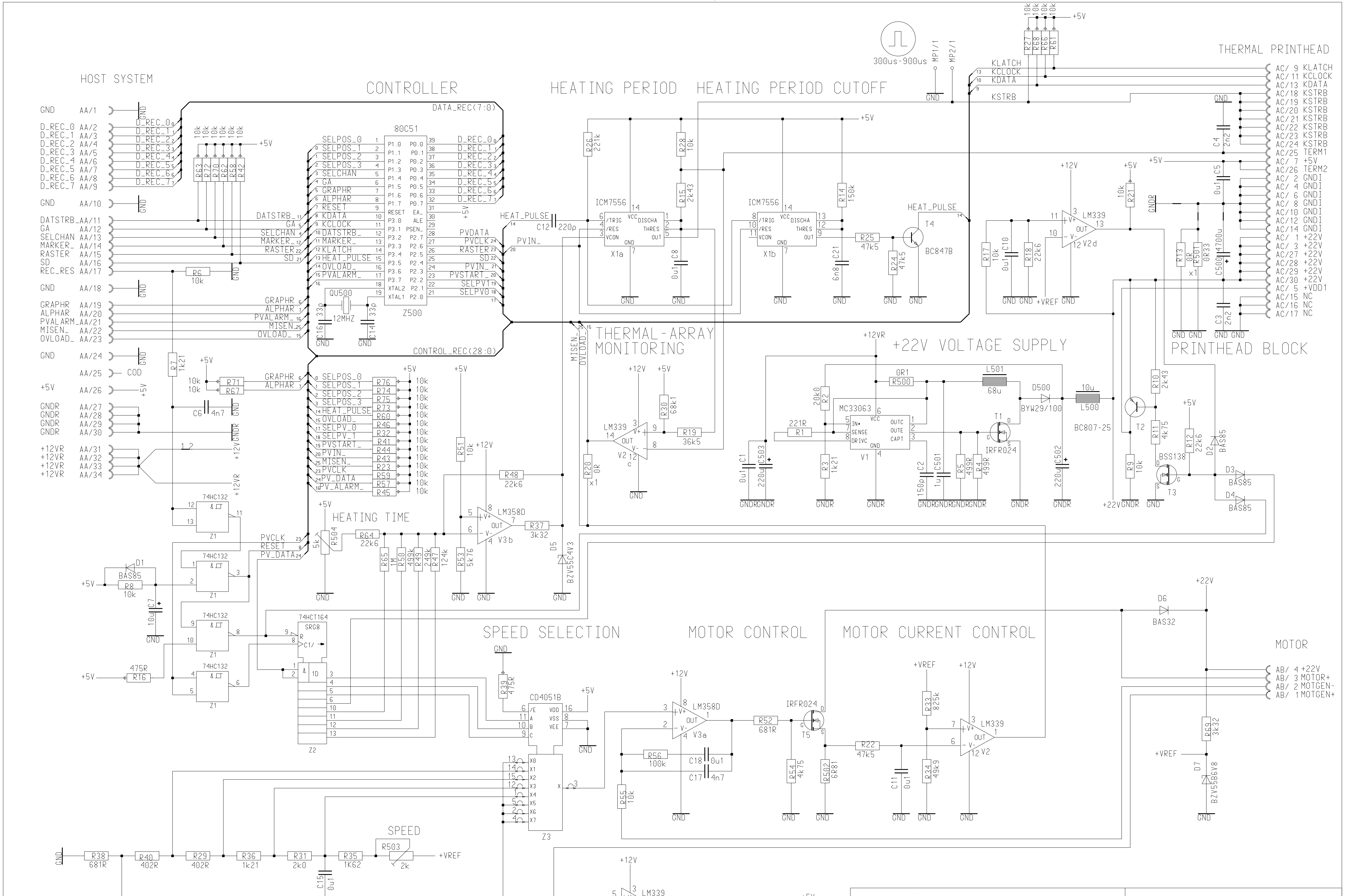

| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803119-D11 | 1/2 |
|---|---|---|---|---|---|---|
| REVISIONS | | | | 43367194 | REF DWG | |
| Revision-No | Index | Date/Name | | Date/Name | ECG-MONITOR | |
| 202557 | D | 11.11.96/JOK | | | | |
| 202572 | E | 04.12.96/JOK | Drawn | 13.10.95/JOK | | |
| 203131 | F | 06.11.97/JOK | Approved | 13.10.95/MNS | | |
| 064702 | G | 24.05.00/MSG | | | | |
| 064854 | H | 09.06.00/MSG | Issued | LOEHNING | | |

Schutzvermerk nach DIN 34 beachten.




Gluing

| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803119-D12 2 /2 |
|---|---|---|---|---|---|
| REVISIONS | | | | | |
| Revision-No | Index | Date/Name | | 43367194 | REF DWG |
| 202356 | B | 05.06.96/JOK | | Date/Name | |
| 202377 | C | 14.06.96/JOK | Drawn | 13.10.95/JOK | |
| 202572 | D | 04.12.96/JOK | Approved | 13.10.95/MNS | ECG-MONITOR |
| 064702 | E | 24.05.00/MSG | | | |
| 064854 | F | 09.06.00/MSG | Issued | LOEHNING | |




Marquette Hellige GmbH D-79007 Freiburg

38803170-D02

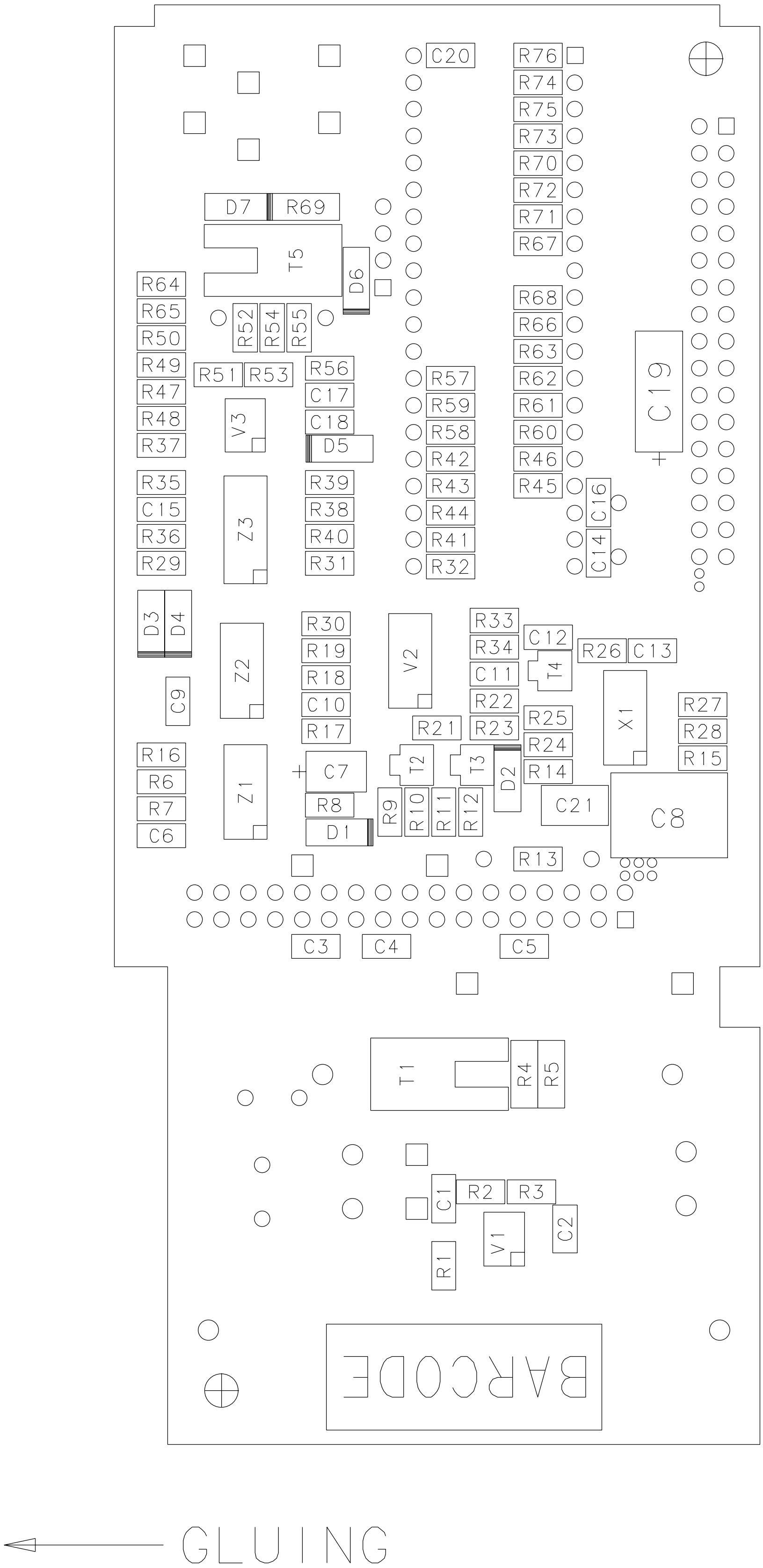
Sheet: 1 of 1

| Not equipped in Version: | Revision-No | Index | Date / Name | A03 | 43367203 |
|---|---|---|---|---|---|
| x1 38803170 | 065687 | A | 19.10.00/MSG | | Date / Name |
| x2 | | | | DRAWN | 29.01.96/MLM |
| x3 | | | | APPROVED | 29.01.96/MLM |
| x4 | | | | | |
| x5 | | | | ISSUED | M. Mueller |

SCHEMATIC

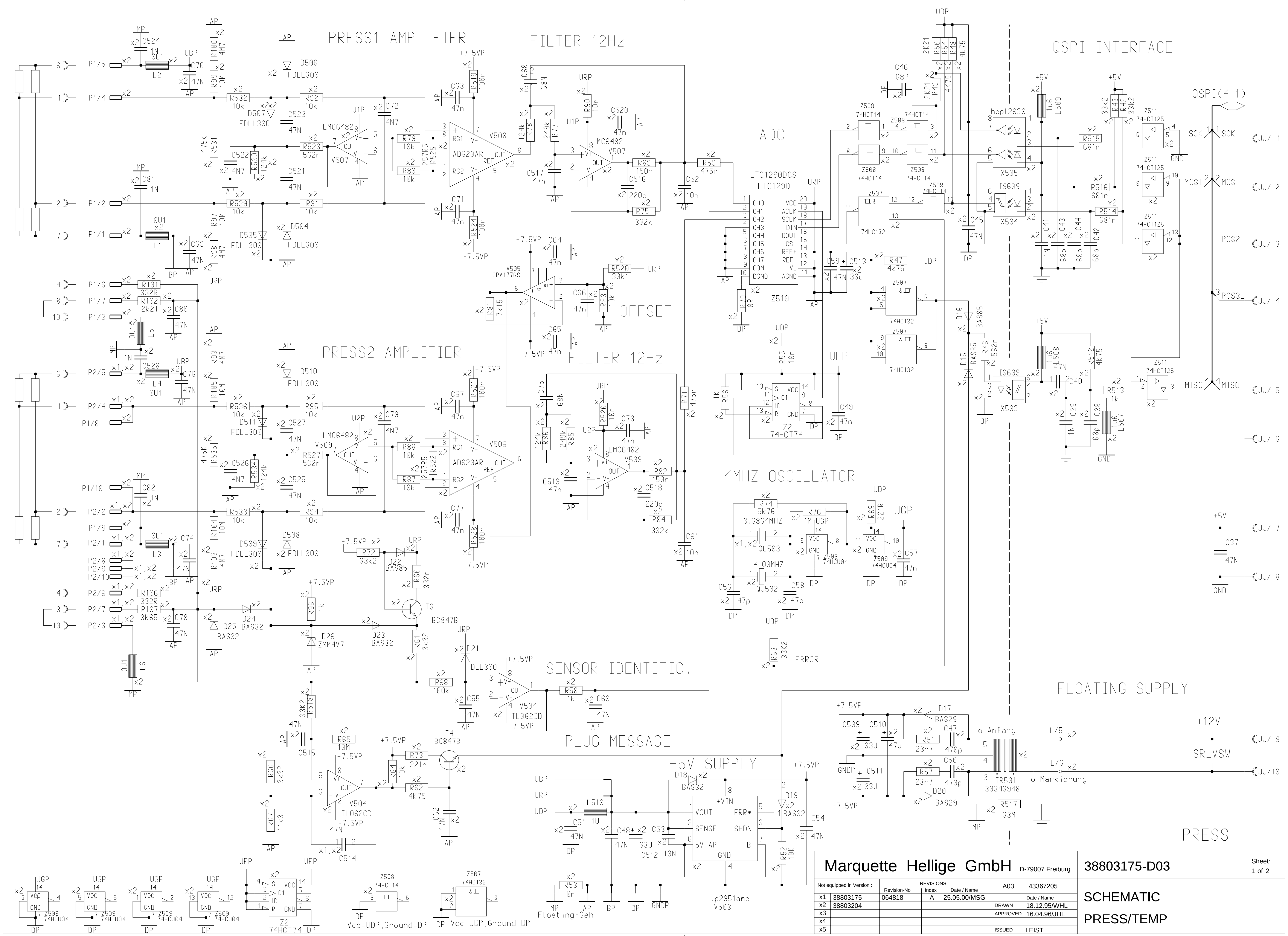
RECORDER 50

[1995, 11, 2, 5]




Schutzvermerk nach DIN 34 beachten.

| | | | | | |
|---|---|---|---|---|---|
| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803170-D04 2/2 |
| REVISIONS | | | | A04 43367203 | REF DWG RECORDER 50 |
| Revision-No | Index | Date/Name | | Date/Name | |
| 065687 | A | 19.10.00/MSG | Drawn | 30.01.96/MNS | |
| | | | Approved | 30.01.96/JOK | |
| | | | Issued | M&E/MUELLER | |


PRESS1 AMPLIFIER
FILTER 12Hz
PRESS2 AMPLIFIER
FILTER 12Hz
OFFSET
ADC
QSPI INTERFACE
QSPI(4:1)
4MHZ OSCILLATOR
SENSOR IDENTIFIC.
PLUG MESSAGE
+5V SUPPLY
FLOATING SUPPLY
PRESS
SCK
MOSI
PCS2_
PCS3_
MISO
+12VH
SR_VSW
ERROR
Vcc=UDP,Ground=DP
Floating-Geh.
Schutzvermerk nach DIN 34 beachten
Marquette Hellige GmbH D-79007 Freiburg
38803175-D03
Sheet: 1 of 2
Not equipped in Version :
REVISIONS
Revision-No Index Date / Name
A03 43367205
x1 38803175 064818 A 25.05.00/MSG
x2 38803204
x3
x4
x5
Date / Name
DRAWN 18.12.95/WHL
APPROVED 16.04.96/JHL
ISSUED LEIST
SCHEMATIC
PRESS/TEMP
[1995, 11, 28, 3]
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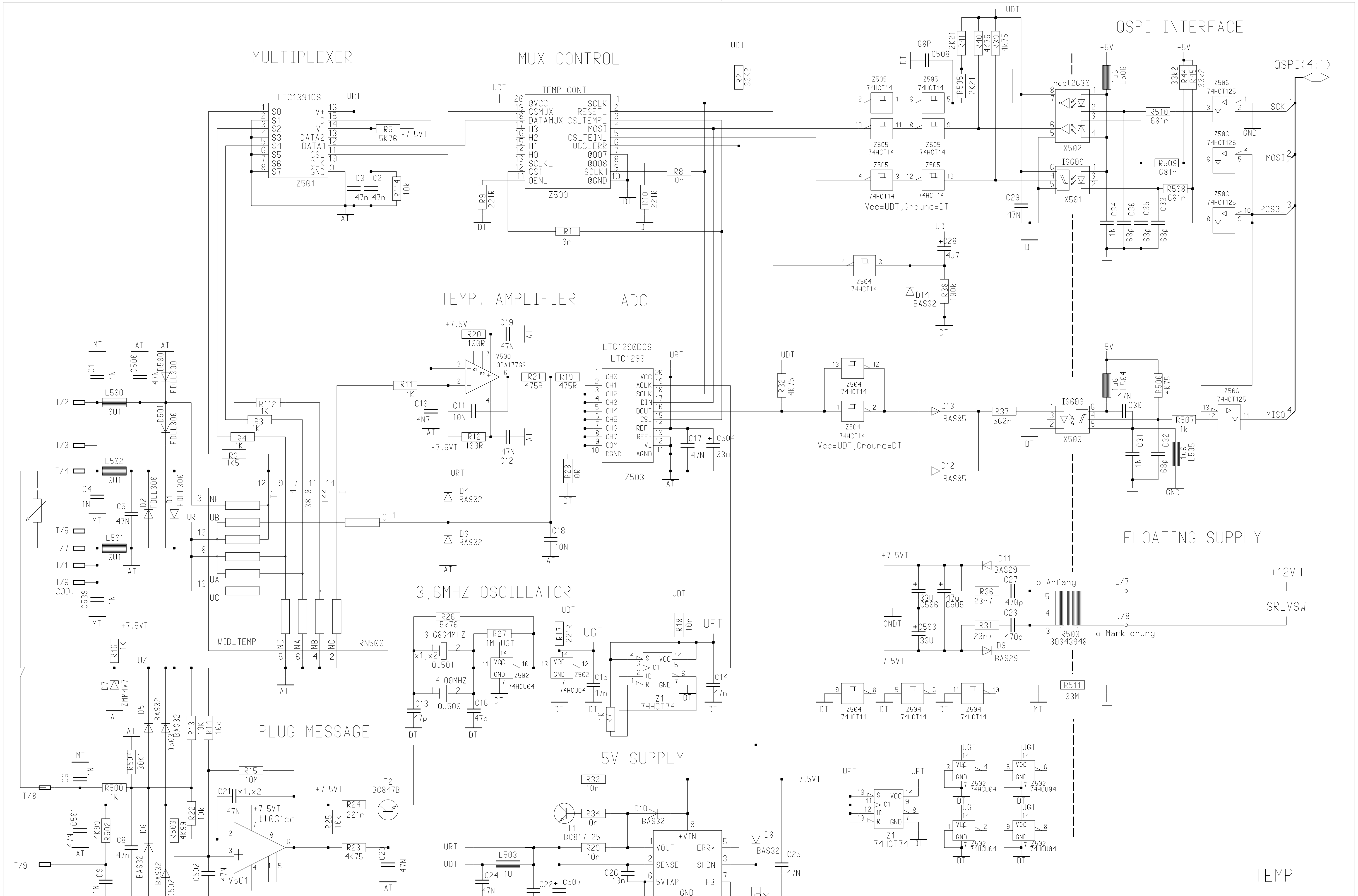


| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803175-D04 | Sheet: 2 of 2 |
|---|---|---|---|---|---|---|
| Not equipped in Version : | REVISIONS | | | A03 | 43367205 | |
| | Revision-No | Index | Date / Name | | Date / Name | SCHEMATIC |
| x1 38803175 | 064818 | A | 25.05.00/MSG | DRAWN | 18.12.95/WHL | |
| x2 38803204 | | | | APPROVED | 16.04.96/JHL | PRESS/TEMP |
| x3 | | | | | | |
| x4 | | | | | | |
| x5 | | | | ISSUED | LEIST | |

[1995, 11, 28, 3]
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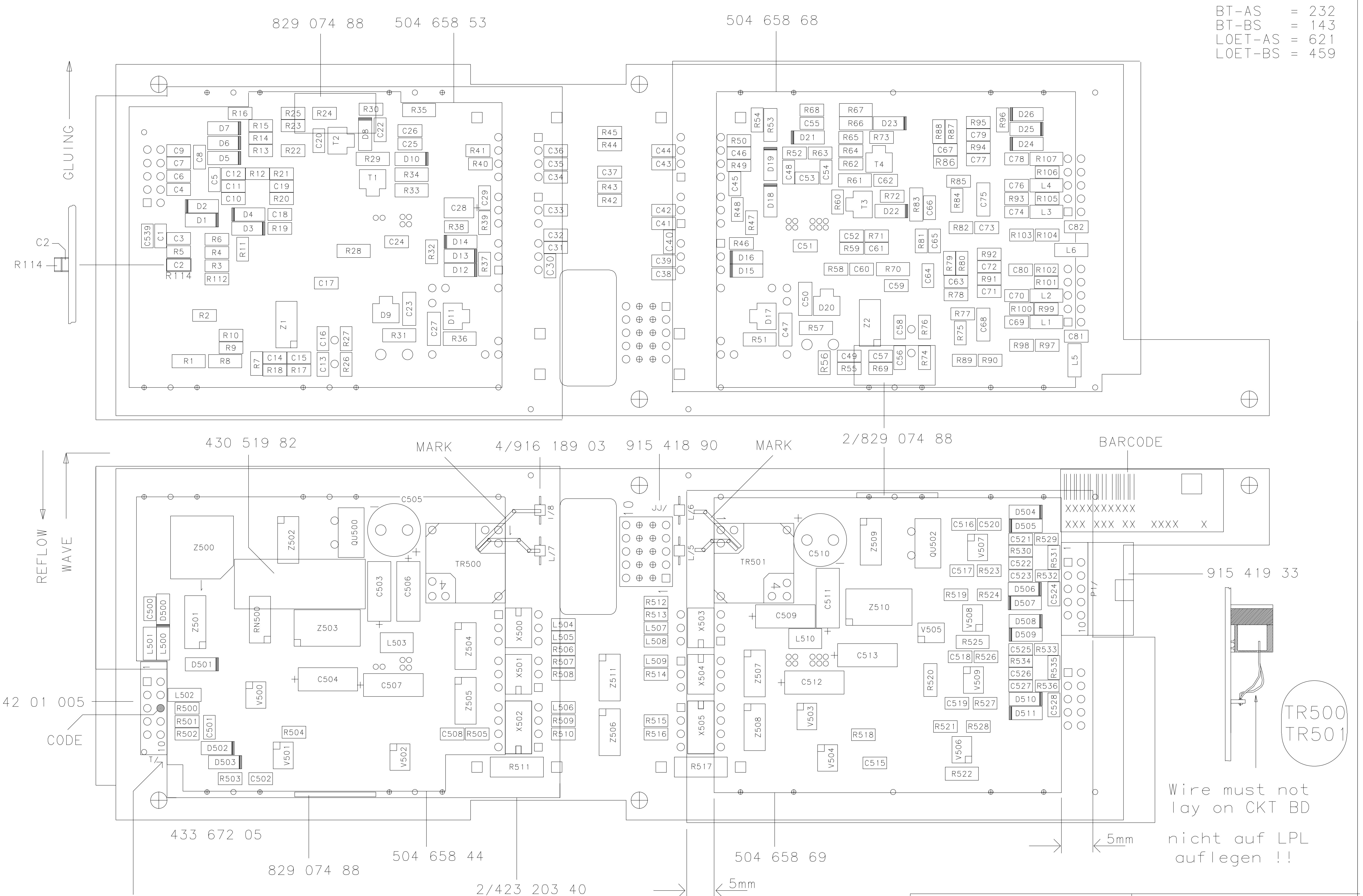
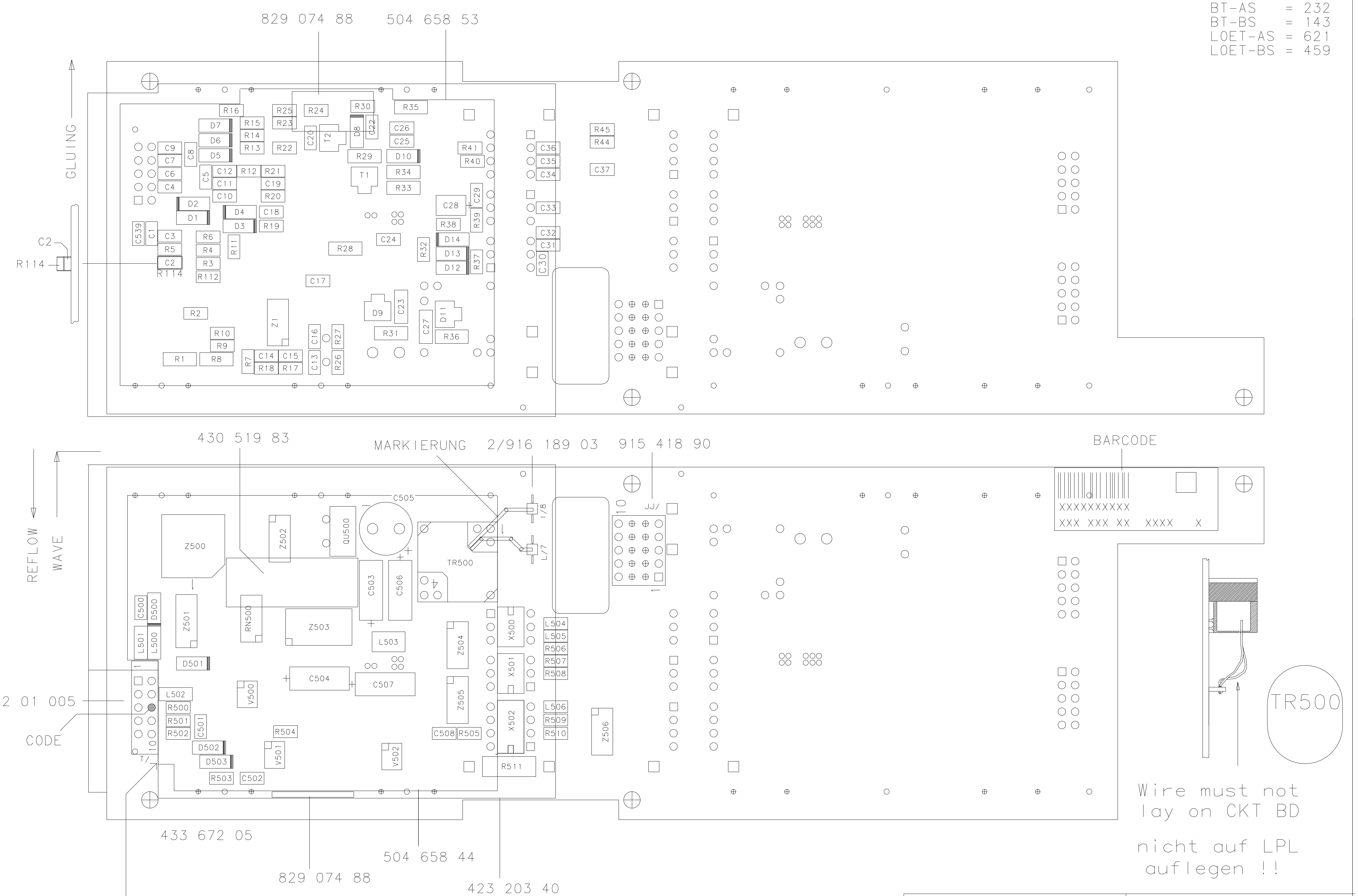
Schutzvermerk nach DIN 34 beachten




justifiy edge of plate and edge
of isolation foil when gluing

Kante von Isolierfolie buendig
zu Kante Blech aufkleben

| Marquette Hellige GmbH D-79007 Freiburg | | | | | 38803175-D05 | 1/1 |
|---|---|---|---|---|---|---|
| REVISIONS | | | M1.5:1 | A03 43367205 | REF DWG PRESS/TEMP | |
| Revision-No | Index | Date/Name | | Date/Name | | |
| ------- | A | 04.04.96/JOK | | | | |
| 202557 | B | 08.11.96/JOK | Drawn | 09.01.96/JOK | | |
| 202665 | C | 06.02.97/MSG | Approved | 09.01.96/JOK | | |
| 202995 | D | 12.08.97/MSG | | | | |
| 064818 | E | 26.05.00/MSG | Issued | M&E/LEIST | | |




justifiy edge of plate and edge of isolation foil when gluing

Kante von Isolierfolie buendig zu Kante Blech aufkleben

Schutzvermerk nach DIN 34 beachten.

Marquette Hellige GmbH D-79007 Freiburg

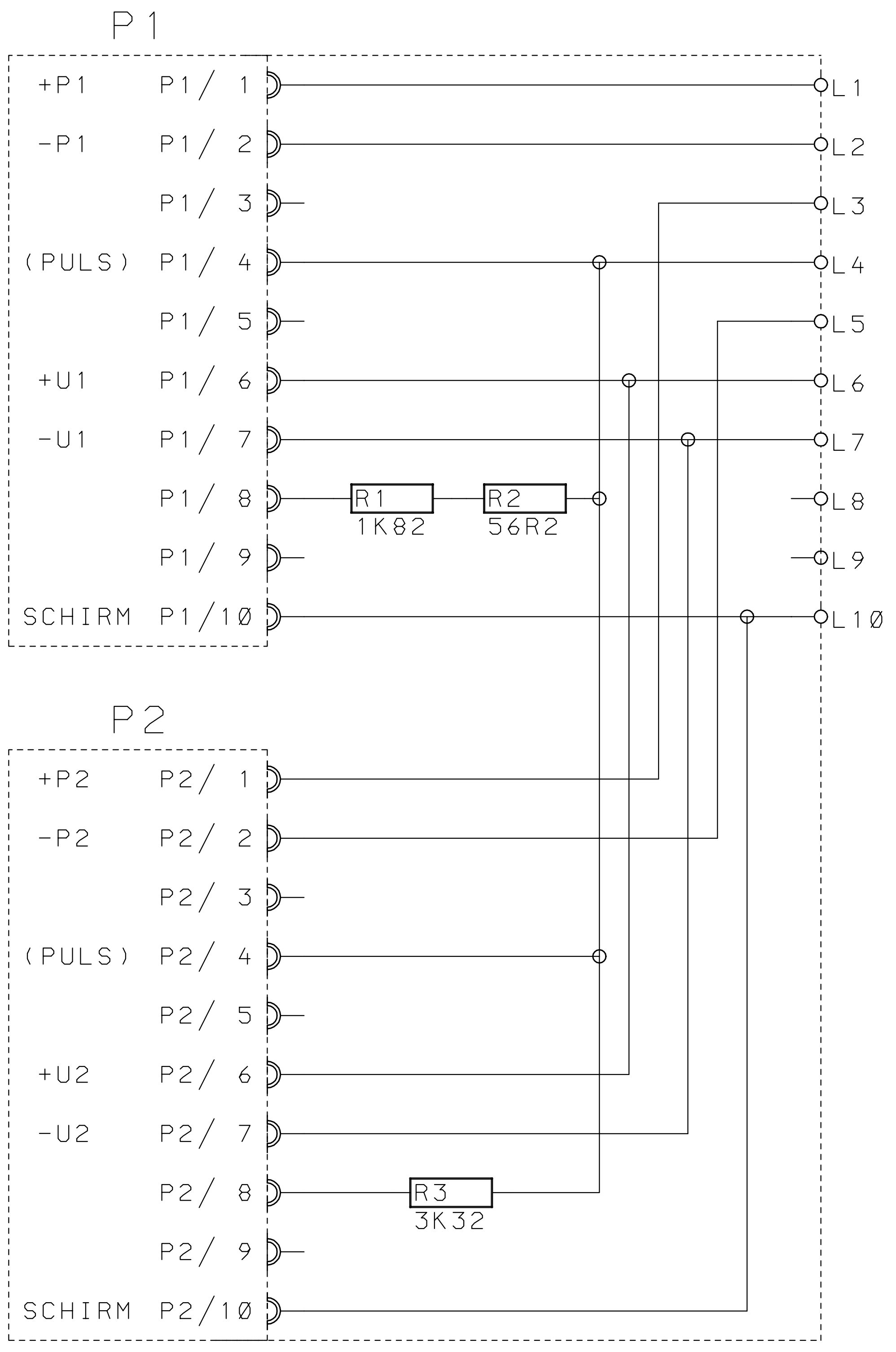
38803204-D05 1/1

| REVISIONS | | | |
|---|---|---|---|
| Revision-No | Index | Date/Name | |
| 202557 | A | 08.11.96/JOK | |
| 202665 | B | 06.02.97/MSG | Drawn 18.07.96/JOK |
| 202996 | C | 12.08.97/MSG | Approved 18.07.96/JOK |
| 064818 | D | 26.05.00/MSG | Issued M&E/LEIST |

M1.5:1

A03
43367205
Date/Name

REF DWG
TEMP




Schutzvermerk nach DIN 34 beachten

| | |
|---|---|
| Werkstoff | |
| Rohteil | |
| Paßmaß | Abmaße |
| Oberfläche | Freimaßtoleranz |
| ACAD-Nr. | P12ACAD__F67218 |

| Änd.-Index | kommt vor | Änd.Nr. | Änderungstext | Datum | Name |
|---|---|---|---|---|---|

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

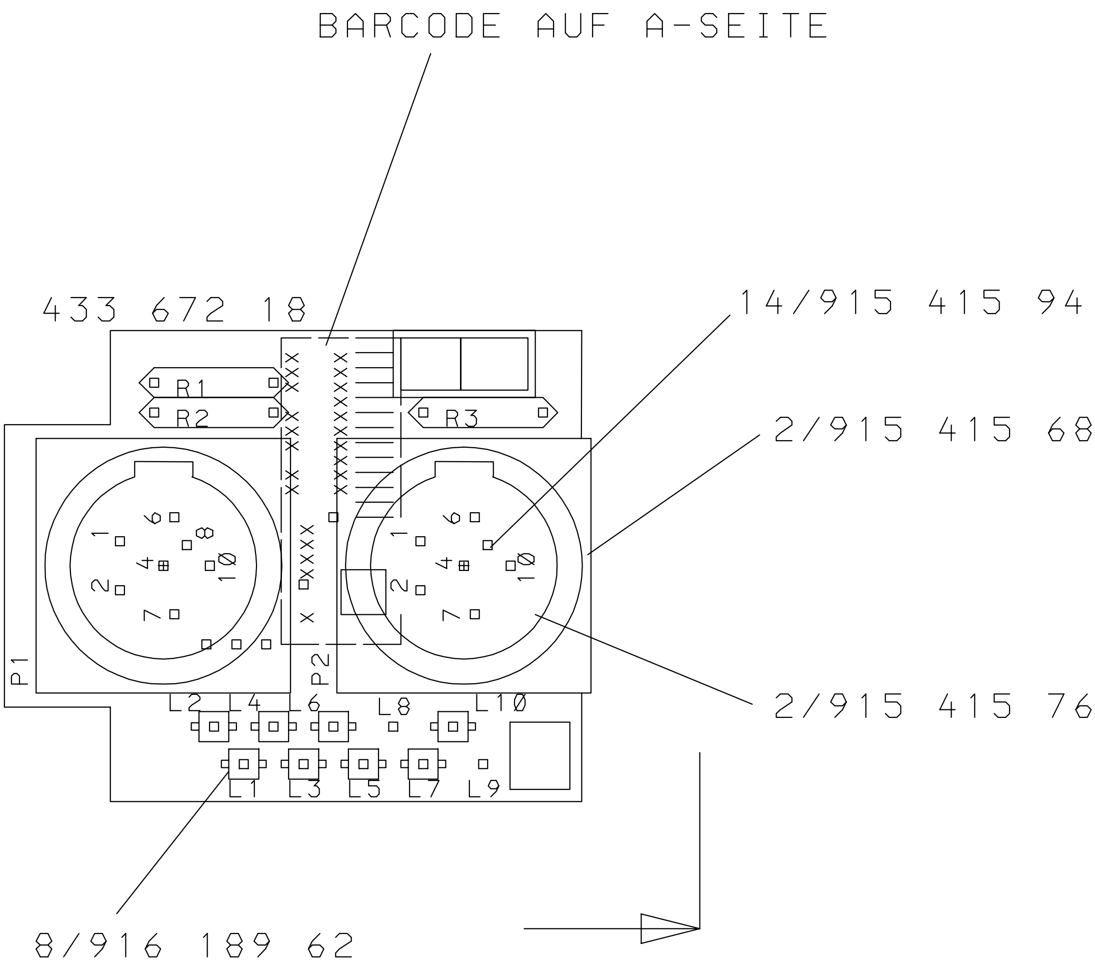
| Maßstab | | Datum | Name |
|---|---|---|---|
| | Entworfen | 09.09.96 | G.Kaltenbach |
| | Geprüft | 09.09.96 | W.Löhning |
| | Normgepr. | | |

Sach-Nr. 388 032 12 P

Format A4

Benennung: Lpl Preßverteiler
PCB Preß 2-Port Adapter

| 1 | 2 | 3 | 4 |
|---|---|---|---|




| | | | | |
|---|---|---|---|---|
| Änd.-Index | kommt vor | Änd.Nr. | Änderungstext | Datum | Name |

Werkstoff

Rohteil

Paßmaß | Abmaße

Oberfläche

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

| Maßstab | | Datum | Name | Sach-Nr. |
|---|---|---|---|---|
| 1,5:1 | Entworfen | 11.09.96 | G.Kaltenbach | 388 032 12 R |
| | Geprüft | 11.09.96 | G.Kaltenbach | |
| | Normgepr. | | | |

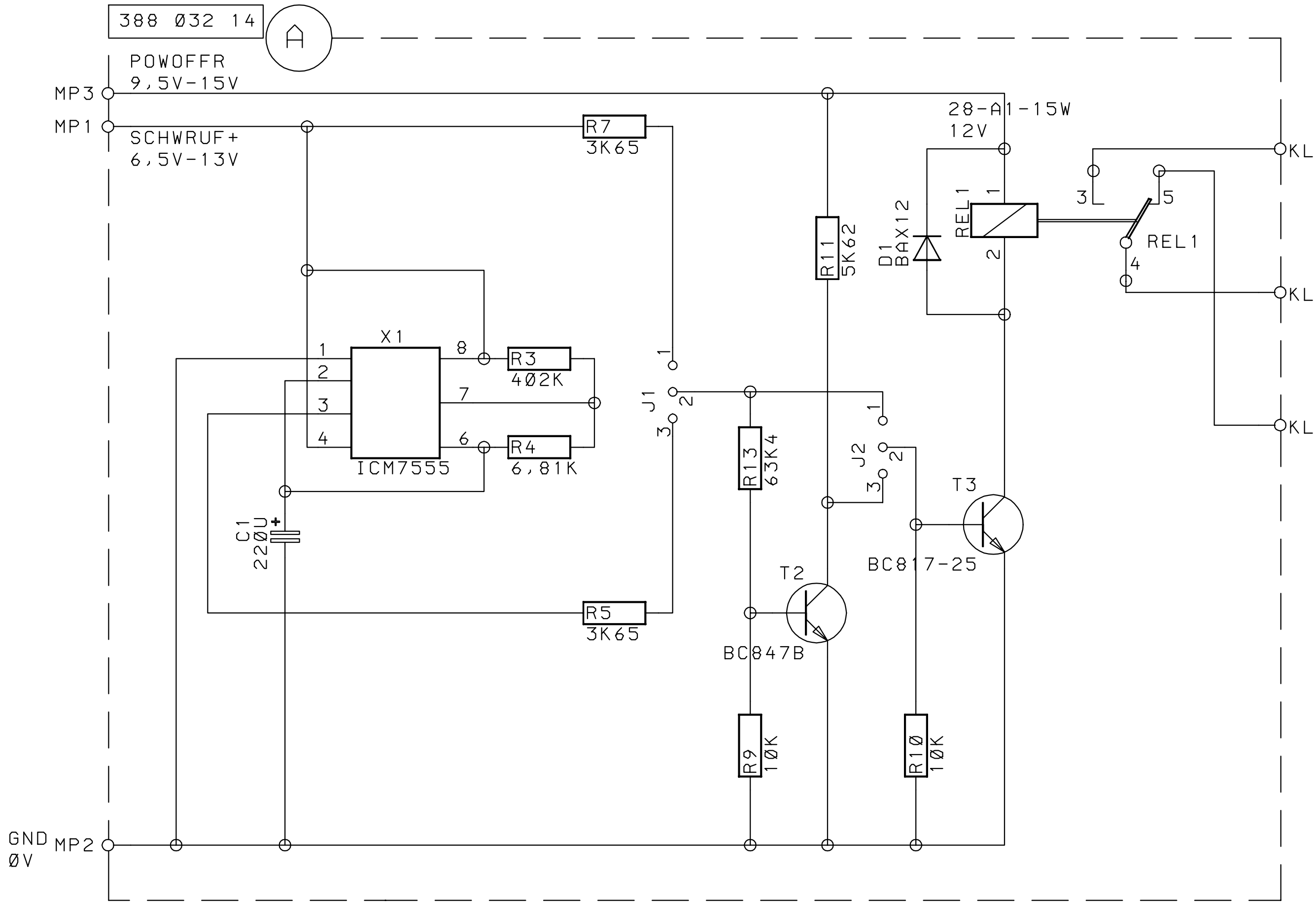
Freimaßtoleranz

ACAD-Nr. R12ACAD__F67218

Format A4

Benennung
Lpl Preßverteiler
PCB Preß 2-Port Adapter

Schutzvermerk nach DIN 34 beachten




| | J1 | J2 |
|---|---|---|
| OHNE ALARMUNTERBRECHUNG. CONTINUOUIS ALARM. | 1-2 | 1-2 |
| MIT ALARMUNTERBRECHUNG. INTERMITTENT ALARM. | 2-3 | 1-2 |
| OHNE ALARMUNTERBRECHUNG, MIT GERAETEAUSFALLERKENNUNG. CONTINUOUS ALARM, WITH DEVICE FAILURE DETECTION. | 1-2 | 2-3 |
| MIT ALARMUNTERBRECHUNG, MIT GERAETEAUSFALLERKENNUNG. INTERMITTENT ALARM, WITH DEVICE FAILURE DETECTION. | 2-3 | 2-3 |

Werkstoff

Rohteil

| Änd.-Index | kommt vor | Änd.Nr. | Änderungstext | Datum | Name |
|---|---|---|---|---|---|

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

Paßmaß | Abmaße

Oberfläche

Freimaßtoleranz

ACAD-Nr. P14ACAD_ F67219

Maßstab 1,5:1

| | Datum | Name |
|---|---|---|
| Entworfen | 29.07.96 | G.Kaltenbach |
| Geprüft | 29.07.96 | G.Waßmer |
| Normgepr. | | |

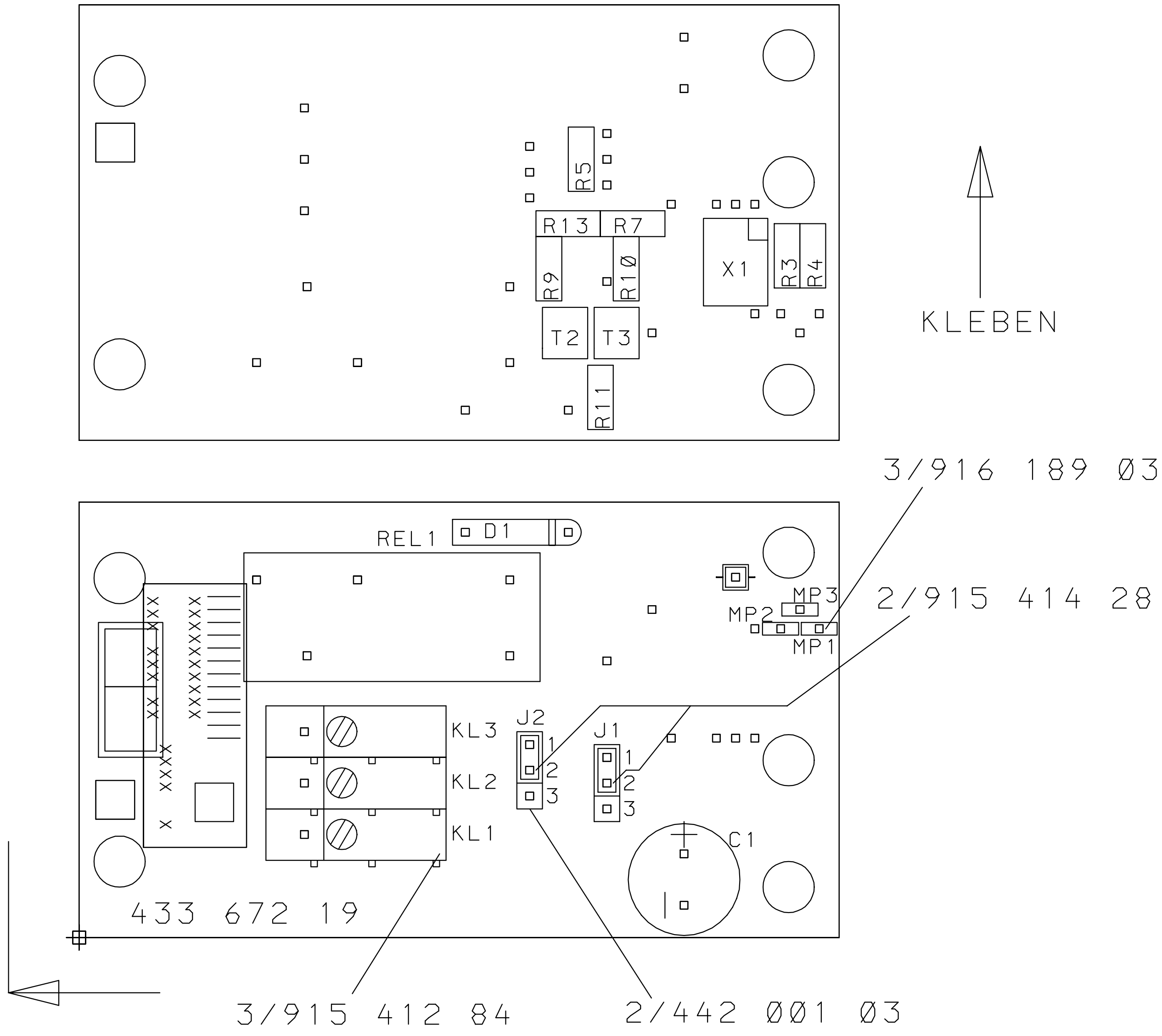
Sach-Nr. 388 032 14 P

Format A4

Benennung Lpl Trennrelais
PCB Relay EAGLE 1000

Schutzvermerk nach DIN 34 beachten

| | J1 | J2 | |
|---|---|---|---|
| OHNE ALARMUNTERBRECHUNG. CONTINUOUIS ALARM. | 1-2 | 1-2 | STANDARDEINSTELLUNG |
| MIT ALARMUNTERBRECHUNG. INTERMITTENT ALARM. | 2-3 | 1-2 | |
| OHNE ALARMUNTERBRECHUNG, MIT GERAETEAUSFALLERKENNUNG. CONTINUOUS ALARM, WITH DEVICE FAILURE DETECTION. | 1-2 | 2-3 | |
| MIT ALARMUNTERBRECHUNG, MIT GERAETEAUSFALLERKENNUNG. INTERMITTENT ALARM, WITH DEVICE FAILURE DETECTION. | 2-3 | 2-3 | |




| Änd.-Index | kommt vor | Änd.Nr. | Änderungstext | Datum | Name |
|---|---|---|---|---|---|

Werkstoff

Rohteil

Paßmaß | Abmaße

Marquette Hellige GmbH
Munzinger Str. 3
D-79111 Freiburg

| Maßstab | | Datum | Name | Sach-Nr. |
|---|---|---|---|---|
| 1,5:1 | Entworfen | 30.07.96 | G.Kaltenbach | 388 032 14 R |
| | Geprüft | 30.07.96 | G.Kaltenbach | |
| | Normgepr. | | | |

Oberfläche

Freimaßtoleranz

ACAD-Nr. R14ACADa F67219

Format A4

Benennung
Lpl Trennrelais
PCB Relay EAGLE 1000

Schutzvermerk nach DIN 34 beachten

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