

ENGLISH

4S-0407-00E0

07 JUN 1999

HAMEG[®]
Instruments

**Oscilloskop
HM407**

SERVICE-MANUAL

HM407

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Herstellers
Manufacturer
Fabricant

HAMEG GmbH
Kelsterbacherstraße 15-19
D - 60528 Frankfurt

KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE

HAMEG[®]
Instruments

Bezeichnung / Product name / Designation:
Oszilloskop/Oscilloscope/Oscilloscope

Typ / Type / Type: **HM407**

mit / with / avec: -

Optionen / Options / Options: **HO79-6**

mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes

EMV Richtlinie 89/336/EWG ergänzt durch 91/263/EWG, 92/31/EWG
EMC Directive 89/336/EEC amended by 91/263/EWG, 92/31/EEC
Directive EMC 89/336/CEE amendée par 91/263/EWG, 92/31/CEE

Niederspannungsrichtlinie 73/23/EWG ergänzt durch 93/68/EWG
Low-Voltage Equipment Directive 73/23/EEC amended by 93/68/EEC
Directive des équipements basse tension 73/23/CEE amendée par 93/68/CEE

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées
Sicherheit / Safety / Sécurité

EN 61010-1: 1993 / IEC (CEI) 1010-1: 1990 A 1: 1992 / VDE 0411: 1994
Überspannungskategorie / Overvoltage category / Catégorie de surtension: II
Verschmutzungsgrad / Degree of pollution / Degré de pollution: 2

Elektromagnetische Verträglichkeit / Electromagnetic compatibility
Compatibilité électromagnétique

EN 50082-2: 1995 / VDE 0839 T82-2
ENV 50140: 1993 / IEC (CEI) 1004-4-3: 1995 / VDE 0847 T3
ENV 50141: 1993 / IEC (CEI) 1000-4-6 / VDE 0843 / 6
EN 61000-4-2: 1995 / IEC (CEI) 1000-4-2: 1995 / VDE 0847 T4-2
Prüfschärfe / Level / Niveau = 2

EN 61000-4-4: 1995 / IEC (CEI) 1000-4-4: 1995 / VDE 0847 T4-4:
Prüfschärfe / Level / Niveau = 3

EN 50081-1: 1992 / EN 55011: 1991 / CISPR11: 1991 / VDE0875 T11: 1992
Gruppe / group / groupe = 1, Klasse / Class / Classe = B

Datum /Date /Date
02.03.1998

Unterschrift / Signature / Signatur

Dr. J. Herzog
Technical Manager/Directeur Technique

General information regarding the CE marking

HAMEG instruments fulfill the regulations of the EMC directive. The conformity test made by HAMEG is based on the actual generic- and product standards. In cases where different limit values are applicable, HAMEG applies the severer standard. For emission the limits for residential, commercial and light industry are applied. Regarding the immunity (susceptibility) the limits for industrial environment have been used.

The measuring- and data lines of the instrument have much influence on emission and immunity and therefore on meeting the acceptance limits. For different applications the lines and/or cables used may be different. For measurement operation the following hints and conditions regarding emission and immunity should be observed:

1. Data cables

For the connection between instruments resp. their interfaces and external devices, (computer, printer etc.) sufficiently screened cables must be used. Without a special instruction in the manual for a reduced cable length, the maximum cable length of a dataline must be less than 3 meters long. If an interface has several connectors only one connector must have a connection to a cable.

Basically interconnections must have a double screening. For IEEE-bus purposes the double screened cables HZ72S and HZ72L from HAMEG are suitable.

2. Signal cables

Basically test leads for signal interconnection between test point and instrument should be as short as possible. Without instruction in the manual for a shorter length, signal lines must be less than 3 meters long.

Signal lines must be screened (coaxial cable - RG58/U). A proper ground connection is required. In combination with signal generators double screened cables (RG223/U, RG214/U) must be used.

3. Influence on measuring instruments.

Under the presence of strong high frequency electric or magnetic fields, even with careful setup of the measuring equipment an influence of such signals is unavoidable.

This will not cause damage or put the instrument out of operation. Small deviations of the measuring value (reading) exceeding the instruments specifications may result from such conditions in individual cases.

HAMEG GmbH

Specifications

Vertical Deflection

Operating modes: Channel I or CH II separate, Channel I and II: alternate or chopped (Chopper Frequency approx. 0.5MHz)
Sum or **Difference** from Channel I and \pm Ch. II,
XY-Mode: via CH I (X) and CH II (Y).
Frequency range: 2x DC to 40MHz (-3dB).
Risettime: <8.75ns. Overshoot: $\leq 1\%$.
Deflection coefficient: 14 calibrated positions variable 2.5:1 to min. **50V/div.**
1mV/div and **2mV/div:** $\pm 5\%$ (0 to 10MHz (-3dB))
5mV/div to **20V/div:** $\pm 3\%$ (1-2.5sequence).
Input impedance: $1M\Omega$ || 15pF.
Input coupling: DC - AC - GD (Ground)
Input voltage: max. 400V (DC + peak AC).

Triggering

Automatic (peak to peak): **$\leq 20\text{Hz}$ -**100MHz**** ($\leq 0.5\text{div}$),
Normal: **DC-100MHz**, LED for trigger indication.
Slope: positive or negative.
Sources: CH I or II, line, ext.
CH I alternate CH II ($\leq 0.8\text{div}$).
Coupling: **AC** ($\geq 10\text{Hz}$ - 100MHz), **DC** (0 - 100MHz),
HF (50kHz - 100MHz), **LF** (0 - $\leq 1.5\text{kHz}$).
Triggering ext.: $\geq 0.3V_{pp}$ from DC to 100MHz
Active TV-Sync-Separator (field & line, pos, neg.)
2nd triggering (Del. Trig.): normal with level control DC to 100 MHz.

Horizontal Deflection

Time coefficients: 1-2-5 sequence, Accuracy $\pm 3\%$
Analog: 22 cal. positions from **0.5s** - **50ns/div.**
Digital: 25 cal. positions from **100s** - **1 μ s/div.**
Variable (analog) 2.5:1 up to 1.25s/div.
X-MAG. x10: analog to **10ns/div.**, dig. to **0.1 μ s/div** $\pm 5\%$.
Delay: **120ms** - **200ns**, variable,
Hold-off time (analog): variable to approx. 10:1.
Bandwidth X-amplifier (analog): 0-3MHz (-3dB).
Input X-amplifier via Channel II, Sensitivity see Channel II.
X-Y-phase shift : $< 3^\circ$ below 120kHz.

Digital Storage

Operating modes: Refresh, Roll, Single, XY, Envelope, Average (2 to 512 waveforms).
Automatic Dot Join function
Sample Rate: max. **100MS/s** (8 bit)
Refresh rate: max. 180/s
Record length: 2048 x 8 bit per channel.
Reference memory: 2 x 2k x 8bit (EEPROM).
Resolution: Y: **25 points/div**, X: **200 points/div**.
Pre-/Posttrigger: 25, 50, 75, 100, -25, -50, -75%.

Operation / Control

Manual (front panel switches);
Auto Set (automatic parameter selection).
Save/Recall of 9 user-defined parameter settings
RS232 interface for remote control via a PC.
Remote control (Option) **HZ68**.
Multifunction-Interface HO79-6(Option): RS232, IEEE-488, Centronics (Postscript, HPGL, PCL, EPSON).
Readout: Display of parameter settings.
Cursor measurement of ΔV , Δt or $\Delta 1/t$ (frequency), separate or in tracking mode.

Component Tester

Test voltage: approx. $7V_{rms}$ (open circuit).
Test current: max. $7mA_{rms}$ (short circuit).
Test frequency: approx. 50Hz
One test lead is grounded (Safety Earth).

General Information

CRT: D14-364GY/123 or ER151-GH/-, rectangular screen (8x10cm) internal graticule
Acceleration voltage: approx 2000V
Trace rotation: adjustable on front panel
Calibrator: square-wave generator ($t_r < 4\text{ns}$) $\approx 1\text{kHz}/1\text{MHz}$; Output: $0.2V \pm 1\%$.
Analog Intensitymodulation, max. +5V (TTL).
Line voltage: 100-240V AC $\pm 10\%$, 50/60Hz
Power consumption: approx. 42 Watt at 50Hz.
Min./Max. ambient temperature: $0^\circ\text{C} \dots +40^\circ\text{C}$
Protective system: Safety class I (IEC1010-1)
Weight: approx. 5.6kg, color: techno-brown
Cabinet: W 285, H 125, D 380 mm

3/98



40MHz Analog-/Digital-Scope HM407

Auto-Set, Save/Recall, Readout/Cursor, RS232 Interface

Analog: 2 x DC-40MHz, max. 1mV/div, Timebase 0.5s/div - 10ns/div
Triggering DC - 100MHz, Component Tester, 1MHz Calibrator
Digital: Max. Sampling Rate 100MS/s, Timebase 100s/div - 0.1 μ s/div
Storage 2 x 2048 x 8 bit, Reference Memory, Post/Pre-Trigger
Storage Modes: Refresh, Single, Roll, Average and Envelope

The worldwide success of HAMEG's HM205 and HM305 has led to the introduction of the new microprocessor controlled HM407 Analog/Digital oscilloscope. This instrument offers much more performance and specifications over its predecessors. The HM407 incorporates a **microprocessor-based** system that extensively automates operation. The majority of signals can be displayed by simply pressing the "Autoset" button. A "**Save/Recall**" function is available for storing frequently used setup parameters.

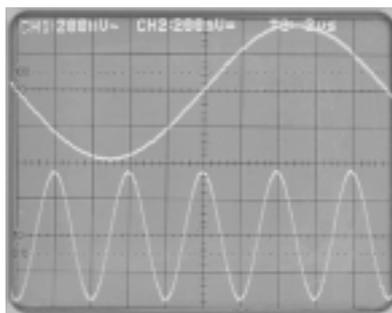
The increased maximum sampling rate of **100MS/s** now allows to capture a **10MHz** signal in "Single" mode with **10 samples** (dots) per period. The **automatic Dot-Join** function provides linear connections between the captured points, ensuring that all digitized signals are displayed without gaps. New features are the **two reference memories**, allowing their contents to be compared with the live signal at any time. Cursors can be activated for waveform measurements. All important parameter settings are displayed on the CRT screen. The **built-in RS232-Interface** enables remote control operation and signal processing via a PC.

Unique in its price range is also the analog section of the HM407. The increased bandwidth of **40MHz** (-3dB) allows the stable display of signals up to **100MHz**. As always, the **Component Tester** with one-button control is a standard feature in the HM407. This is also true for the switchable **1kHz/1MHz Calibrator** which permits you to check the transient characteristics from probe tip to the screen at any time.

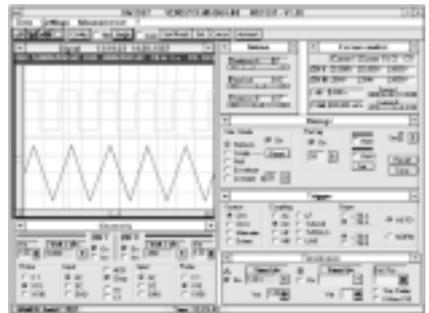
All in all, the new HM407 presents itself as a practical hands-on oscilloscope for today's progressive measurement requirements offering a price/performance ratio that sets new standards world-wide.

Accessories supplied: Line Cord, Operators Manual, 2 Probes 1:1/ 10:1

Screen photo of stored sinewave signals.

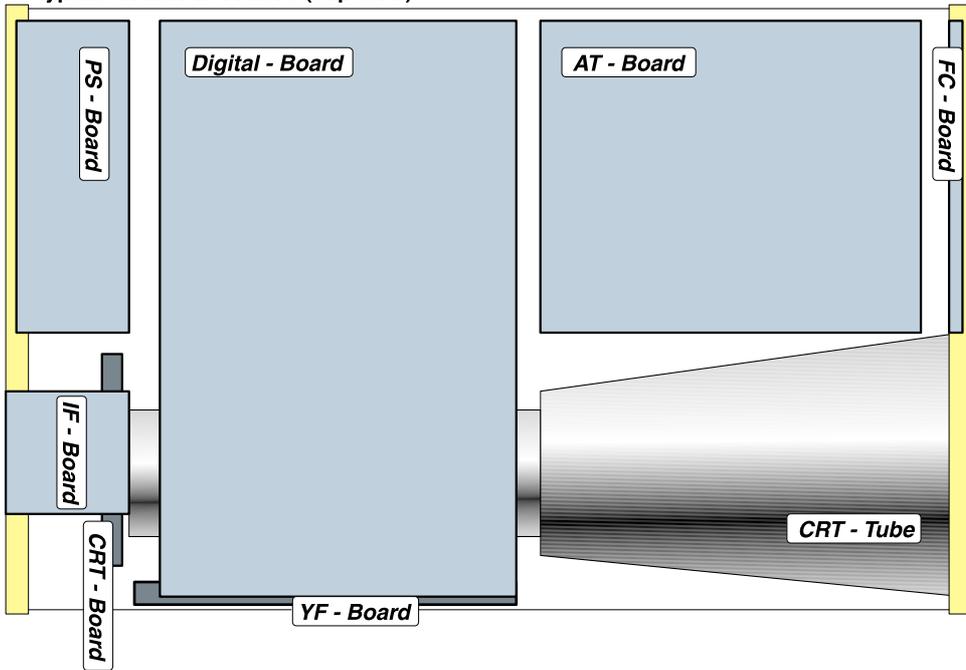


Screen shot of measurement software.

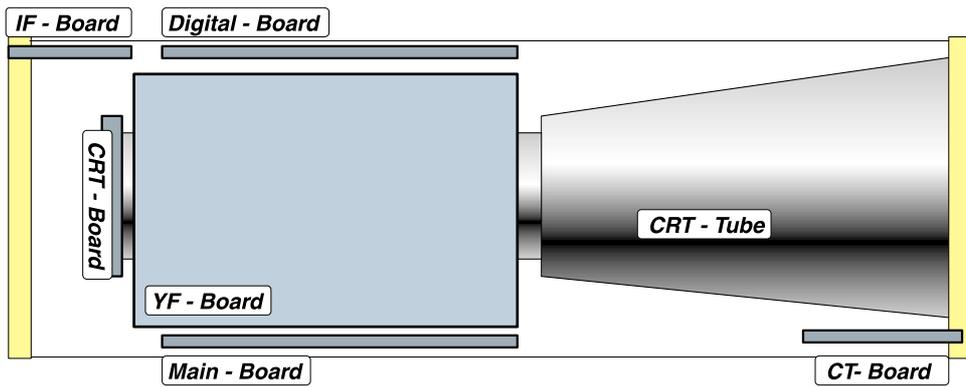


Typical board allocation

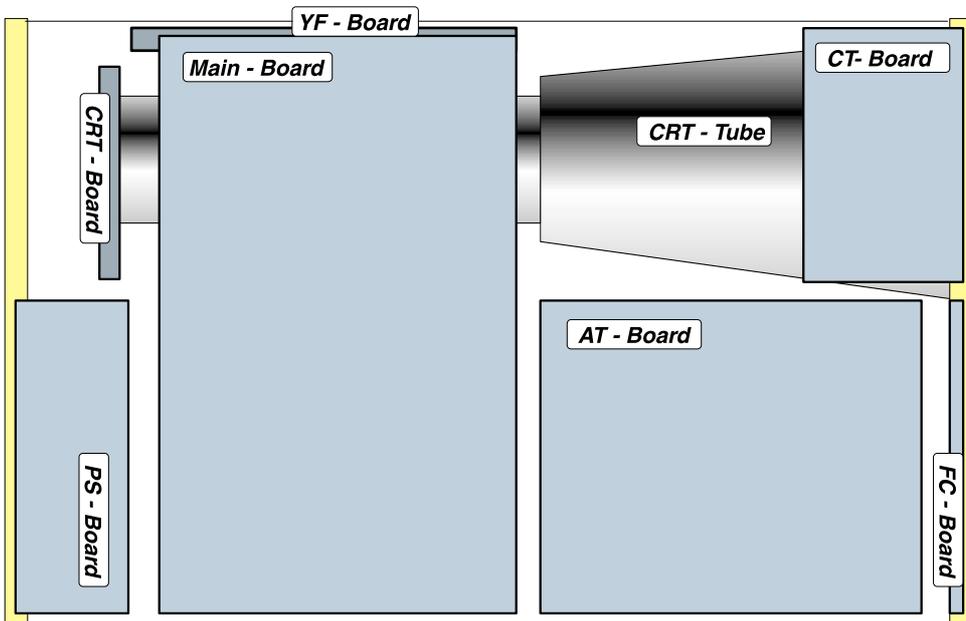
Typical boards allocation (Top view)

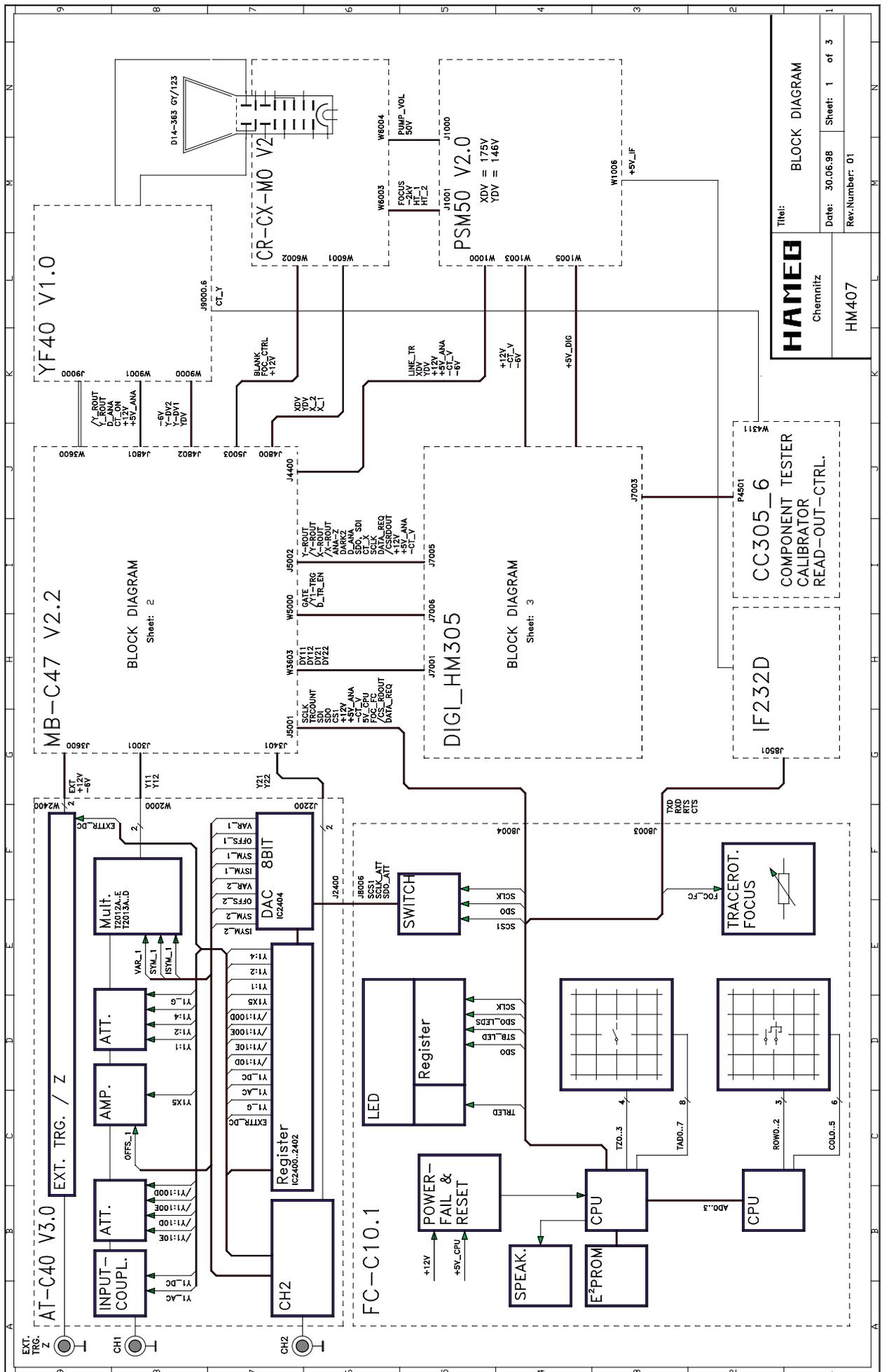


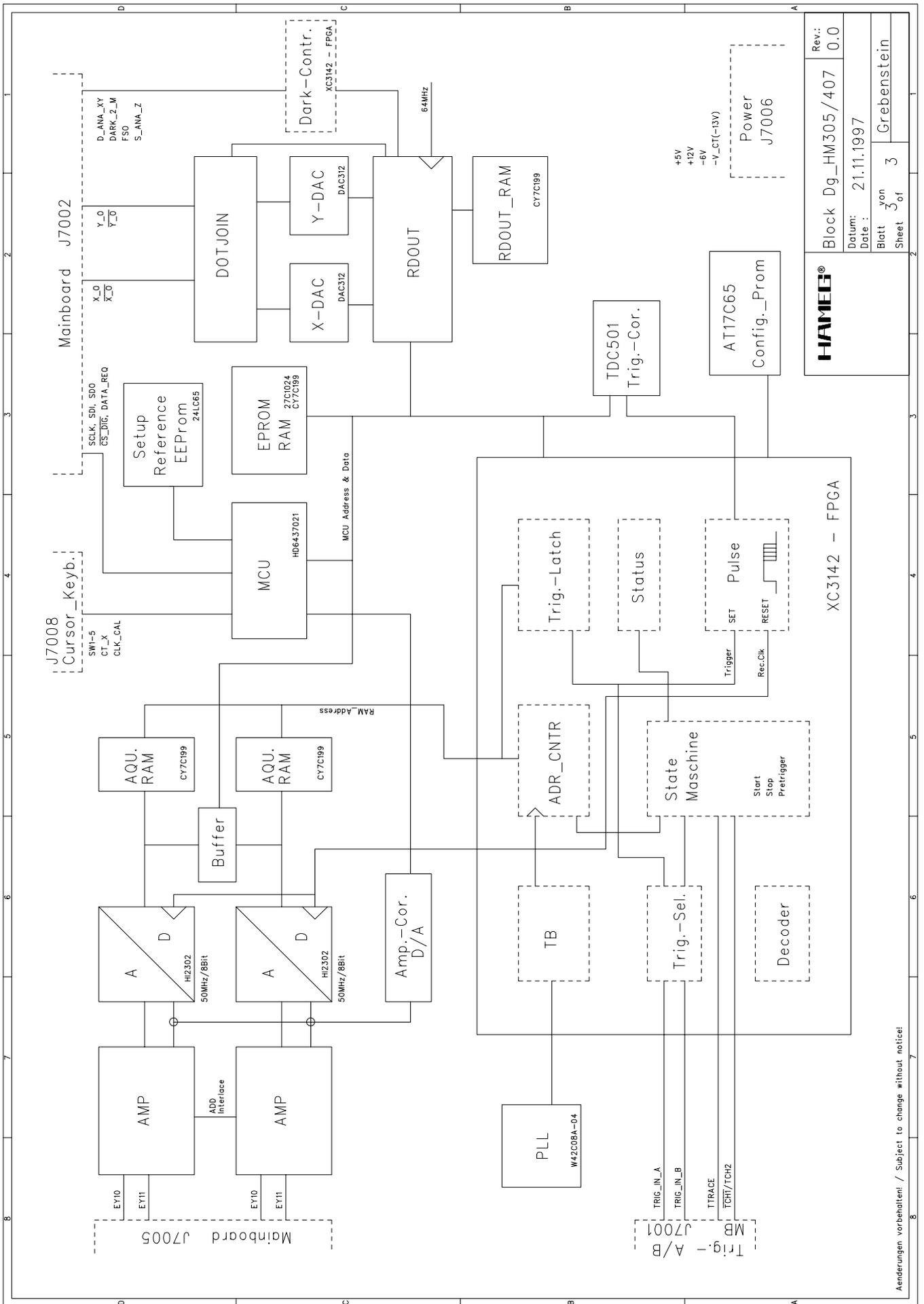
Typical boards allocation (Back side)



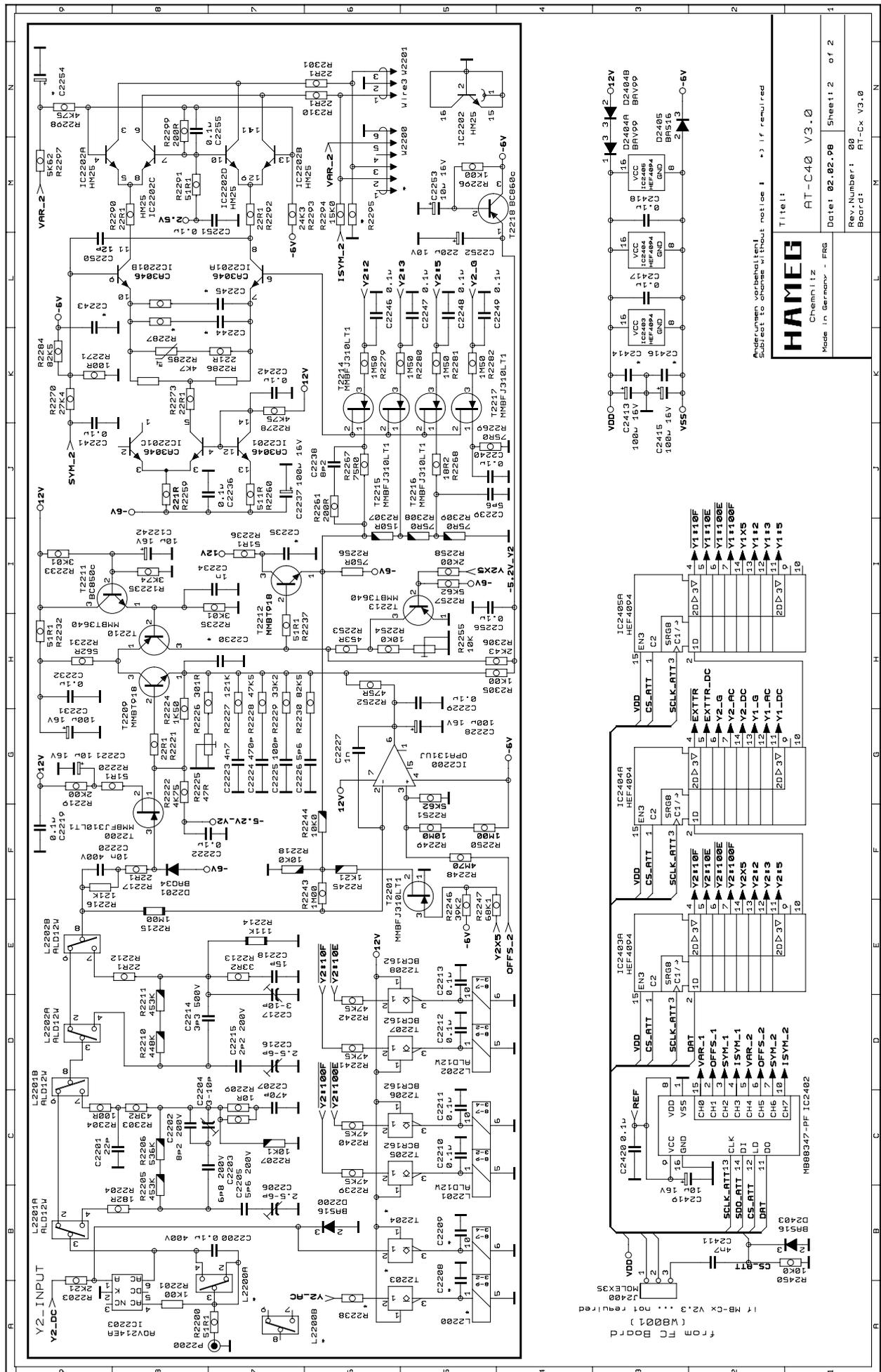
Typical boards allocation (Bottom view)







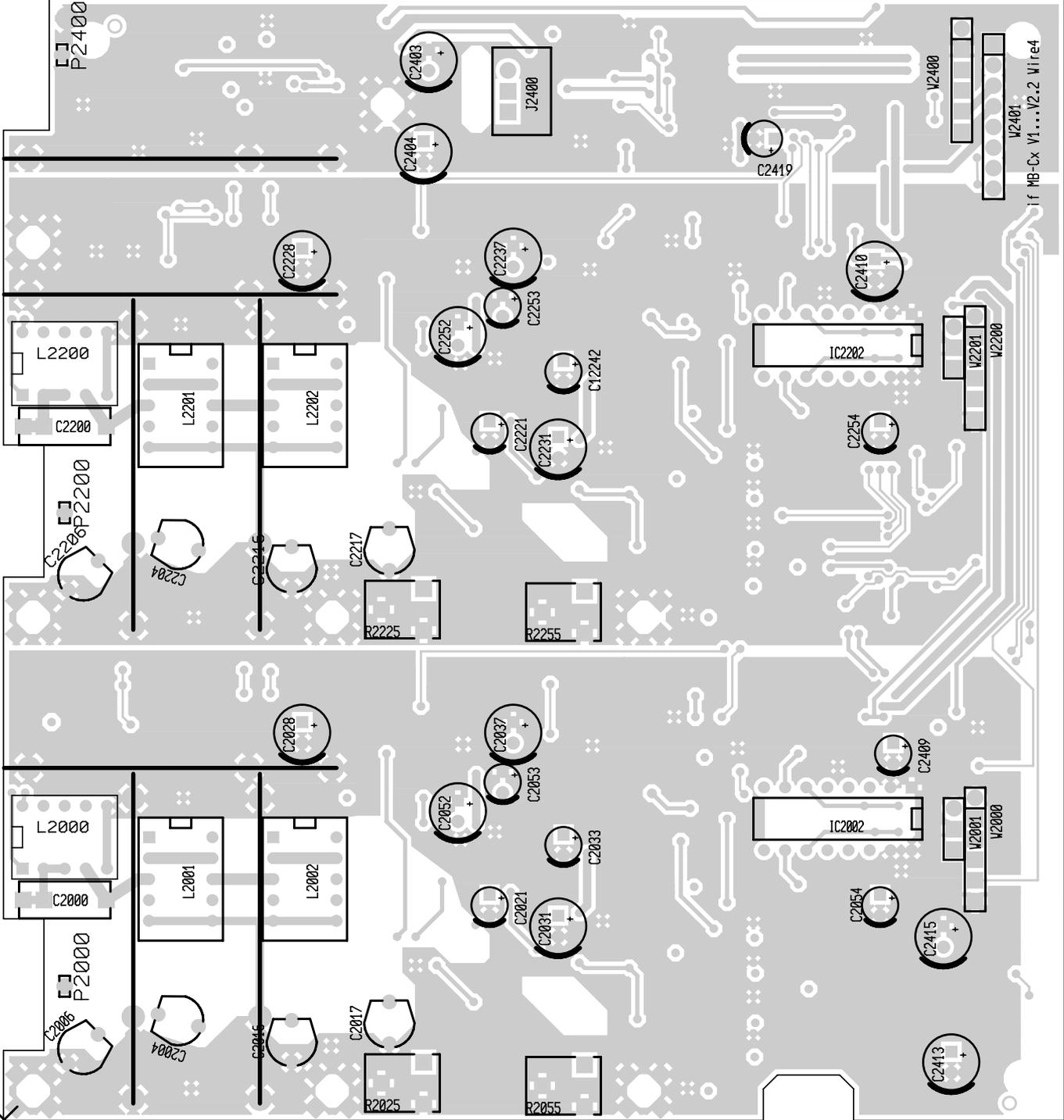
HAMEG®		Block Dg_HM305/407	Rev.: 0.0
Datum: 21.11.1997		Blatt 3 von 3 Grebenstein	
Date: 21.11.1997		Sheet 3 of 3	

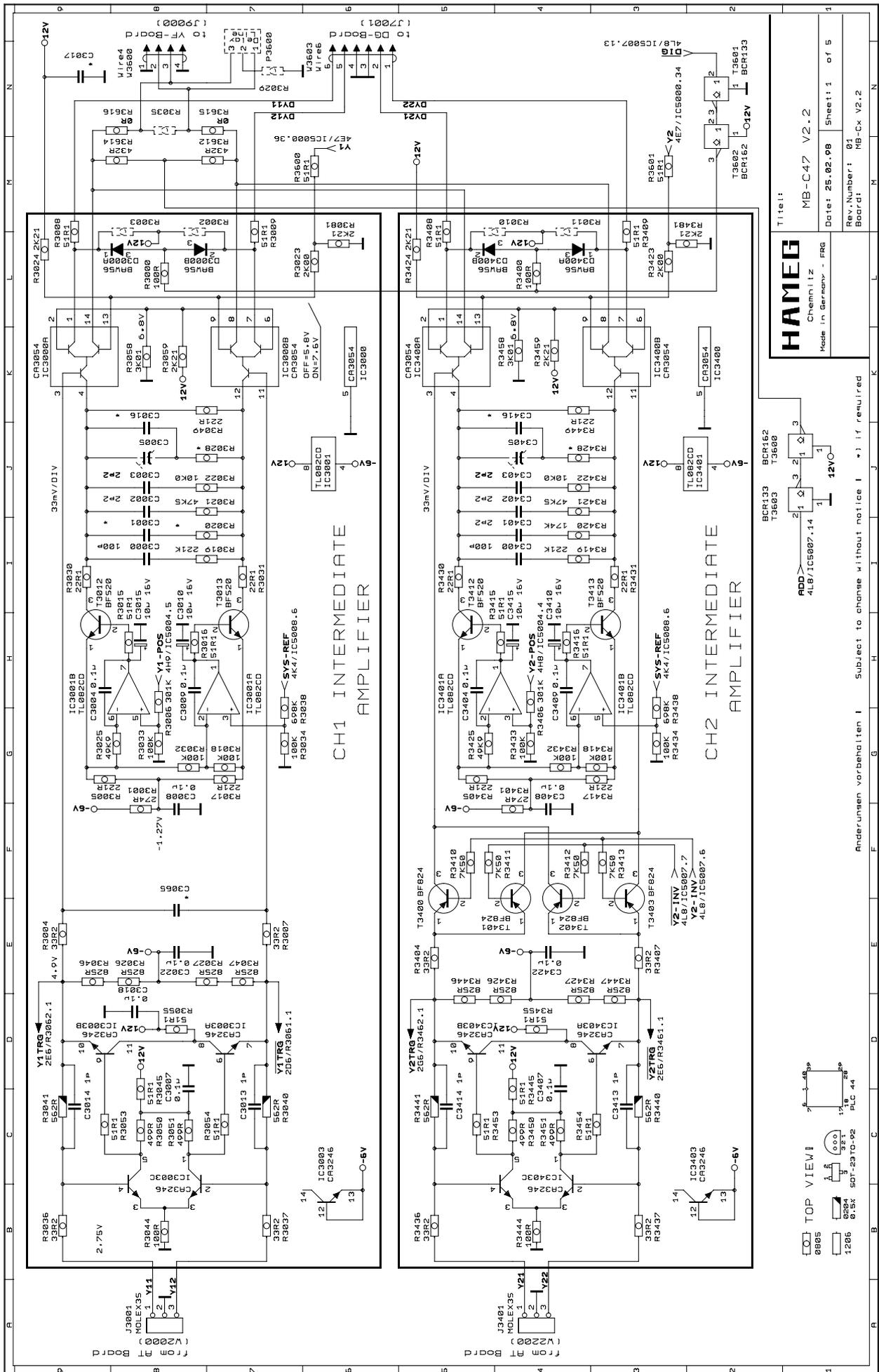


Subject to change without notice

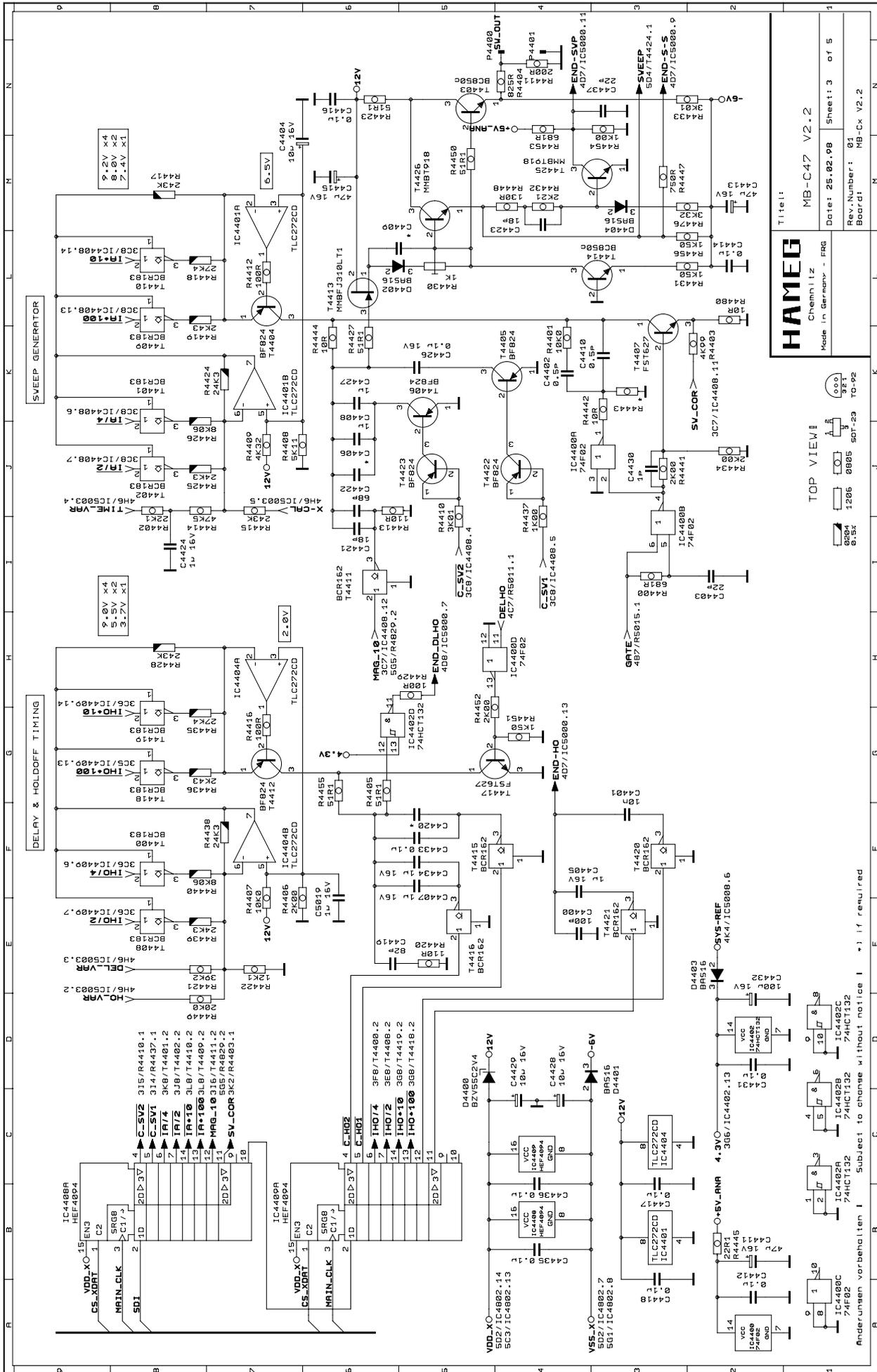
AT - Board Diagram Top Side







Main - Board Diagram



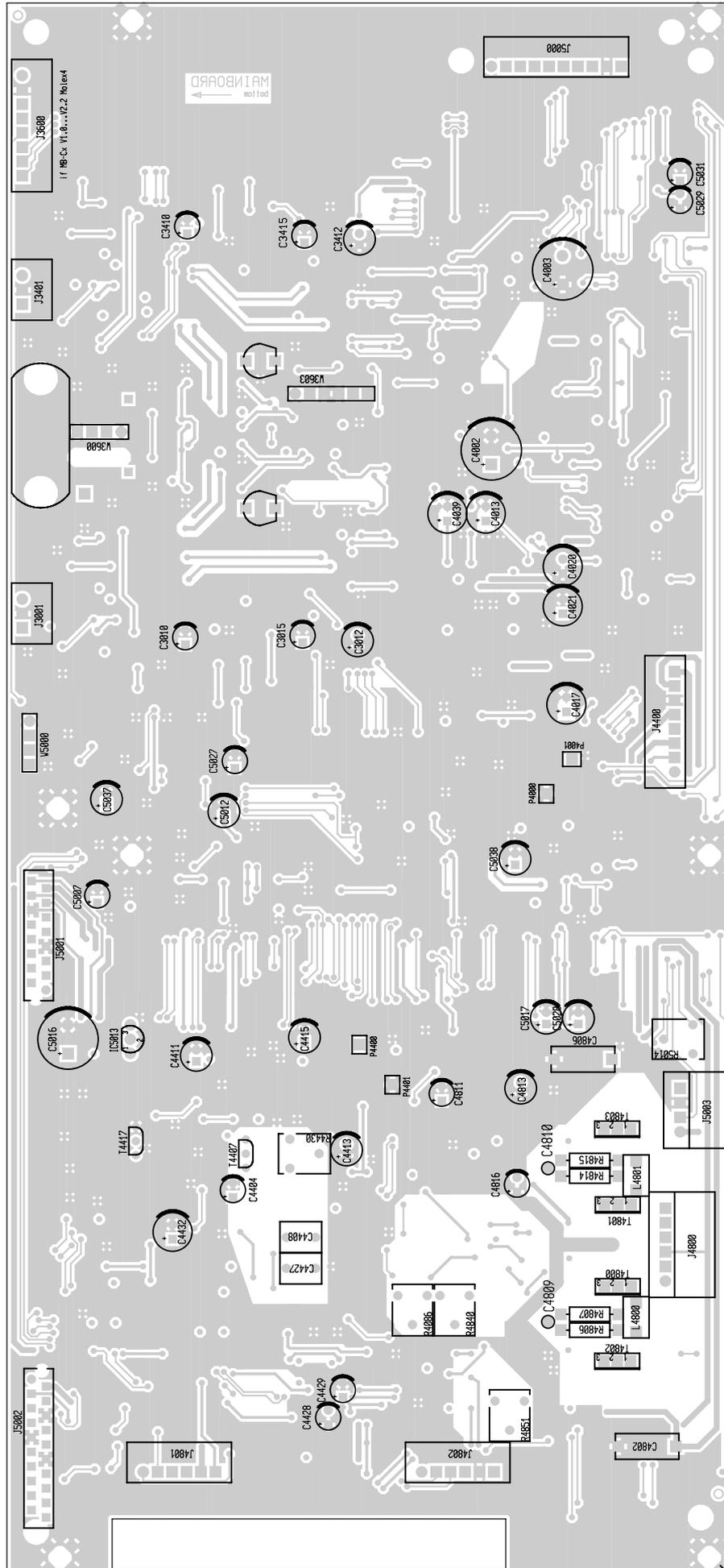
HAMEG
 Chemnitz
 Made in Germany - FRG
 Rev. Number: 01
 Board: MB-Cx V2.2

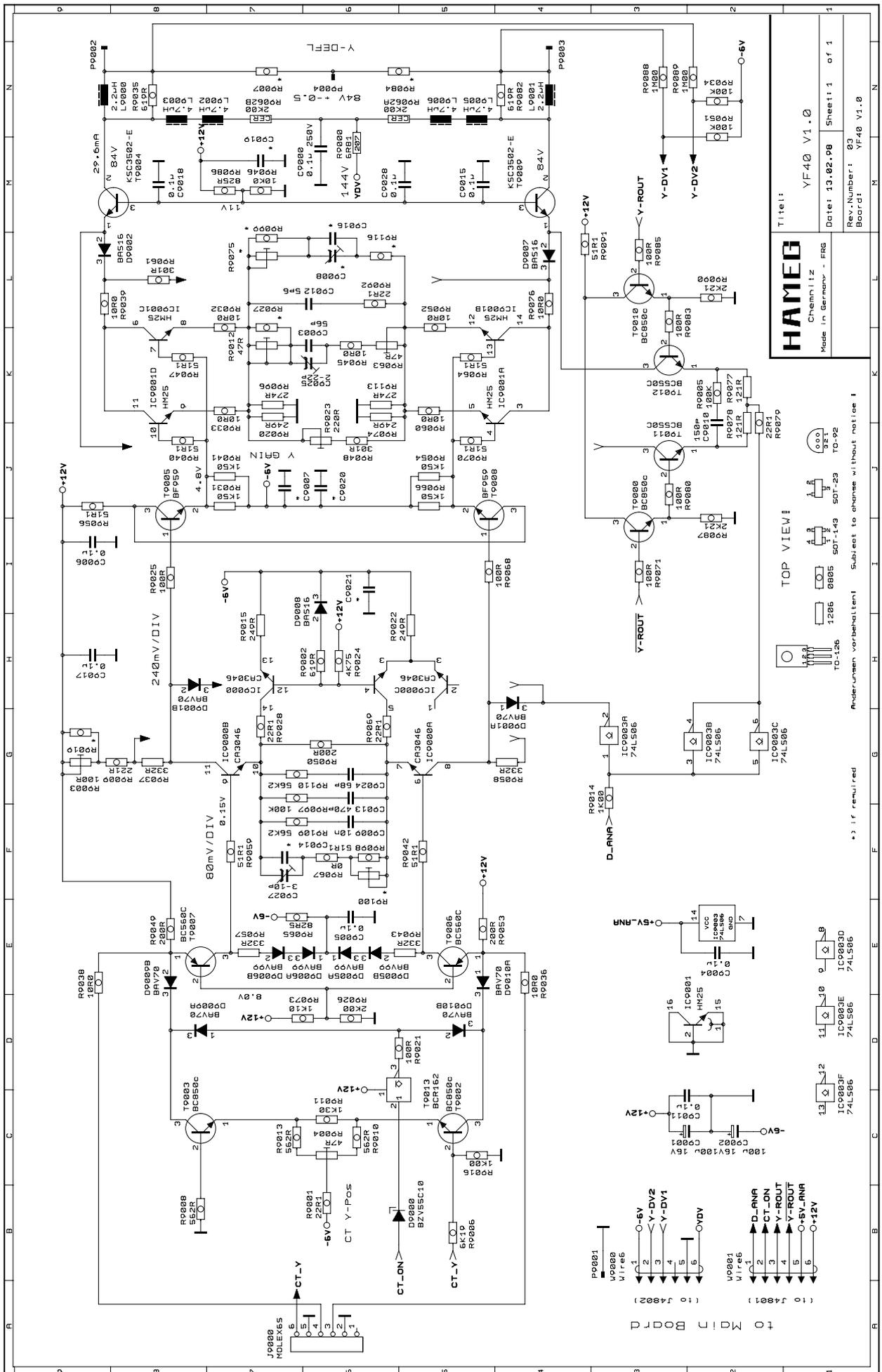
Titel: MB-C47 V2.2
 Date: 25.02.98
 Sheet: 3 of 5

TOP VIEW!
 8294 8294 8294 8294
 8294 1205 8085 8085 8085 8085
 8294 1205 8085 8085 8085 8085

IC4401A
 IC4401B
 IC4401C
 IC4401D
 IC4401E
 IC4401F
 IC4401G
 IC4401H
 IC4401I
 IC4401J
 IC4401K
 IC4401L
 IC4401M
 IC4401N
 IC4401O
 IC4401P
 IC4401Q
 IC4401R
 IC4401S
 IC4401T
 IC4401U
 IC4401V
 IC4401W
 IC4401X
 IC4401Y
 IC4401Z

VDD-XO-EN3
 CS-XDR1
 MAIN-CLK
 SDI
 VDD-XO-EN3
 CS-XDR1
 MAIN-CLK
 SDI
 V55-XO-EN3
 CS-XDR1
 MAIN-CLK
 SDI
 O-12V
 O-6V
 O-5V-REF
 O-5V
 O-2V





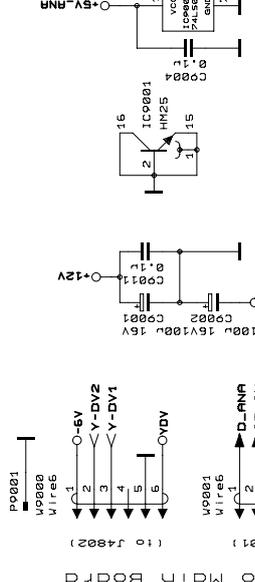
HAMEG
Chemnitz
Made in Germany - FRG

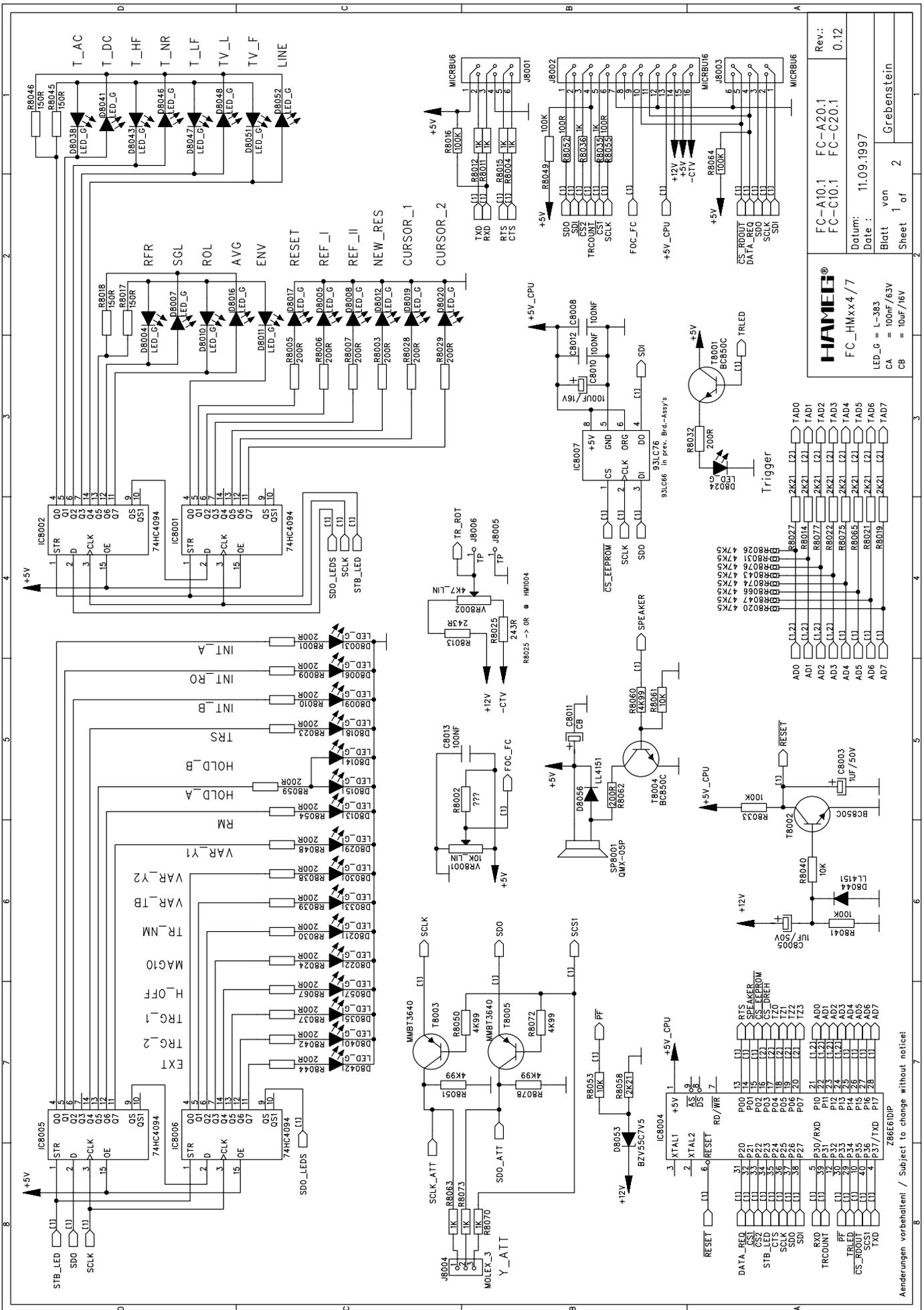
Titel: YF40 V1.0
Date: 13.02.98
Rev. Number: 03
Board: YF40 V1.0

TOP VIEW!

1206 0805 50T-143 50T-23 TO-92
TO-126
Anderungen vorbehalten! Subject to change without notice!

*) if required





HAMEG®
FC-HMxx/7

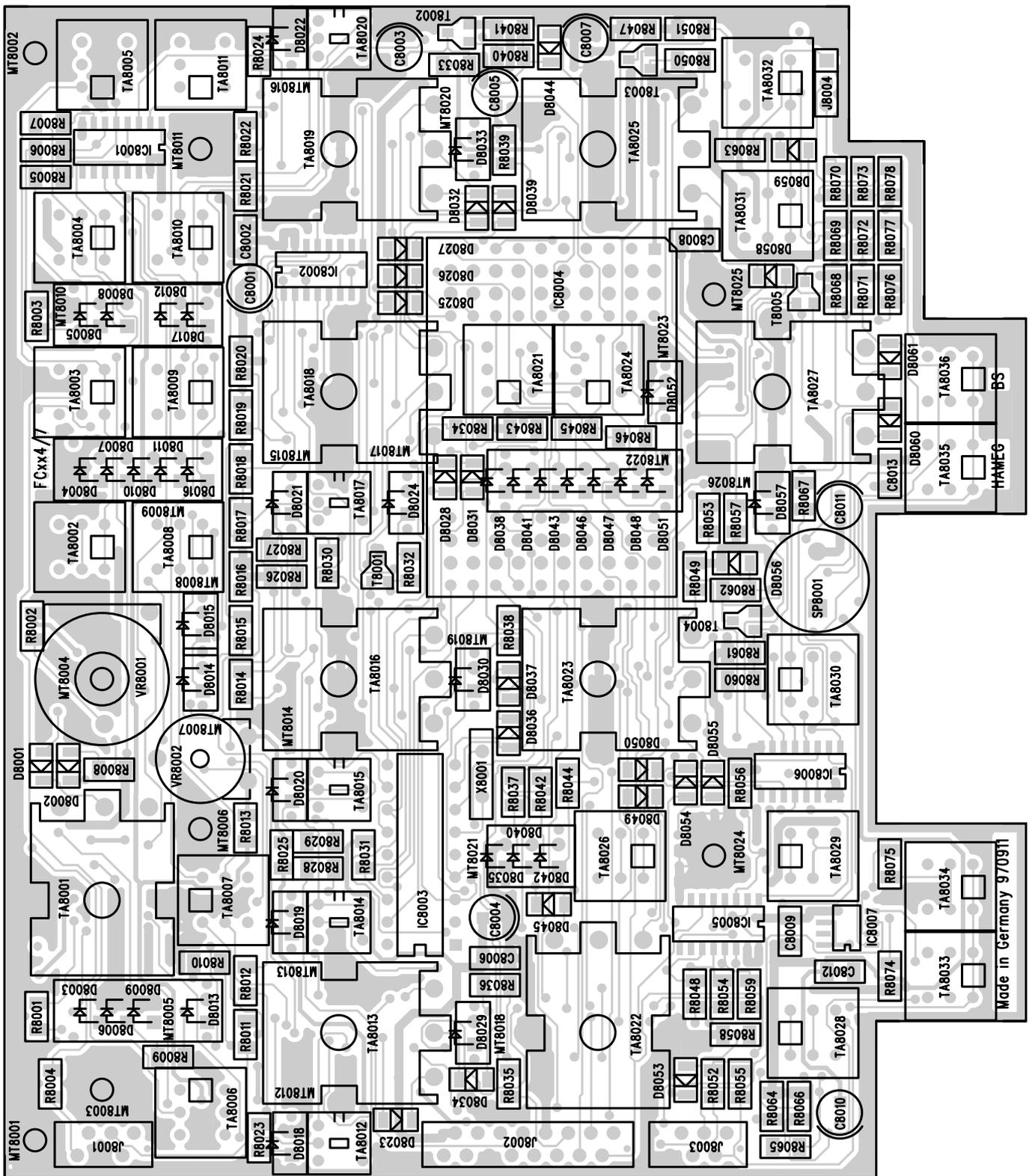
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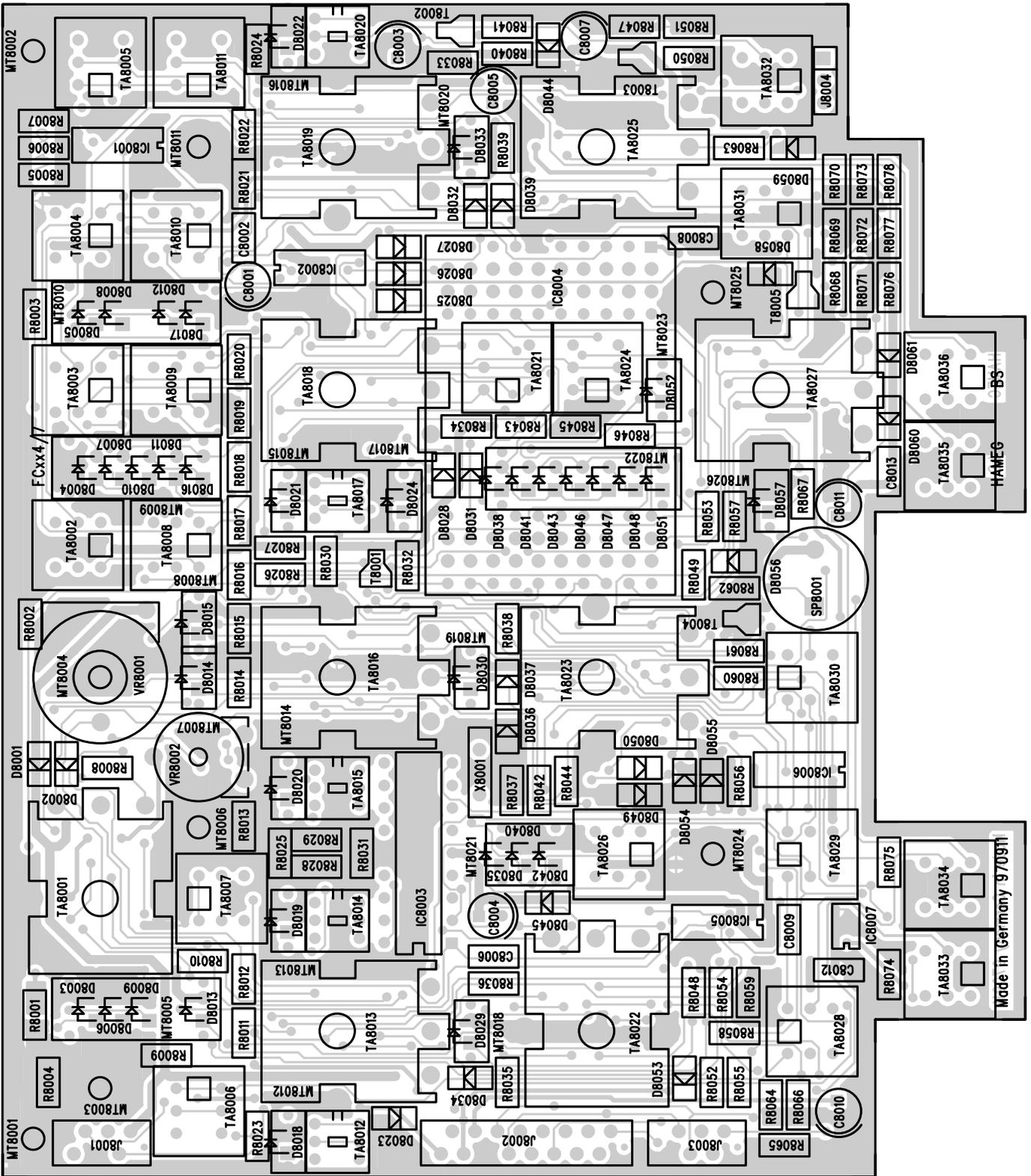
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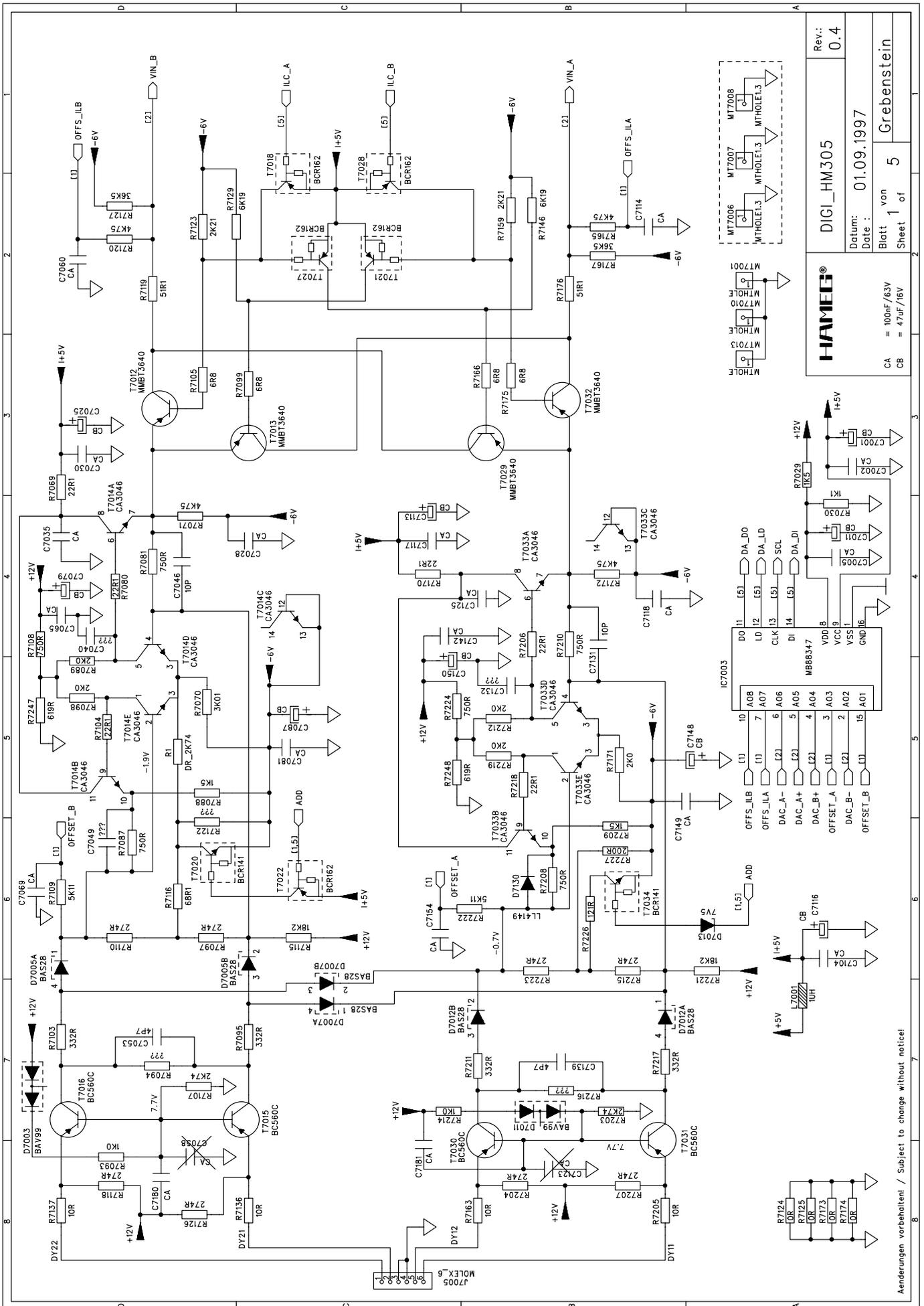
Blatt 1 of 2
Sheet 1 of 2

Grebenstein

LED_G = L-383
CA = 100nF/63V
CB = 10uF/16V







HAMEC®

DIGI_HM305

Rev.: 0.4

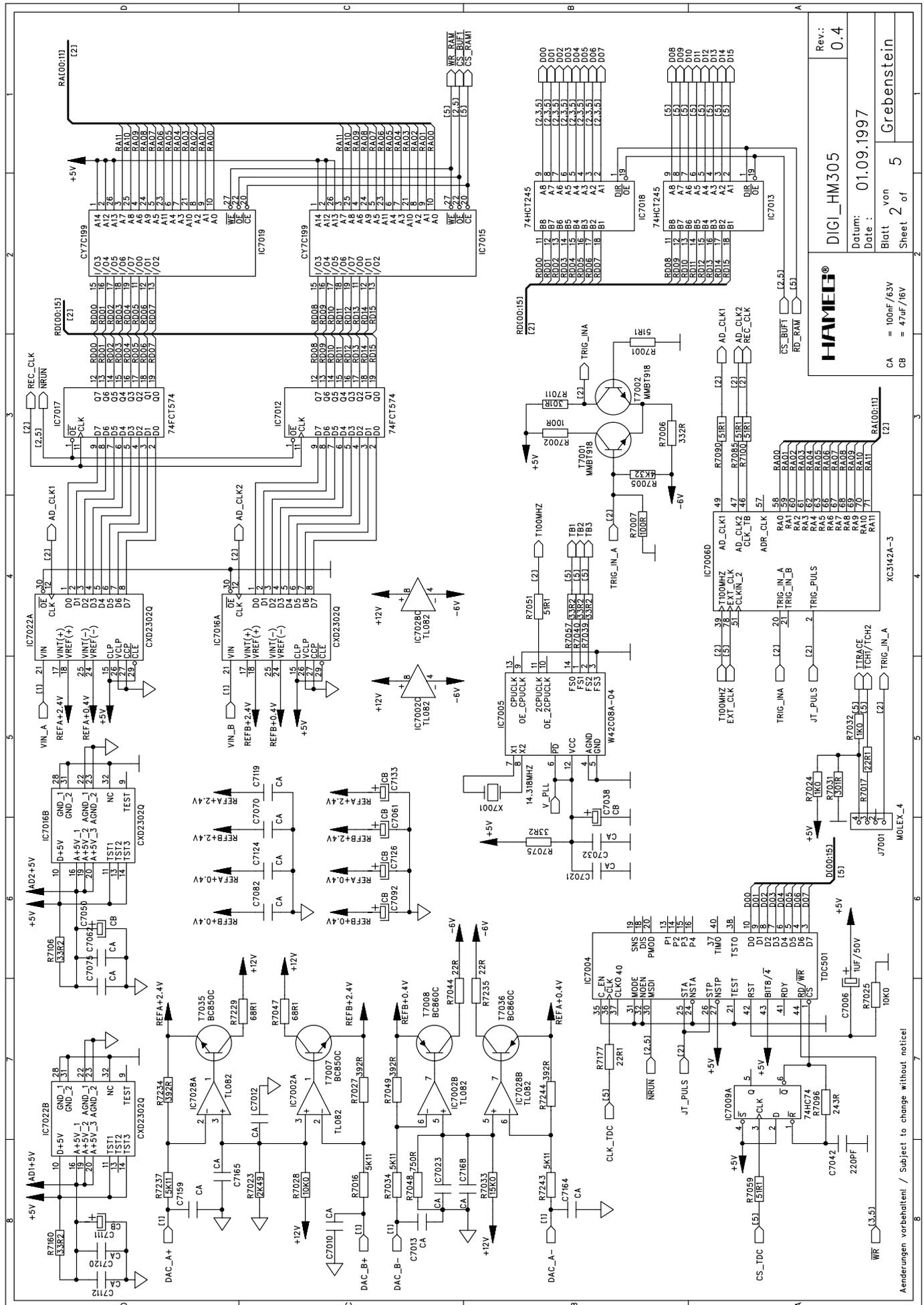
Datum: 01.09.1997

Blatt 1 of 5

Grebenstein

CA = 100nF/63V
CB = 47µF/16V

Digital - Board Diagram (old)



HAMEES®

DIGI_HM305

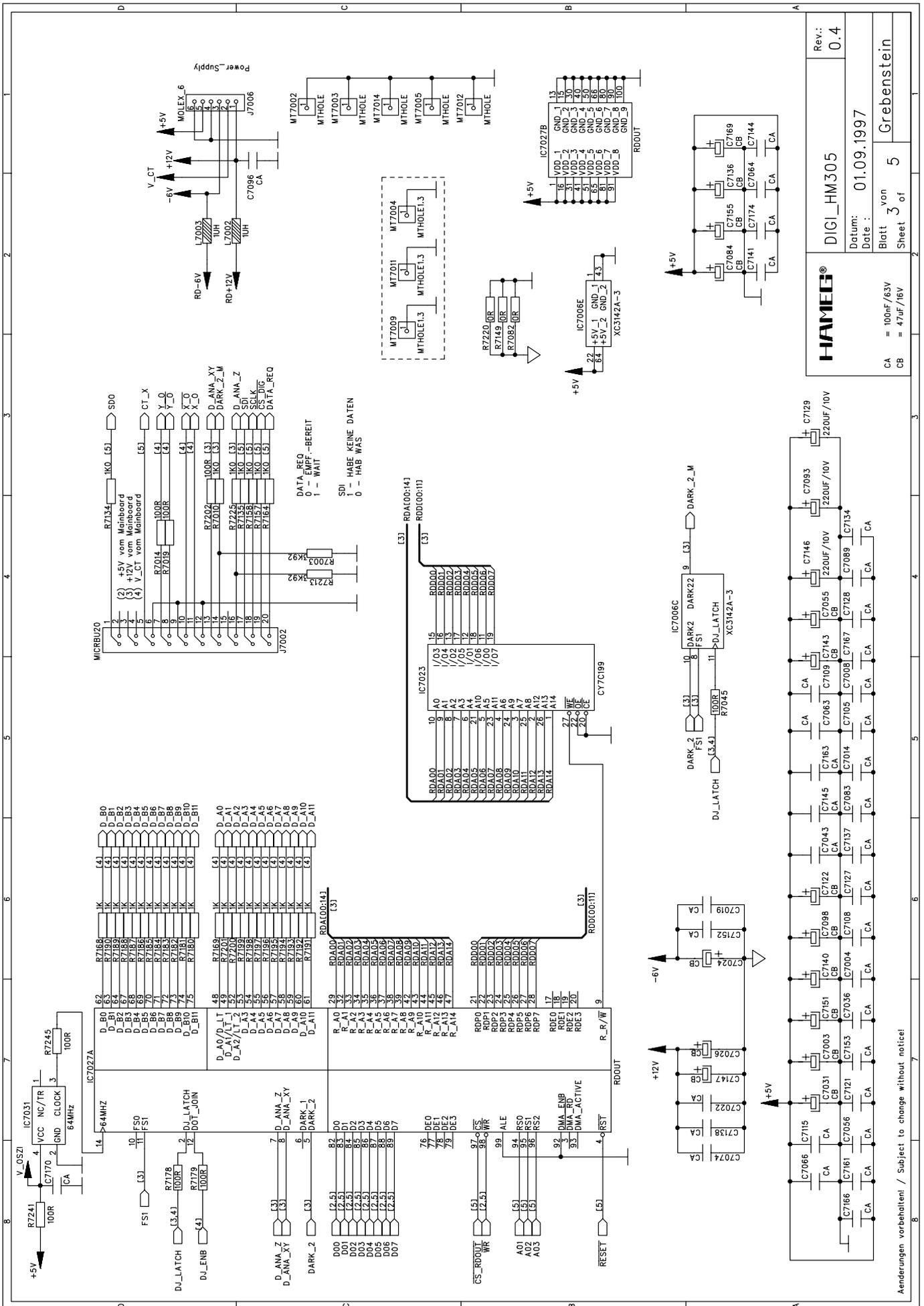
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Datum: 01.09.1997

Blatt 2 of 5

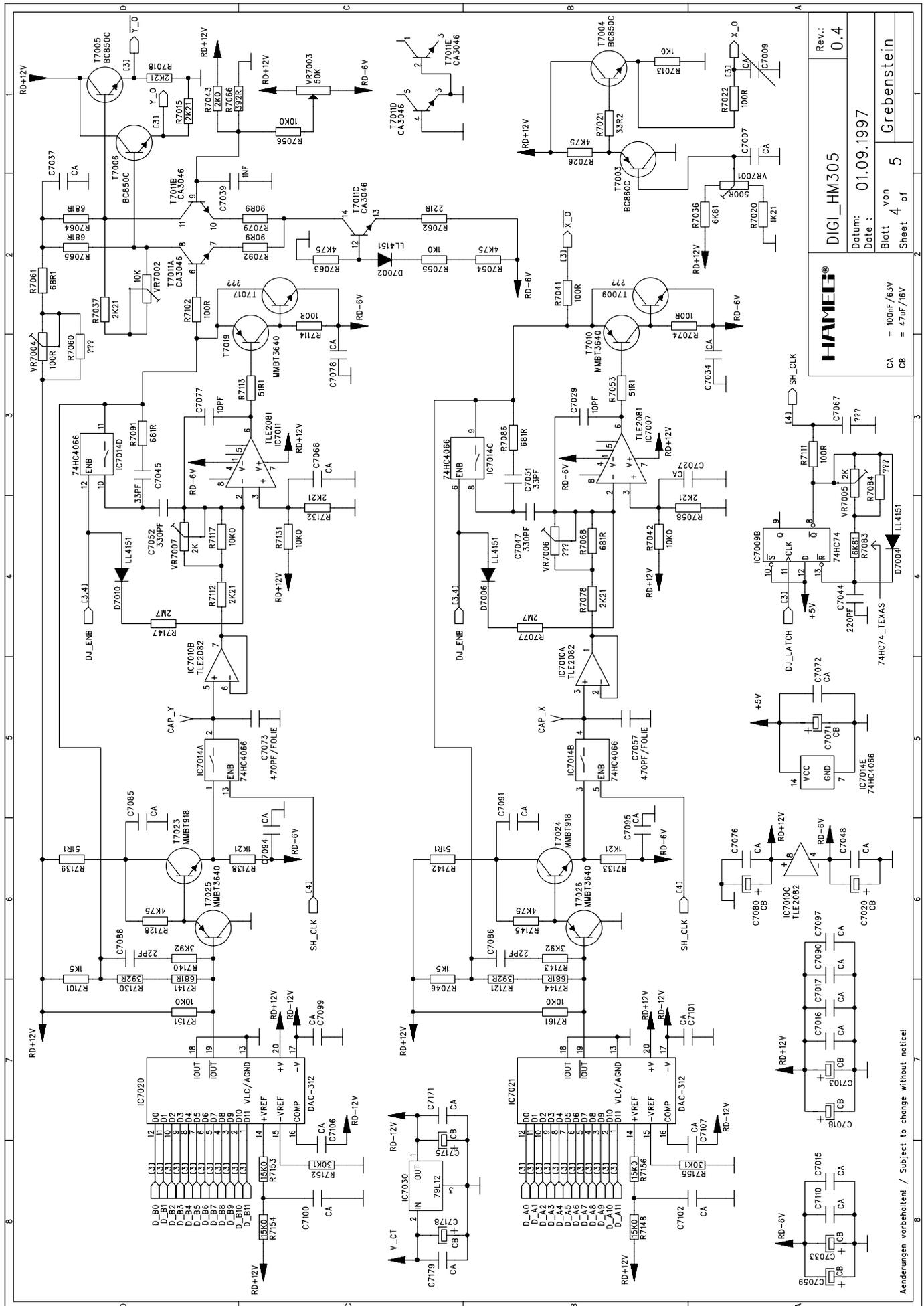
von Grebenstein

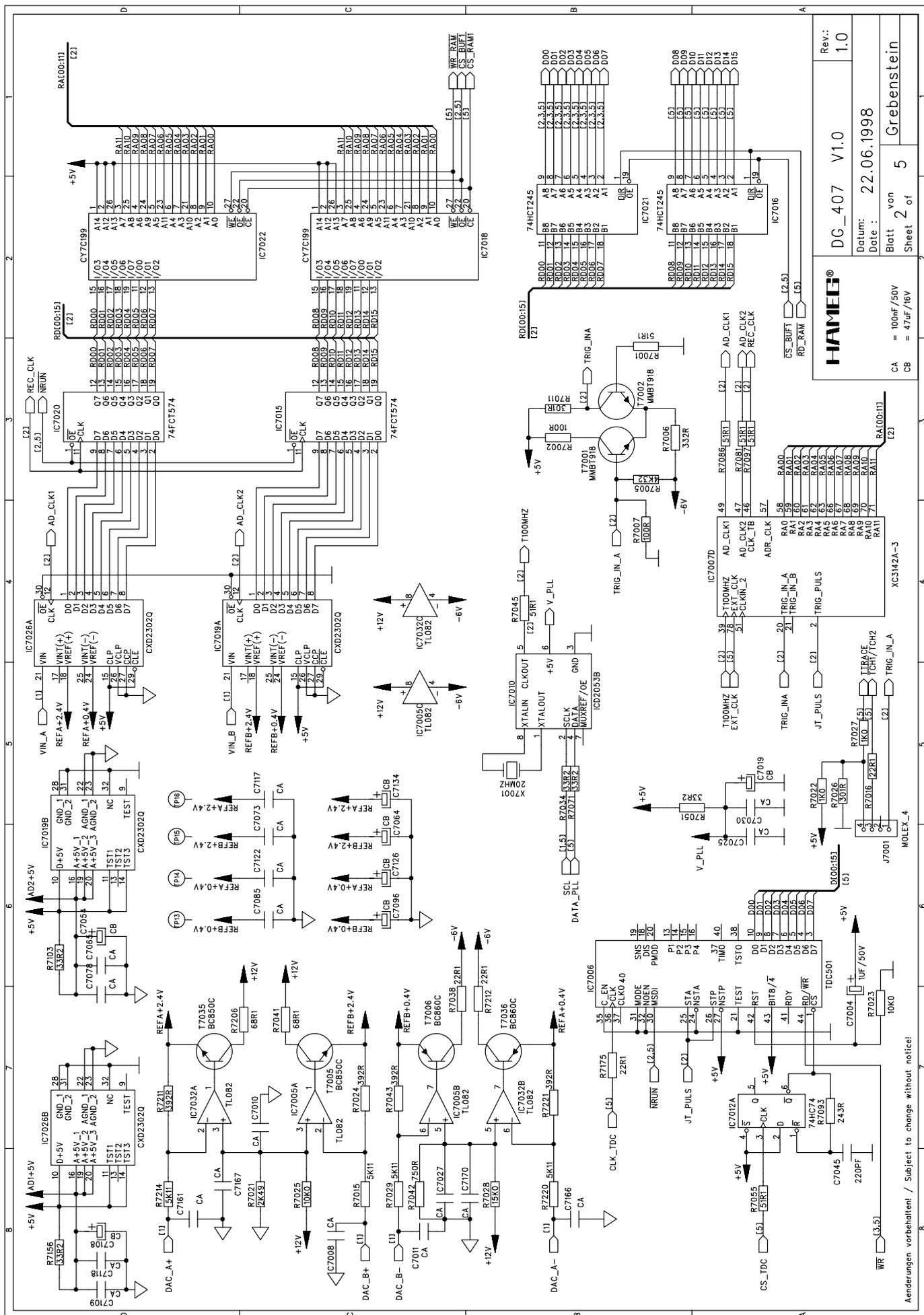
CA = 100nF/63V
CB = 47µF/16V



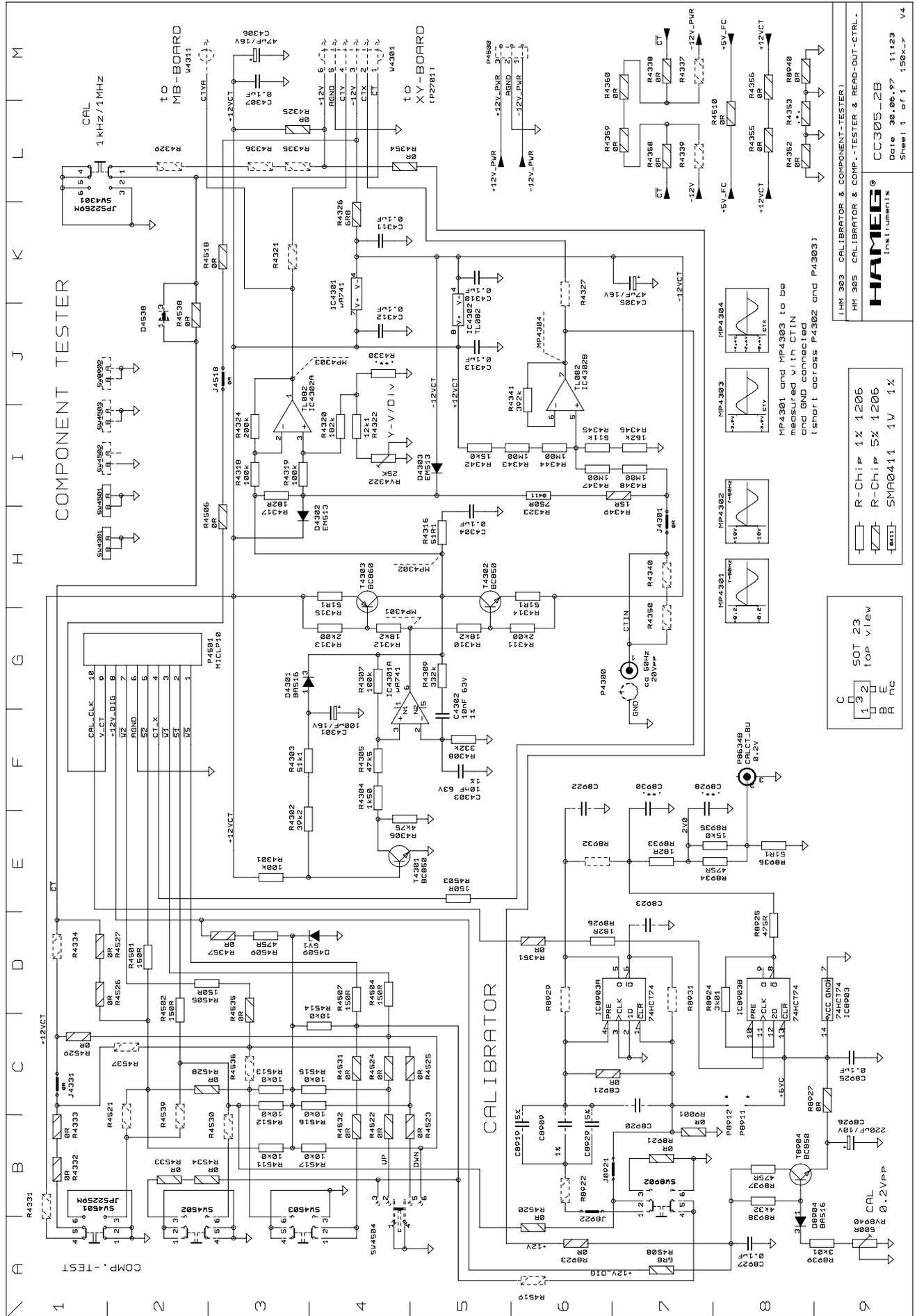
HAMEG®
 DIGI_HM305
 Rev.: 0.4
 Datum: 01.09.1997
 Blatt 3 of 5
 Grebenstein
 CA = 100nF/63V
 CB = 47µF/16V

Digital - Board Diagram (old)



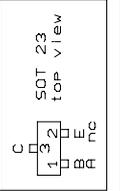


HAMEG®
 Rev.: 1.0
 Datum: 22.06.1998
 Blatt 2 of 5
 Grebenstein
 CA = 100nF/50V
 CB = 47µF/16V

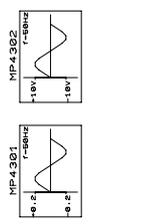


HM 383 CALIBRATOR & COMPONENT-TESTER
 HM 385 CALIBRATOR & COMP.-TESTER & READ-OUT-CTRL.
HAMEG
 Instruments
 CC305-2B
 Date 30.06.97 11:23
 Sheet 1 of 1 1504-V 4

R-Chip 1% 1206
 R-Chip 5% 1206
 SMA0411 1W 1%

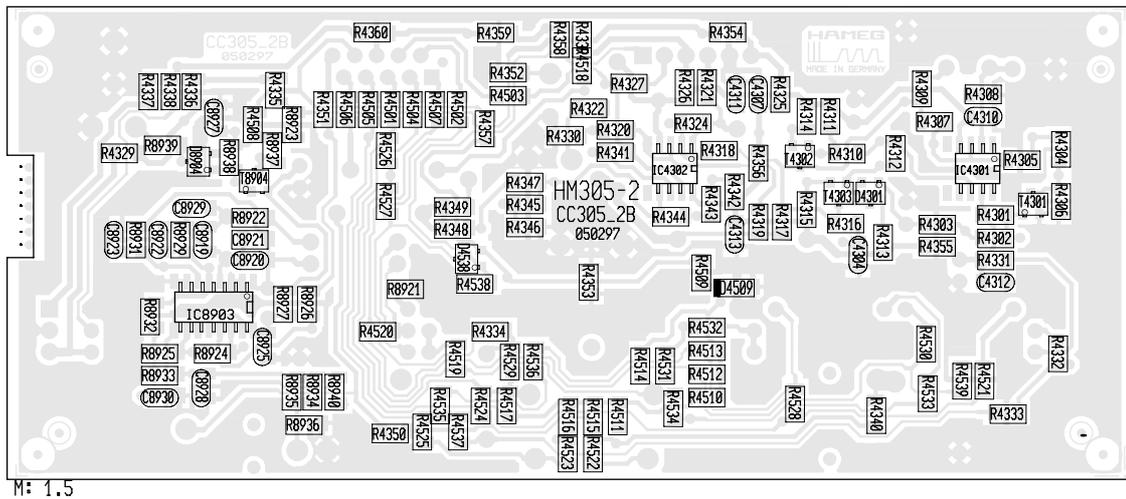
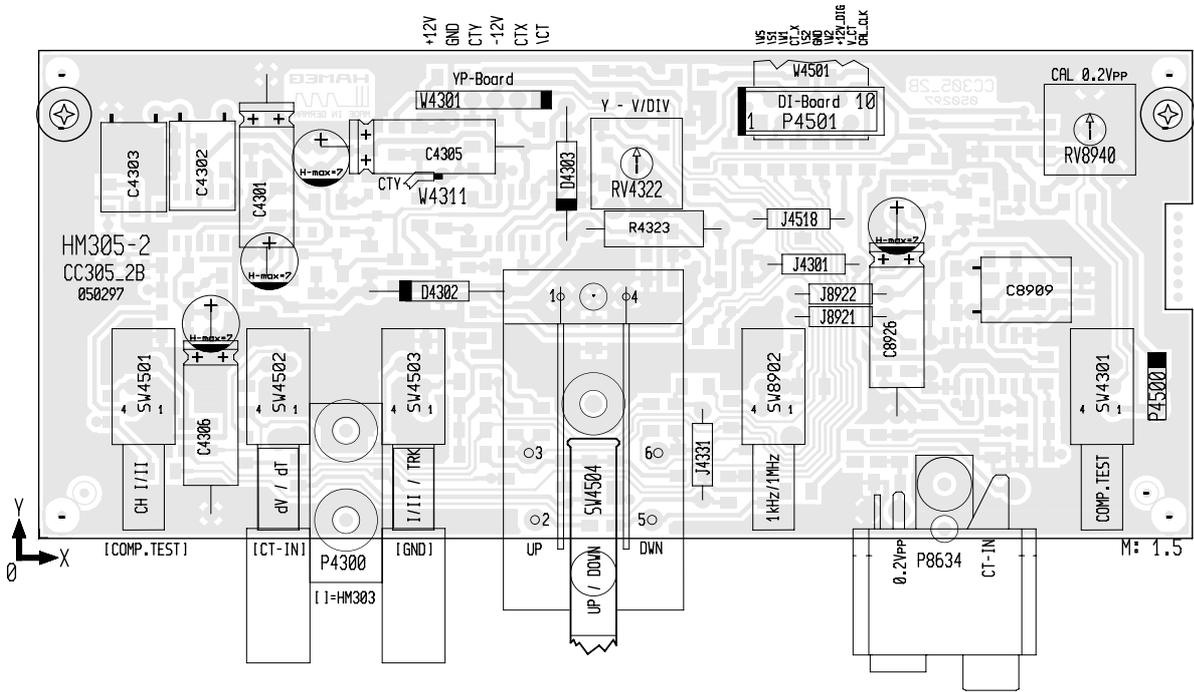


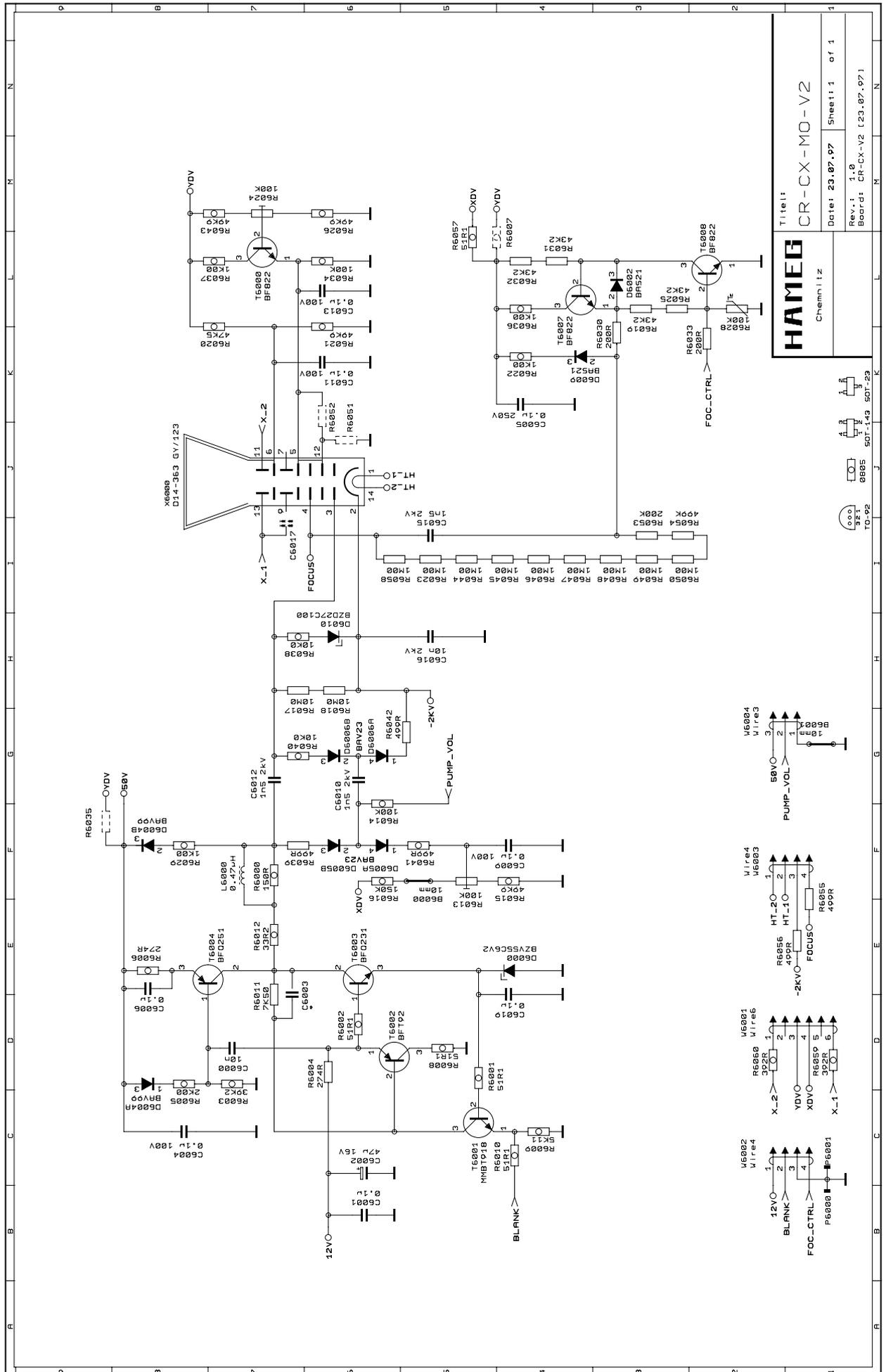
MP4301
 MP4302
 MP4303
 MP4304



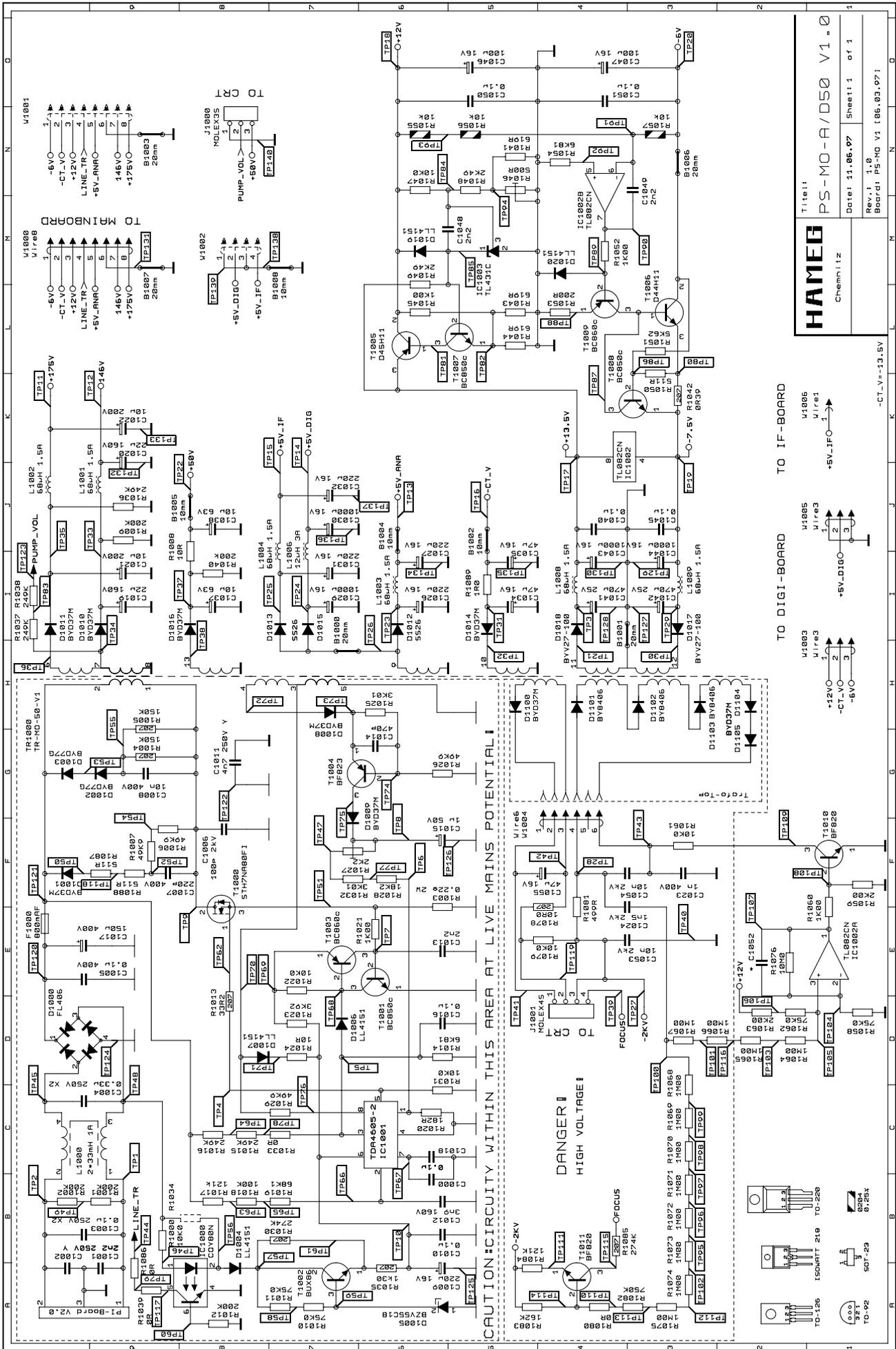
MP4301 and MP4303 to be measured with CTIN and GND connected (short across P4302 and P4303)

CT - Board Top and Bottom Side



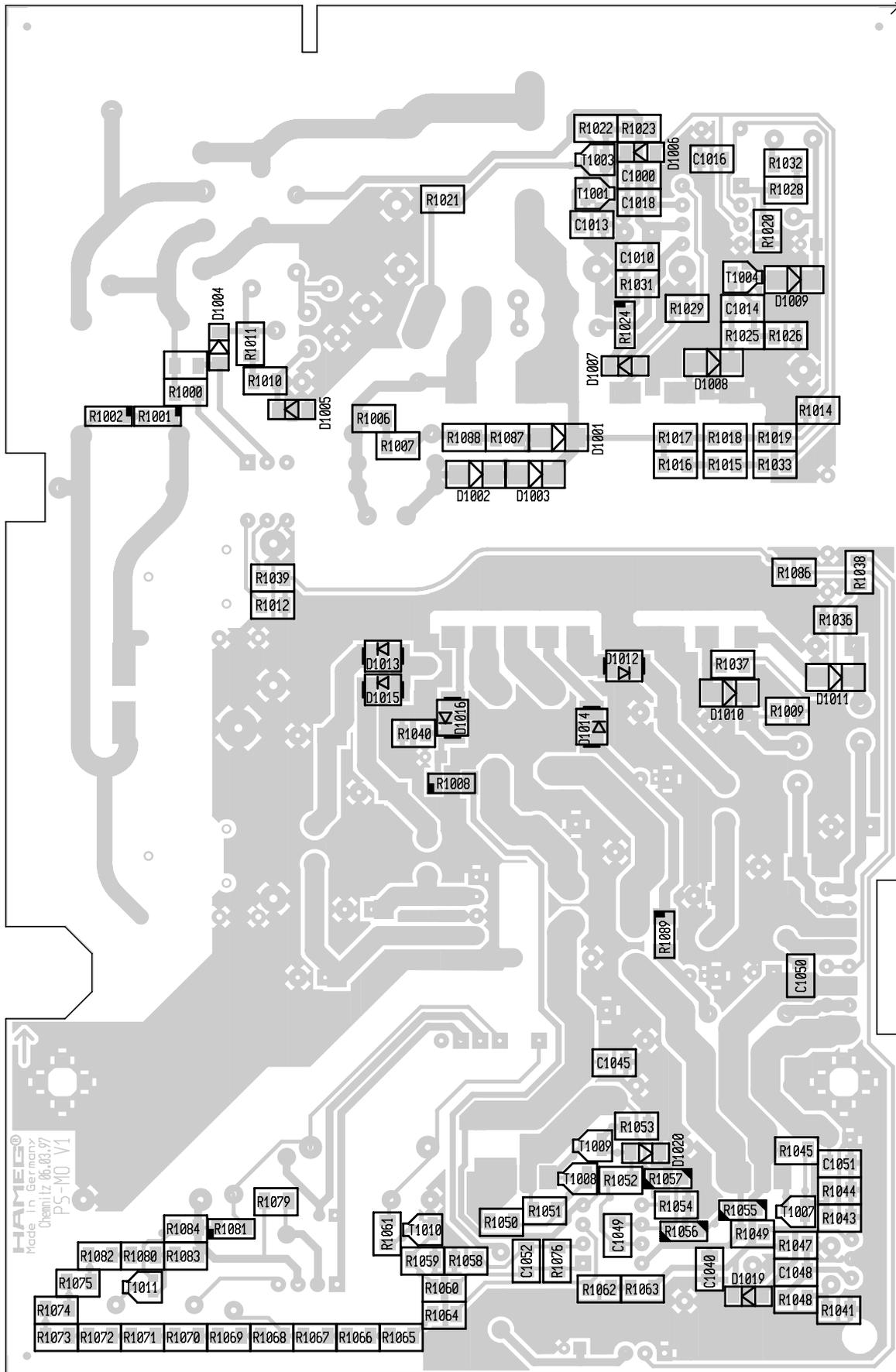


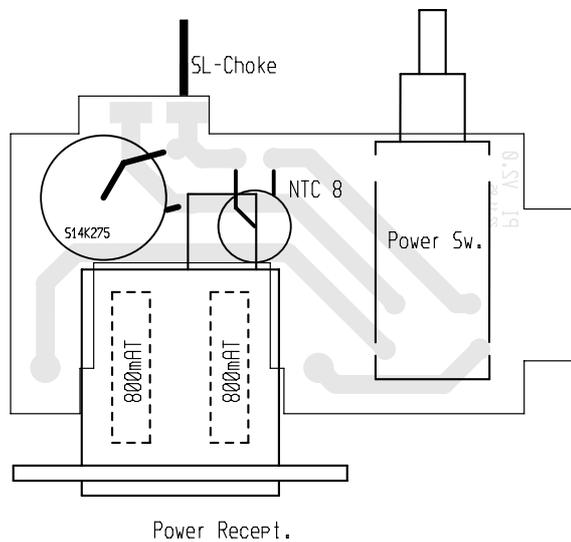
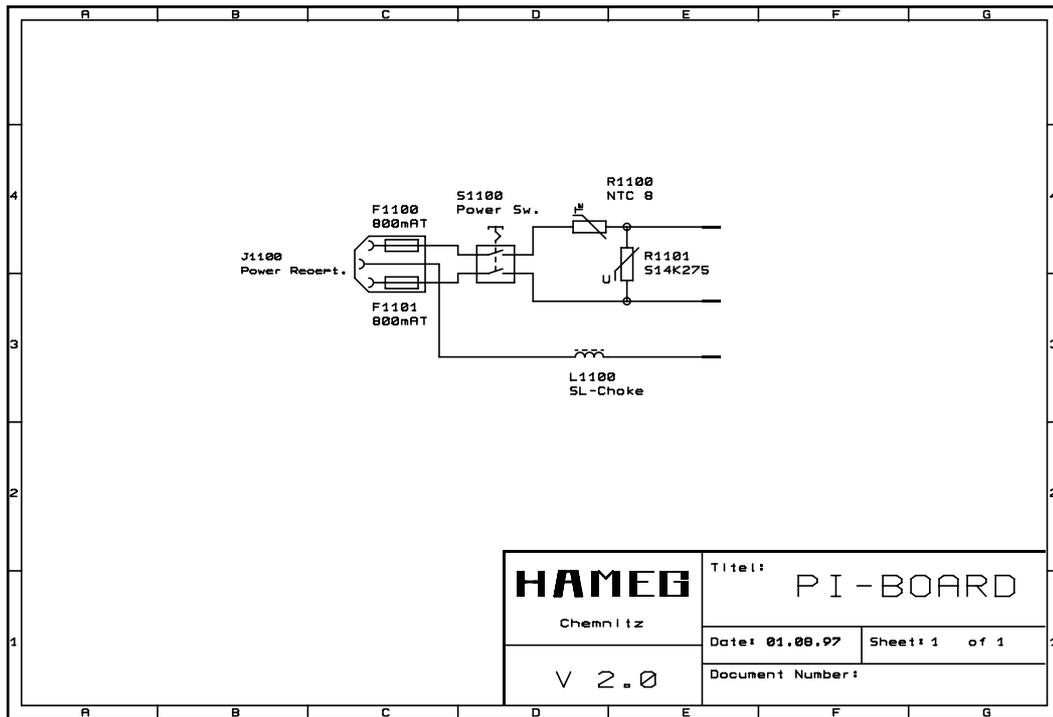
PS - Board Diagram

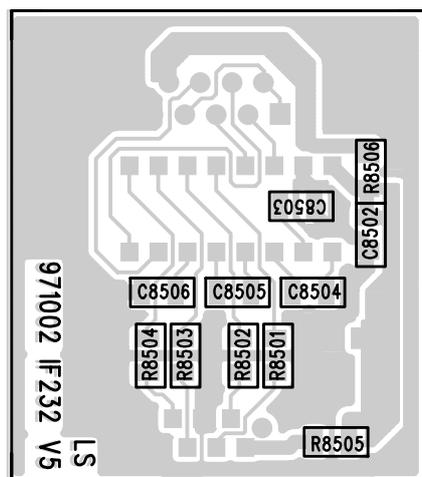
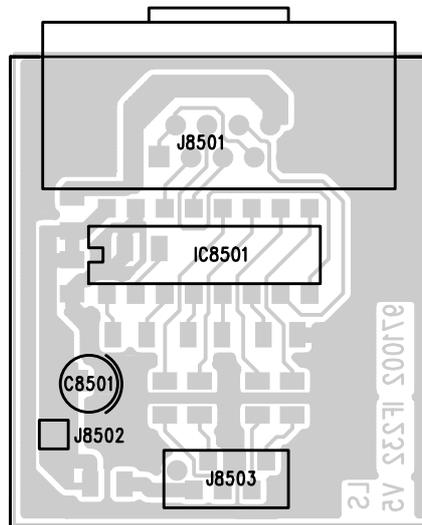


HAMEE
Chemnitz

Title: PS-MO-A/D50 V1.0
Date: 11.06.97 Sheet: 1 of 1
Rev: 1.0 Board: PS-MO V1 [06.03.97]







Appendix / Anhang

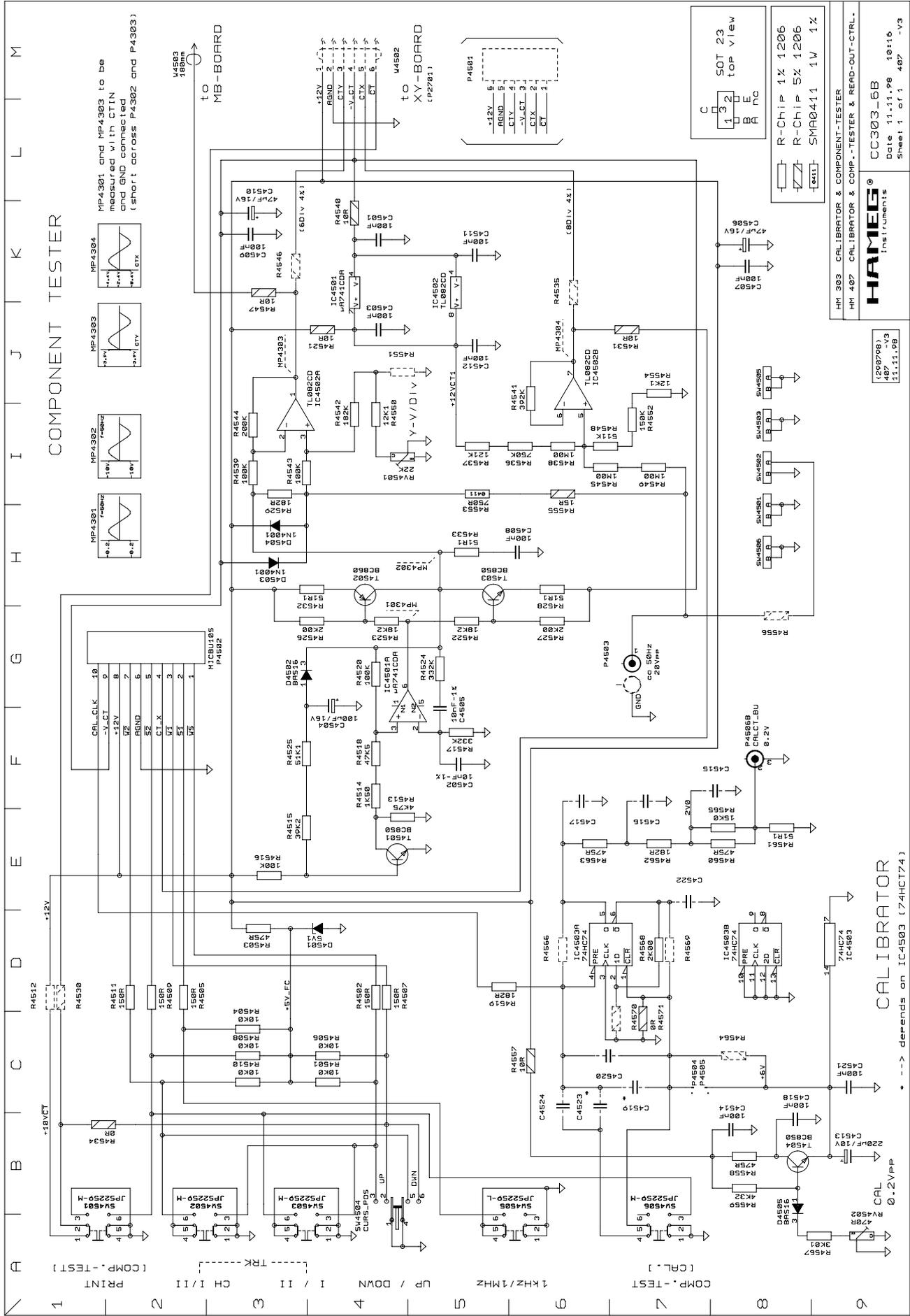
Technical changes (Upgrade)

CC - Board

Diagram	50
Top and bottomside	51

PS - Board (PS_OS_1A)

Diagram	52-53
Top side	54
Rear side	55



COMPONENT TESTER

CALIBRATOR

--- depends on IC4503 (74HC174)

MP4301 and MP4303 to be measured with CTIN and GND connected (short across P4302 and P4303)

MP4302

MP4303

MP4304

IC4501

IC4502

IC4503

IC4504

IC4505

IC4506

IC4507

IC4508

IC4509

IC4510

IC4511

IC4512

IC4513

IC4514

IC4515

IC4516

IC4517

IC4518

IC4519

IC4520

IC4521

IC4522

IC4523

IC4524

IC4525

IC4526

IC4527

IC4528

IC4529

IC4530

IC4531

IC4532

IC4533

IC4534

IC4535

IC4536

IC4537

IC4538

IC4539

IC4540

IC4541

IC4542

IC4543

IC4544

IC4545

IC4546

IC4547

IC4548

IC4549

IC4550

IC4551

IC4552

IC4553

IC4554

IC4555

IC4556

IC4557

IC4558

IC4559

IC4560

IC4561

IC4562

IC4563

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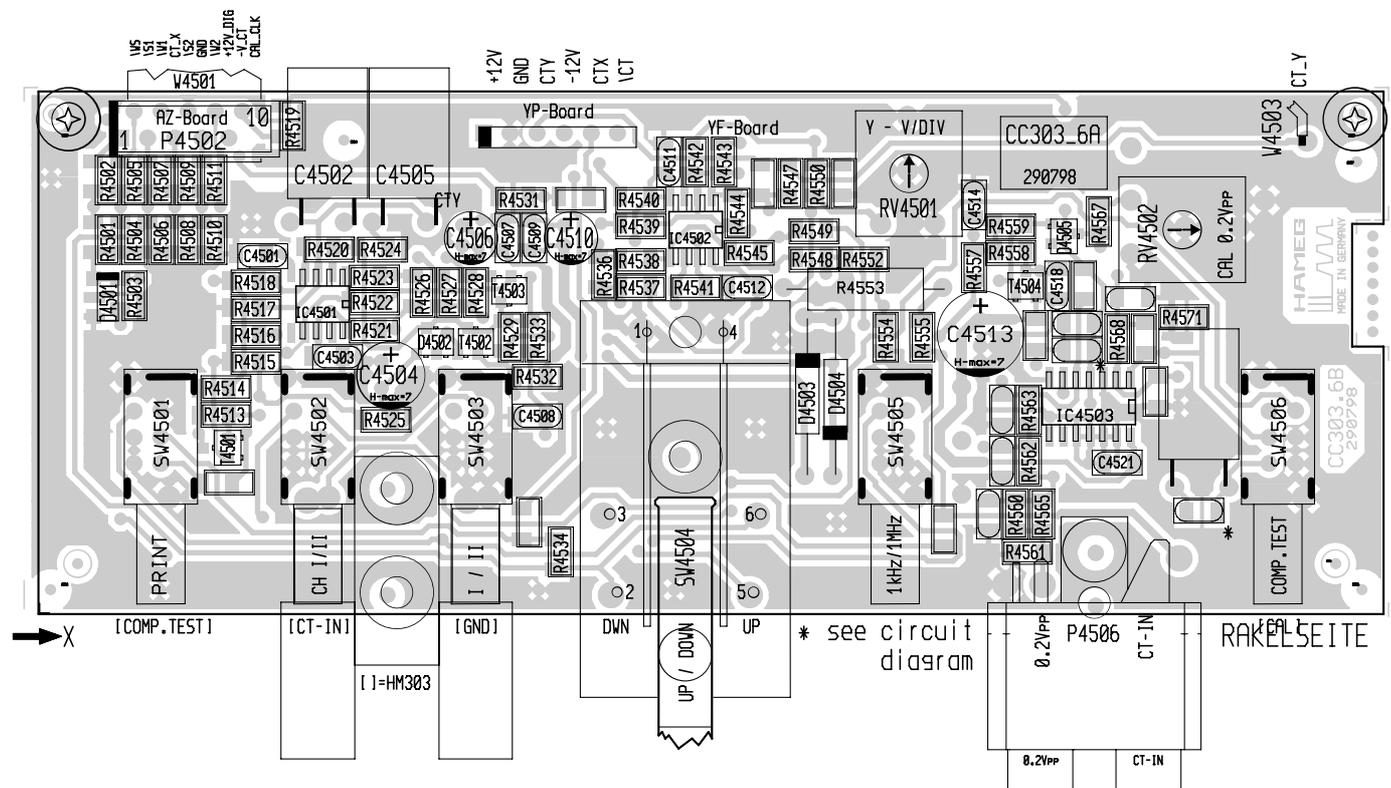
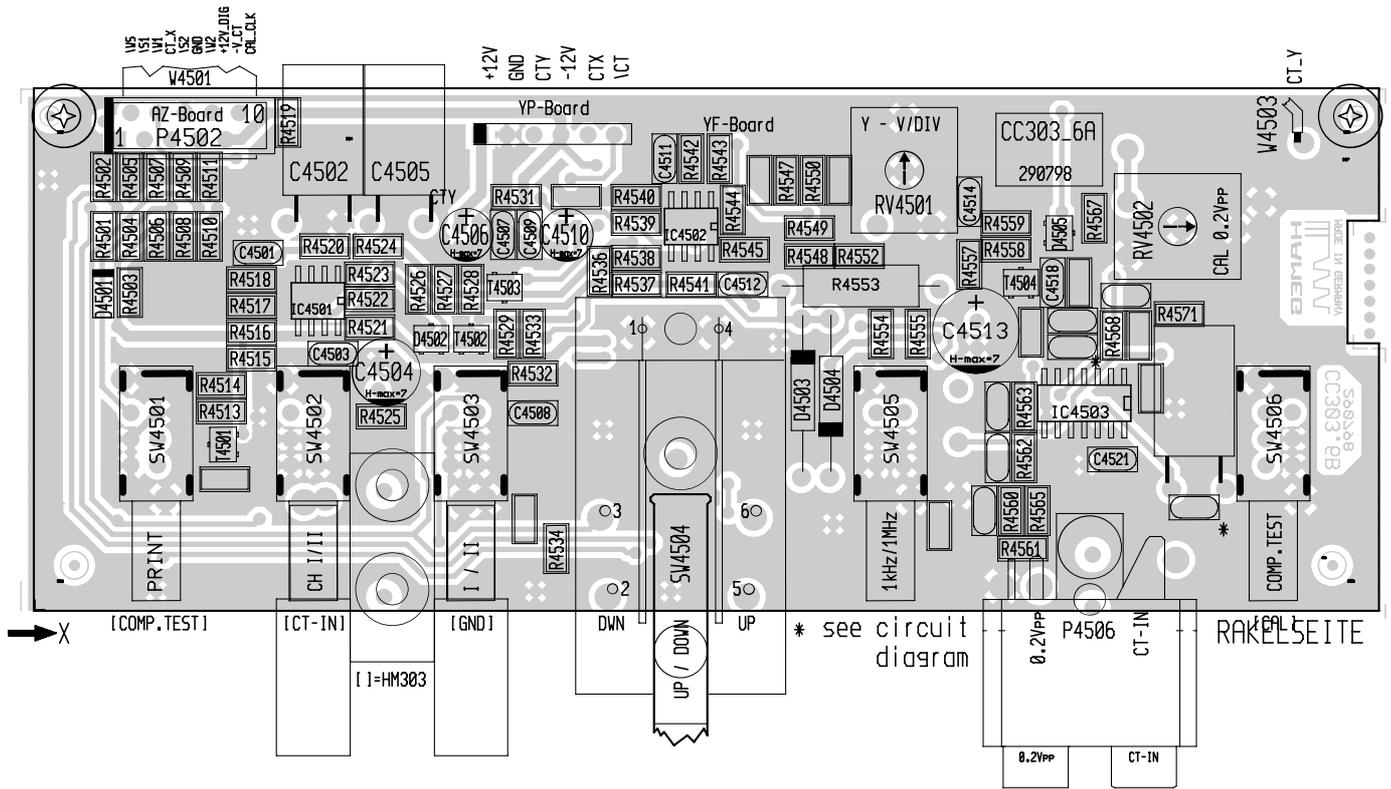
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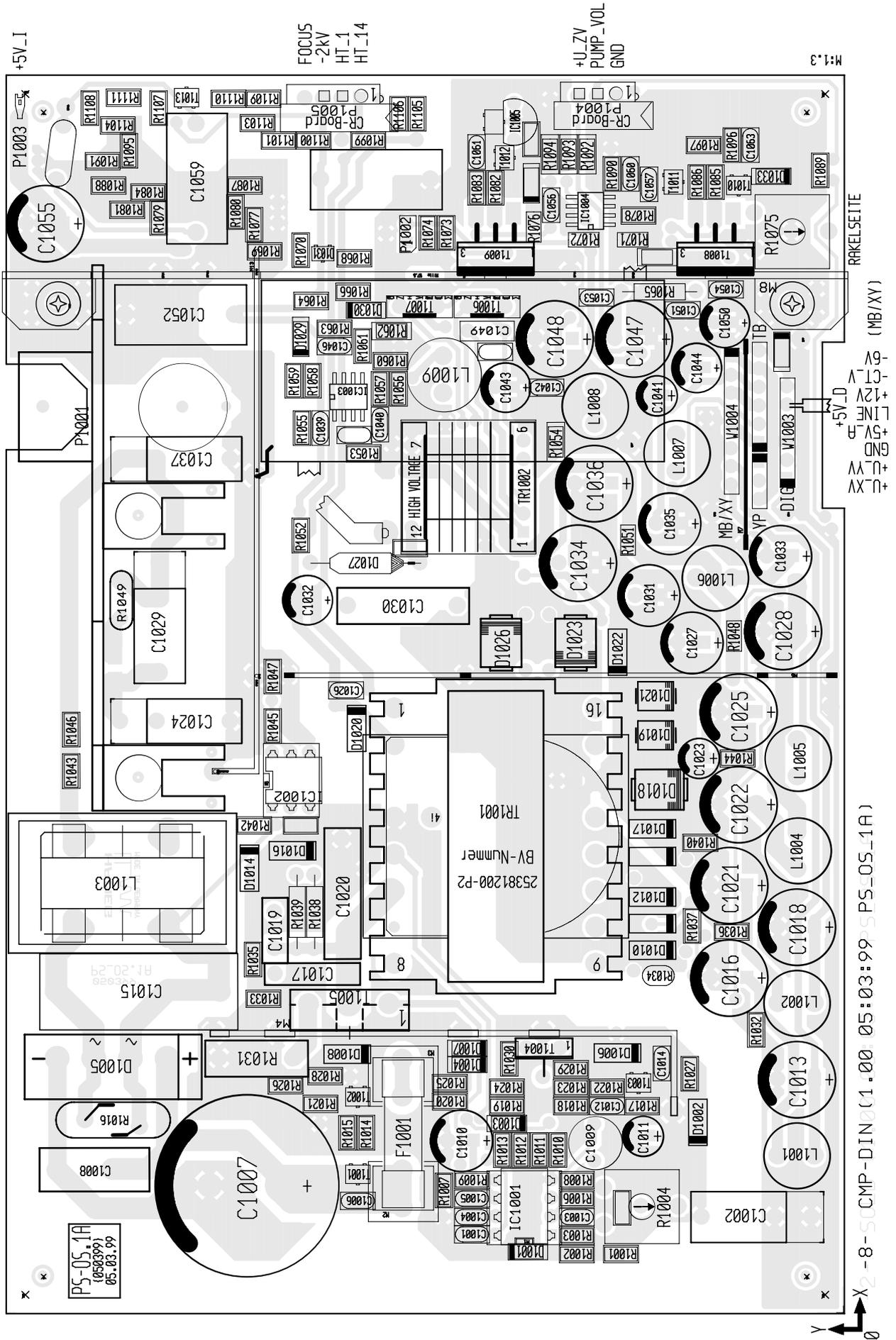
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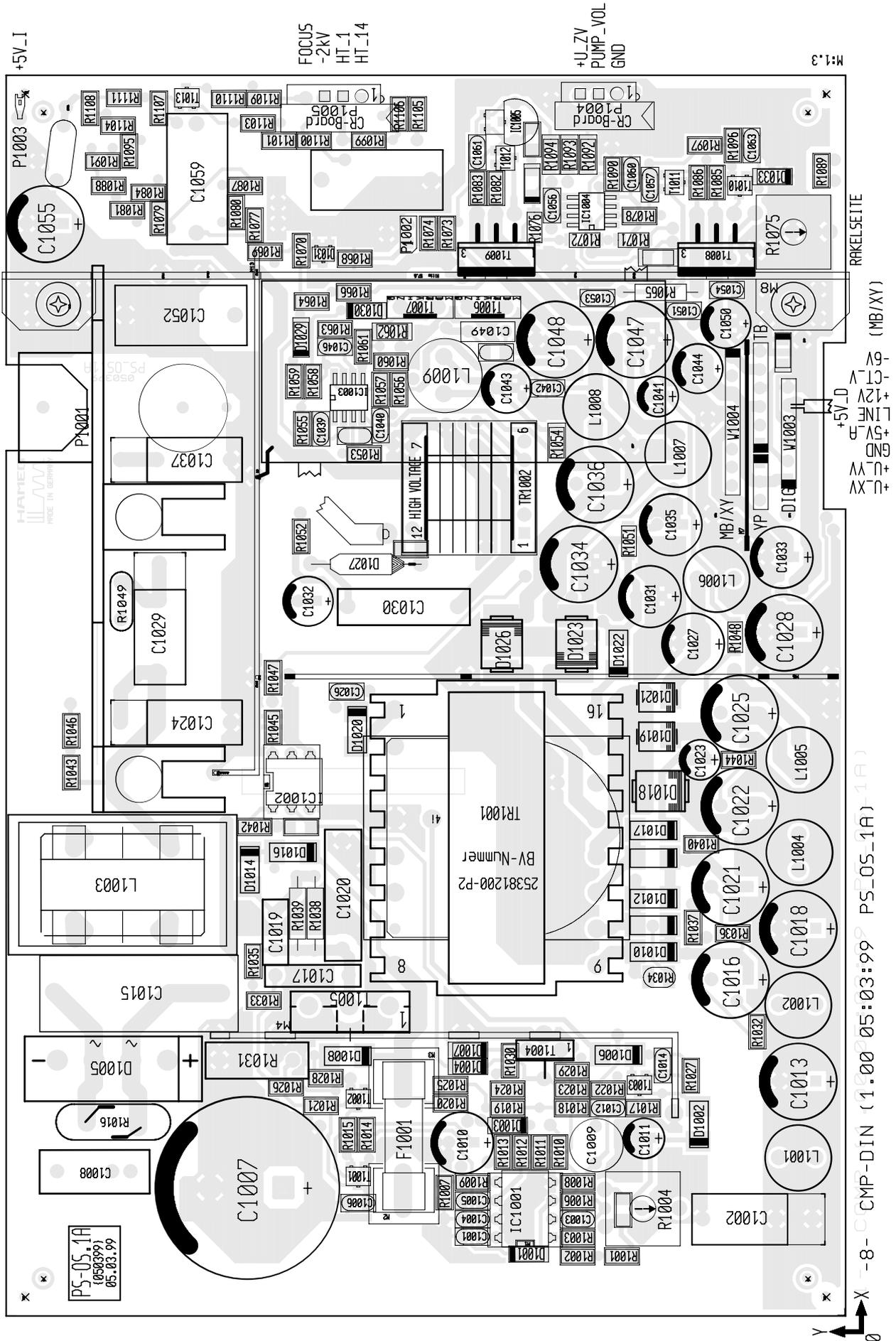
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