HAMEG Instruments

Arbitrary Power Supply HM8142

Service-Manual



CE

Hersteller / Manufacturer / Fabricant **HAMEG Instruments GmbH / Industriestraße 6 / D-63533 Mainhausen**

KONFORMITÄTSERKLÄRUNG / DECLARATION OF CONFORMITY / DECLARATION DE CONFORMITE

HAMEG Instruments

Die HAMEG Instruments GmbH bescheinigt die Konformität für das Produkt
The HAMEG Instruments GmbH herewith declares conformity of the product
HAMEG Instruments GmbH déclare la conformite du produit

Bezeichnung / Product name / Designation:
Netzgerät
Power Supply
Alimentation

Typ / Type / Type: **HM8142**
mit / with / avec: **–**
Optionen / Options / Options: **–**

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 equipements basse tension 73/23/CEE amendée par 93/68/CEE

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées

Sicherheit / Safety / Sécurité
EN 61010-1:2001 (IEC 61010-1:2001)
Überspannungskategorie / Overvoltage category / Catégorie de surtension: II

Verschmutzungsgrad / Degree of pollution / Degré de pollution: 2

Elektromagnetische Verträglichkeit / Electromagnetic compatibility / Compatibilité électromagnétique

EN 61326-1/A1 Störaussendung / Radiation / Emission:
Tabelle / table / tableau 4; Klasse / Class / Classe B.

Störfestigkeit / Immunity / Imunitee: Tabelle / table / tableau A1.

EN 61000-3-2/A14 Oberschwingungsströme / Harmonic current emissions / Émissions de courant harmonique: Klasse / Class / Classe D.

EN 61000-3-3 Spannungsschwankungen u. Flicker / Voltage fluctuations and flicker / Fluctuations de tension et du flicker.

Datum /Date /Date
01.06.2005

Unterschrift / Signature /Signatur

G. Hübenett
Produktmanager

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 rechannelntial, 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 emmission 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 and not be used outchannel buildings. 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 and not be used outchannel buildings.
Signal lines must 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 Instruments GmbH

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Arbitrary Power Supply HM8142



2x 0-30 V/0-2 A 5 V/0-2 A

Display resolution 10 mV/1 mA

Arbitrary waveform power supply (512 points)

Tracking mode for 30 V outputs

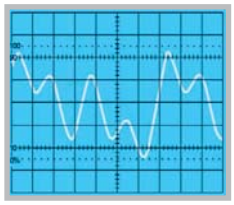
External modulation of output voltages

Electronic load up to 30 W per channel (max. 2 A)

SENSE lines

Multimeter mode for all adjustable outputs

AF arbitrary signal



HO880 IEEE-488 Interface
(Fig. similar)



HO890 RS-232 Interface
(Fig. similar)



RS-232 | optional IEEE 488 | optional USB

Arbitrary Power Supply HM8142

Valid at 23 °C after a 30 minute warm-up period

Output voltages:	2 x 0 - 30 V_{DC}; 1 x 5 V_{DC}
Output currents:	2 x 0 - 2 A_{DC}; 1 x 2 A_{DC}
Resolution:	10 mV/1 mA
Operating modes:	constant voltage (CV); constant current (CC)
Output impedance:	‹ 5 mΩ II 0.1 µF+1.5 mH (V-source)
Residual ripple (V):	‹ 2 mV_{rms} (at full load; 10 Hz – 100 kHz) ‹ 3 mV_{rms} (at full load; 10 Hz – 1 MHz)
(A):	‹ 60 μA_{rms} (at full load)
Bandwidth (-3 dB):	› 8 kHz
Slew rate (dV/dt):	typ. › 0.7 V/µs
Rise time:	typ. 50 µs
Recovery time:	typ. 40 µs
Current limit response time:	200 µs (2 µs f. I_{out} › 3 A)
Stability (dV/dϑ):	‹ 300 ppm/°C+250 µV/°C
(dI/dϑ):	‹ 300 ppm/°C+ 25 µA/°C
Modulation inputs:	0 - 3 V (± 1 V); R_i = 10 kΩ
Setting accuracy:	0,2 % of reading ± 3 digits
Measurement accuracy:	0,2 % of reading ± 1 digit
Load regulation:	0.03 % (at V_A = 15 V; ΔI = 1 A)
Line regulation:	‹ 1 mV/V
Compensation for line resistances:	to max. 1 Ω
Setting time:	‹ 5 ms (manual), ‹ 10 ms (IEEE)

Arbitrary function	**(for one output voltage only)**
Number of points:	512
Point parameters:	voltage and dwell time
Min. dwell time:	100 µs
Max. dwell time:	50 sec.
Step widths:	100 µs, 200 µs, 500 µs; 1, 2, 5 ms; 10, 20, 50 ms...50 s (16 values)
Repeat rate in arbitrary mode:	1-255 fach and ∞
Vertical resolution:	10 mV

Sink mode	
Operating mode:	constant current (CC)
Output power:	60 Watt (max. 2 A) per output
Output impedance:	› 100 kΩ + 1 µF (I-source)
Programming accuracy:	0,2 % of reading ± 3 digits
Resolution:	1 mA
Measurement accuracy:	0.2 % of reading ± 1 digit

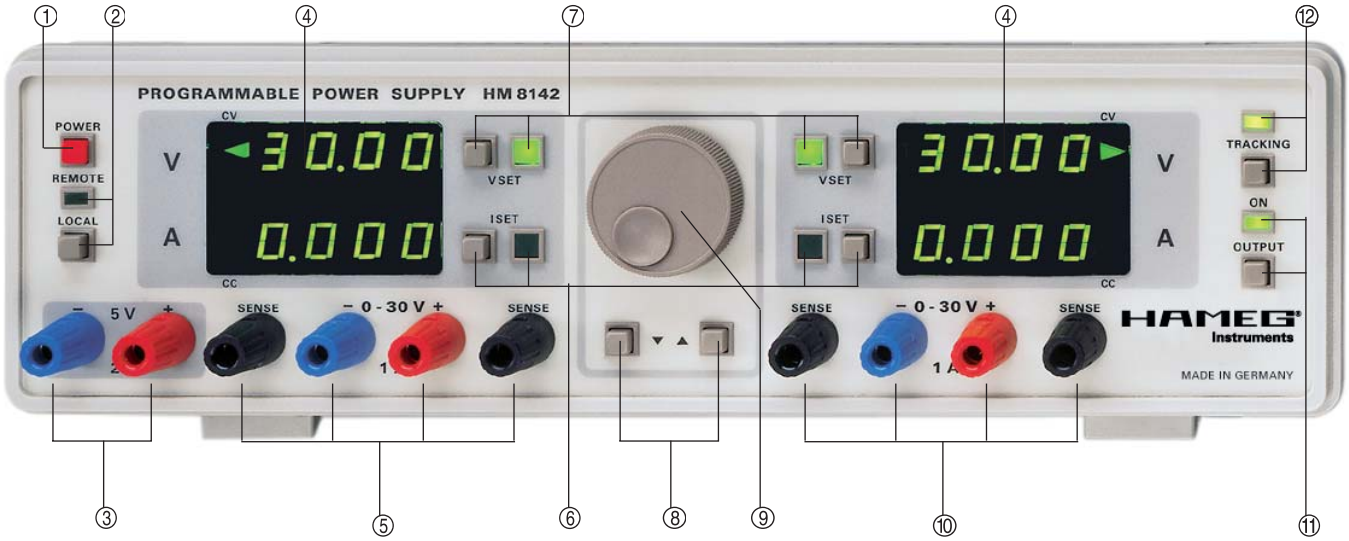
Miscellaneous	
Safety class:	Safety class I (EN61010-1)
Power supply:	115/230 V ±15 %; 50/60 Hz
Power consumption:	approx. 160 W
Operating temperature:	0°C to +40°C
Max. relative humidity:	10 %-90 % (without condensation) 5 %-95 % RH
Dimensions (W x H x D):	285 x 75 x 365 mm
Weight:	approx. 10 kg

Accessories supplied: Operator's Manual and power cable
Optional accessories: HZ10 test leads, HZ42 19" Rackmount kit 2RU, HZ72-S/L Cable for IEEE bus, 1 m/1.5 m, HO880 IEEE-488 interface, HO890 RS-232 interface

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Controls and display

① **POWER** switch
Mains connector at rear panel

② **REMOTE / LOCAL** (pushbutton and LED)
The REMOTE LED is lit when the instrument is operated via interface. Return to local by depressing the the localswitch is possible, provided the instrument is not in local lockout state.

③ **5V** (Fixed)
5V output; max. current 2 A

④ **Digital display** (2x4 digit)
Simultaneous display of settings and measurement values for output voltage and output current

⑤ **30V** (adjustable, 0–30V)
4mm bananatype output sockets for SOURCE and SENSE

⑥ I_{Set} (pushbutton and LED)
Setting of current limit via frontpanel. When depressing the button the setting function is active and the appertaining LED is lit for approx. 4 sec.

⑦ V_{Set} (pushbutton and LED)
Setting of output voltage via frontpanel. When depressing the button the setting function is active and the appertaining LED is lit for approx. 4 sec.

⑧ **UP / DOWN** (pushbuttons)
Decreases or increases the current and voltage settings by 1 mA and 10 mV steps respectively.

⑨ **Rotary knob**
Parameter setting for voltage and current values

⑩ **30V** (adjustable, 0–30V)
4mm bananatype output sockets for SOURCE and SENSE

⑪ **OUTPUT** (pushbutton and LED)
On/off key for all output voltages

⑫ **TRACKING** (pushbutton and LED)
Aktivation of the tracking function for the 30V outputs

Rear panel

⑬ **MODULATION R / L** (BNC sockets)
Analog modulation inputs for the 30V outputs

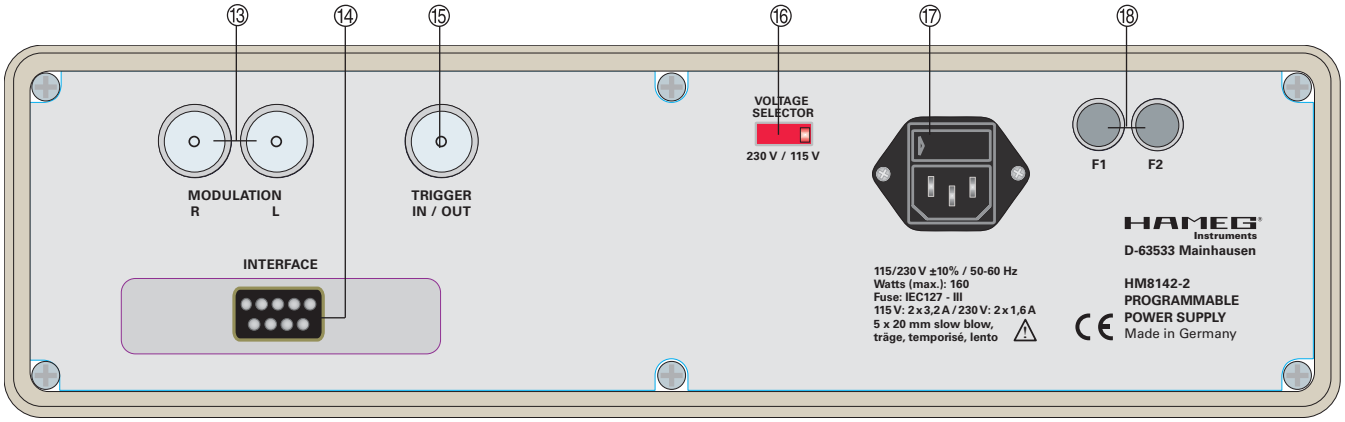
⑭ **Interface RS-232**

⑮ **TRIGGER IN/OUT** (BNC socket)
Input/output for start and trigger signals to/from the HM8142

⑯ **Voltage selector**

⑰ **Mains connector**

⑱ **Fuses**



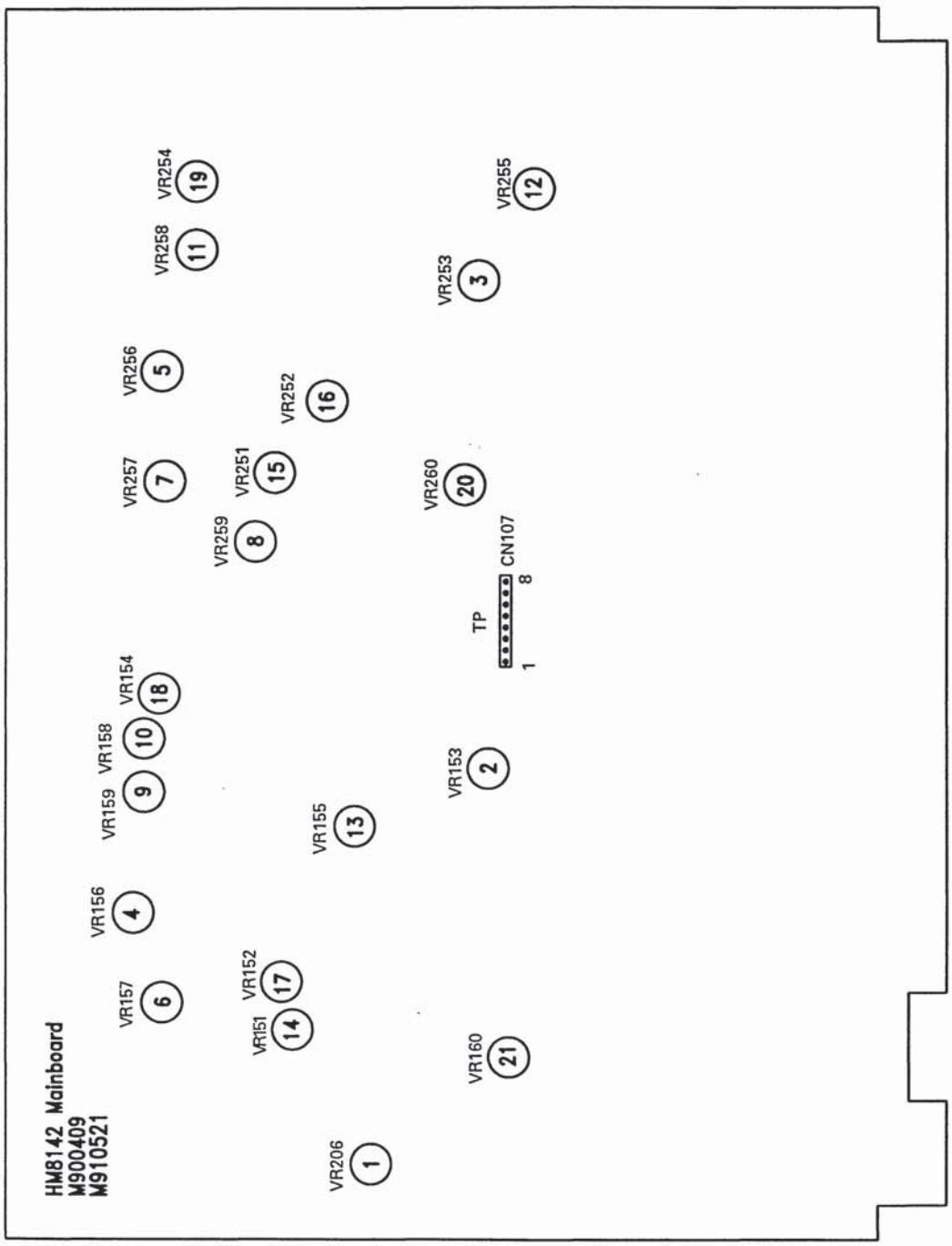
Adjustment

Measurement equipment required
- Digital Multimeter (DMM), e.g. HM8012, HM8112-3
- Power supply 17V, min. 1.2A
- Load 15Ω 15W

Presettings:
Switch on the HM8142 while depressing the LOCAL button ②. Service mode is now indicated by the blinking decimal points in the display. Switch the output on and the tracking mode off and start the adjustment procedure described below. The index is subdivided into the left channel (index a) and the right channel of the power supply (index b). For adjustment points and figures see the following page.

Adjustment	HM8142 Settings	Connection of measuring instruments	Adjustm. point	Adjustm. value
Output 5V / 2A		DMM to 5V output	VR206 (1)	5V ±5mV
Initial current I_0a	15.00 V 0.002 A	DMM 0.2V, DC to CN107 checkpoint TP1 -TP2	VR153 (2)	6mV ±0.5mV
Initial current I_0b	15.00 V 0.002 A	DMM 0.2V, DC to CN107 checkpoint TP7-TP8	VR253 (3)	6mV ±0.5mV
Offset +Ia	15.00 V 0.002 A	DMM 20mA,DC to output 30V/1A left channel	VR156 (4)	2.25mA ±0.03mA
Offset +Ib	15.00 V 0.002 A	DMM 20mA,DC to output 30V/1A right channel	VR256 (5)	2.25mA ±0.03mA
Offset –Ia	15.00 V 0.002 A	Connecting as fig. 1, DMM 20mA,DC 30V/1A left channel	VR157 (6)	2.25mA ±0.03mA
Offset –Ib	15.00 V 0.002 A	Connecting as fig. 1, DMM 20mA,DC 30V/1A right channel	VR257 (7)	2.25mA ±0.03mA
Maximum value –Ib	15.00 V 1.000 A	Connection as fig.1, DMM 2A, DC 30V/1A right channel	VR259 (8)	–1 A ±0A
Maximum value –Ia	15.00 V 1.000 A	Connection as fig.1, DMM 2A, DC 30V/1A left channel	VR159 (9)	–1 A ±0A
Maximum value +Ia	15.00 V 1.000 A	DMM 2A, DC to output 30V/1A left channel	VR158 (10)	1 A ±0A
Maximum value +Ib	15.00 V 1.000 A	DMM 2A, DC to output 30V/1A right channel	VR258 (11)	1 A ±0A
Current display right channel	15.00 V 1.000 A	DMM 2A, DC to output 30V/1 A right channel	VR255 (12)	1 A ±0A display
Current display left channel	15.00 V 1.000 A	DMM 2A, DC to output 30V/1 A right channel	VR155 (13)	1 A ±0A display
Offset Ua	0.00 V 0.010 A	DMM 0.2V, DC to output 30V/1A left channel	VR151 (14)	0 mV ±2mV
Offset Ub	0.00 V 0.010 A	DMM 0.2V, DC to output 30V/1 A right channel	VR251 (15)	0 mV ±2mV
Maximum value *1) Ub	19.00 V 0.010 A	DMM 20V, DC to output 30V/1A right channel	VR252 (16)	19V ±3mV
Maximum value *1) Ua	19.00 V 0.010 A	DMM 20V, DC to output 30V/1A left channel	VR152 (17)	19V ±3mV
Voltage display *1) left channel		–	VR154	19 V ±0V display (18)
Voltage display *1) right channel		–	VR254	19 V ±0V display (19)
Statistical internal resistance right channel	14.00 V 1.000 A	Connection as fig. 2, DMM 20V, DC to output 30V/1A right channel	VR260 (20)	du ≤1mV
Statistical internal resistance left channel		Connection as fig. 2, DMM 20V, DC to output 30V/1A left channel	VR160 (21)	du ≤1mV

*1) If a multimeter with min. 30 000 digit resolution is available, set output voltage to 30.00V and adjust to 30V ±3mV.



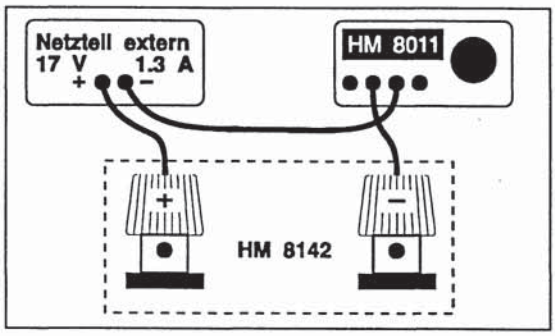


Bild1: **Figure1:**
Anschluß von separatem Netzteil und Multimeter
Connection of separate power supply and DMM
Branchement de l'alimentation extérieure et du multimètre

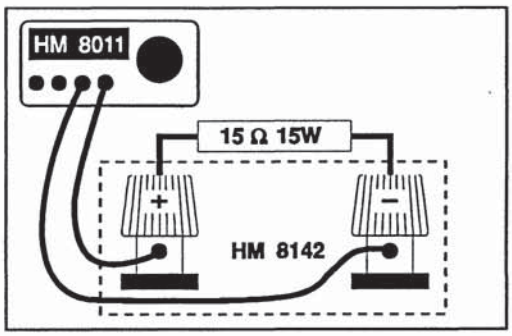
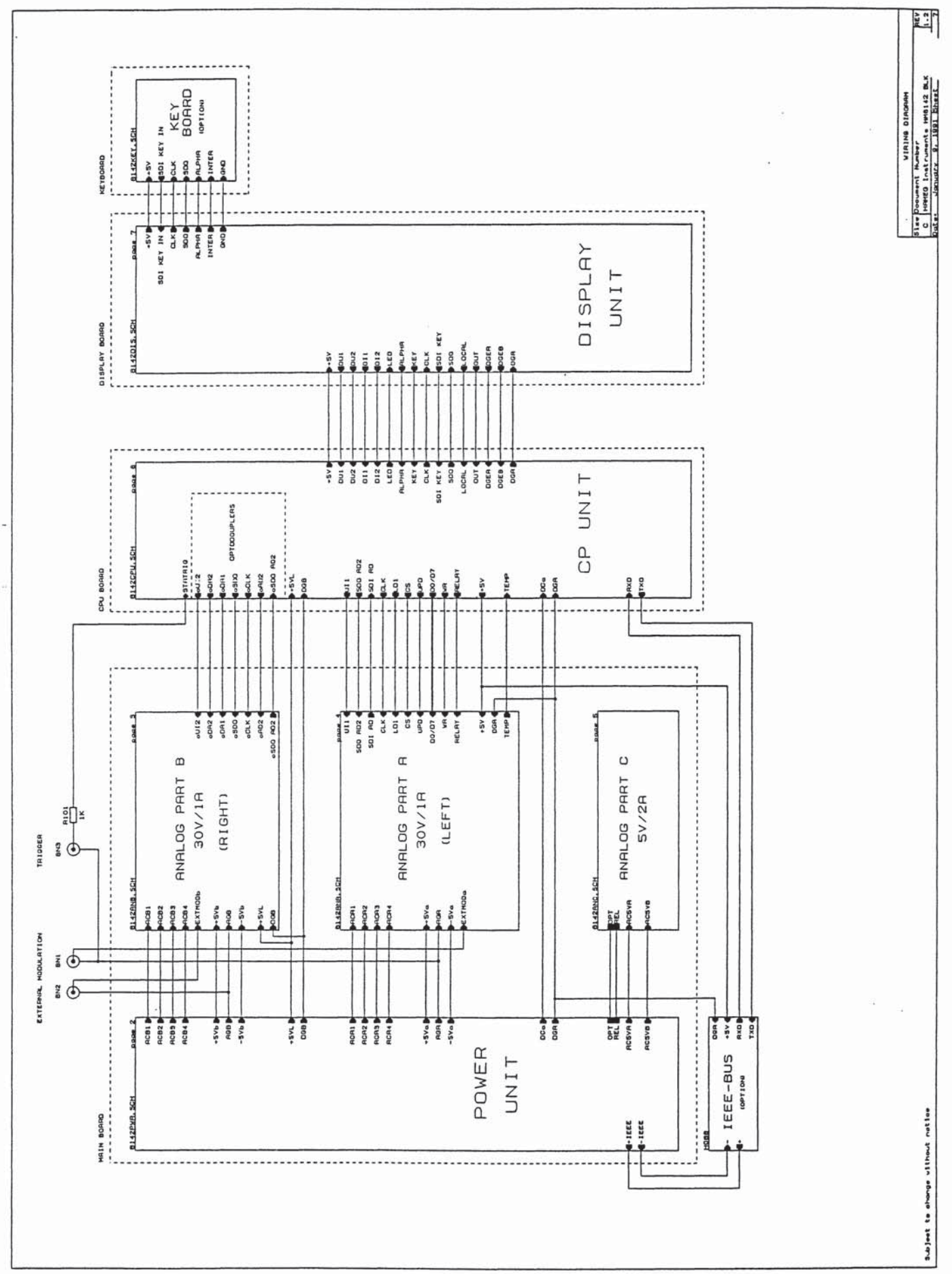
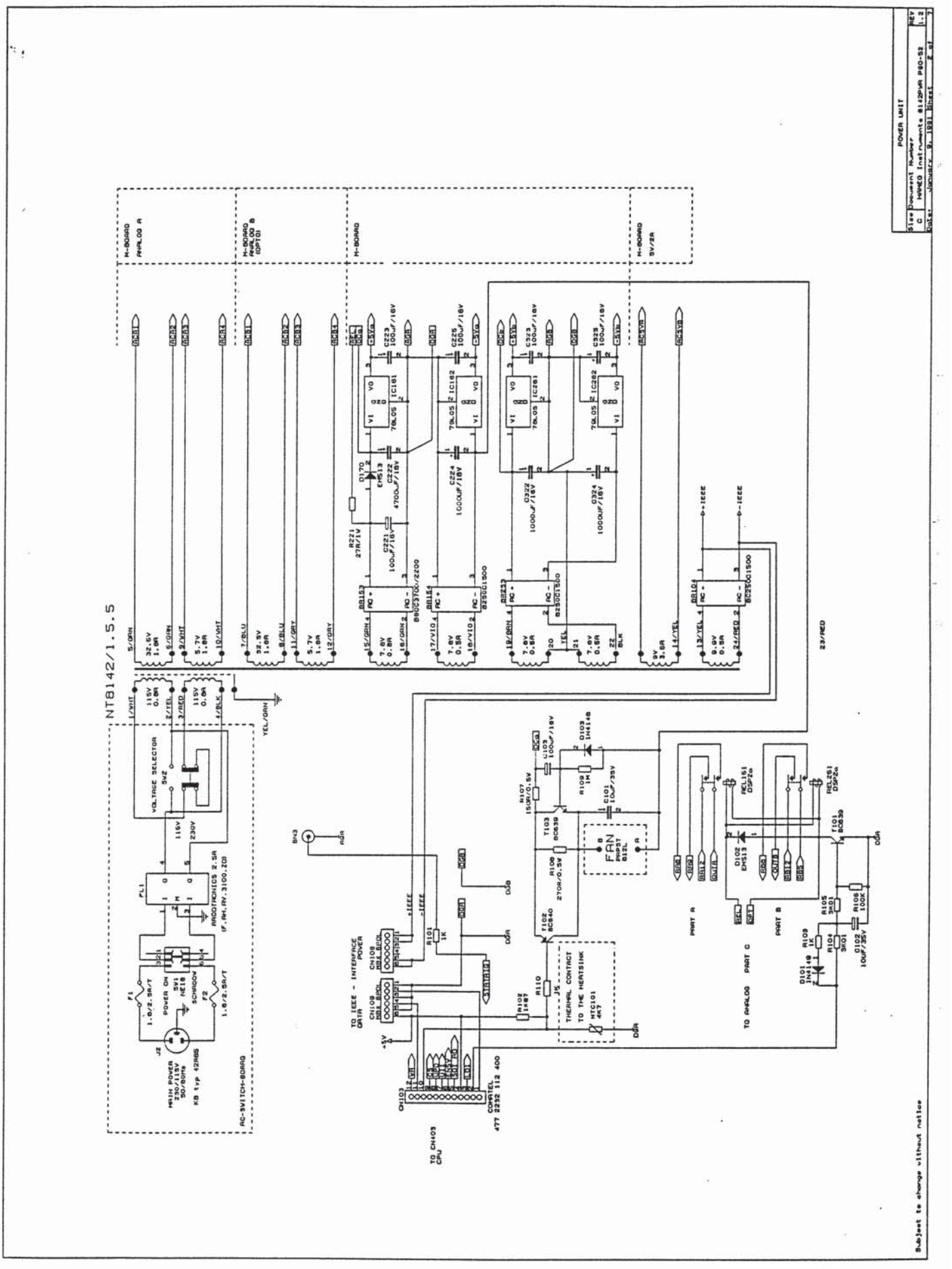
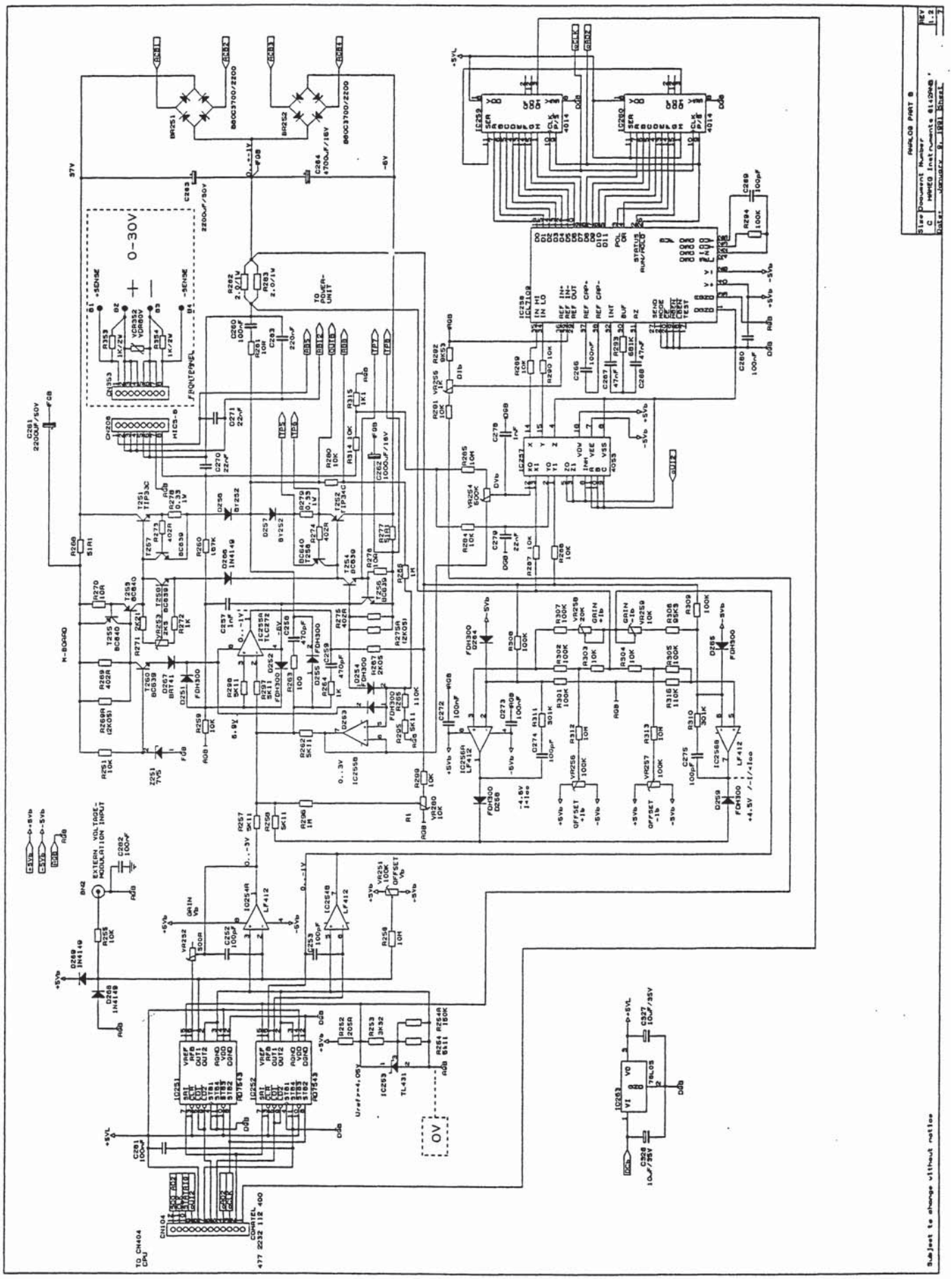
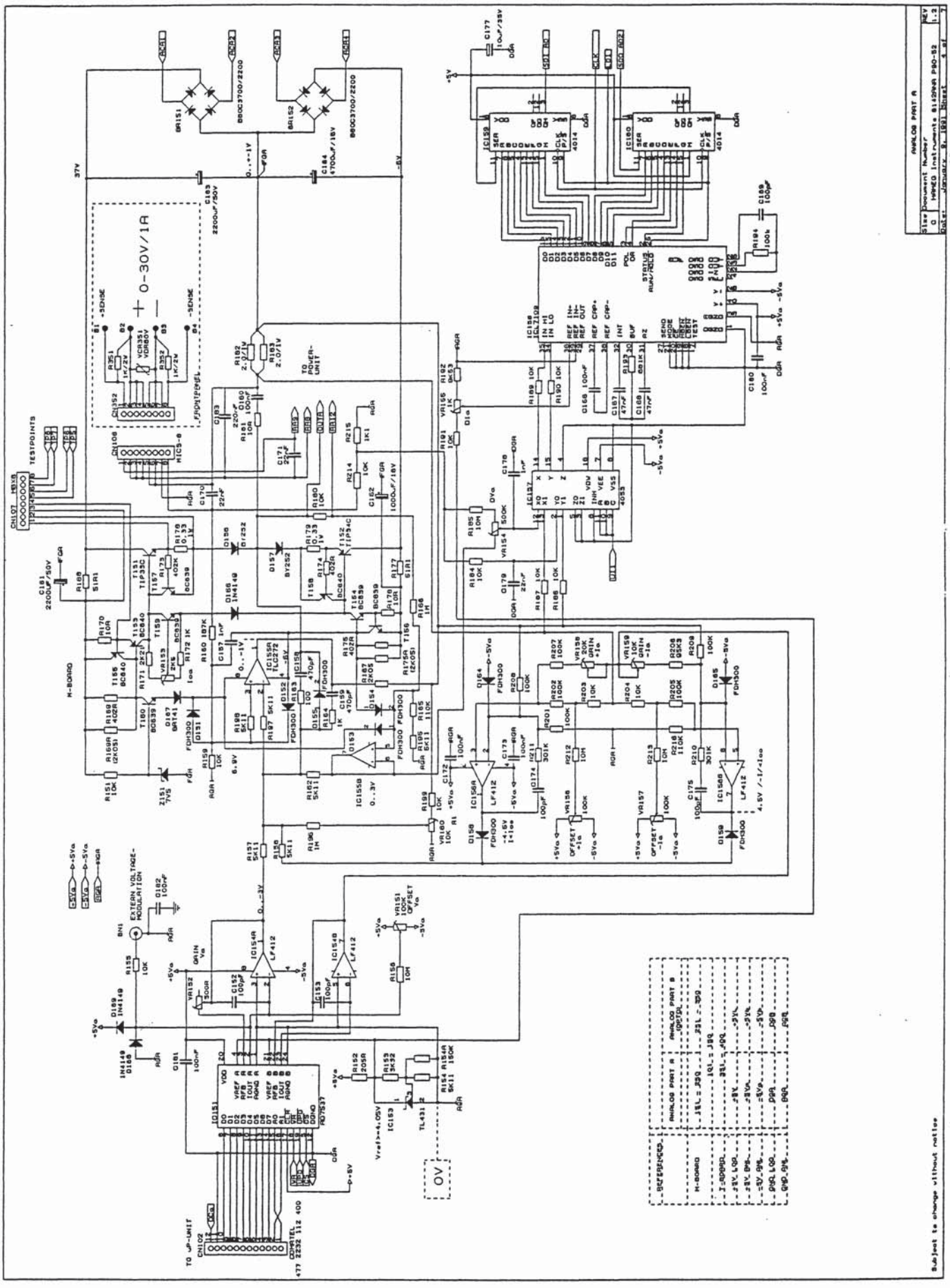


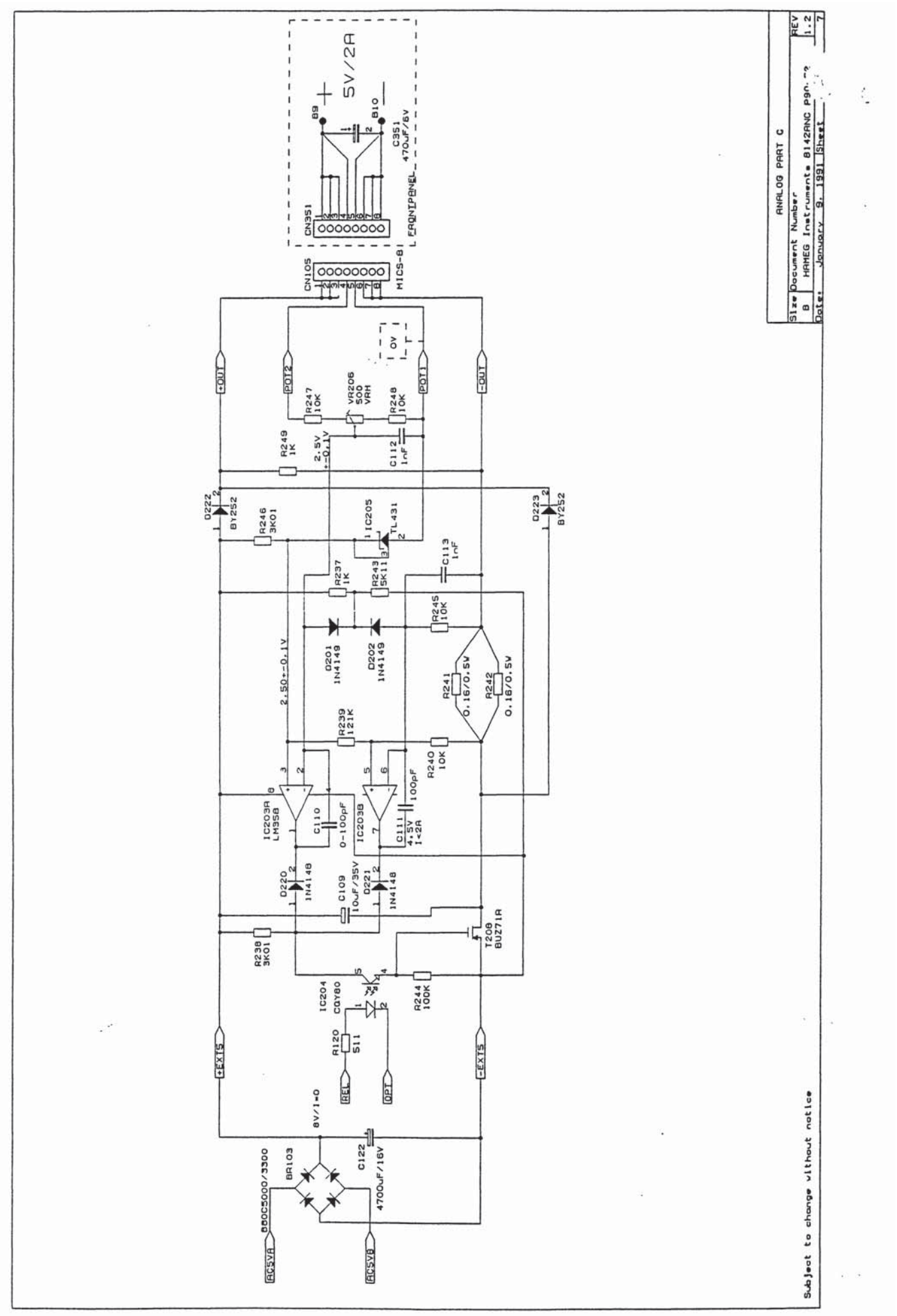
Bild2: **Figure2:**
Anschluß des Lastwiderstandes
Connection of load resistance
Branchement de la charge

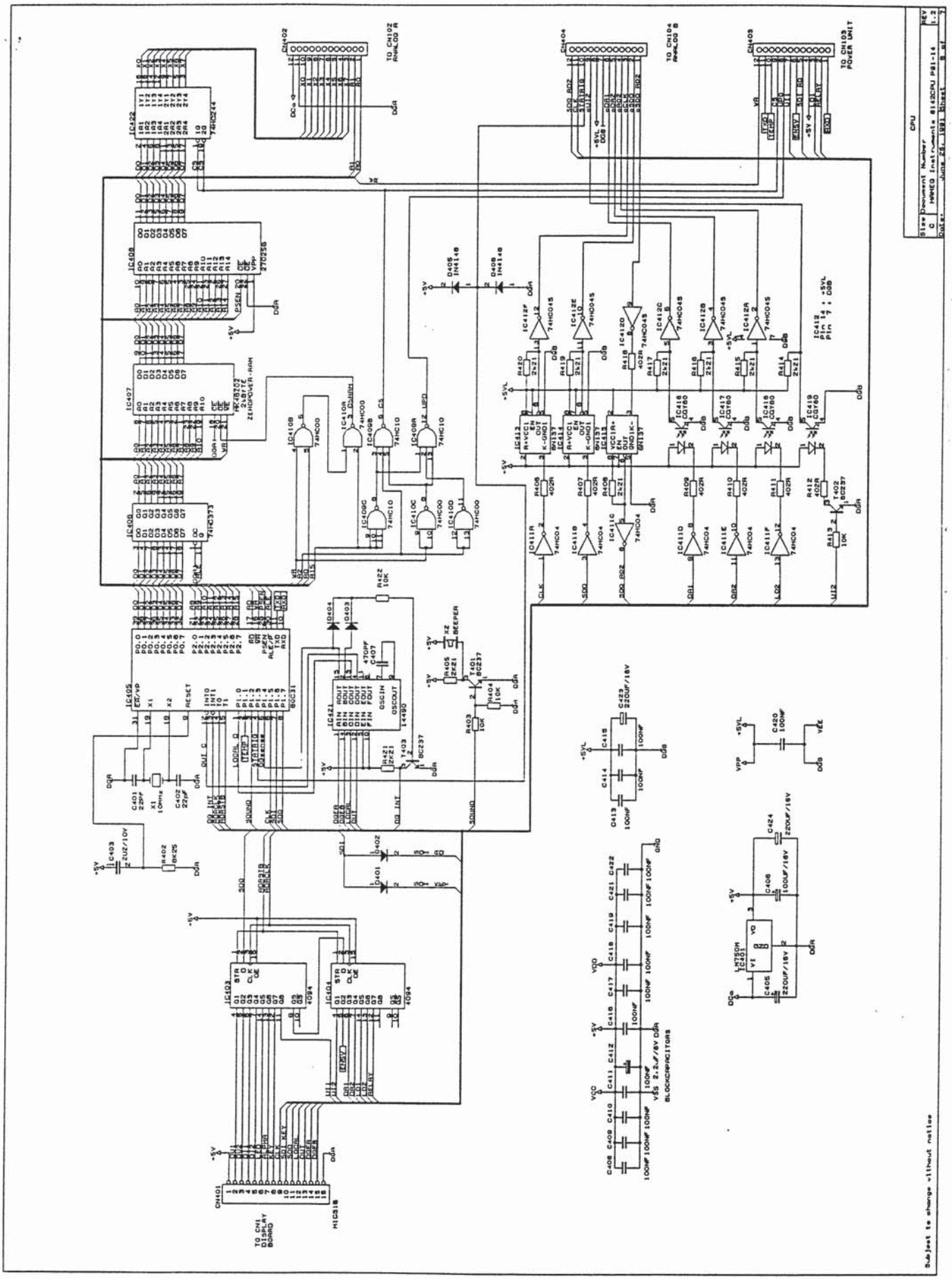

KEYBOARD
A142KEY.SCH
KEY BOARD (OPTION)
DISPLAY BOARD
A142DIS.SCH
DISPLAY UNIT
CPU BOARD
A142CPU.SCH
CP UNIT
OPTOCOUPLERS
MAIN BOARD
A142PWR.SCH
POWER UNIT
A142ANB.SCH
ANALOG PART B 30V/1A (RIGHT)
A142ANA.SCH
ANALOG PART A 30V/1A (LEFT)
A142ANC.SCH
ANALOG PART C 5V/2A
IEEE-BUS (OPTION)
TRIGGER
EXTERNAL MODULATION
R101 1K
BN3
BN1
BN2
VIRING DIAGRAM
Size Document Number
C HAMEG Instruments HM8142 BLK
Date: January 8, 1991 Sheet
REV 1.2
Subject to change without notice


NT8142/1.5.5
POWER UNIT
M-BOARD ANALOG A
M-BOARD ANALOG B (OPTO)
M-BOARD
M-BOARD 5V/2A
VOLTAGE SELECTOR
POWER ON
SCHADOW
MAINS POWER 230/115V 50/60Hz
KB typ 42RBS
AC-SWITCH-BOARD
TO IEEE - INTERFACE PCB
TO CH403 CPU
TO THERMAL CONTACT
TO THE HEATSINK
TO ANALOG PART C
PART A
PART B
FAN
Subject to change without notice

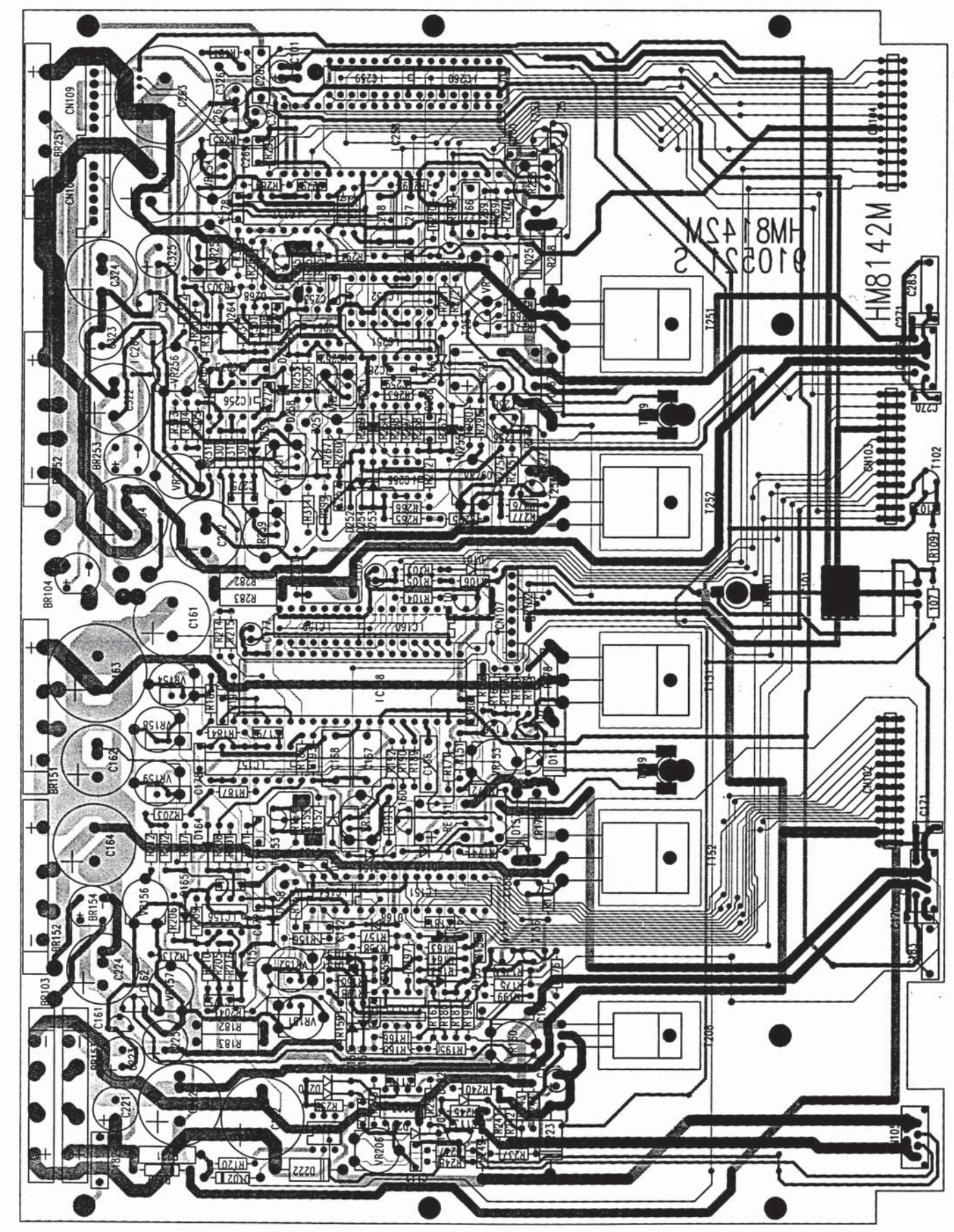



+ 0-30V/1A —
M-BOARD
ANALOG PART A
ANALOG PART B
DIGITAL
Subject to change without notice

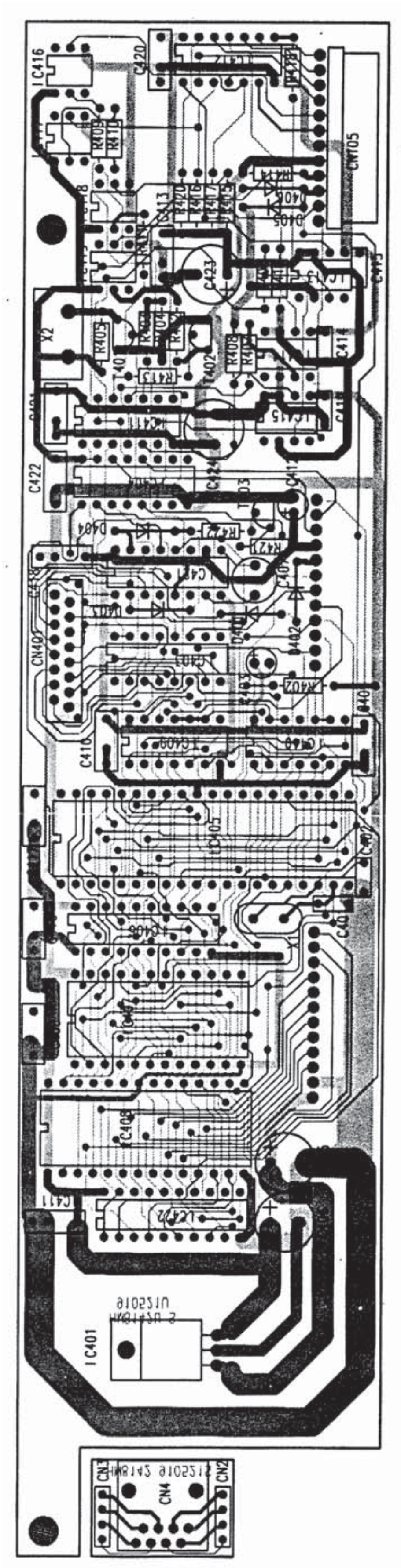

ANALOG PART C
Size B
Document Number
HAMEG Instruments 8142ANC pgn.??
Date: January 9, 1991 Sheet
REV 1.2
Subject to change without notice
5V/2A
C351 470uF/6V
CN351
L FRONTPANEL
MICS-8
CN105
+OUT
-OUT
+EXTS
-EXTS
POT1
POT2
R247 10K
VR206 500 VRH
R248 10K
R249 1K
2.5V +-0.1V
C112 1nF
D222 BY252
D223 BY252
R246 3K01
IC205 TL431
R237 1K
R243 5K11
C113 1nF
R245 10K
D201 1N4149
D202 1N4149
2.50+-0.1V
R239 121K
R241 0.16/0.5W
R242 0.16/0.5W
R240 10K
IC203A LM358
IC203B
C110 0-100pF
C111 4.5V 1<2A 100pF
D220 1N4148
D221 1N4148
C109 10uF/35V
R238 3K01
T208 BUZ71A
IC204 CQY80
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R244 100K
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OPT
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C122 4700uF/16V
B50C5000/3300
ACSVA
ACSVB



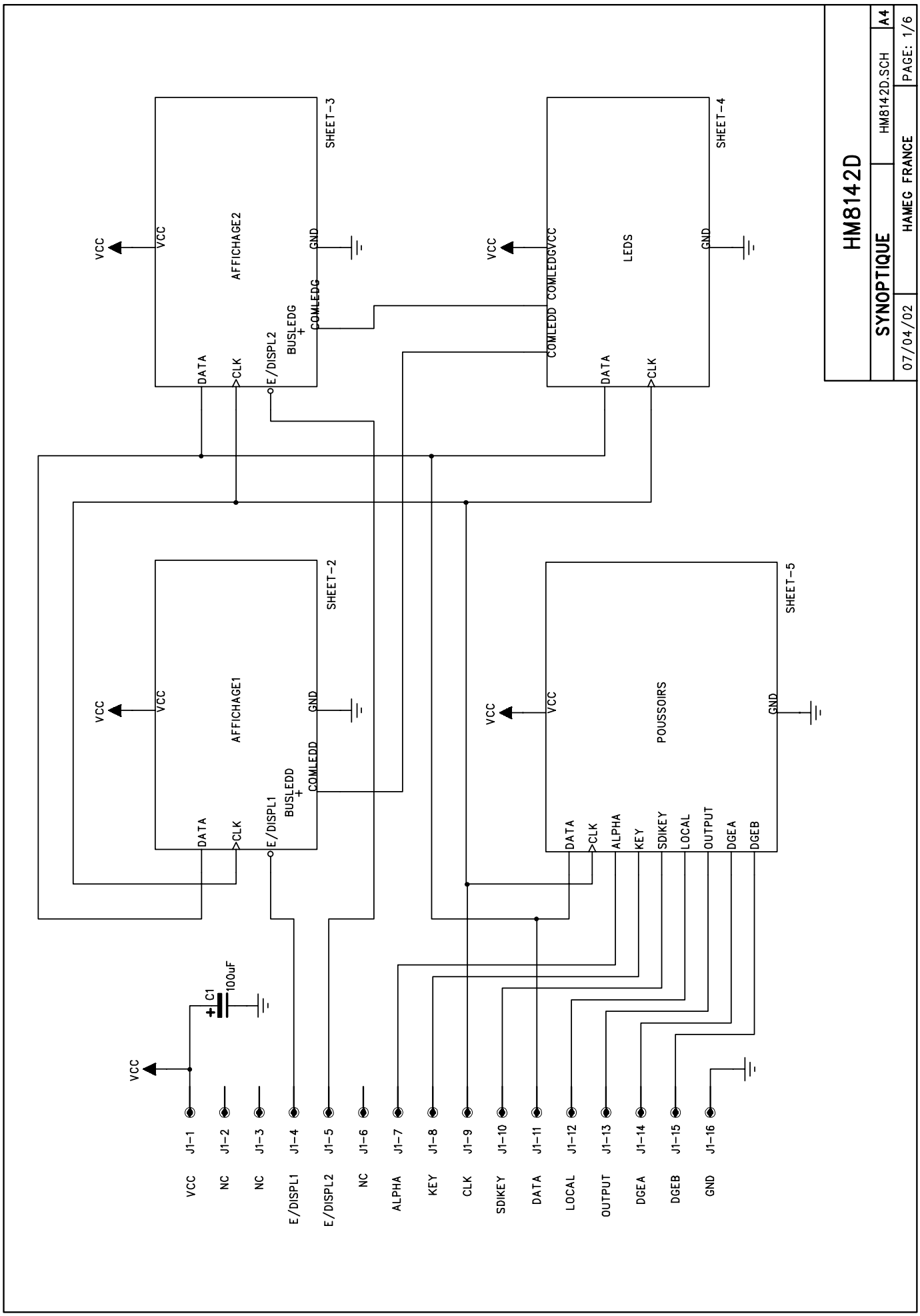
Mainboard

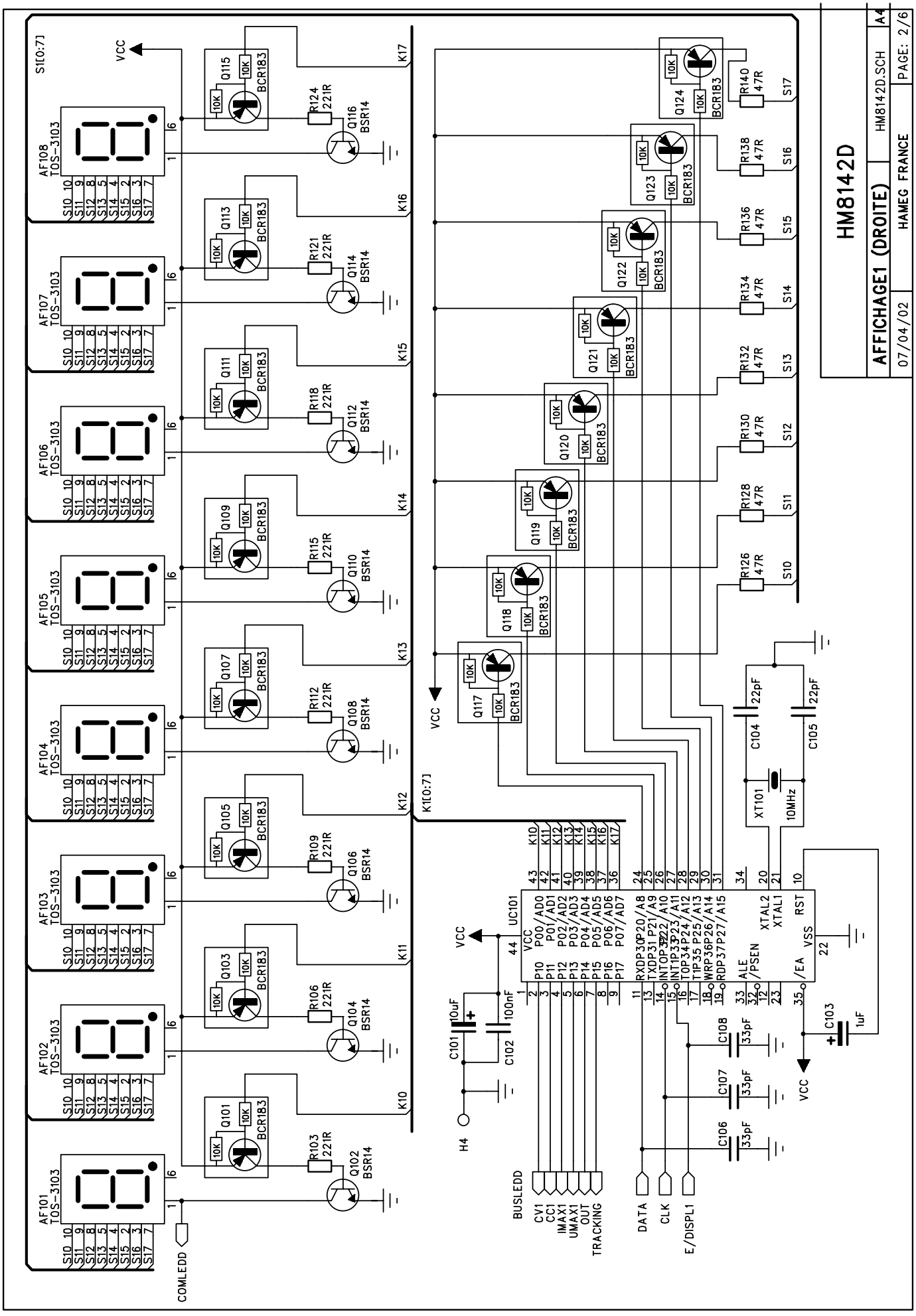


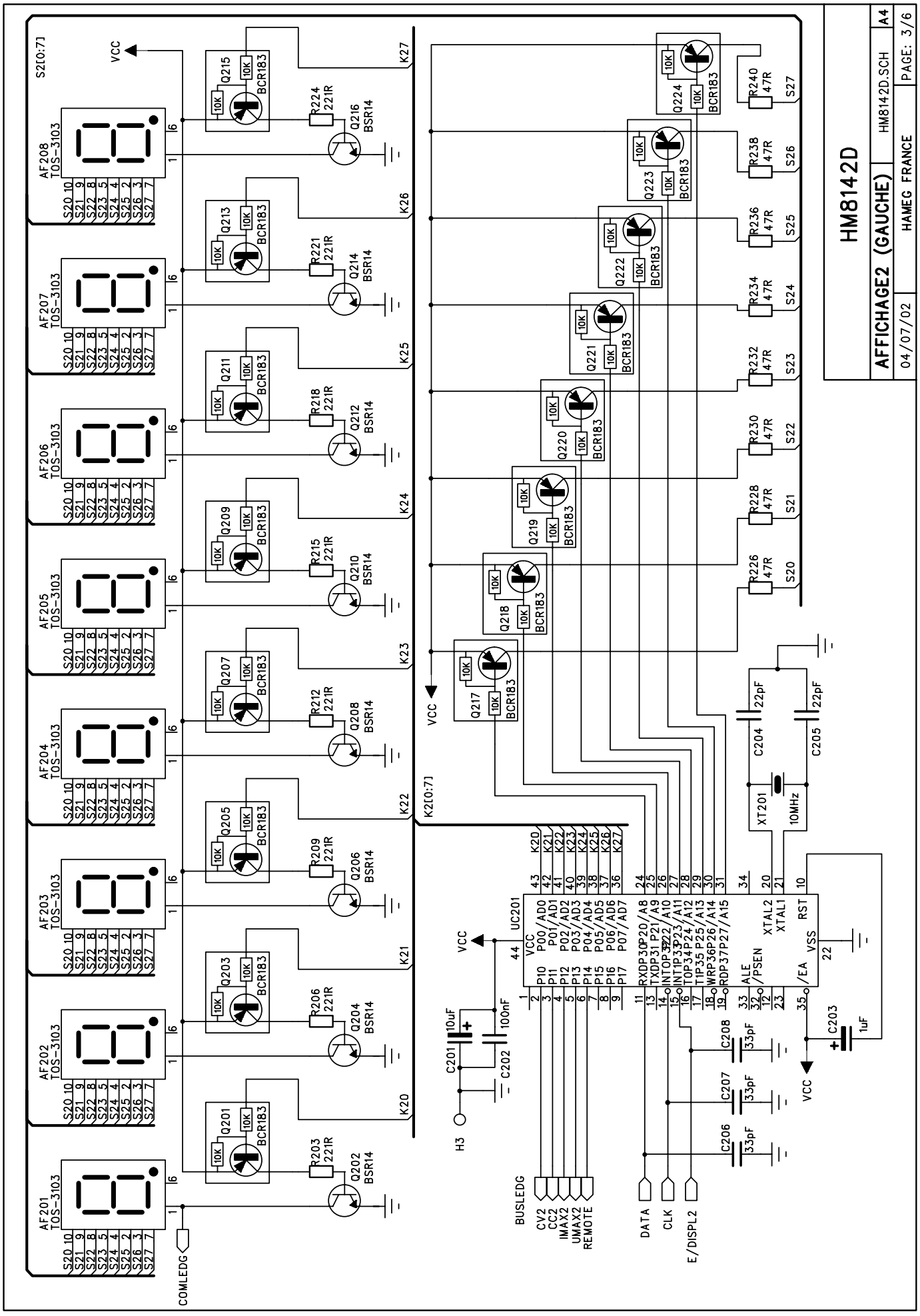
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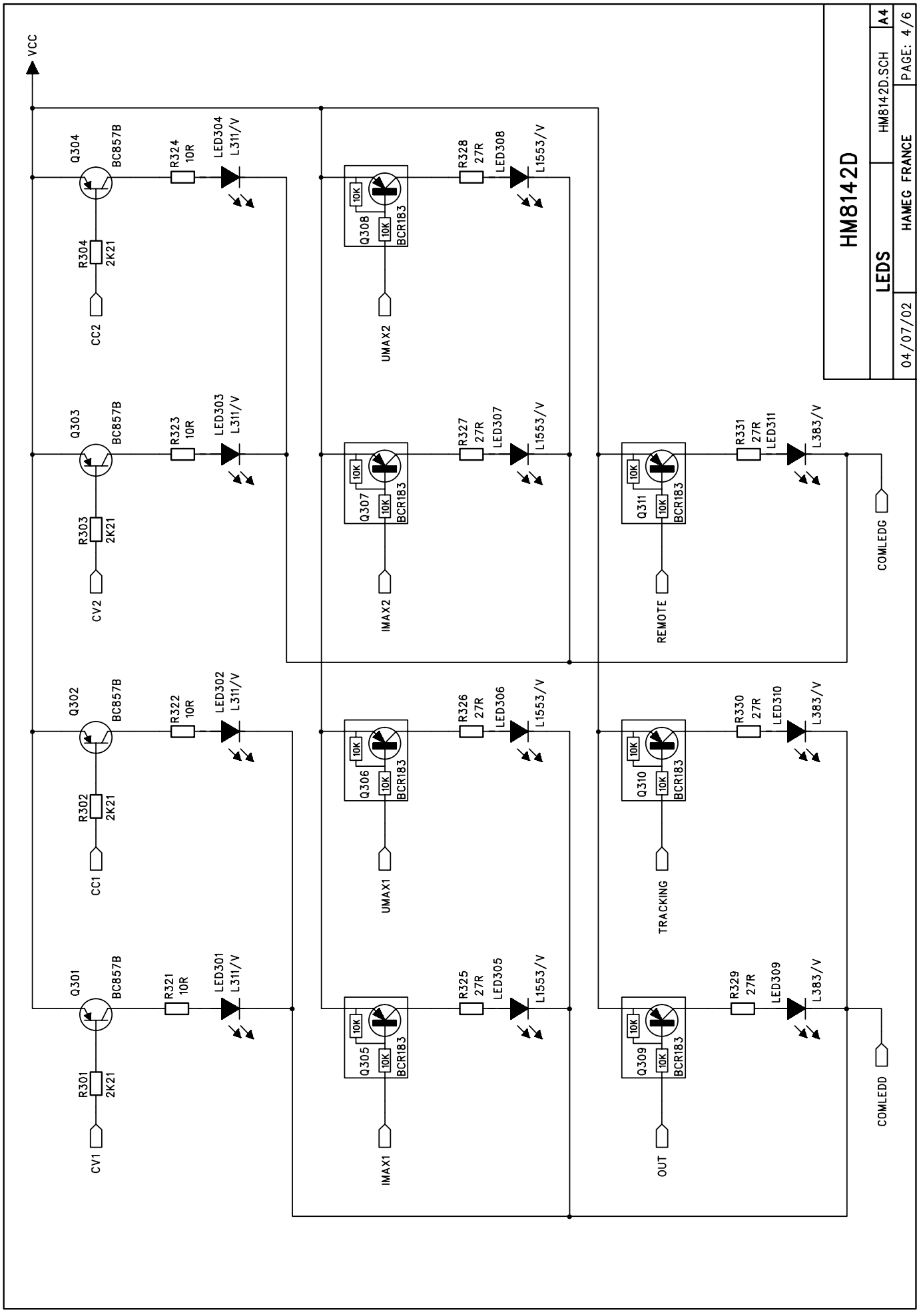


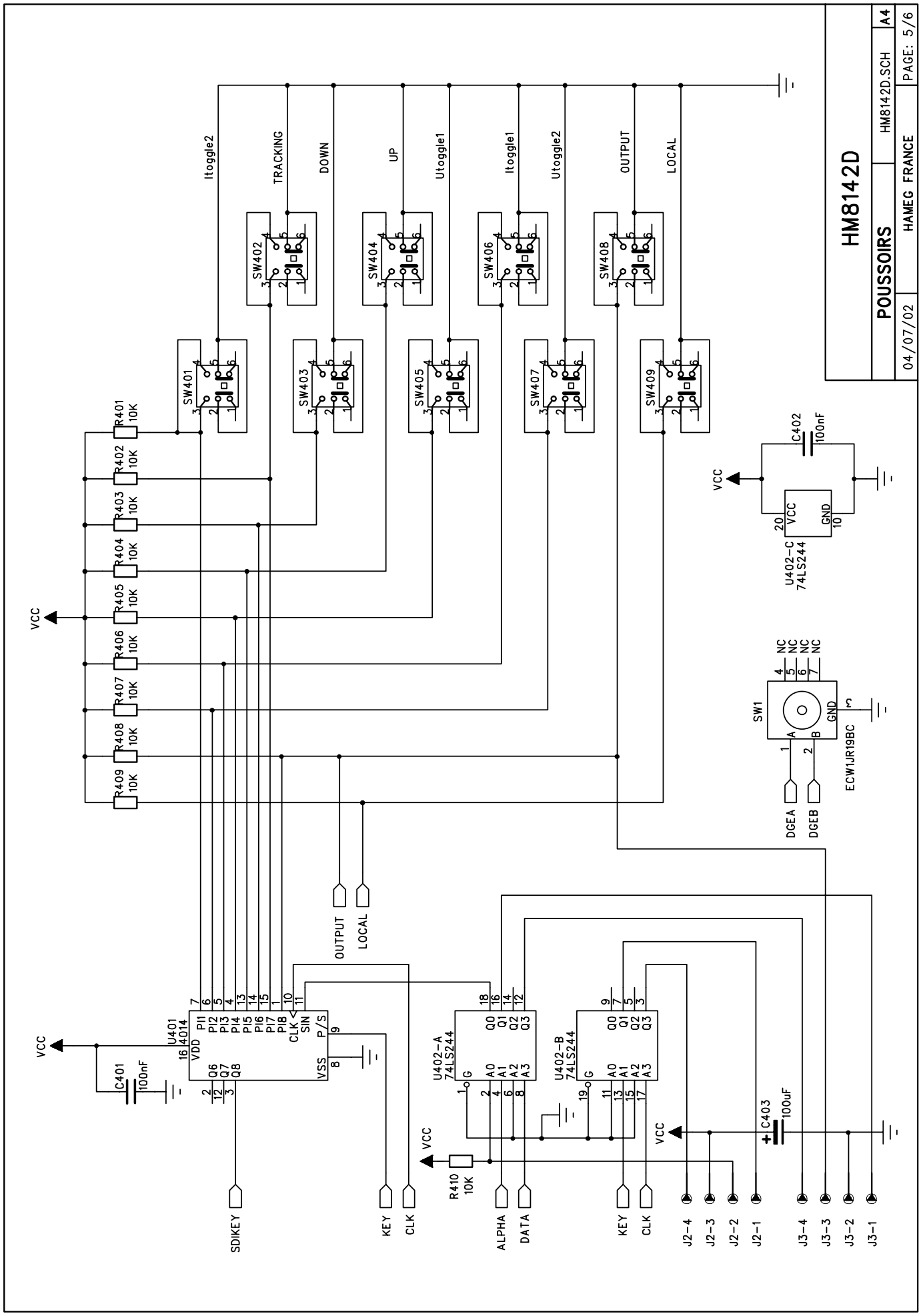
 Subject to change without notice

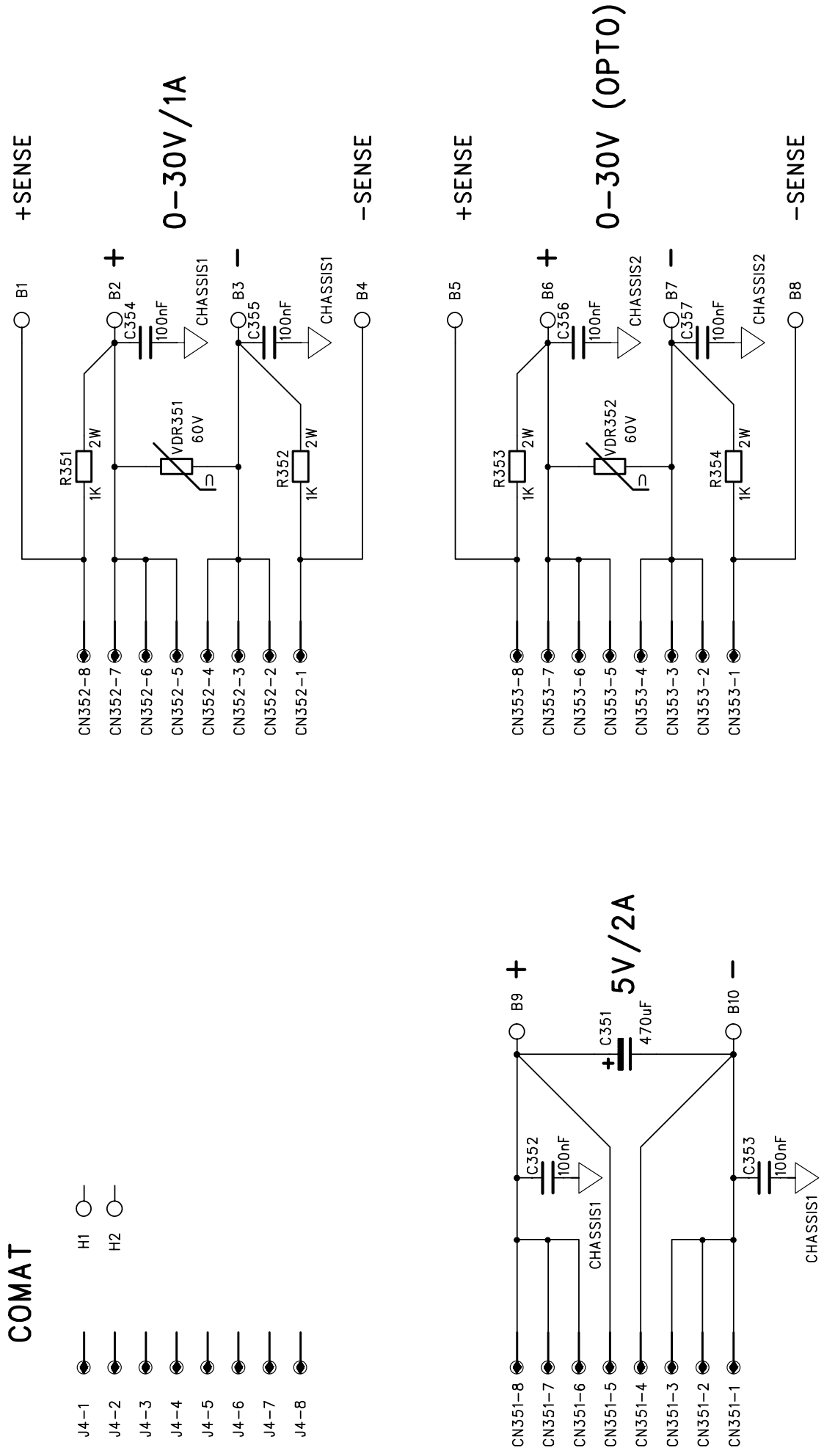

HM8142D
SYNOPTIQUE
HM8142D.SCH
A4
07/04/02
HAMEG FRANCE
PAGE: 1/6
AFFICHAGE2
SHEET-3
VCC
GND
DATA
CLK
E/DISPL2
BUSLEDG
COMLEDG
LEDS
SHEET-4
COMLEDD
COMLEDGVCC
AFFICHAGE1
SHEET-2
E/DISPL1
BUSLEDD
POUSSOIRS
SHEET-5
ALPHA
KEY
SDIKEY
LOCAL
OUTPUT
DGEA
DGEB
C1
100uF
J1-1
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J1-8
J1-9
J1-10
J1-11
J1-12
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J1-15
J1-16
NC
CLK
DATA


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K1[0:7]
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AF102 TOS-3103
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AF106 TOS-3103
AF107 TOS-3103
AF108 TOS-3103
Q101 BCR183
Q102 BSR14
Q103 BCR183
Q104 BSR14
Q105 BCR183
Q106 BSR14
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Q122 BCR183
Q123 BCR183
Q124 BCR183
R103 221R
R106 221R
R109 221R
R112 221R
R115 221R
R118 221R
R121 221R
R124 221R
R126 47R
R128 47R
R130 47R
R132 47R
R134 47R
R136 47R
R138 47R
R140 47R
UC101
XT101
10MHz
C101 10uF
C102 100nF
C103 1uF
C104 22pF
C105 22pF
C106 33pF
C107 33pF
C108 33pF
H4
COMLEDD
BUSLEDD
CV1
CC1
IMAX1
UMAX1
OUT
TRACKING
DATA
CLK
E/DISPL1

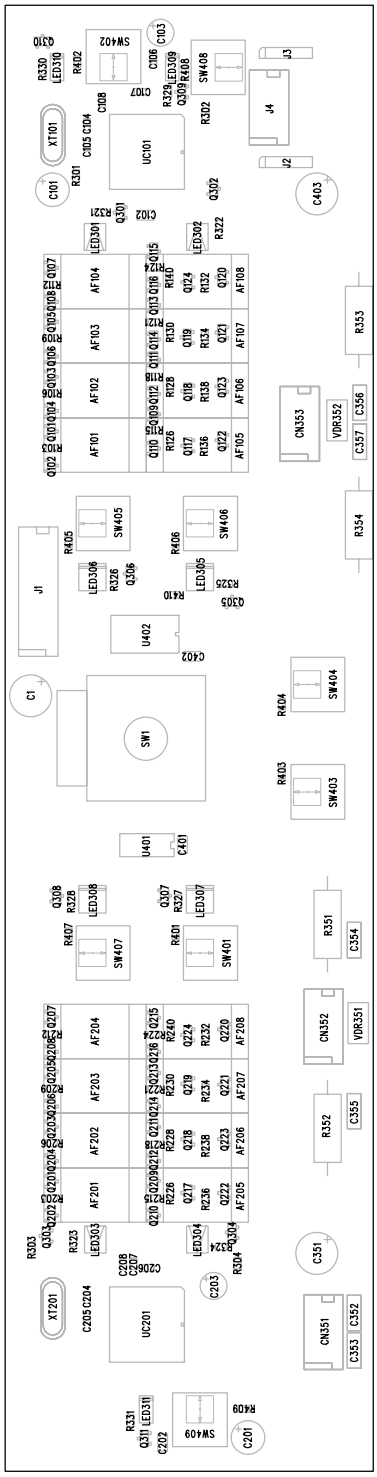

HM8142D
AFFICHAGE2 (GAUCHE)
HM8142D.SCH
A4
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HAMEG FRANCE
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AF201 TOS-3103
AF202 TOS-3103
AF203 TOS-3103
AF204 TOS-3103
AF205 TOS-3103
AF206 TOS-3103
AF207 TOS-3103
AF208 TOS-3103
S2[0:7]
K2[0:7]
VCC
COMLEDG
UC201
XT201
10MHz
C201 10uF
C202 100nF
C203 1uF
C204 22pF
C205 22pF
C206 33pF
C207 33pF
C208 33pF
H3
BUSLEDG
CV2
CC2
IMAX2
UMAX2
REMOTE
DATA
CLK
E/DISPL2
Q201 BCR183
Q202 BSR14
Q203 BCR183
Q204 BSR14
Q205 BCR183
Q206 BSR14
Q207 BCR183
Q208 BSR14
Q209 BCR183
Q210 BSR14
Q211 BCR183
Q212 BSR14
Q213 BCR183
Q214 BSR14
Q215 BCR183
Q216 BSR14
Q217 BCR183
Q218 BCR183
Q219 BCR183
Q220 BCR183
Q221 BCR183
Q222 BCR183
Q223 BCR183
Q224 BCR183
R203 221R
R206 221R
R209 221R
R212 221R
R215 221R
R218 221R
R221 221R
R224 221R
R226 47R
R228 47R
R230 47R
R232 47R
R234 47R
R236 47R
R238 47R
R240 47R


VCC
Q304
BC857B
R324
10R
LED304
L311/V
R304
2K21
CC2
Q308
10K
BCR183
R328
27R
LED308
L1553/V
UMAX2
Q303
BC857B
R323
10R
LED303
L311/V
R303
2K21
CV2
Q307
BCR183
R327
27R
LED307
L1553/V
IMAX2
Q311
BCR183
R331
27R
LED311
L383/V
REMOTE
COMLEDG
Q302
BC857B
R322
10R
LED302
L311/V
R302
2K21
CC1
Q306
BCR183
R326
27R
LED306
L1553/V
UMAX1
Q310
BCR183
R330
27R
LED310
L383/V
TRACKING
Q301
BC857B
R321
10R
LED301
L311/V
R301
2K21
CV1
Q305
BCR183
R325
27R
LED305
L1553/V
IMAX1
Q309
BCR183
R329
27R
LED309
L383/V
OUT
COMLEDD
HM8142D
LEDS
HAMEG FRANCE
HM8142D.SCH
A4
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HM8142D
POUSSOIRS
HAMEG FRANCE
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A4
Itoggle2
TRACKING
DOWN
UP
Utoggle1
Itoggle1
Utoggle2
OUTPUT
LOCAL
SW401
SW402
SW403
SW404
SW405
SW406
SW407
SW408
SW409
R401 10K
R402 10K
R403 10K
R404 10K
R405 10K
R406 10K
R407 10K
R408 10K
R409 10K
VCC
C402 100nF
U402-C 74LS244
SW1
ECW1JR19BC
DGEA
DGEB
U401 4014
C401 100nF
U402-A 74LS244
U402-B 74LS244
C403 100uF
R410 10K
SDIKEY
KEY
CLK
ALPHA
DATA
J2-4
J2-3
J2-2
J2-1
J3-4
J3-3
J3-2
J3-1


0–30V/1A
+SENSE
–SENSE
B1
B2
B3
B4
C354
100nF
C355
100nF
CHASSIS1
CHASSIS1
R351
2W
1K
R352
2W
1K
VDR351
60V
CN352–8
CN352–7
CN352–6
CN352–5
CN352–4
CN352–3
CN352–2
CN352–1
0–30V (OPTO)
+SENSE
–SENSE
B5
B6
B7
B8
C356
100nF
C357
100nF
CHASSIS2
CHASSIS2
R353
2W
1K
R354
2W
1K
VDR352
60V
CN353–8
CN353–7
CN353–6
CN353–5
CN353–4
CN353–3
CN353–2
CN353–1
5V/2A
B9
B10
C351
470uF
C352
100nF
C353
100nF
CHASSIS1
CHASSIS1
CN351–8
CN351–7
CN351–6
CN351–5
CN351–4
CN351–3
CN351–2
CN351–1
COMAT
H1
H2
J4–1
J4–2
J4–3
J4–4
J4–5
J4–6
J4–7
J4–8

Displayboard



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