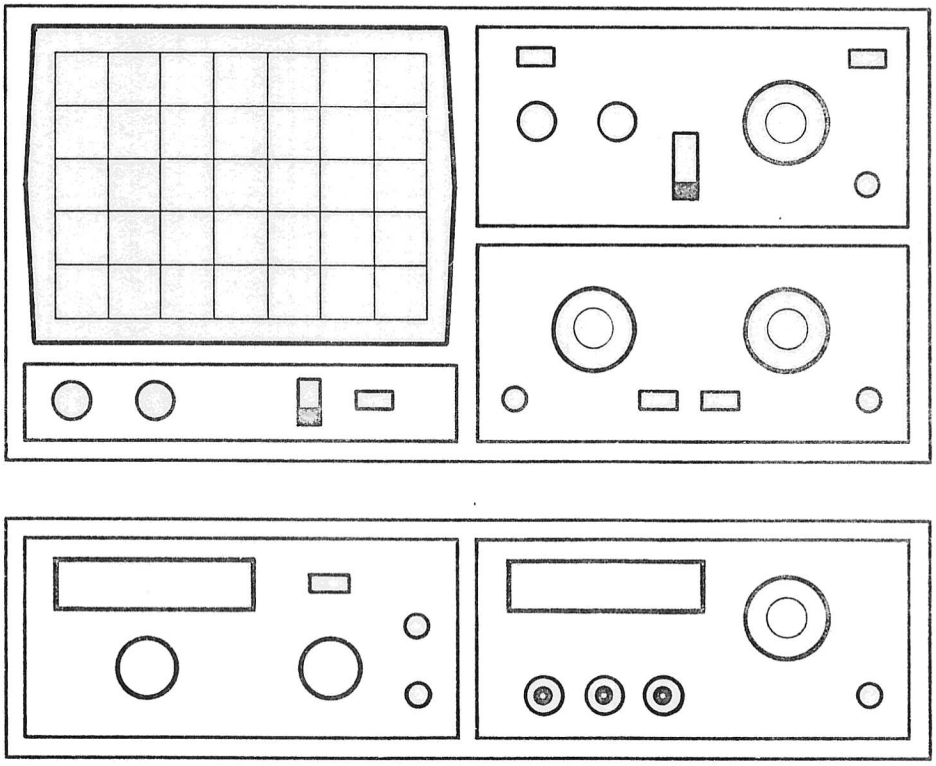
HAMEG
Instruments

MANUAL

Graphic Printer
HM 8148-2



Graphic Printer HM 8148-2

Transport

Immediately after being unpacked, the unit should be controlled for visible damage. If any damage has occurred during transport, the shipping agent (railway, post office or shipping company) must be informed and inspection of the unit arranged for. The unit may not be used under any circumstances.

Safety

This unit has been manufactured and tested in compliance with the guidelines stipulated in the West German VDE Standard No. 0411, Parts 1 and 1a ("Protective measures for electronic measuring instruments"). In accordance with Safety Class I as defined in this standard, all housing and chassis parts are connected to the grounded wire of the power cord.
If the unit is connected to a Class II oscilloscope, then this will result in the oscilloscope also being operated under Class I safety conditions.
Unless used with a protective insulating transformer, this unit may only be connected to properly designed and installed grounding outlets.

Warning

It is not permissible to interrupt the grounded wire either inside or outside of the unit.
The unit may not be opened or shut unless it has first been isolated from all external voltages.
If it should be absolutely essential to carry out measurements, troubleshooting or adjustments on the opened unit while it is being operated, then this work must be performed by a qualified technician who is familiar with the associated risks.

Operating conditions

The permissible ambient temperature range for operation is +10° C to +40° C; for transport and storage only, temperatures between −40° C and +70° C are permissible. Any location may be chosen for operation as long as the ventilation openings are not covered.

Warranty

Each unit is subjected to continuous operation over a period of 10 hours, followed by complete testing of all functions and performance, prior to leaving the factory. It is nevertheless possible for premature component failure to occur.
For this reason, a **2-year functional warranty** is granted on all HAMEG equipment. This warranty is voided if any changes are made on the unit.
The warranty does not cover damage caused during transport.
To prevent damage from occurring during transport, we recommend shipping the unit only in its original packaging.

To facilitate speedy processing, it is advisable to attach a note to the unit listing the problem, your name and full telephone number (including prefix(es)), in addition to the usual shipping documentation.

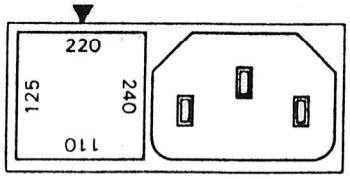
Maintenance

This unit requires no maintenance.
The outside of the unit should be regularly cleaned with a fine brush to remove dust. Stubborn dirt can be removed by going over it with a moistened cloth (water + 1% mild detergent). Care must be taken to prevent any liquid from penetrating into the unit.

The unit must be switched off before opening the paper drawer!

Switching over the mains/line voltage

The instrument is set for 220V (240V U.K.) line voltage on delivery. It can be switched over to other voltages at the fuse holder combined with the 3-pole appliance inlet at the rear of the instrument. Firstly the fuse holder printed with the voltage values is removed using a small screw driver and - if required - provided with another fuse. Refer to the table below for the prescribed value of the fuse. Then replace the fuse holder so that the impressed white triangle points to the desired voltage. Here pay attention that the cover plate is also correctly engaged. The use of repaired fuses or short circuiting the fuse holder is not allowed. Damage arising because of this is not covered by the guarantee.



Fuse type: Size **5 x 20 mm**; 250 V~, C;
IEC 127, Sheet III; DIN 41 662 (possibly DIN 41 571 sheet 3).
Cutoff: **medium (M)**.

Line voltage	**Fuse rating**
110 V ~ ±10%	**M1.6 A**
125 V ~ ±10%	**M1.6 A**
220 V ~ ±10%	**M0.8 A**
240 V ~ ±10%	**M0.8 A**

Specifications

Operating Modes

ONLINE MANUAL	"Hardcopy" (by pressing PRINT button)
ONLINE TIMER	"Hardcopy" (timer-controlled)
ONLINE AUTOM.	"Hardcopy" (controlled by trigger event)
PRINTER SET	Setting of printer parameters
CLOCK SET	Setting of time of day (hours/minutes)
DATE SET	For setting the date (day, month, year)
TIMER SET	Setting of timer parameters
IEEE (optional)	Setting of IEEE parameters

Printer data

Printing system	Thermal (with thermal overload protection)
Dots per line	256
Dot density	Vertical: 2.86 dots/mm, horizontal: 11.43 dots/mm (theoretical)
Dot size	0.42 mm x 0.32 mm (0.02" x 0.01")
Paper width	112 mm (4.41")
Printing width	89.6 mm (3.53")
Printout speed	approx. 16 ms per line of dots
Average printhead life	30 million lines of dots

Paper

Dimensions	112 mm wide (printing width 89 mm), paper roll diameter 29 mm
Coloring	White; turns black with heat application
Type	HAMEG HZ83, EPSON P-40 TRP

Interfaces

Standard	HAMEG System interface
Optional	IEEE - 488 (in preparation)

Miscellaneous

Battery backup	Ensures that all parameters will remain stored in memory when printer is powered down
Realtime clock	For display of time of day (hours/minutes)
Display	4-digit, 7-Segment LED display
Electrical information	Complies with safety requirements of VDE 0411 Class I
Power supply	110, 125, 220, or 240 V AC Permissible voltage fluctuation: ±10%
AC line frequency range	50 to 60 Hz
Power consumption	Less than 30 watts typical; approx. 130 watts for solid black printing
Weight	Approx. 6 kg
Color	"Techno brown"
Case dimensions	285 x 75 x 365 mm (width x height x depth) (11.22" x 2.95" x 14.37")

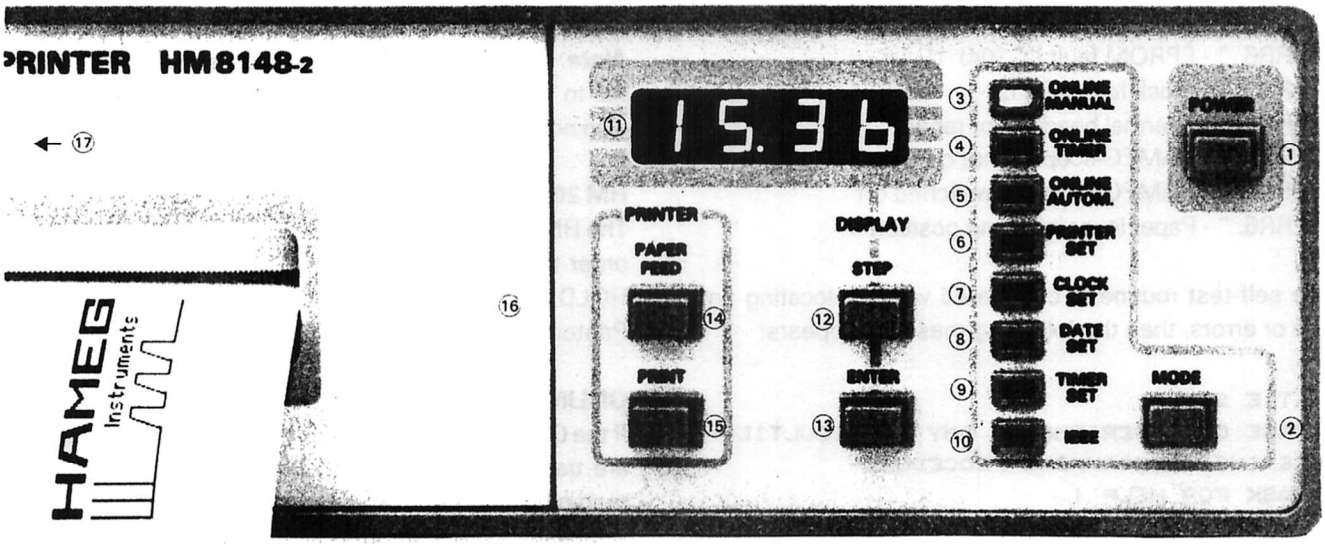
Standard accessories

connection cable: printer - scope HZ84, 1 roll of thermal paper,
power cord, footrest, operating instructions

Introduction

The HM 8148-2 Graphics Printer allows very fast printout (less than 15 seconds) of data stored in the memory of digital storage oscilloscopes HM 205-2 or HM 208.
Each printout provides effective, good-quality documentation of scope screen contents, supplemented with time of day, date, and information on certain scope settings.
All parameters are entered using a user-friendly, menu-driven routine that virtually excludes any possibility of error, sounding an audible alarm (3 beeps) if an impermissible entry is made.
This unit permits either manual or automatic capture of measurement data, either timer-controlled (using the built-in realtime clock) or in response to a given trigger event registered on the oscilloscope. An itegrated "help" function can be called using the keys PAPER FEED (modes 4-7) and STEP (modes 1-3). After one of these keys has been pressed, brief operating instructions are displayed (see the printout that is made when the unit is powered up).
The contents of the oscilloscope memory are transferred to the HM 8148-2 via the HAMEG interface and a 26-way ribbon cable with 2 connectors that is supplied as a standard accessory along with the HM 8148-2.
A second cable combination, also supplied as a standard accessory, must be installed in the HM 205-2 oscilloscope. The procedure to be followed is explained in the section "Installation of the HO 74 Interface Adapter".
If it is wished to have an HM 208 oscilloscope retrofitted with a HAMEG interface, this must be done by the manufacturer or one of its foreign distributors. It is not possible to connect both the IEEE-488 and the HAMEG interface to the HM 208 at the same time.

Controls and indicators



① **POWER SWITCH**
(Power input located on rear panel of unit)

② **MODE**
Press to change the operating mode

③ **ONLINE MANUAL**
Indicator for "Mode 1"; manually controlled printout

④ **ONLINE TIMER**
Indicator for "Mode 2"; timer-controlled printout

⑤ **ONLINE AUTOM.**
Indicator for "Mode 3"; trigger controlled printout

⑥ **PRINTER SET**
Indicator for "Mode 4"; for entry of printer parameters

⑦ **CLOCK SET**
Indicator for "Mode 5"; for entry of current time of day

⑧ **DATE SET**
Indicator for "Mode 6"; for entry of date

⑨ **TIMER SET**
Indicator for "Mode 7"; for entry of timer parameters

⑩ **IEEE** (Option; in preparation)
Indicator for "Mode 8"; for entry of IEEE-488 parameters

⑪ **DISPLAY**
4-digit LED display

⑫ **STEP** (help function; modes 1-3)
Push-button key for incrementing the displayed value by 1

⑬ **ENTER**
Press to enter the displayed value
and activate the next digit

⑭ **PAPER FEED** (help function; modes 4-7)
Push-button key for advancing paper

⑮ **PRINT**
Press to print out oscilloscope screen contents

⑯ **DRAWER**
Holds paper roll

⑰ **PAPER RELEASE LEVER**
Lower position: for printing.
Upper position: for changing paper

Makeready and self-test

After the supplied ribbon cable has been used to connect the oscilloscope to the Graphic Printer, the oscilloscope must be operated in storage mode.

If an HM 208 is connected, then it must be set to "DUAL" mode. Otherwise the printout obtained will not be identical with the image displayed on the CRT screen.

Power up the Graphic Printer by pressing the red power button. A self-test routine is automatically initiated, the results of which are printed out and/or displayed. The following error messages can occur:

" ERR0 " - Battery voltage is too low
" ERR1 " - Paper drawer is not shut
" ERR2 " - No paper
" ERR3 " - RAM fault (IC305)
" ERR5 " - EPROM fault (IC303)
" ERR6 " - EPROM fault (IC304)
" ERR7 " - Clock fault (IC402)
" ERR2. " - Thermal head out of range
" ERR3. " - HAMEG-scope is not connected
" ERR4. " - HAMEG-scope is switched off
" ERR6. " - Paper lever in wrong position

If the self-test routine is completed without locating any faults or errors, then the following message appears:

```
N O T E S :
IN CASE OF EXPERIENCING ANY DIFFICULTIES-
CONCERING PROGRAMMING PROCEDURE-
--> ASK FOR HELP !
HELP FOR MODE 1...3 (YELL. LEDs)
--> PRESS <STEP> - KEY
HELP FOR MODE 4...8 (GREEN LEDs)
--> PRESS <FEED> - KEY
FOR SELECTING OTHER MODES
--> PRESS <MODE> - KEY

PLEASE REMEMBER THESE HELP STATEMENTS FOR
ALL FURTHER MODES, THEY'LL NOT BE REPEATED!


N O  E R R O R S  F O U N D !

R O M  -  V E R S I O N : 2.0  (01.03.89)
S E L F T E S T  P A S S E D !
```

The unit is now ready for operation, and is set to the following default mode:
ONLINE MANUAL (Mode 1)
(Timer not activated; hardcopy mode 0; see also "test log" on page M 6).

Operating modes

Preliminary remark
In order for the printout to be identical with the image displayed in the oscilloscope screen, the horizontal position control on the oscilloscope must be adjusted so that the trace begins at the left-hand edge of the graticule. Signal portions outside of the graticule – except in the Y-axis – are not printed out!

1: ONLINE MANUAL (Mode 1)

HM205-2
When the **PRINT** button is depressed, the contents of the oscilloscope's memory at that instant in time are transferred to the printer, regardless of which mode it is being operated in (REFRESH, SINGLE or HOLD mode).
After the memory contents have been transferred (when the transfer takes place a brief change in the screen image will be noted), the transferred data are printed out as a corresponding waveform.
Note: In this mode the printer does not send a reset signal to the scope, and consequently the oscilloscope is also not armed for a subsequent trigger event.

HM 208
The HM 208 must always be operated in DUAL mode! In order to ensure correct printout by the Graphic Printer, HOLD I and HOLD II should be pressed.
Printout is not possible in XY mode.

2: ONLINE TIMER (Mode 2)
If the Graphics Printer is in this operating mode, then data are transferred from the oscilloscope at a preprogrammed point in time.
Repeated, cyclic printouts can be obtained by specifying a time interval.
The Graphics Printer may be switched off between two printout cycle times without causing any problems.
The largest time interval which may be specified is 24 hours.

3: ONLINE AUTOMATIC (Mode 3)
In this mode, data transfer is triggered by the oscilloscope itself; for this to work, the scope must be set to SINGLE mode and the RESET button pressed (so that the RESET LED lights up).
If the oscilloscope input signal now exceeds the trigger threshold, then the input waveform at that moment in time is sampled and stored in memory. Once this has been performed, a corresponding signal is sent to the printer, which initiates data transfer and subsequently sends a reset signal to the oscilloscope. The scope is then ready for a new trigger event.
The data received by the Graphics Printer are immediately printed out.

This mode permits automatic continuous monitoring of test signals.

4: PRINTER SET (Mode 4)

If the MODE button is used to select the PRINTER SET mode, then four digits appear which indicate the zoom range. These digits refer to the time divisions in the oscilloscope screen graticule; the numbers 0 - 9 are assigned to the divisions from left to right, i.e. along the X-axis.

The first two digits stand for the range to be printed for Channel I, and the second two for the range to be printed for Channel II.

Example: 0900
Printout:
For Channel I, the entire range from division 0 up to and including division 9
For Channel II, approx. 100 stored sampling points values spanning the range from the beginning of division 0 to the end of division 0, with a magnification of 10.
This value is factory-preset to 0909, i.e. for full printout of both channels over the entire range.

If it is wished to change any of the printer parameters, press the ENTER button after they appear in the display; a dot will appear to the right of the first digit. The STEP button can now be used to change its value. To proceed to the next digit, press the ENTER button again and continue in the same manner.
After the ENTER button has been pressed five times, entry of the parameters for the zoom ranges has been completed.
Only one digit is now displayed; this refers to the setting of the "hardcopy" format.

Its meaning is as follows:

0 = complete printout
1 = printout without HAMEG logo
2 = printout without parameter field

Here too, the STEP button can be used to set the desired format. Pressing the ENTER button again then causes a branch to the 3rd submenu.
The four digit which now appear govern the sensitivity of the two oscilloscope channels is analogous to the zoom parameters.
The following table lists the possible entry values and their meanings:

1mV =	17	40mV =	11	1V =	5
2mV =	16	50mV =	10	2V =	4
4mV =	15	.1V =	9	4V =	3
5mV =	14	.2V =	8	5V =	2
10mV =	13	.4V =	7	10V =	1
20mV =	12	.5V =	6	20V =	0

After this procedure has been completed (at this point the LED dot is lit to the right of the 4th digit), pressing the ENTER button advances to the last submenu – for entry of the time base parameters – in accordance with the following table, using the same procedure as described above:

1µs =	23	0.5ms =	15	.2s =	7
2µs =	22	1ms =	14	.5s =	6
5µs =	21	2ms =	13	1s =	5
10µs =	20	5ms =	12	2s =	4
20µs =	19	10ms =	11	5s =	3
50µs =	18	20ms =	10	10s =	2
0.1ms =	17	50ms =	9	20s =	1
0.2ms =	16	.1s =	8	50s =	0

When the time base entries have been completed, pressing the ENTER button causes a jump back to the first submenu (zoom ranges).

5: CLOCK SET (Mode 5)

When this mode is selected, the current time of day is displayed and may be changed using the ENTER and STEP buttons as described above for mode no. 4. The clock uses a 24-hour system (i.e. '1735' = 5:35 p.m.).
The printer's realtime clock may be programmed to be accurate to the second. To do so, preset the clock to a time slightly ahead of the current time (e.g. one minute ahead). Wait until the set time is reached, and then immediately press the MODE button to exit the CLOCK SET mode.

6: DATE SET (Mode 6)

The current date (day, month) is displayed.
The ENTER and STEP buttons can now be used in the way described above for Mode 4 to change any of the digits.
After the 4th digit has been set, pressing the ENTER button again causes the year to be displayed (19xx). The last two digits of the year can be changed using the ENTER and STEP buttons in the usual way.
Illegal entries, e.g. June 32, are not accepted (an audible alarm sounds).

7: TIMER SET (Mode 7)

(Permits timer-controlled automatic printout from a stipulated starting time and starting date).
The starting time appears in the display; changes may be made as described above.
After the 4th digit has been entered, the starting date appears; the programmed time and date must be in the future!
After the starting date has been entered, pressing the ENTER button advances to the last submenu (interval setting).
Sample procedure:
If the interval time "1253" is displayed, when the starting time and starting date are reached the first printout is made. Thereafter, a new printout is made every 12 hours and 53 minutes.

Parameter field

Each printout (hardcopy) contains following supplementary information:

Date, time of day

Signal parameters (modifiable)
- CH 1 - Volts / DIV : 20V
- CH 2 - Volts / DIV : 20V
- Timebase - SEC/DIV : 50 s

Printer parameters (modifiable)
- zoom range (CH 1) : 0 - 9
- zoom range (CH 2) : 0 - 9
- Number of dots : 1000 (fixed)
- Remarks :

The position of the test parameter data on the printout is automatically assigned corresponding to the position of the traces on the Y-axis (HM 205-2 / Dual-Mode).

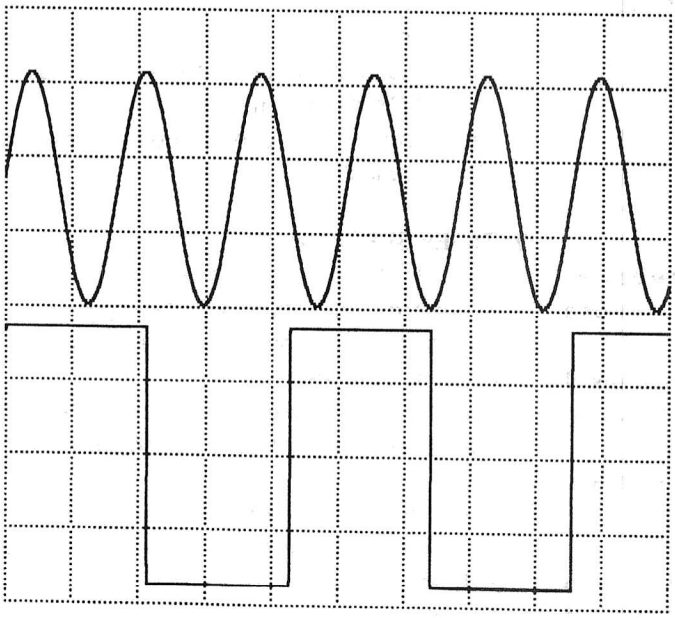
Default settings

If the **MODE** button is held when switching the Graphics Printer on (**POWER**), then after an initialization phase lasting approx. 20 seconds the unit has following settings:

Mode:	ONLINE-MANUAL (Mode 1)
Time:	0000
Date:	0000
Year:	1900
Zoom range:	0909
Hardcopy Mode:	0
CH I:	20V/DIV.
CH II:	20V/DIV.
TB:	50 sec./DIV.
Starting time:	0000
Starting date:	0000
Interval:	0000

It may become necessary to perform this initialization in the case of undefined states, e.g. if the battery voltage is too low, etc.

Test log



DATE: 00.00.1900
TIME: 00:00

SIGNALPARAMETER:

CH1 - VOLTS/DIV:20 V
CH2 - VOLTS/DIV:20 V
TIMEBASE-SEC/DIV:50 s

PRINTERPARAMETER:

ZOOMRANGE - CH1:0-9
ZOOMRANGE - CH2:0-9
NUMBER OF DOTS :1000

REMARKS:

HAMEG Instruments

Rotary switch

If the printing assembly drawer is opened, a rotary switch comes into view; this is for service purposes only, and should normally be in its "0" position.

Printing assembly drawer

Before opening or closing the printing assembly drawer the Graphic Printer must be switched off.

Changing the 3 AA alkaline-cell batteries

If the battery voltage falls below about 3V, the the error message "ERR0" is displayed to indicate the batteries should be replaced.

Procedure:

Always pull the printer's plug first!

Unscrew the two screws holding the rear panel in place.

Pull the printer case off towards the back.

The battery compartment comes into view, and is easily accessible. After replacing the batteries, reassemble the printer by following the above steps in reverse order.

The mean service life of the batteries is approx. 3 years.

Attention! Only alkaline battery types may be used. Any of the following battery size designations is acceptable:
Mignon · AA · AM3 · LR6.

Tearing off printouts

If it is wished to tear off a printout, first lift up the thermal paper so that it is in contact with the metal rim above the paper chute. Then pull away with an upward, lateral motion in such a way that the metal rim cuts it off cleanly.

Loading a new paper roll

The end of each paper roll is indicated by the appearance of a colored marking on the thermal paper.

In order to prevent paper feed problems, a new roll of thermal paper must now be loaded.

Attention! Thermal printing paper is coated on one side only. The heat-sensitive side is on the outside of the roll and must be facing towards the print head (see diagram).

Procedure:

Switch off the printer.

Place the paper release lever in its upper position.

Pull out the printing assembly drawer.

Remove any paper left over from the previous roll.

Load a new roll of paper (30 mm in dia., 112 mm wide).

Cut the protuding free end of the roll off diagonally, making sure that no adhesive residues are left on the paper.

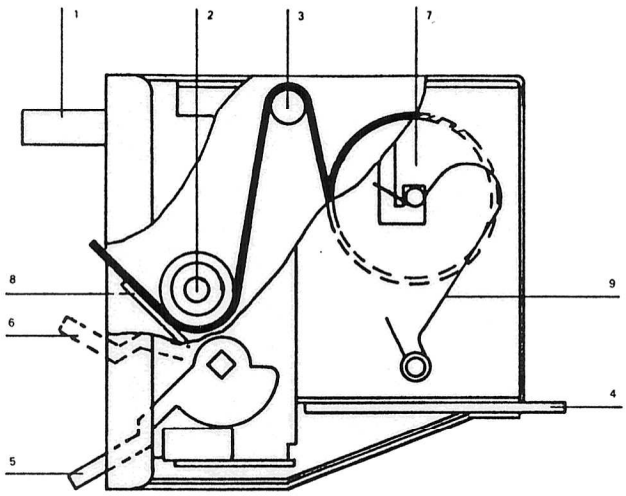
Thread the paper through until it emerges in front.

Pull out about 10 cm of paper and straighten it.

Close the drawer.

Return the paper release lever to its lower position.

The printer is now ready for operation again.



Installation of the HO74 interface adapter

This cable combination is used to implement the connection between the memory card and rear panel of the HM 205-2.

Only one device or interface may be connected to the HM 205-2

The HO74 interface adapter is supplied along with the Graphics Printer, and is installed as follows:

Before opening the HM205-2, disconnect the power cord.

Place the oscilloscope on a soft surface with the front side facing down.

Remove the back cover and carefully pull the case off towards the back.

Place the scope right side up again (in horizontal position), so that its back is facing towards you.

Slide the 26-way ribbon cable with its connector above the vertivally positioned Z board through the cutout for the CRT neck in the rear chassis.

Attach the connector to the unused connector socket on the memory board.

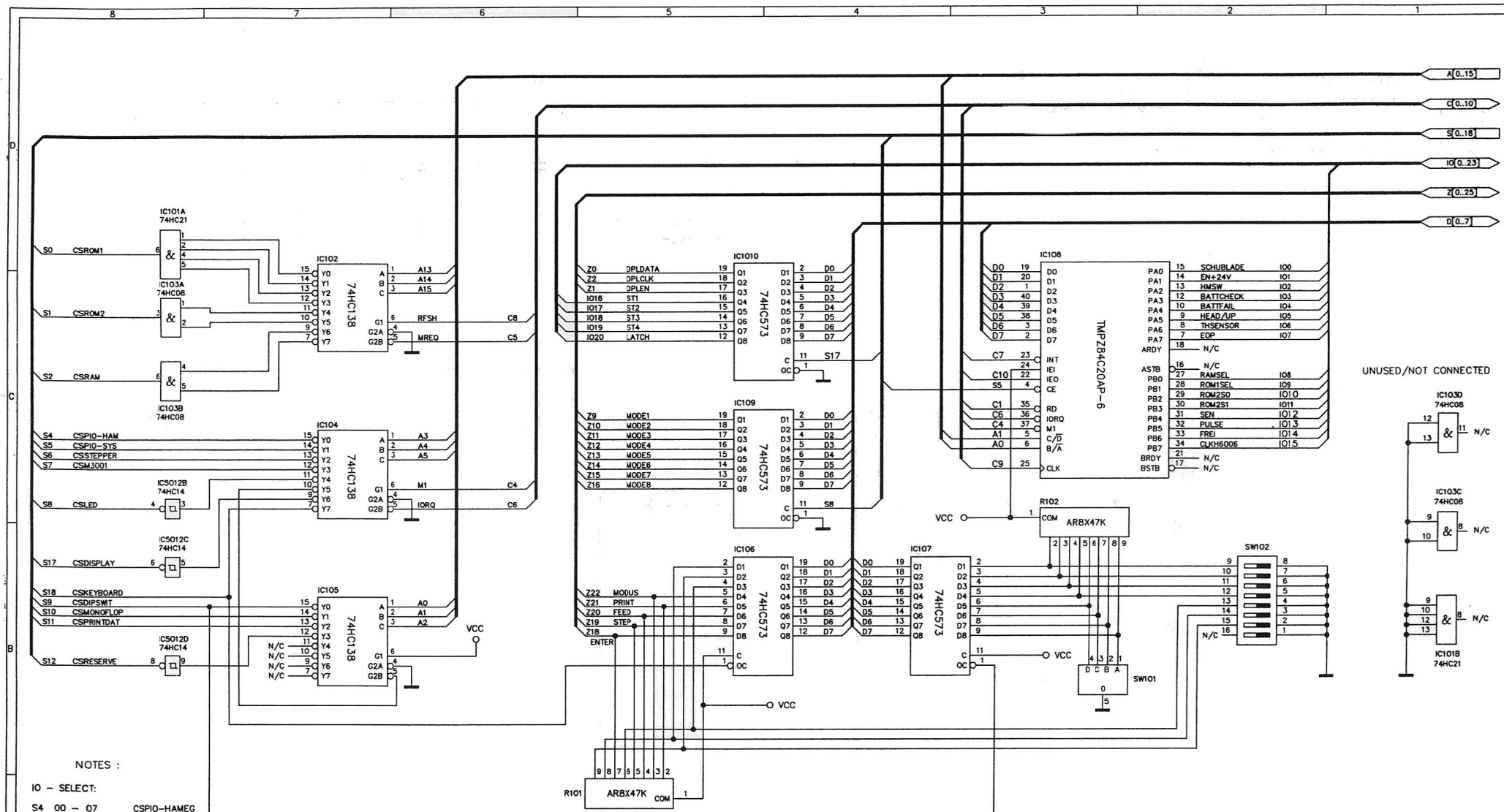
Insert the connector on the other end of the ribbon cable through the space between the Z board and the attachment angle, using the supplied screws and nuts.

Remove the area in the rear cover designated with *W*, Z and Y.

Place the scope face down again on a soft surface.

Carefully slide the case back on, and fasten the rear panel in place.

The HM 205-2 is now ready for operation again.



NOTES :

IO – SELECT:

S4	00 – 07	CSPIO-HAMEG
S5	08 – 0F	CSPIO-SYSTEM
S6	10 – 17	CSSTEPPER
S7	18 – 1F	CSM3001
S8	20 – 27	CSLED
S9	28	CSDIPSWITCH
S10	29	CSMONOFLOP
S11	2A	CSPRINTDATA
S12	2B	CSRESERVE
S13	2C	CSFREI
S14	2D	CSFREI
S15	2E	CSFREI
S16	2F	CSFREI
S17	30 – 37	CSDISPLAY
S18	38 – 3F	CSKEYBOARD

MEM – SELECT:

S0	0000 – 7FFF	CSROM1
S1	8000 – BFFF	CSROM2
S2	C000 – FFFF	CSRAM

CPU – Main Board

Änderungen vorbehalten !/Subject to change without notice !

HAMEG®
–Graphic Printer–
HM 8148-2

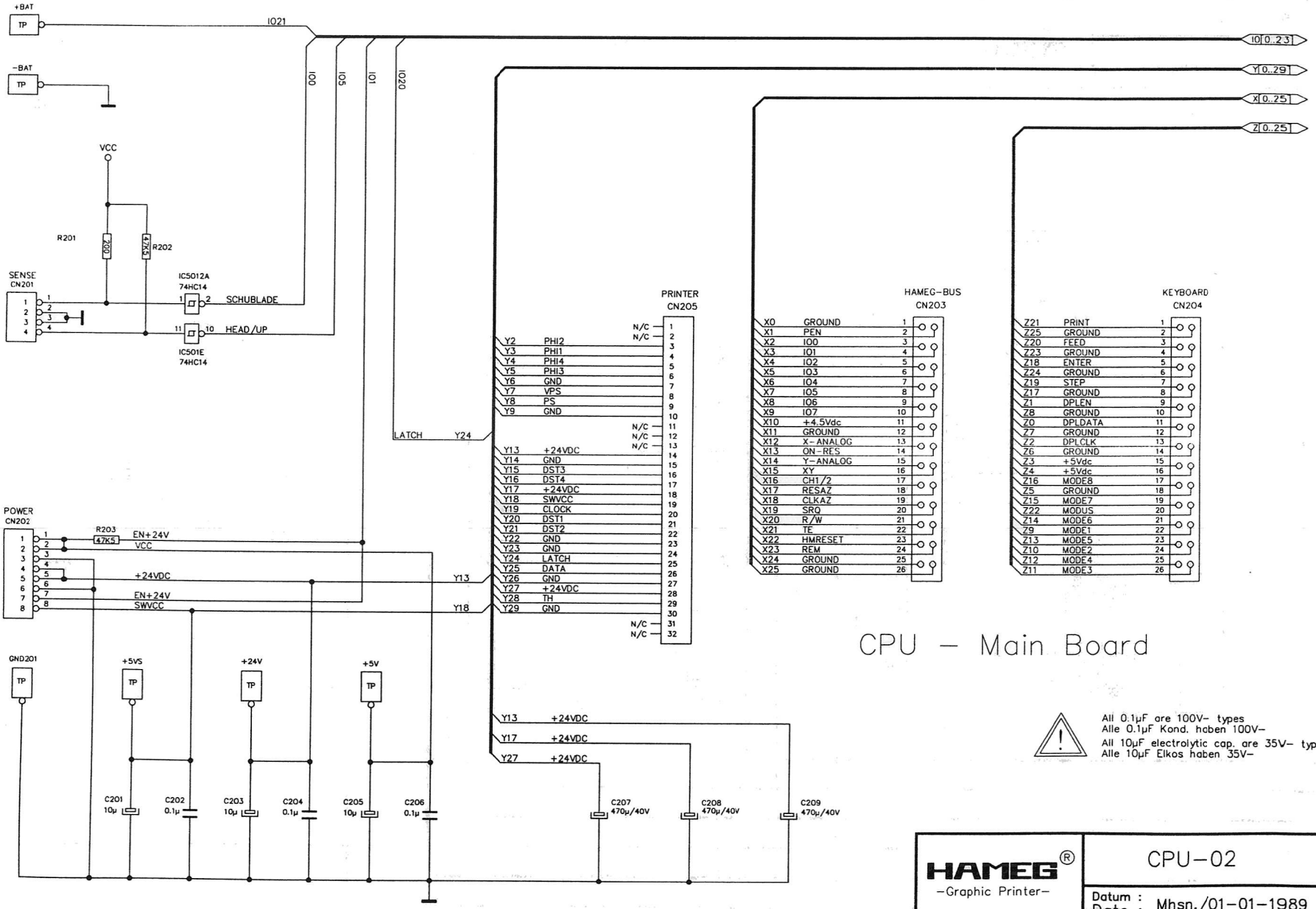
CPU–02

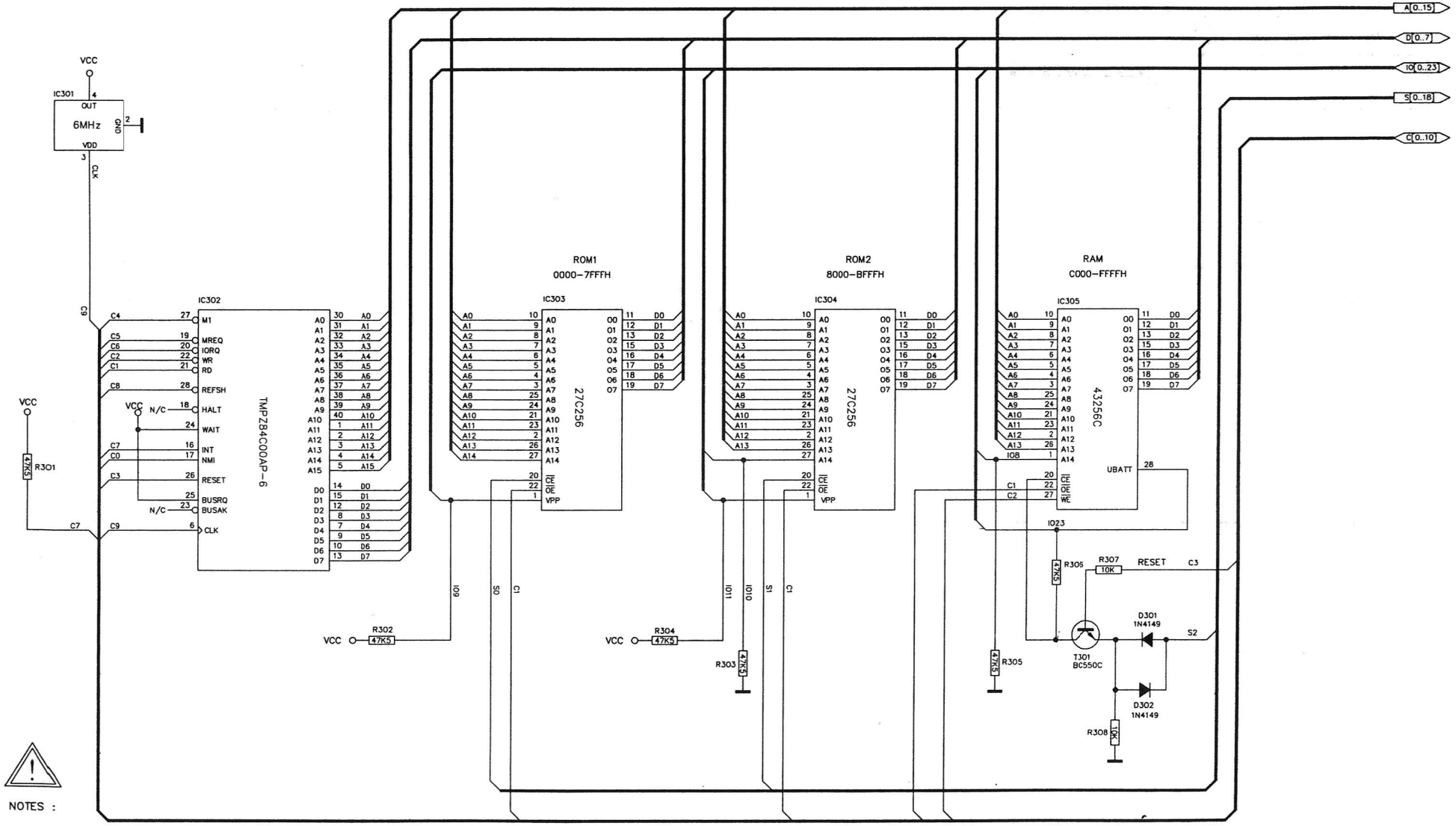
Rev.: 02

Datum : Mhsn./01–01–1989
Date :

Blatt 1 von 6
Sheet

H. Joosten


+BAT
TP
-BAT
TP
I021
I00
I05
I01
I020
I0 0..23
Y 0..29
X 0..25
Z 0..25
VCC
R201
R202
SENSE
CN201
IC5012A
74HC14
SCHUBLADE
HEAD/UP
IC501E
74HC14
LATCH
Y24
PRINTER
CN205
Y2 PHI2
Y3 PHI1
Y4 PHI4
Y5 PHI3
Y6 GND
Y7 VPS
Y8 PS
Y9 GND
Y13 +24VDC
Y14 GND
Y15 DST3
Y16 DST4
Y17 +24VDC
Y18 SWVCC
Y19 CLOCK
Y20 DST1
Y21 DST2
Y22 GND
Y23 GND
Y24 LATCH
Y25 DATA
Y26 GND
Y27 +24VDC
Y28 TH
Y29 GND
HAMEG-BUS
CN203
X0 GROUND
X1 PEN
X2 I00
X3 I01
X4 I02
X5 I03
X6 I04
X7 I05
X8 I06
X9 I07
X10 +4.5Vdc
X11 GROUND
X12 X-ANALOG
X13 ON-RES
X14 Y-ANALOG
X15 XY
X16 CH1/2
X17 RESAZ
X18 CLKAZ
X19 SRQ
X20 R/W
X21 TE
X22 HMRESET
X23 REM
X24 GROUND
X25 GROUND
KEYBOARD
CN204
Z21 PRINT
Z25 GROUND
Z20 FEED
Z23 GROUND
Z18 ENTER
Z24 GROUND
Z19 STEP
Z17 GROUND
Z1 DPLEN
Z8 GROUND
Z0 DPLDATA
Z7 GROUND
Z2 DPLCLK
Z6 GROUND
Z3 +5Vdc
Z4 +5Vdc
Z16 MODE8
Z5 GROUND
Z15 MODE7
Z22 MODUS
Z14 MODE6
Z9 MODE1
Z13 MODE5
Z10 MODE2
Z12 MODE4
Z11 MODE3
POWER
CN202
R203
47KS
EN+24V
VCC
+24VDC
EN+24V
SWVCC
GND201
+5VS
+24V
+5V
C201 10µ
C202 0.1µ
C203 10µ
C204 0.1µ
C205 10µ
C206 0.1µ
C207 470µ/40V
C208 470µ/40V
C209 470µ/40V
Y13 +24VDC
Y17 +24VDC
Y27 +24VDC
CPU – Main Board
All 0.1µF are 100V- types
Alle 0.1µF Kond. haben 100V-
All 10µF electrolytic cap. are 35V- types
Alle 10µF Elkos haben 35V-
HAMEG®
-Graphic Printer-
HM 8148-2
CPU-02
Rev.: 02
Datum : Mhsn./01-01-1989
Date :
Blatt 2 von 6
Sheet 2 of 6
H. Joosten
Änderungen vorbehalten !/Subject to change without notice !



NOTES :

C0 = NMI
C1 = RD
C2 = WR
C3 = RESET
C4 = M1
C5 = MREQ
C6 = IORQ
C7 = INT
C8 = RFSH
C9 = CLK

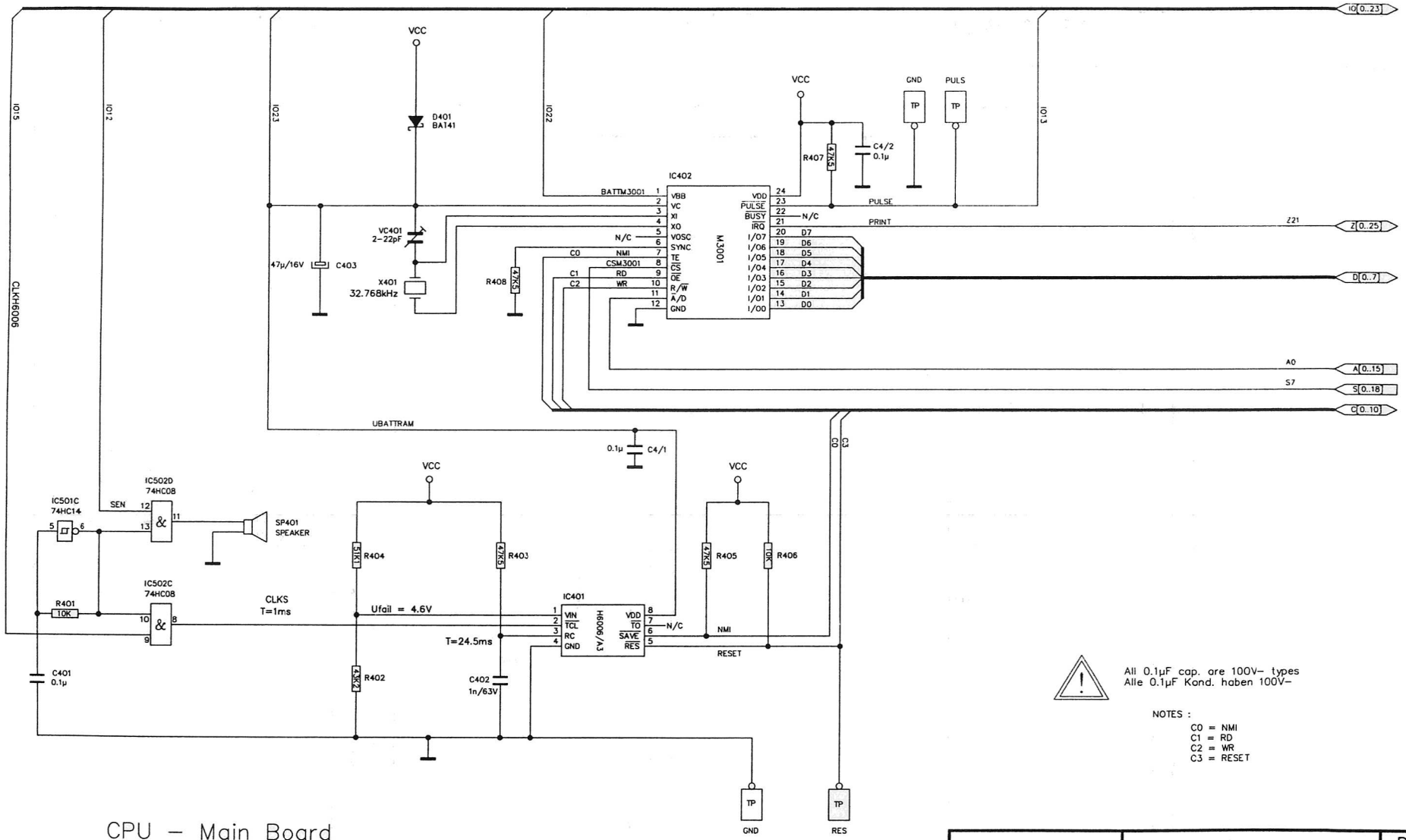
S0 = ROM1 (0000-7FFF) *2
S1 = ROM2 (8000-BFFF) *4
S2 = RAM (C000-FFFF) *2

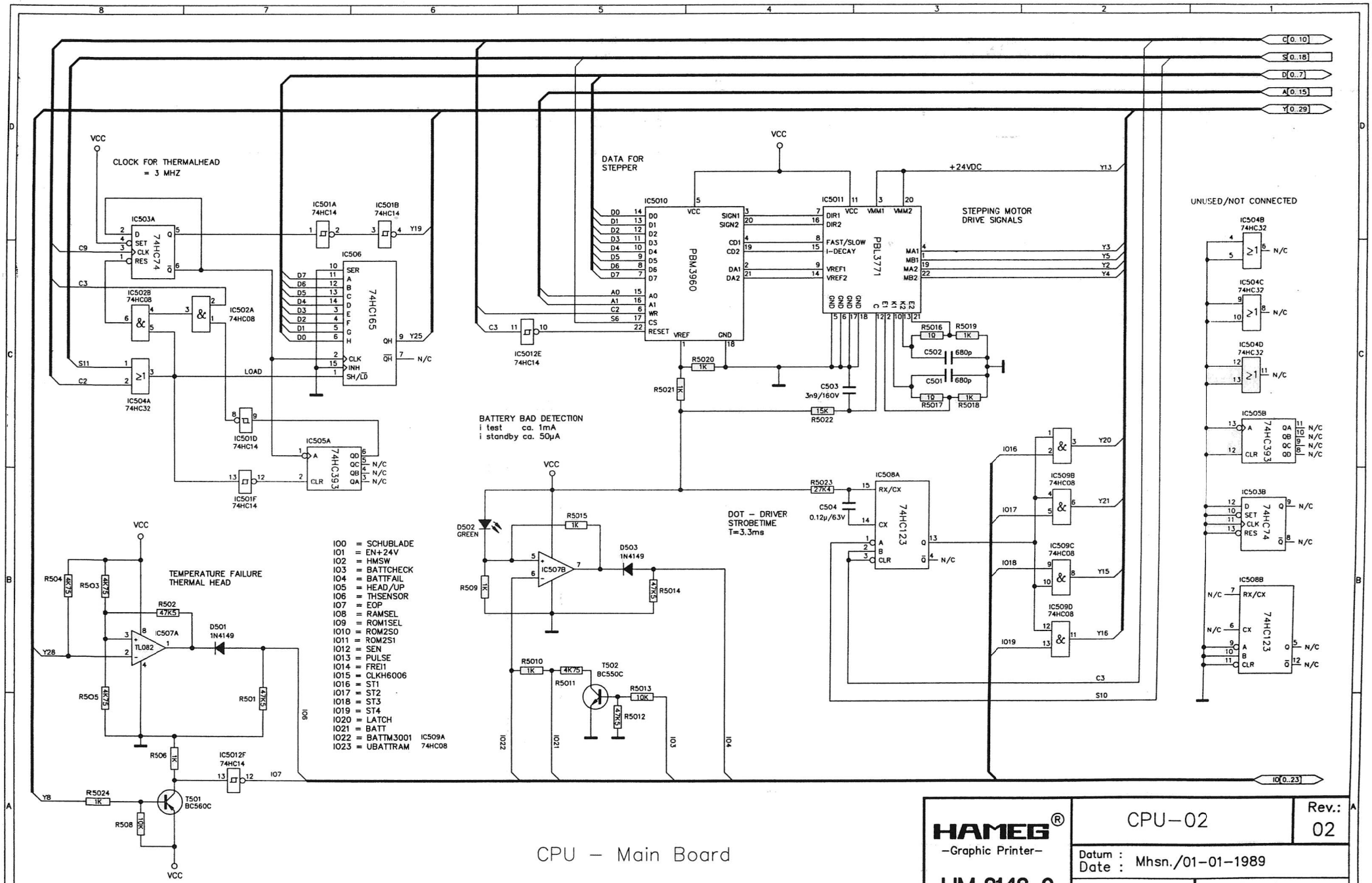
IO9 = BANK SELECT ROM1 (2*32K)
IO10 = BANK SELECT ROM2 (4*16K)
IO11 = BANK SELECT ROM2 (4*16K)

CPU - Main Board

Änderungen vorbehalten !/Subject to change without notice !

HAMEG® -Graphic Printer- HM 8148-2	CPU - 02	Rev.: 02
	Datum : Date : Mhsn./01-01-1989	
	Blatt 3 von 6 Sheet 3 of 6	H. Joosten


IO[0..23]
IO15
IO12
IO23
IO22
IO13
CLKH6006
VCC
D401
BA141
VC401
2-22pF
X401
32.768kHz
47µ/16V
C403
R408
47K5
IC402
M3001
BATTM3001
N/C
CO
CSM3001
C1
C2
RD
WR
VBB
VC
XI
XO
VOSC
SYNC
NMI
TE
CS
OE
R/W
A/D
GND
VDD
PULSE
BUSY
IRQ
I/07
I/06
I/05
I/04
I/03
I/02
I/01
I/00
D7
D6
D5
D4
D3
D2
D1
D0
R407
C4/2
0.1µ
GND
PULS
TP
PRINT
Z21
Z[0..25]
D[0..7]
A0
A[0..15]
S7
S[0..18]
C[0..10]
UBATTRAM
C4/1
C3
IC501C
74HC14
IC502D
74HC08
IC502C
74HC08
SEN
SP401
SPEAKER
R401
10K
CLKS
T=1ms
Ufail = 4.6V
T=24.5ms
R404
51K1
R403
47K5
R405
47K5
R406
10K
IC401
H6006/A3
VIN
TCL
RC
GND
VDD
TO
SAVE
RES
N/C
NMI
RESET
R402
4K42
C401
0.1µ
C402
1n/63V
All 0.1µF cap. are 100V- types
Alle 0.1µF Kond. haben 100V-
NOTES :
C0 = NMI
C1 = RD
C2 = WR
C3 = RESET
CPU - Main Board
HAMEG®
-Graphic Printer-
HM 8148-2
CPU-02
Rev.: 02
Datum : Mhsn./01-01-1989
Date :
Blatt 4 von 6
Sheet
H. Joosten
Änderungen vorbehalten !/Subject to change without notice !

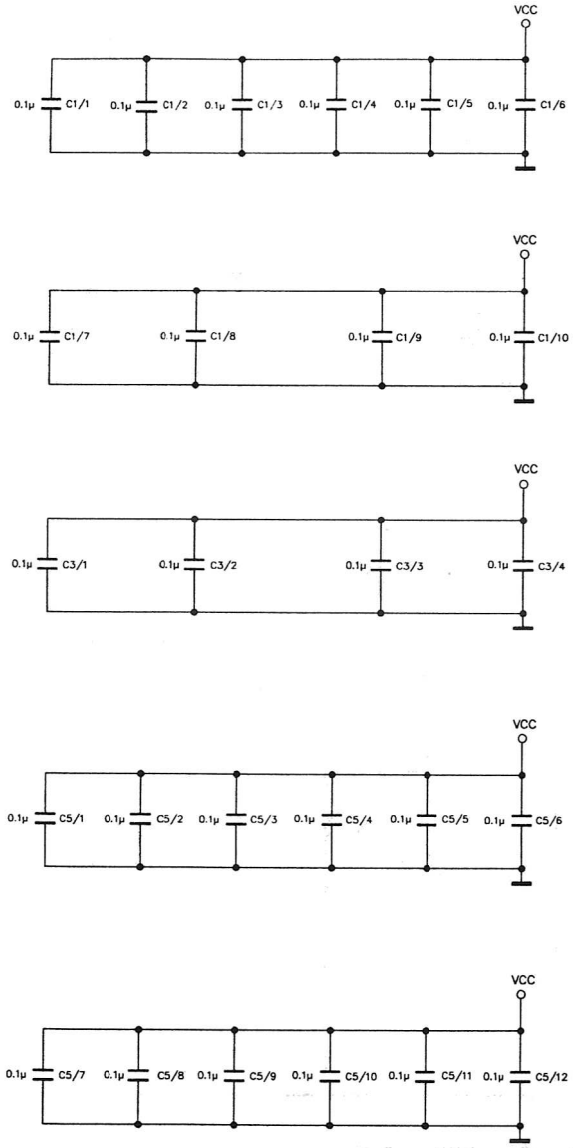


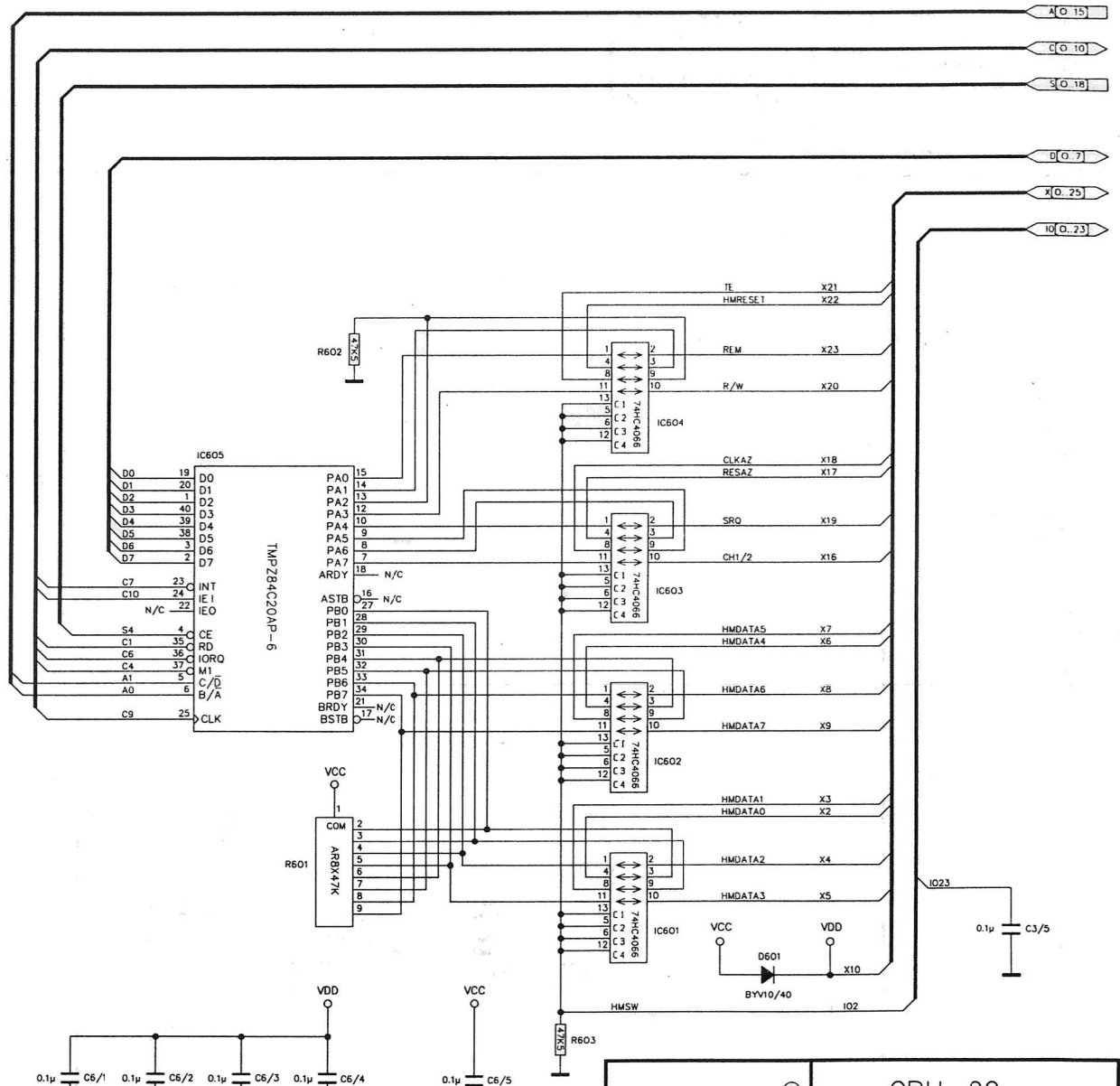
CPU – Main Board

HAMEG® –Graphic Printer– HM 8148-2	CPU–02	Rev.: 02
	Datum : Date : Mhsn./01-01-1989	
	Blatt Sheet 5 von of 6	H. Joosten

Änderungen vorbehalten !/Subject to change without notice !

CPU – Main Board





All 0.1µF cap. are 100V– types
Alle 0.1µF Kond. haben 100V–

Änderungen vorbehalten !/Subject to change without notice !

HAMEG®
–Graphic Printer–
HM 8148-2

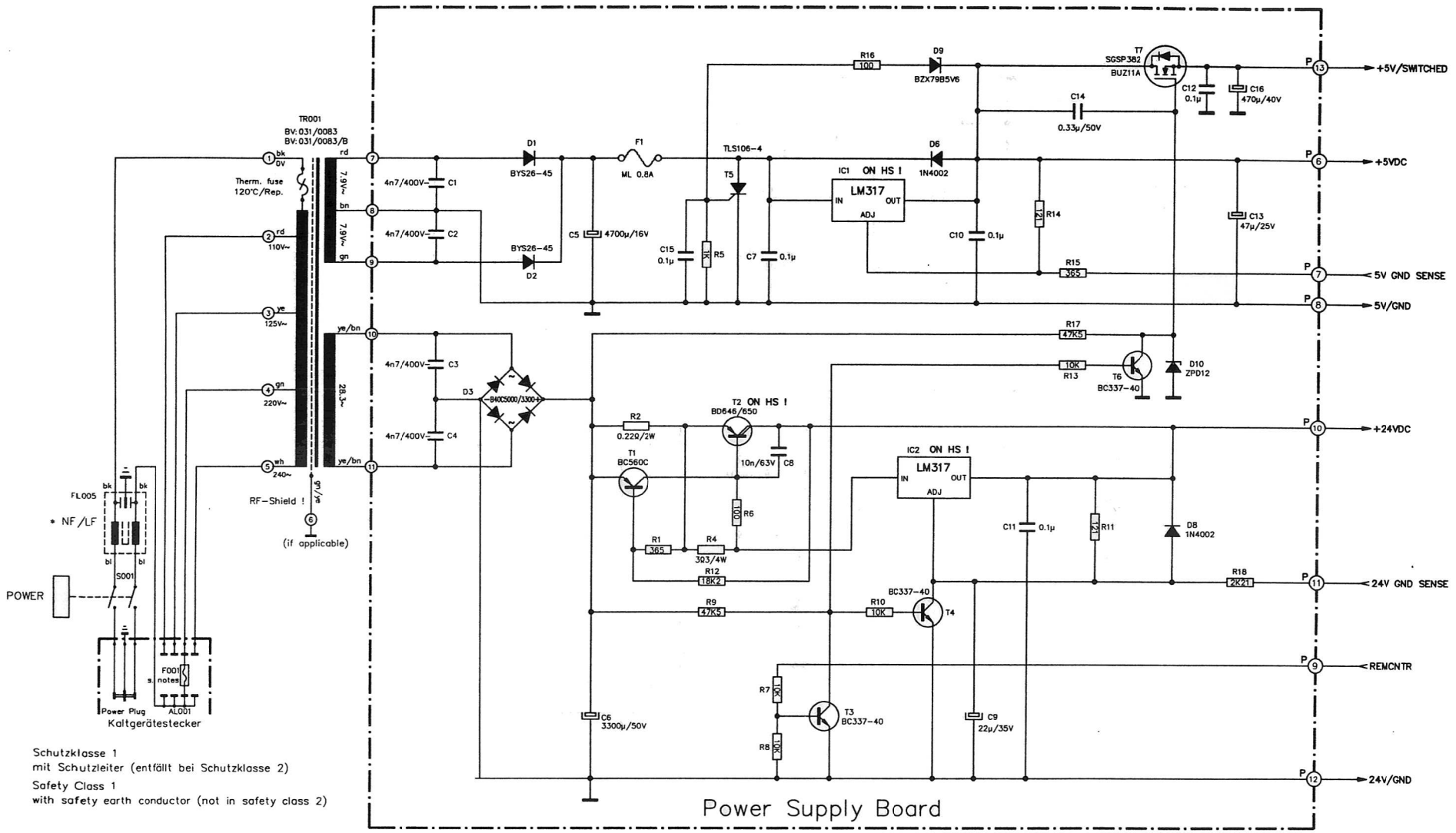
CPU–02

Rev.: 02

Datum : Mhsn./01–01–1989
Date :

Blatt 6 von 6
Sheet 6 of 6

H. Joosten



Schutzklasse 1
mit Schutzleiter (entfällt bei Schutzklasse 2)

Safety Class 1
with safety earth conductor (not in safety class 2)

Notes :

Netzsicherung Power fuse links	110V 125V	T/L 1.6A	5X20mm, träge; 5X20mm, time lag.
Type : IEC 127-III DIN 41662 SEV 1064 BS 4265	220V 240V	T/L 0.8A	
	AC 47....63Hz		

Änderungen vorbehalten !/Subject to change without notice !

ACHTUNG : Das Netzteil enthält sicherheitserhebliche Bauteile ! – Nur Original Ersatzteile verwenden !
CAUTION : Power Supply contains safety relevant parts ! – Use original replacement parts only !

Alle 0.1µF Kond. haben 100V– !
All 0.1µF cap. are 100V–types !

* Netzfilter wahlfrei / Line Filter optional

ON HS ! Auf Kühlkörper / On heat sink

Leistung : Ca. 30W (typ.) --> 130W (max.) bei 220V/50Hz.
Power cons.: Ca. 30W (typ.) --> 130W (max.) at 220V/50Hz.

HAMEG®
–Graphic Printer–
HM 8148-2

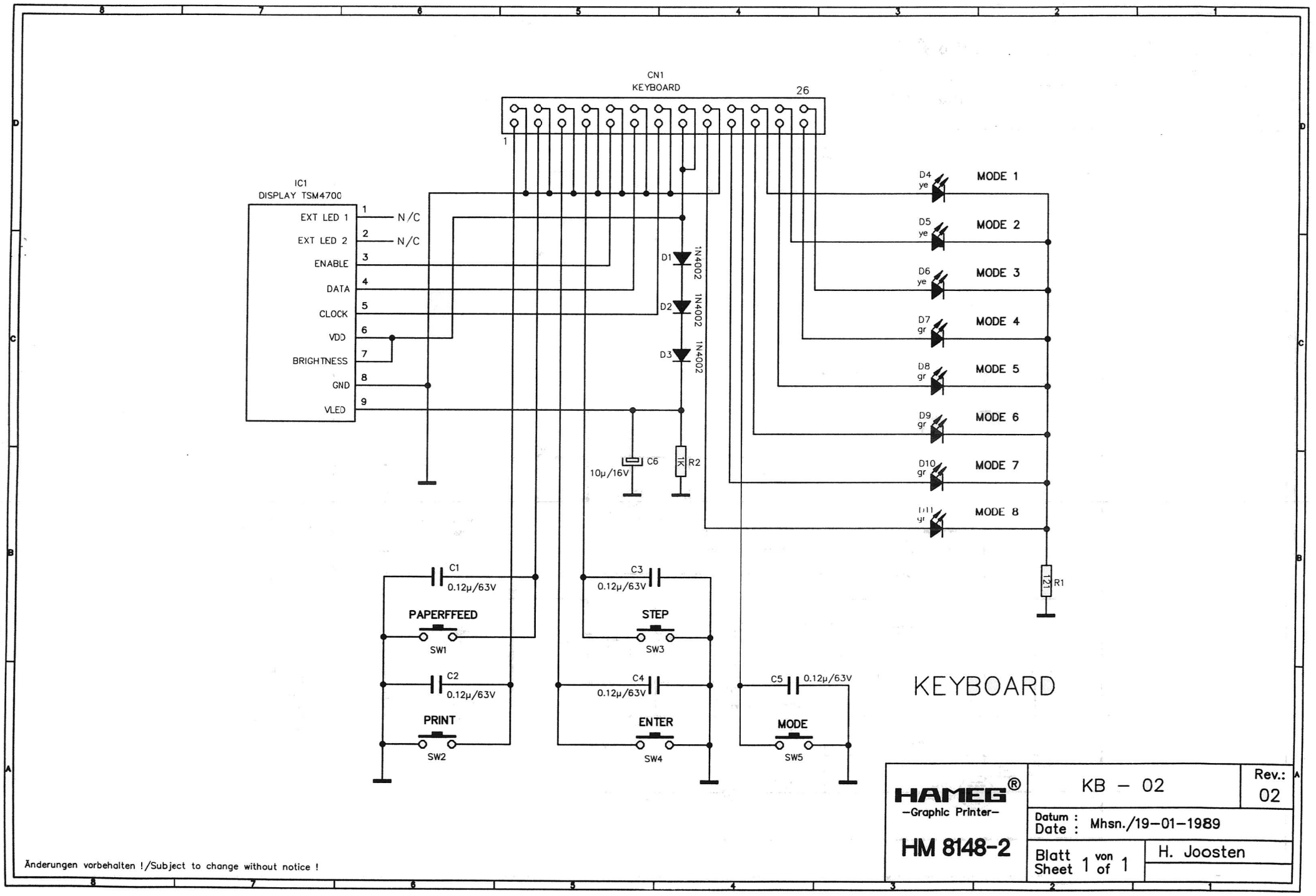
PS–02

Rev.: 02

Datum : Mhsn./17–01–1989
Date :

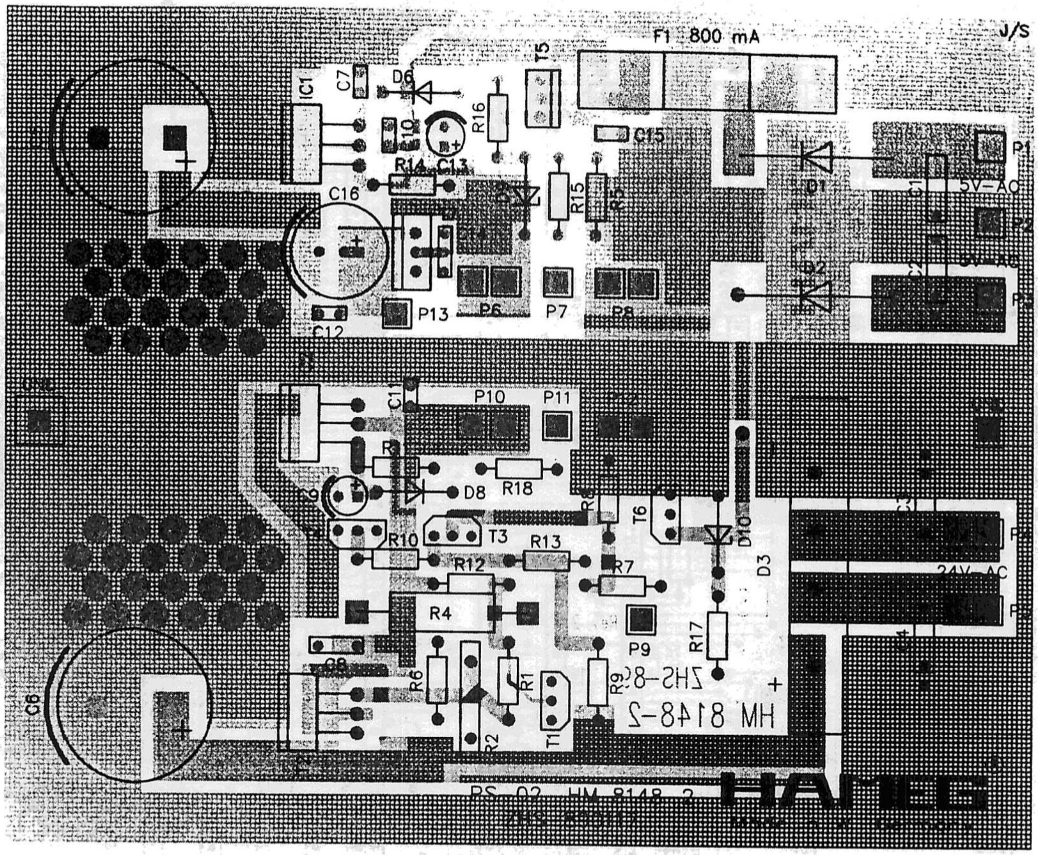
Blatt 1 von 1
Sheet

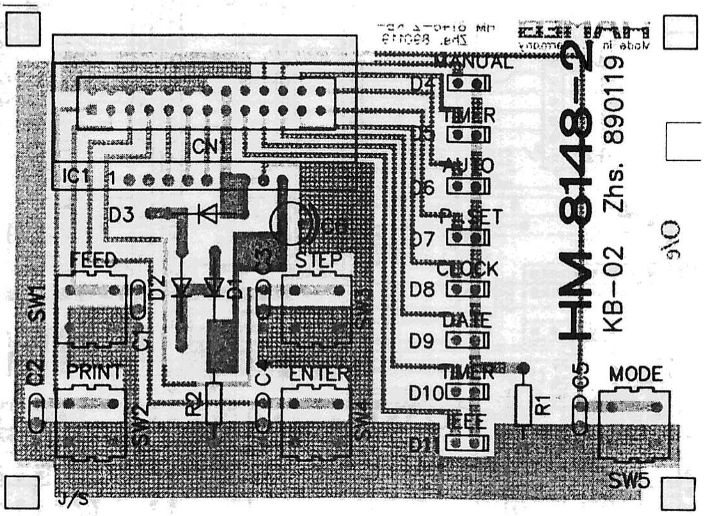
H. Joosten
J. Bruder

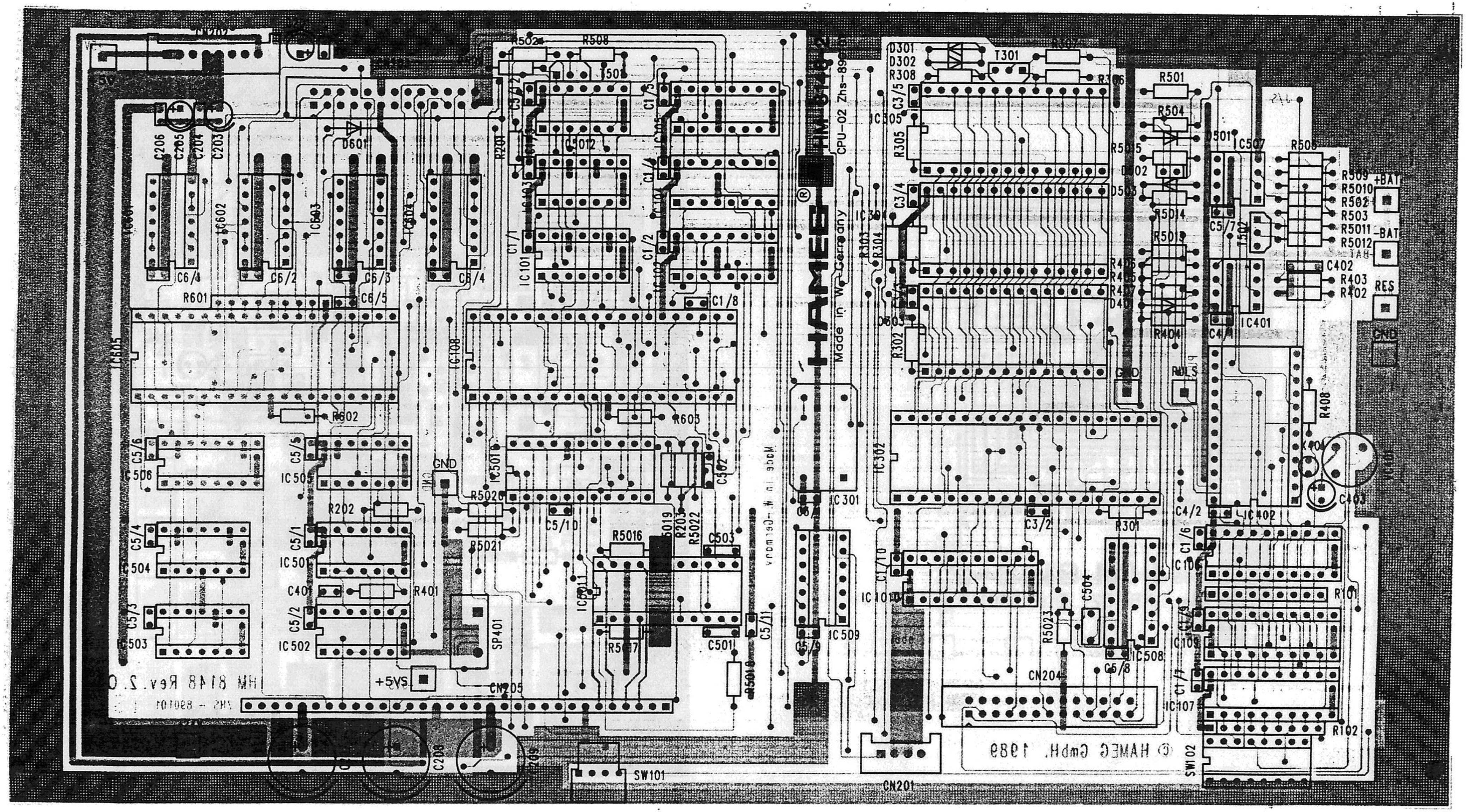


Änderungen vorbehalten !/Subject to change without notice !

HAMEG® –Graphic Printer– HM 8148-2	KB – 02	Rev.: 02
	Datum : Date : Mhsn./19–01–1989	
	Blatt Sheet 1 von of 1	H. Joosten


F1 800 mA
J/S
IC1
C7
D6
R16
T5
C15
D1
P1
5V-AC
P2
R14
C13
C16
R15
P13
P6
P7
P8
C12
P10
P11
C11
D8
R18
C9
R10
T3
R13
R12
R7
R4
T6
D10
D3
P9
R17
R6
R1
R9
R2
T1
C8
C6
HM 8148-2
24V-AC
HAMEG


MANUAL
D4
TIMER
AUTO
D6
PRESET
D7
CLOCK
D8
DATE
D9
TIMER
D10
D11
R1
C5
MODE
SW5
HM 8148-2
KB-02
Zhs. 890119
CN1
IC1
D3
FEED
SW1
D2
C1
C2
PRINT
SW2
R2
ENTER
SW4
STEP
SW3
J/S



HAMEG
HM 8148-2
CPU-02 Zhs-8901
Made in W.-Germany
© HAMEG GmbH, 1989
HM 8148 Rev. 2.0
+BAT
-BAT
RES
GND
+5VS
SW102
SW101
CN201
CN204
CN205
SP401

Item	Quantity	Reference	Part
1	2	R6,R16	100
2	1	C6	3300/50/4
3	2	R15,R1	365
4	1	D10	ZPD12
5	1	C13	47/25/1
6	1	C5	4700/16/4
7	1	C16	470/40/2
8	1	R2	R22/2W/4
9	2	D8,D6	1N4002
10	3	T3,T4,T6	BC337-40
11	1	R4	3R3/4W/10
12	1	T1	BC560C
13	1	C14	.33/50/2
14	1	T7	SGSP382
15	5	C12,C7,C10,C11,C15	.1/50/1
16	2	R14,R11	121
17	2	IC1,IC2	LM317
18	1	T5	TLS106-4
19	1	T2	BD646
20	1	C8	.01/63/2
21	4	C1,C2,C3,C4	.0047/400/4
22	1	F1	0.8A/ML
23	1	R5	1K
24	4	R7,R8,R10,R13	10K
25	1	R18	2K21
26	2	R17,R9	47K5
27	1	C9	22/35/1
28	1	D3	B40C5000/3300
29	1	R12	18K2
30	2	D1,D2	BYS26-45
31	1	D9	BZX79B5V6
32	2	F1/1,F1/2	FUSECLIP
33	3	GS1,GS2,GS3	GS2208
34	1	PS-02 890117	PCB
35	1	S001	NETZSCHALTER
36	1	NETZTRAFO	BV:031/0083
37	1	LUMBERG-KABEL 8-pol.	PSCON-8P
38	1	KALTGERAETE STECKER	AL001
39	1	NETZSICHERUNG	1,6/0,8A TRAEGE
40	1	NETZFILTER	BV:F 11.171/15

Item	Quantity	Reference	Part
1	1	R1	121
2	1	CN1	26PCONL
3	3	D1,D2,D3	1N4002
4	5	SW1,SW2,SW3,SW4,SW5	KEY
5	1	KB-02 890119	PCB
6	1	CN2	PINROW/9
7	3	D4,D5,D6	YELLOW
8	5	D7,D8.D9,D10,D11	GREEN
9	1	IC1	DISPLAY TSM4700
10	1	C6	10/16/1
11	1	R2	1K
12	5	C5,C1,C2,C3,C4	.12/63/2

Item	Quantity	Reference	Part
1	10	+5VS,+5V,GND201,+24V, GND401,GND402,+BAT,-BAT, PULS,RES	TP
2	1	R201	200
3	1	CN201	4PCONP
4	2	IC5012,IC501	74HC14
5	18	R203,R202,R301,R302,R303, R304,R305,R306,R403,R405, R407,R408,R501,R502,R602, R603,R5012,R5014	47K5
6	1	CN202	8PCONP
7	1	CN205	32PCONP
8	2	CN203,CN204	26PCONP
9	3	C209,C207,C208	470/40/2
10	38	C206,C1/1,C1/2,C1/3,C1/4, C1/5,C1/6,C1/7,C1/8,C1/9, C202,C204,C3/1,C3/2,C3/3, C3/4,C3/5,C4/1,C401,C4/2, C5/1,C5/2,C5/3,C5/4,C5/5, C5/6,C5/7,C5/8,C5/9,C6/1, C6/2,C6/3,C6/4,C6/5, C1/10,C5/10,C5/11,C5/12	.1/50/1
11	3	C205,C201,C203	10/35/1
12	2	IC605,IC108	TMPZ84C20AP-6
13	4	IC604,IC601,IC602,IC603	74HC4066
14	3	R601,R101,R102	AR8x47k
15	1	D601	BYV10/40
16	1	D401	BAT41
17	1	C403	47/16/1
18	1	X401	32K768/M
19	6	R401,R307,R308,R406,R508, R5013	10K
20	3	IC502,IC103,IC509	74HC08
21	1	SP401	SPEAKER
22	1	R404	51K1
23	1	R402	43K2
24	1	C402	.001/63/2
25	1	IC401	H6006/A3
26	1	IC402	M3001
27	1	VC401	2-22pF
28	1	IC301	6MHz
29	1	IC302	TMPZ84C00AP-6
30	2	IC303,IC304	27C256
31	1	IC305	43256C
32	2	T301,T502	BC550C
33	4	D302,D301,D501,D503	1N4149
34	1	IC503	74HC74
35	1	IC504	74HC32
36	1	IC506	74HC165
37	1	IC505	74HC393
38	1	D502	GREEN
39	1	IC507	TL082
40	9	R506,R509,R5010,R5015,	1K

Item	Quantity	Reference	Part
		R5018,R5019,R5020,R5021, R5024	
41	4	R5011,R503,R504,R505	4K75
42	2	C501,C502	680P/160/2
43	2	R5017,R5016	1R
44	1	IC5011	PBL3771
45	1	IC5010	PBM3960
46	1	C503	.0039/160/2
47	1	R5022	15K
48	1	IC508	74HC123
49	1	T501	BC560C
50	1	C504	.12/63/2
51	1	R5023	68K1
52	1	IC101	74HC21
53	3	IC102,IC104,IC105	74HC138
54	4	IC106,IC107,IC109,IC1010	74HC573
55	1	SW101	BCDSW
56	1	SW102	DIPSW8
57	1	FS/R6/IC402	24 PIN
58	2	FS/R3/IC401,FS/R3/IC507	08 PIN
59	2	FS/R4/IC5010, FS/R4/IC5011	22 PIN
60	5	FS/R3/IC506,FS/R3/IC102, FS/R3/IC104,FS/R3/IC105, FS/R3/IC508	16 PIN
61	13	FS/R3/IC501,FS/R3/IC101, FS/R3/IC103,FS/R3/IC502, FS/R3/IC503,FS/R3/IC504, FS/R3/IC505,FS/R3/IC509, FS/R3/IC601,FS/R3/IC602, FS/R6/IC603,FS/R6/IC604, FS/R3/IC5012	14 PIN
62	4	FS/R3/IC1010,FS/R3/IC106, FS/R3/IC107,FS/R3/IC109	20 PIN
63	3	FS/R6/IC108,FS/R6/IC302, FS/R6/IC605	40 PIN TOP
64	3	FS/R6/IC303,FS/R6/IC304, FS/R6/IC305	28 PIN
65	1	BATTANSCHLUSS1	BATSNAP
66	2	KABEL70mm/2,KABEL70mm/1	FLKA1.50/12
67	1	KABEL70mm/3	FLKA2.50/3
68	1	4PCON1	4PCONM
69	1	44PCON1	44PCONM
70	1	KABEL100mm	FLKA2.50/4
71	2	CPU-02 890101, CON-02 890120	PCB

Effective Monday, 8th October, and starting with Serial Number 3450, all printers leaving the factory will be equipped with system software revision V2.5.

This revision supports the HAMEG oscilloscopes HM205-2, HM205-3, HM208 with printer interface HO77, and HM408.

Software V2.5 offers the following additional features:

- XY-printout from Yt-data stored in the above oscilloscopes.
- Trace marks for Channel I and Channel II
- Faster reconfiguration on initialization and when changing zoom-parameters
- New IBM-compatible character set
- Printout of type of connected oscilloscope
- Extended range of error messages

The following ammendments should be added to the respective pages in the existing operating manual for the HM8148-2.

Page M3 "Introduction"

With the lastest software revision V2.5, the HAMEG graphic printer HM8148-2 will operate with oscilloscopes HM205-2, HM205-3, HM208 with printer interface HO77, and HM408. The printer HM8148-2 will now provide a conversion routine for printouts in the XY-mode from these oscilloscopes.

Page M4 "Initialization and self–test"

The error messages generated by the printer have been changed and extended as follows:

ER00	Bad Battery!
ER01	Insert printing/paper drawer!
ER02	Paper empty!
ER03	Test of RAM/IC305 failed!
ER04	*Wait for CLKAZ low!*
ER05	Test of ROM1/IC303 failed!
ER06	Test of ROM2/IC304 failed!
ER07	Test of Clock/IC402 failed!
ER08	Input Failure!
ER09	Undefined Scope Condition!
ER10	HM408-Error! (Transfer Enable)
ER11	Hameg-Scope in Analog-Mode!
ER12	Thermal-Head out of Range!
ER13	Hameg-Scope is not connected!
ER14	Hameg-Scope without Power!
ER15	Internal Error!
ER16	Paper Lever in wrong position!
ER17	Test of Keyboard failed!
ER18	X-Mag. (x10) is not available!
ER19	Expanded-Mode is not available!
ER20	Bad Command!
ER21	*Wait for CLKAZ low!*
ER22	*Wait for SRQ high!*
ER23	Internal Error!
ER24	*Test of IEEE-Option failed!*

Errors marked "*" are already in preparation of the IEEE-Interface Option for the HM8148-2.

Page M5 "Printer Set (Mode 4)"

Due to the implementation of the XY-Mode, the available hardcopy modes, which can be accessed after going through the "Zoomrange setup" (0909), have been extended as follows:

0 = Hardcopy with company logo and parameters
1 = Hardcopy with parameters only
2 = Hardcopy with graticule only
3 = Hardcopy in XY-Mode

The composition of the XY-printout will depend from which previous hardcopy mode option 3 was selected. (For example: If hardcopy mode was set to 2 (graticule only) and is then changed to 3, the XY-printout will only contain the graticule. If hardcopy mode was previously set to 0 and is then changed to 3, the XY-printout will contain graticule, company logo and parameters).

Timebase Parameters		Channel Parameters	
0	Blank	0	Blank
1	50 s/Div.	1	20 V/Div.
2	20 s/Div.	2	10 V/Div.
3	10 s/Div.	3	5 V/Div.
4	5 s/Div.	4	4 V/Div.
5	2 s/Div.	5	2 V/Div.
6	1 s/Div.	6	1 V/Div.
7	0.5 s/Div.	7	0.5 V/Div.
8	0.2 s/Div.	8	0.4 V/Div.
9	0.1 s/Div.	9	0.2 V/Div.
10	50 ms/Div.	10	0.1 V/Div.
11	200 ms/Div.	11	50 mV/Div.
12	10 ms/Div.	12	40 mV/Div.
13	5 ms/Div.	13	20 mV/Div.
14	2 ms/Div.	14	10 mV/Div.
15	1 ms/Div.	15	5 mV/Div.
16	0.5 ms/Div.	16	4 mV/Div.
17	0.2 ms/Div.	17	2 mV/Div.
18	0.1 ms/Div.	18	1 mV/Div.
19	50 µs/Div.		
20	20 µs/Div.		
21	10 µs/Div.		
22	5 µs/Div.		
23	2 µs/Div.		
24	1 µs/Div.		

Page M6 "Parameter Field"

If the oscilloscope HM408 is connected, the parameter field on the hardcopy will contain all information shown by the readout on the oscilloscope screen.

Input Sensitivity Channel I
Input Sensitivity Channel II
Timebase
Triggerlevel
Pretrigger
Delta Cursor
Add Mode

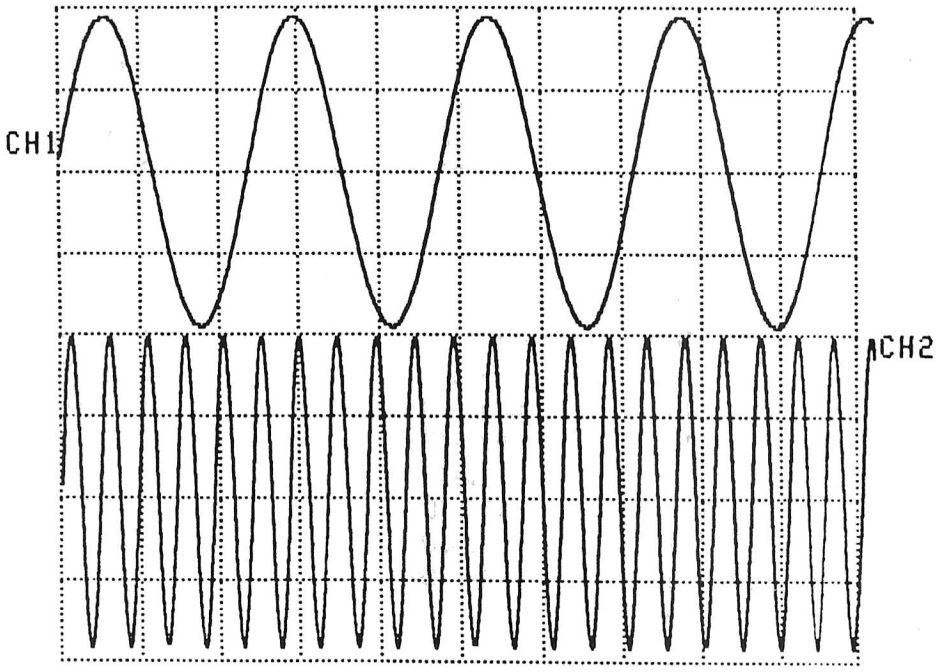
Behind "Hardcopy Source:" the type of oscilloscope from which the data are printed will be shown.

Page M6 "Default settings"

The basic initialization routine started by pressing the POWER and MODE buttons simultaneously is now running much faster. It is completed when the message "Printer Configuration completed" is printed out. The default parameters will then be as follows:

Mode:	ONLINE-MANUAL (Mode 1)
Time:	0000 (hhmm) hour/minute
Date:	0000 (ddmm) day/month
Year:	1990
Zoom:	0909 (CH I start/end field, CH II start/end)
Hardcopy:	0
CH I:	0 (Blank)
CH II:	0 (Blank)
Timebase:	0 (Blank)
Starttime:	0000 (hhmm) hour/minute
Startdate:	0000 (ddmm) day/month
Interva :	0000 (hhmm) hour/minute

Page M6 "Test log"




```
DATE: 08-10-1990
TIME: 09:31:35

SIGNALPARAMETER:
----------------
CH1 -  VOLTS/DIV:=0.2V
CH2 -  VOLTS/DIV:=0.2V
TIMEBASE-SEC/DIV:=5ms
TRIGGERLEVEL CH2:AUTO
PRETRIGGER      :0%
DELTA CURSOR    :OFF
ADD  CH1,CH2    :OFF

PRINTERPARAMETER:
-----------------
ZOOMRANGE  - CH1:0-9
ZOOMRANGE  - CH2:0-9
HARDCOPY SOURCE :HM 408

REMARKS:
--------
```

Graphics Printer HM8148-2
New Software V 2.5

Effective Monday, 8th October, and starting with Serial Number 3450, all printers leaving the factory will be equipped with system software revision V 2.5.

This revision supports the HAMEG oscilloscopes HM205-2, HM205-3, HM208 with printer interface HO77, and HM408.

Software V 2.5 offers the following additional features:

- XY-printouts from Yt-data stored in the above oscilloscopes.
- Trace marks for Channel I and Channel II
- Faster reconfiguration on initialization and when changing zoom-parameters.
- New IBM-compatible character set
- Printout of type of connected oscilloscope
- Extended range of errror messages

The following ammendments should be added to the respective pages in the existing operating manual for the HM8148-2:

Page M3 "Introduction"

With the latest software revision V 2.5, the HAMEG graphics printer HM8148-2 will operate with oscilloscopes HM205-2, HM205-3, HM208 with printer interface HO77, and HM408. The printer HM8148-2 will now provide a conversion routine for printouts in the XY-mode from these oscilloscopes.

Page M4 "Initialization and self-test"

The error messages generated by the printer have been changed and extended as follows:

ER00	Bad Battery!
ER01	Insert printing/paper drawer!
ER02	Paper empty!
ER03	Test of RAM/IC305 failed!
ER04	*Wait for CLKAZ low!*
ER05	Test of ROM1/IC303 failed!
ER06	Test of ROM2/IC304 failed!
ER07	Test of Clock/IC402 failed!
ER08	Input Failure!
ER09	Undefined Scope Condition!
ER10	HM408-Error! (Transfer Enable)
ER11	HAMEG-Scope in Analog-Mode!
ER12	Thermal Head out of Range!
ER13	HAMEG-Scope is not connected!
ER14	HAMEG-Scope without Power!
ER15	Internal Error!
ER16	Paper Lever in wrong position!
ER17	Test of Keyboard failed!
ER18	X-Mag.(x10) is not available!
ER19	Expanded-Mode is not available!
ER20	Bad Command!
ER21	*Wait for CLKAZ low!*
ER22	*Wait for SRQ high!*
ER23	Internal Error!
ER24	*Test of IEEE-Option failed!*

Errors marked "*" are already in preparation of the IEEE-Interface Option for the HM8148-2.

Page M5 "4: Printer Set (Mode 4)

Due to the implementation of the XY-Mode, the available hardcopy modes, which can be accessed after going through the "Zoomrange setup" (0909), have been extended as follows:

0	Hardcopy with company logo and parameters
1	Hardcopy with parameters only
2	Hardcopy with graticule only
3	Hardcopy in XY-Mode

The composition of the XY-printout will depend from which previous hardcopy mode option 3 was selected. (For example: If hardcopy mode was set to 2 (graticule only) and is then changed to 3, the XY-printout will only contain the graticule. If hardcopy mode was previously set to 0 and is then changed to 3, the XY-printout will contain graticule, company logo and parameters.)

New setup tables have been defined to select input sensitivity and timebase parameters, now also allowing to blank figures in the parameter fields of the hardcopy.

Timebase Parameters	
0	Blank
1	50s/Div.
2	20s
3	10s
4	5s
5	2s
6	1s
7	0.5s
8	0.2s
9	0.1s
10	50ms
11	20ms
12	10ms
13	5ms
14	2ms
15	1ms
16	0.5ms
17	0.2ms
18	0.1ms
19	50us
20	20us
21	10us
22	5us
23	2us
24	1us

Channel Parameters	
0	Blank
1	20V/Div.
2	10V
3	5V
4	4V
5	2V
6	1V
7	0.5V
8	0.4V
9	0.2V
10	0.1V
11	50mV
12	40mV
13	20mV
14	10mV
15	5mV
16	4mV
17	2mV
18	1mV

If the digital storage oscilloscope HM408 is connected, the setup parameters will be transferred automatically to the printer.

Page M6 "Parameter Field"

If the oscilloscope HM408 is connected, the parameter field on the hardcopy will contain all information shown on by the readout on the oscilloscope screen.

Input Sensitivity Channel I
Input Sensitivity Channel II
Timebase
Triggerlevel
Pretrigger
Delta Cursor
Add Mode

Behind "Hardcopy Source:" the type of oscilloscope from which the data are printed will be shown.

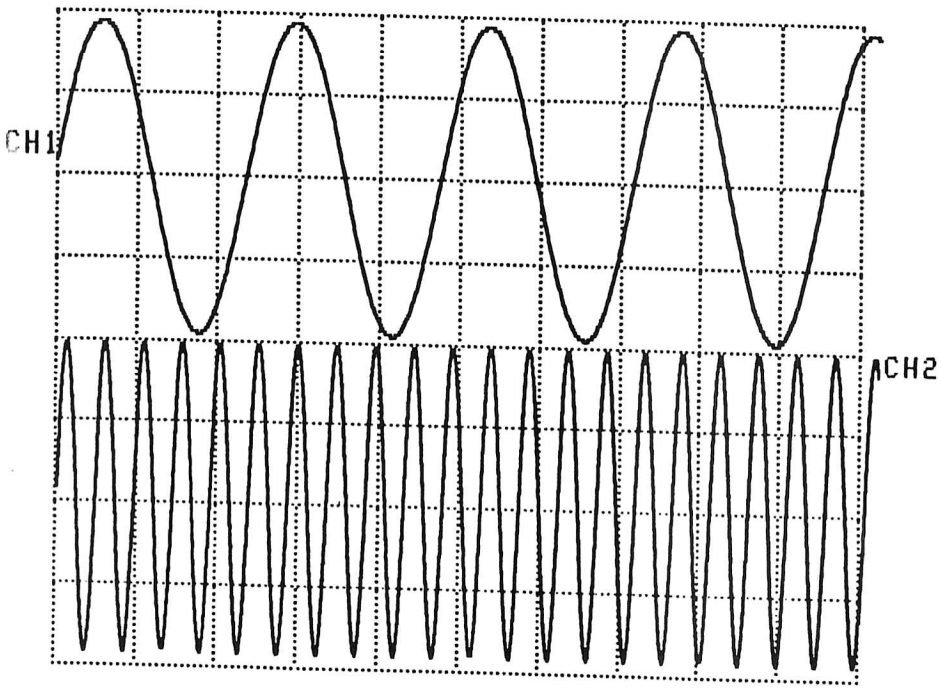
Page M6 "Default settings"

The basic initialization routine started by pressing the POWER and MODE buttons simultaneously is now running much faster. It is completed when the message "Printer Configuration completed" is printed out. The default parameters will then be as follows:

Mode:	ONLINE-MANUAL (Mode 1)	
Time:	0000	(hhmm) hour/minute
Date:	0000	(ddmm) day/month
Year:	1990	
Zoom:	0909	(CH1 start/end field, CH2 start/end)
Hardcopy:	0	
CH1:	0	(Blank)
CH2:	0	(Blank)
Timebase:	0	(Blank)
Starttime:	0000	(hhmm) hour/minute
Startdate:	0000	(ddmm) day/month
Interval:	0000	(hhmm) hour/minute

Page M6 "Test log"

Frankfurt, 17th October 1990
CHB/s



DATE: 08-10-1990
TIME: 09:31:35

SIGNALPARAMETER:

CH1 - VOLTS/DIV:	=0.2V
CH2 - VOLTS/DIV:	=0.2V
TIMEBASE-SEC/DIV:	=5ms
TRIGGERLEVEL CH2:	AUTO
PRETRIGGER:	0%
DELTA CURSOR:	OFF
ADD CH1,CH2:	OFF

PRINTERPARAMETER:

ZOOMRANGE - CH1:	0-9
ZOOMRANGE - CH2:	0-9
HARDCOPY SOURCE:	HM 408

REMARKS:

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HAMEG

Oscilloscopes

Multimeters

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Signal Generators

Check Point Testers

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