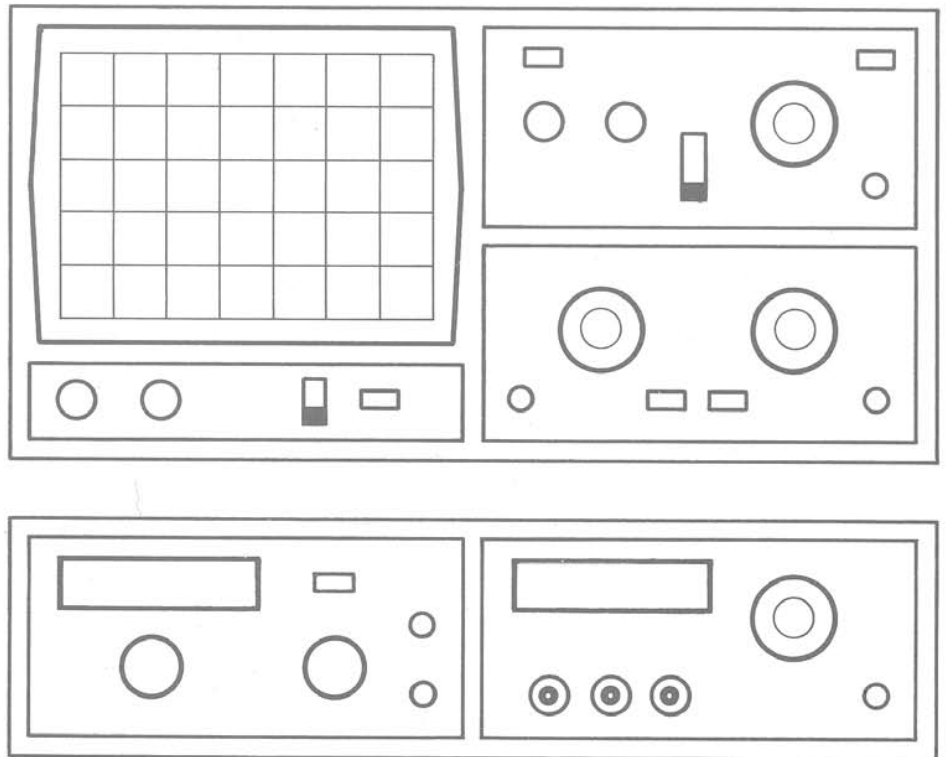


HAMEG

Instruments

MANUAL

Graphic Printer HM 8148



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Circuit Diagrams

Components Location

Parts List

**Graphic Printer
HM 8148**

General information

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

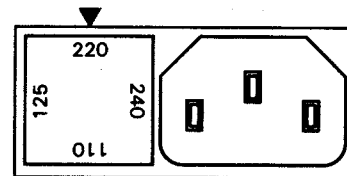
This unit requires no maintenance.

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	Setting of calendar date
TIMER SET	Setting of timer parameters
IEEE (optional)	Setting of IEEE parameters

Printer data

Printing system	Thermal
Dots per line	256
Dot density	2.86 dots/mm (72.64 dots/inch)
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	3000 lines of dots/min.
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

Interfaces

Standard	HAMEG System interface
Optional	IEEE - 488

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: $\pm 10\%$
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

- 1 HO 74 interface adapter for HM 205-2, 1 connection cable: printer - scope,
- 1 roll of thermal paper, power cord, footrest, operating instructions

Operating Instructions

Introduction

The HM 8148 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.

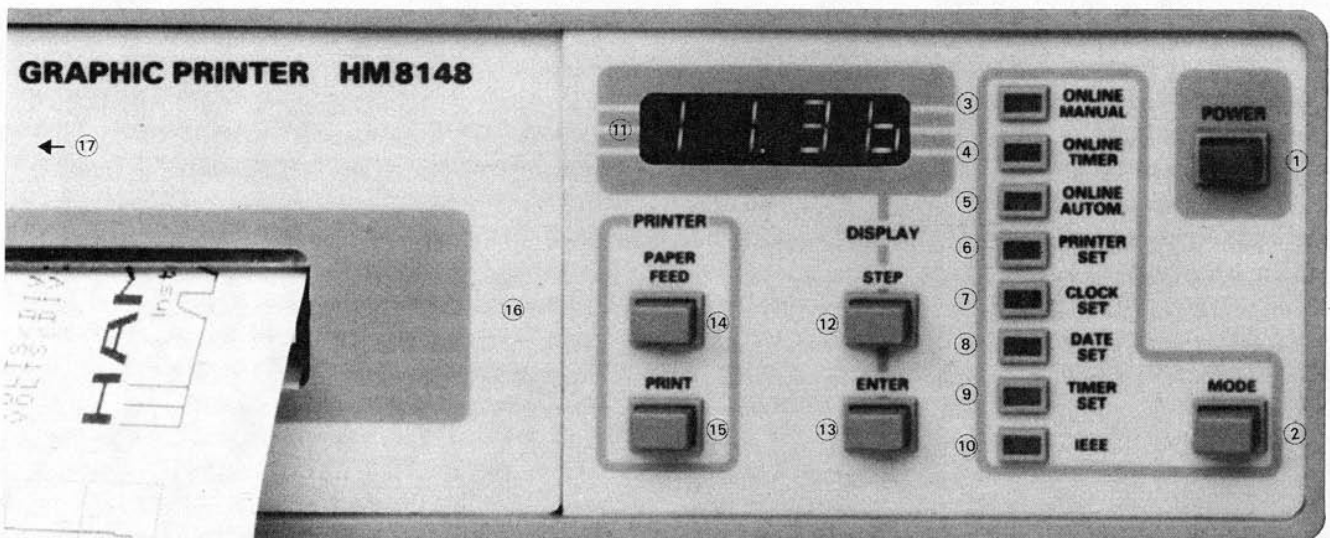
All parameters are entered using a user-friendly, menu-driven routine that virtually excludes any possibility of mistakes. Moreover, this unit permits automatic capture of measurement data, either timer-controlled using the built-in realtime clock or in response to a given trigger event registered on the oscilloscope.

The contents of the oscilloscope memory are transferred to the HM 8148 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.

A second ribbon cable with one standard connector and one connector for attachment inside the HM 205-1 oscilloscope, also supplied as a standard accessory, must be installed in the oscilloscope (if used) to implement the HAMEG interface. The procedure to be followed is explained in the section "Installation of the HO 74 interface adaptor".

If an HM 208 oscilloscope is to be retrofitted with a HAMEG interface, this must be done by HAMEG 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 (optional)**
Indicator for "Mode 8"; for entry of IEEE-488 parameters
- ⑪ **DISPLAY**
4-digit LED display
- ⑫ **STEP**
Press to increment the displayed value by one
- ⑬ **ENTER**
Press to enter the displayed value and activate the next digit
- ⑭ **PAPER FEED**
Press to advance 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 using an HM 205-2, it does not make any difference whether channel I, channel II or dual mode is used.

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 (U204)
- " ERR4 " - RAM fault (U205)
- " ERR5 " - EPROM fault (U205)
- " ERR6 " - EPROM fault (U206)
- " ERR7 " - Clock fault (U301)
- " ERR0. " - PIO fault (U910)
- " ERR1. " - PIO fault (U801)
- " ERR2. " - Printer interface is not connected
- " ERR3. " - Oscilloscope is not connected
- " ERR4. " - Oscilloscope is not switched on
- " ERR6. " - Paper lever in wrong position

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

```
NO ERRORS FOUND !
ROM - VERSION: (e.g.: 0.0 (01.08.87))
SELFTEST PASSED !
```

The unit is now ready for operation. Its initial (default) settings are as follows:

```
Mode 1 = ONLINE MANUAL
Current time of day / month / year
Zoom range: division 0 to 9 (no zoom) for both channels
Evaluation procedure mode 0 (linear approximation)
    for both channels
No timer parameters
```

Note: 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 lefthand edge of the graticule. Portions of traces displayed to the right of the righthand edge of the graticule will not be printed out.

Operating modes

1: ONLINE MANUAL

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 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 another trigger event if it is in SINGLE mode.

HM 208

The HM 208 must always be operated in DUAL mode to ensure correct printout by the Graphic Printer.

This is possible in oscilloscope modes **ROLL** and **REFRESH**, but not in **XY** mode.

2: ONLINE TIMER

If the Graphic Printer is in this operating mode, then data are transferred from the oscilloscope at a pre-programmed point in time.

When the preprogrammed starting time is reached, the image displayed in the oscilloscope screen at that moment in time is automatically printed out. It is possible to obtain repeated, cyclic printouts by specifying a time interval (e.g. every hour).

If the oscilloscope is set to SINGLE or HOLD, then it is not possible to update the contents of its digital waveform memory. Consequently, it is not advisable to use these oscilloscope modes with this printer mode.

The Graphic Printer may be powered down between two printout cycle times without causing any problems.

Note: The starting time must be within the current month, i.e. it may not be later than on the last day of this month.

The maximum interval between printouts which may be entered is 24 hours.

3: ONLINE AUTOMATIC

In this Graphic Printer 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 signal is sent to the printer, which initiates data transfer and subsequently sends a reset signal to the oscilloscope. This clears the oscilloscope so

that it will be ready for a new trigger event. The data received by the Graphic Printer are immediately printed out.

This mode permits automatic continuous monitoring of test signals.

4: PRINTER SET

If the MODE button is used to select the PRINTER SET mode, then the time of day disappears from the display. Instead, 4 digits appear which indicate the so-called "zoom range". This refers 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, "0" indicating the range from the left-hand border of the screen to the first vertical bar, "1" the range between the first and second vertical bars, and so on up to "9".

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 2.

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 9, 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 desired to change any of these values, 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. Each press of the button causes it to be incremented by one. To proceed to the next digit, press the ENTER button again and make changes with the STEP button, and so on until the 4th digit (last one on the right) has been assigned the desired value.

When ENTER is pressed for the fifth time, the first two digits go blank and two new digits appear on the right-hand side of the display. These define the evaluation procedure to be used when printing out. The dot is now to the right of the first of these digits; it refers to Channel I and can be assigned the value 0 or 1.

Pressing ENTER for the 6th time advances the dot to the second of the two displayed digits, which refers to the evaluation procedure to be used for Channel II.

Printout: 0 - linear approximation

1 - minimum/maximum evaluation

When ENTER is now pressed a 7th time, the 4 digits corresponding to the zoom ranges reappear.

The PRINTER SET mode may be left at any time by using the MODE button.

5: CLOCK SET

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

The DATE SET mode is used to display and change the date (day, month and year). When this mode is selected, four digits first appear: the first two digits are for the day of the month, and the third and fourth digits for the month of the year.

To change the displayed values, press ENTER. A dot will appear on the left side of the 1st digit. By pressing the STEP button, this digit may be assigned the value 0, 1, 2 or 3 (tenth).

The 2nd digit corresponds to the ones in the day of the month, and can be set to any value between 0 and 9.

Impossible values (e.g. 3207) cannot be entered, since the dot cannot be advanced by pressing ENTER, nor can the DATE SET mode be exited by pressing the MODE button.

When ENTER is pressed for the third time the dot advances to the 3rd digit, which corresponds to the tenth in the month; this can only be set to 0 or 1.

Pressing ENTER a fourth time advances the dot to the digit furthest to the right. This digit represents the ones in the month and can be set to any value between 0 and 9 by pressing STEP.

The next step is to enter the year (e.g. 1988). Pressing ENTER again causes the entered year to be displayed. The digits 19 in the first two fields are permanently entered and may not be changed; the dot thus appears next to the 3rd digit. Both this digit and the following one may be set to any value between 0 and 9.

After entering the year, push MODE to revert the display of day and month, whereby a leap-year check is made.

If the DATE SET is plausible, this mode can now be exited by pressing MODE again.

7: TIMER SET

Once the Graphic Printer has been set to TIMER SET mode, the starting time, date and time interval may be entered, in that order, for subsequent data transfer from the oscilloscope and automatic printout.

The values entered in TIMER SET mode are only relevant for operation in ONLINE TIMER mode.

The four digits which initially appear represent the starting time; this may be changed using the ENTER and STEP buttons as described above.

When ENTER is pressed for the 5th time, the starting date is displayed; for example, 0110 stands for October 1. The dot appears to the right of the first digit. The first and second digits may be changed with ENTER and STEP as described above.

Since the month must be identical with that entered in DATE SET, it may not be changed.

Consequently, when ENTER is pressed for the 7th time the entered time interval is displayed. If this value is 0000 then no time interval is entered and with the printer in ONLINE TIMER mode hardcopy is printed out only when the starting time is reached.

If STEP is pressed once, the value 1000 appears (with the dot to the right of the 1), and pressing ENTER advances the dot to the right of the first zero. STEP may now be used to set the ones of the hour. The minutes are set in the same way.

If the time interval is set to 1253, for example, the first printout is performed when the starting time on the starting day (in the current month) is reached. Thereafter a new printout will be made automatically every 12 hours and 53 minutes.

Signal evaluation

As described above in connection with mode 4, two different signal evaluation procedures are possible.

In the procedure indicated by "0", a linear approximation is carried out, i.e. when the oscilloscope data (1024 data points on the X-axis) are compressed for representation using the actual number of available dots for printing (a total of 280), an approximated linear mapping is performed. That means that the average is calculated for each group of 4

consecutive points and this calculated value assigned to one printer point.

In order to prevent any spikes (high or low) being dropped in this way, it is necessary to choose evaluation procedure "1". In this procedure, the set of scope data is divided up into a number of intervals of equal size. Each of them is then checked to determine its minimum and maximum, and both of these values are printed out, thus preventing any spikes from being lost. In the case of continuous smooth waveforms, this procedure results in stepped plots.

If use of the zoom function results in a situation in which the number of oscilloscope data points along the X-axis is less than the number of printing dots (280), then the gaps are filled in by means of linear interpolation.

Each hardcopy printout contains the following additional information:

Date, time of day, and space for remarks

Signal parameters: CH 1 - VOLTS / DIV :

CH 2 - VOLTS / DIV :

Timebase - SEC/DIV :

Printer parameters: Zoom range (CH 1) : 0 - 9

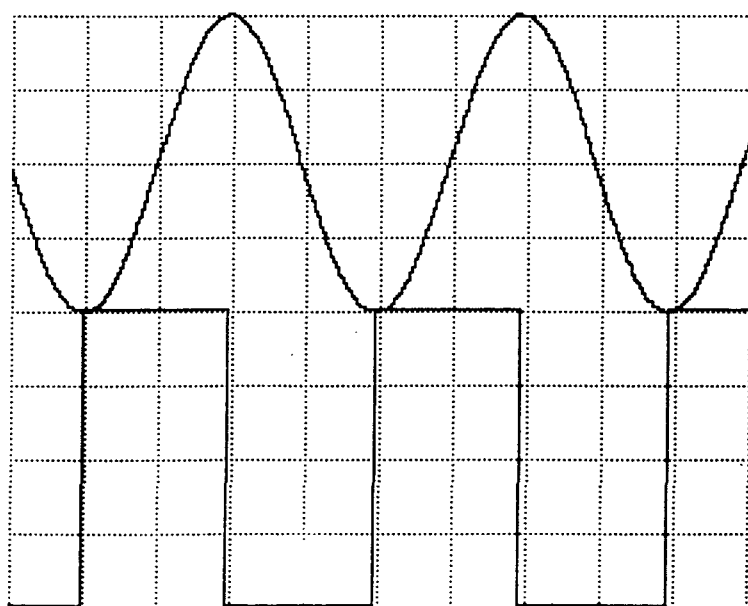
Zoom range (CH 2) : 0 - 9

Evaluation (CH 1) : 0 - 1

Evaluation (CH 2) : 0 - 1

When the Graphic Printer is used with an HM 205-2, if the scope is operated in dual-channel mode the printer automatically recognizes the respective positions of the two channels on the Y-axis, i.e. which channel is to be printed on top and which on the bottom, provided that their Y-positions are not the same, and prints out the corresponding parameters in the same order.

As already mentioned, when using the Graphics Printer with an HM 208 the oscilloscope must always be operated in DUAL mode. No assignment of parameters is therefore performed.



DATE: 20.01.1988
TIME: 14:51

SIGNALPARAMETER:

CH1 - VOLTS/DIV:

CH2 - VOLTS/DIV:

TIMEBASE-SEC/DIV:

PRINTERPARAMETER:

ZOOMRANGE - CH1:0-9

ZOOMRANGE - CH2:0-9

EVALUATION - CH1:0

EVALUATION - CH2:0

REMARKS:



Test log

Autoset

The autoset function is used to reset all parameters to their default values. To perform, hold the MODE button depressed while powering up the printer by pressing the POWER button. Following an initialization phase lasting approx. 6 seconds, the printer settings are automatically reset to the following values:

Mode:	ONLINE MANUAL
Time, date, year:	0000
Zoom range:	0909
Starting time:	0000
Time interval:	0000
Evaluation type:	00

Rotary switch

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

Printing assembly drawer

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

Changing the three alkaline-cell batteries

If the voltage of the back-up batteries is too low the self-test routine performed when the printer is powered up will display the error message " ERRO ".

To replace the batteries, first disconnect the printer from its external power source. Then - and only then - remove the printer case by taking off the rear cover and pulling off the housing shell towards the back. The battery compartment is then easily accessible.

After replacing the batteries and reassembling the printer, the unit is automatically re-initialized upon power-up. The initialization process takes approx. 6 seconds.

Mean service life of the batteries: approx. 3 years.

Important!

Use only alkaline battery types.

Batteries with the following designations are suitable:

Mignon (AA - LR6, AM3)

Loading a new paper roll

If a red streak appears on the paper during printout, then a new roll of thermal paper must be loaded immediately. This indicates that the paper roll has been used up.

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).

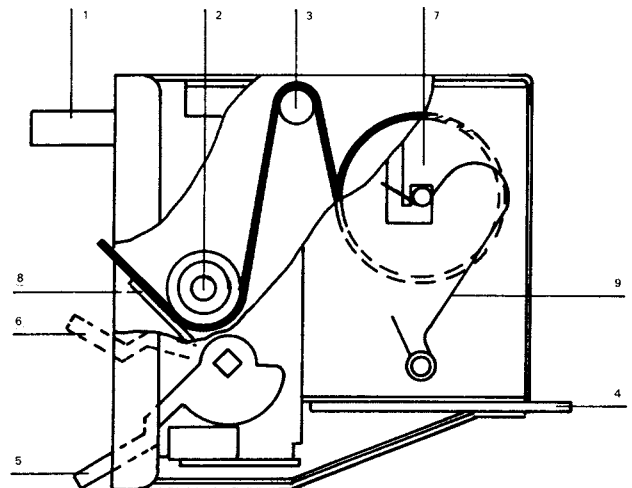
Cut off diagonally the protruding free end of the roll (making sure that no adhesive residues are left on the paper).

Insert the paper and slide it through until it emerges in front.

Pull out approx. 10 cm of paper and straighten it. Close the drawer.

Return the paper release lever to its lower position.

After being powered up, the printer is ready for operation as soon as the "NO ERRORS" message is displayed.



Installation of interface adaptor HO 74

The function of the adaptor is to connect the digital storage memory of the HM 205-2 oscilloscope to external devices, such as the Graphic Printer, XY recorder interface HO 75 and IEEE interface HO 77.

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

The interface adaptor HO 74 is supplied with the Graphic Printer and is installed as follows:

Disconnect the power cord before opening the HM 205-2.

Place the oscilloscope with the front side facing down on a soft surface. Remove the back cover and carefully pull the case off towards the back.

Place the scope rightside up again, so that its back is facing towards you.

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

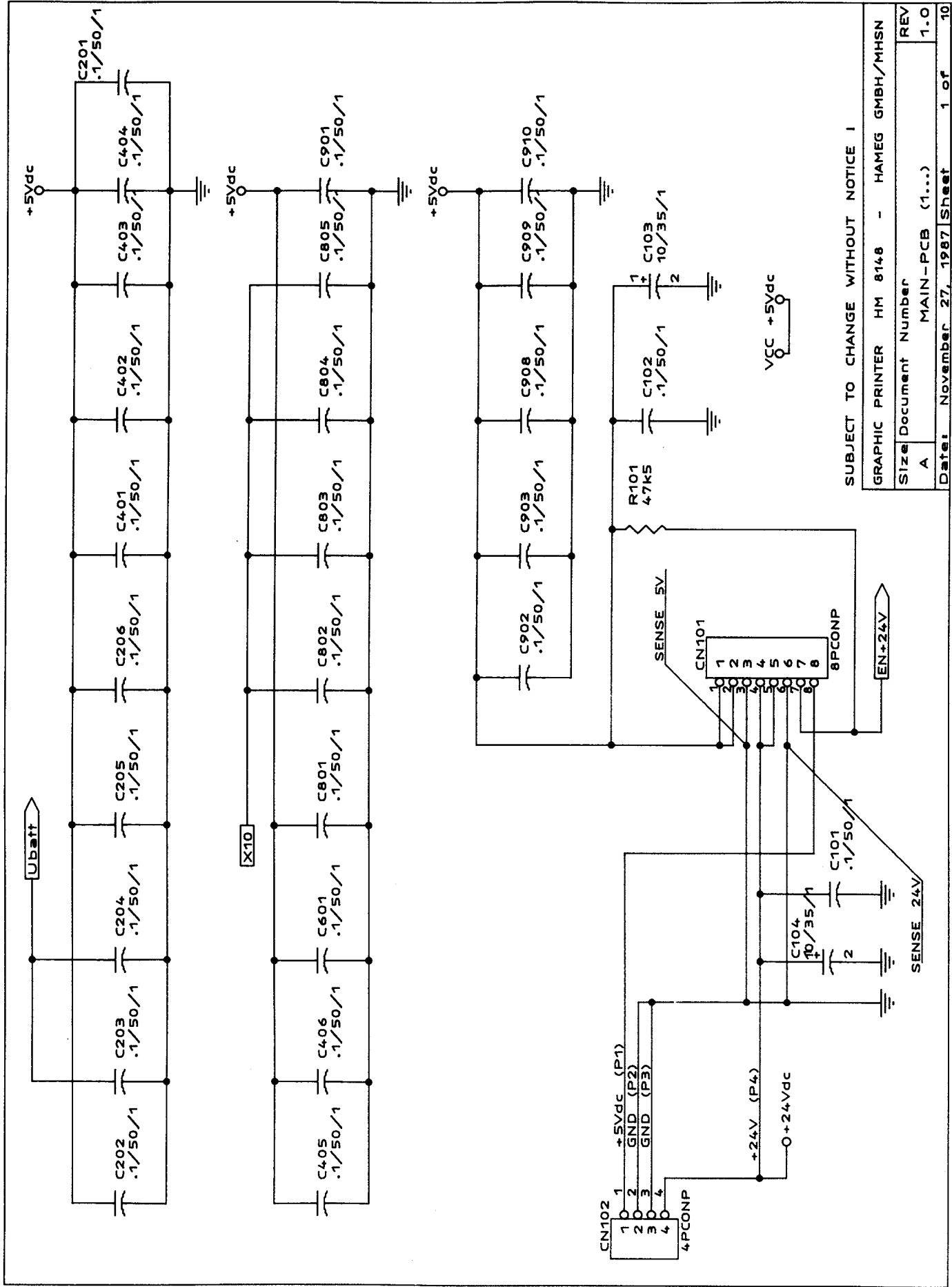
Attach the connector to the unused connector socket on the storage board.

Insert the connector on the other end of the ribbon cable through the space between the Z board and the attachment angle. Then insert the connector through the rectangular opening in the angle and fasten using the supplied screws and nuts.

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

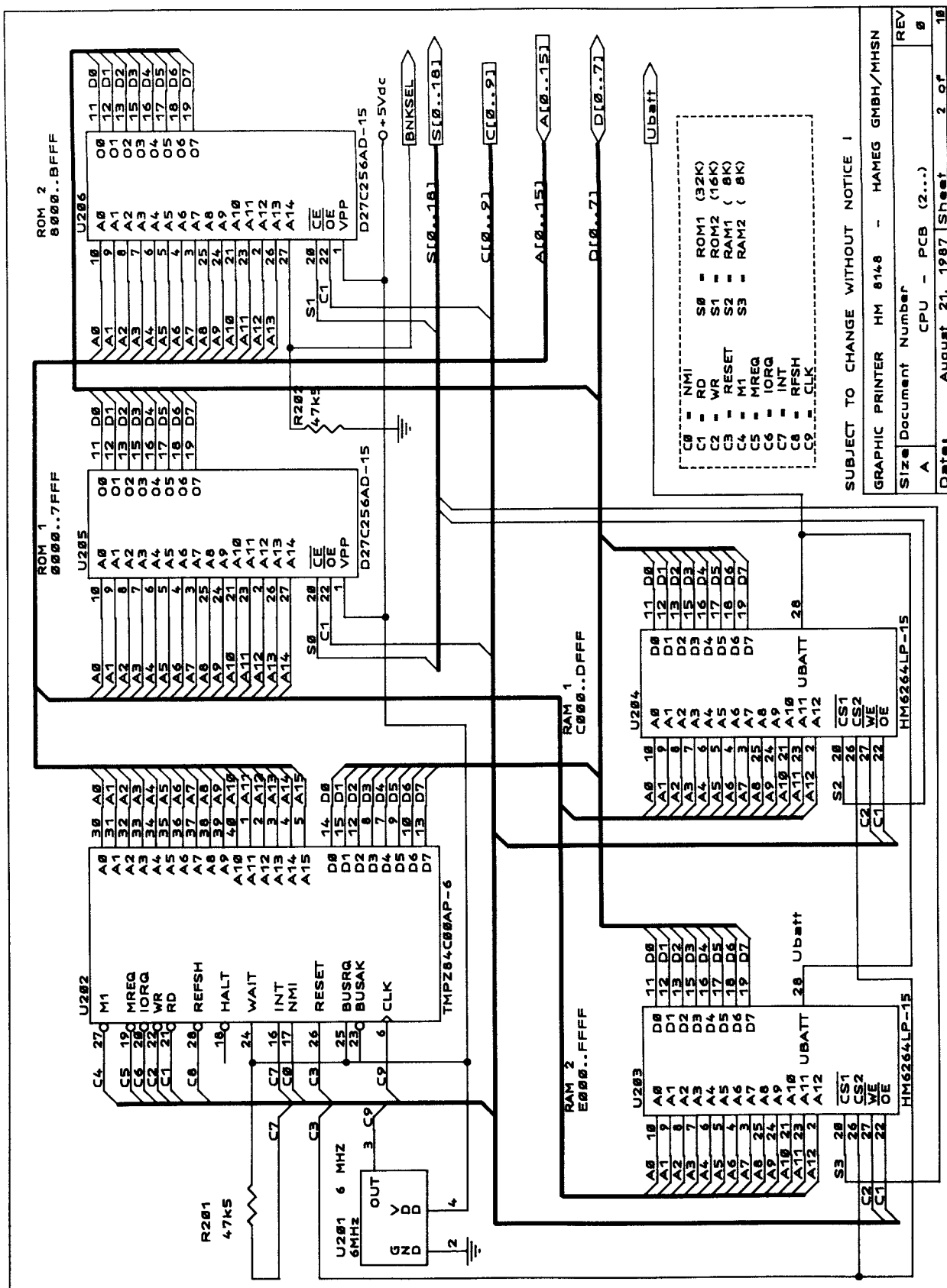
Place the scope face down again on a soft surface.

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



SUBJECT TO CHANGE WITHOUT NOTICE I

GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size	Document Number
A	MAIN-PCB (1...)
REV	1.0



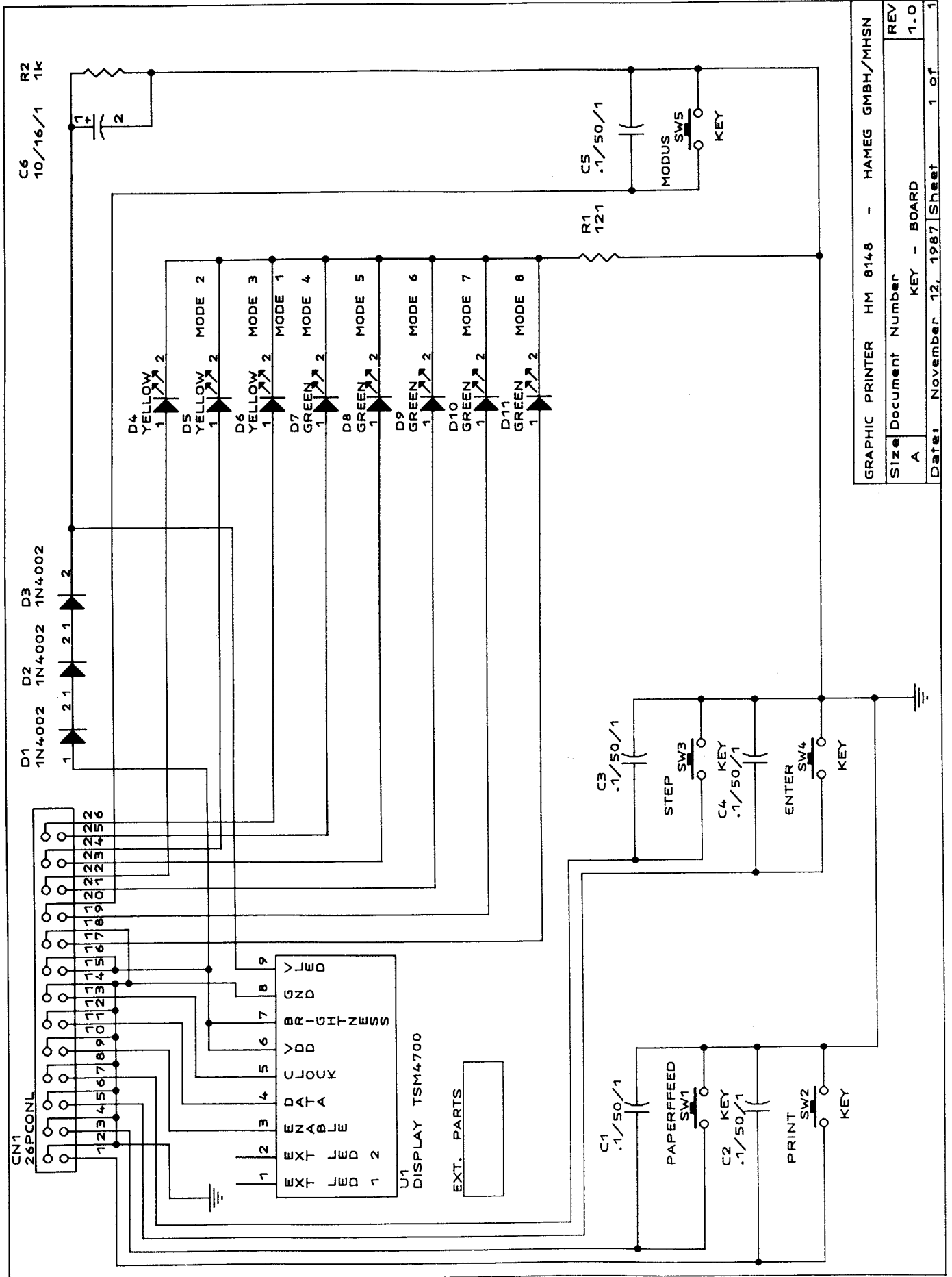
SUBJECT TO CHANGE WITHOUT NOTICE I

GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN

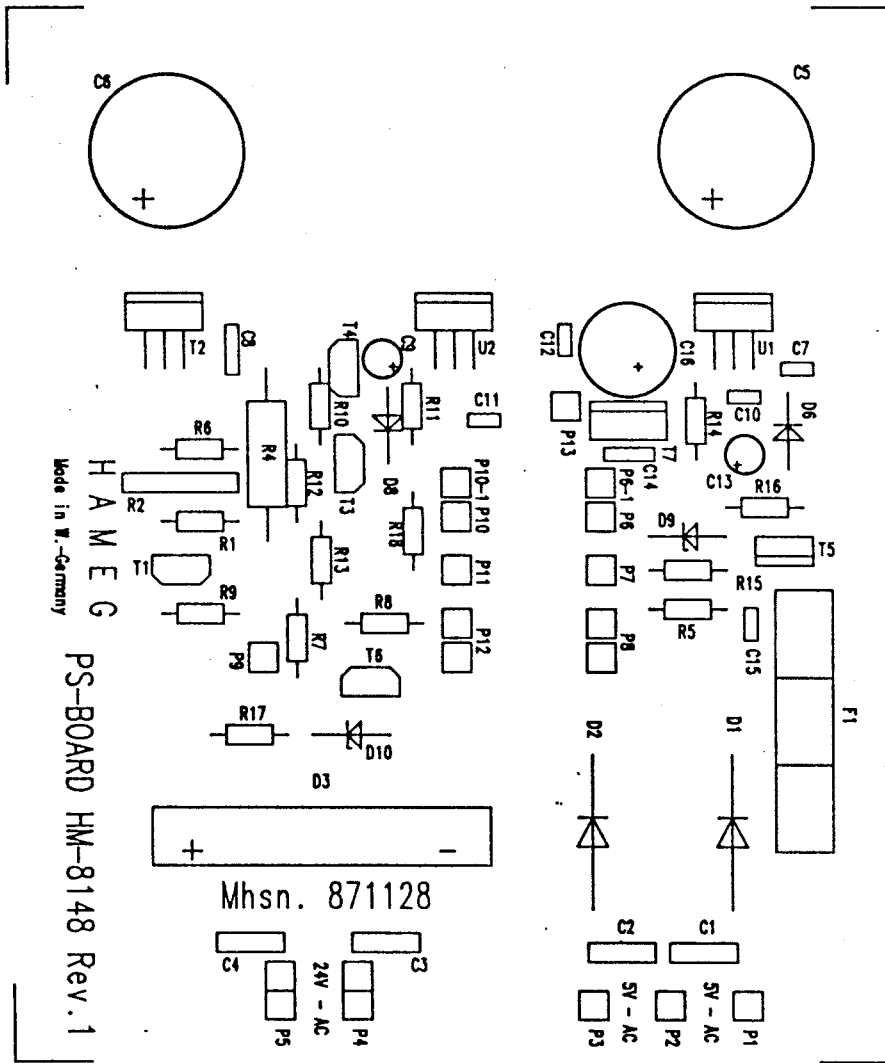
Size Document Number CPU - PCB (2...)

REV 0

Date: August 21, 1987 Sheet 2 of 18



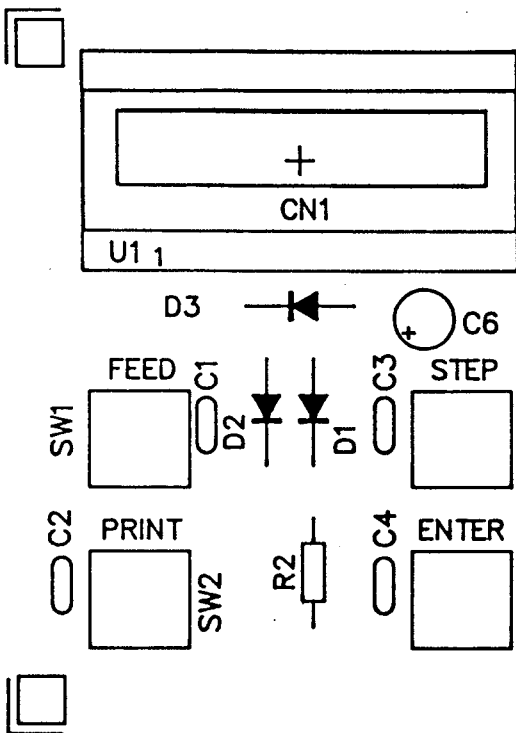
GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size	Document Number
A	KEY - BOARD
Date:	November 12, 1987 Sheet 1 of 1
REV	1.0



H A M E G
Made in W.-Germany

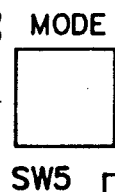
PS-BOARD HM-8148 Rev.1

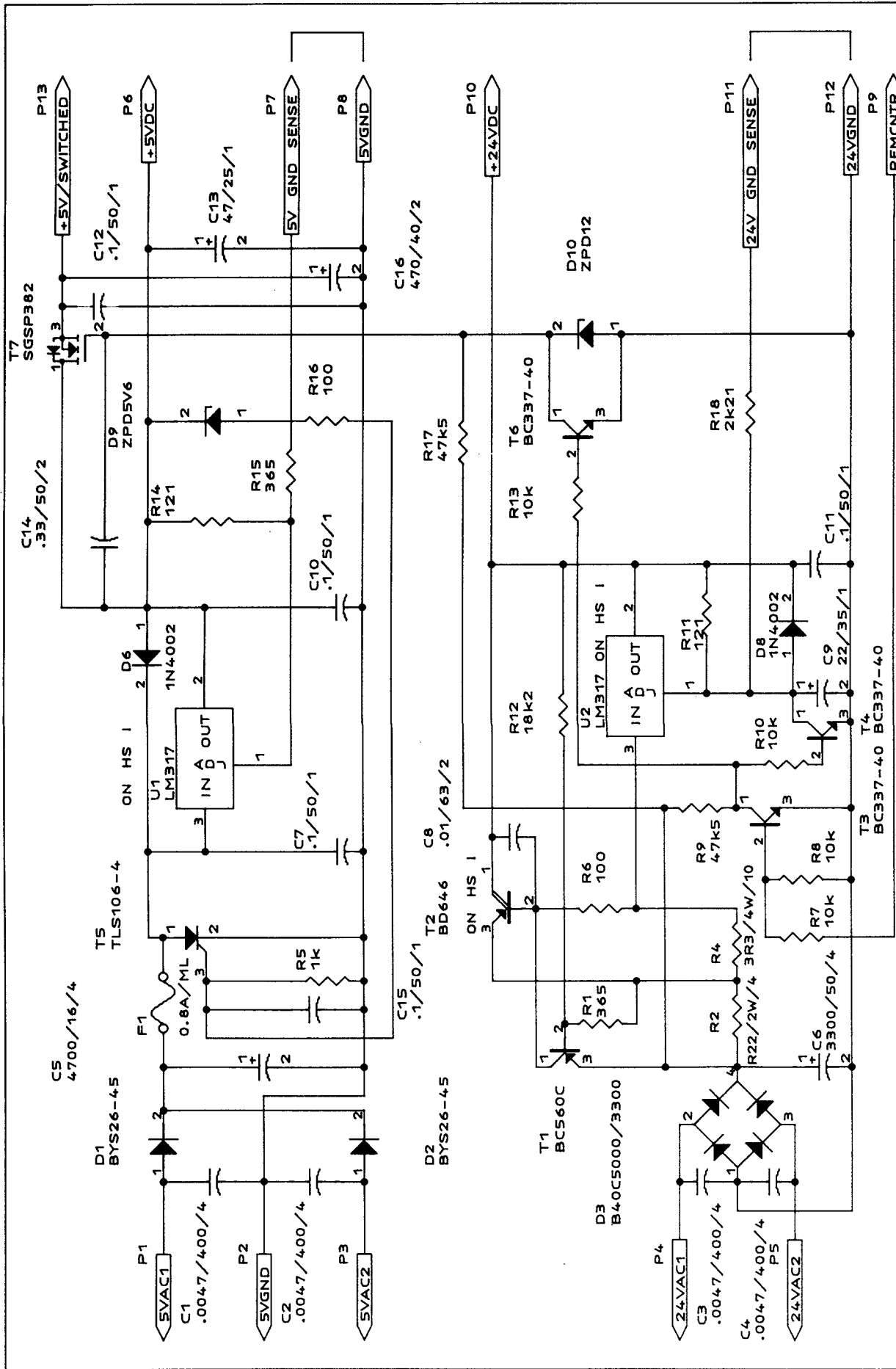
Mhsn. 871128



- MANUAL D4
- TIMER D5
- AUTO D6
- Pr.SET D7
- CLOCK D8
- DATE D9
- TIMER D10
- IEEE D11

GRAPHIC PRINTER HM-8148



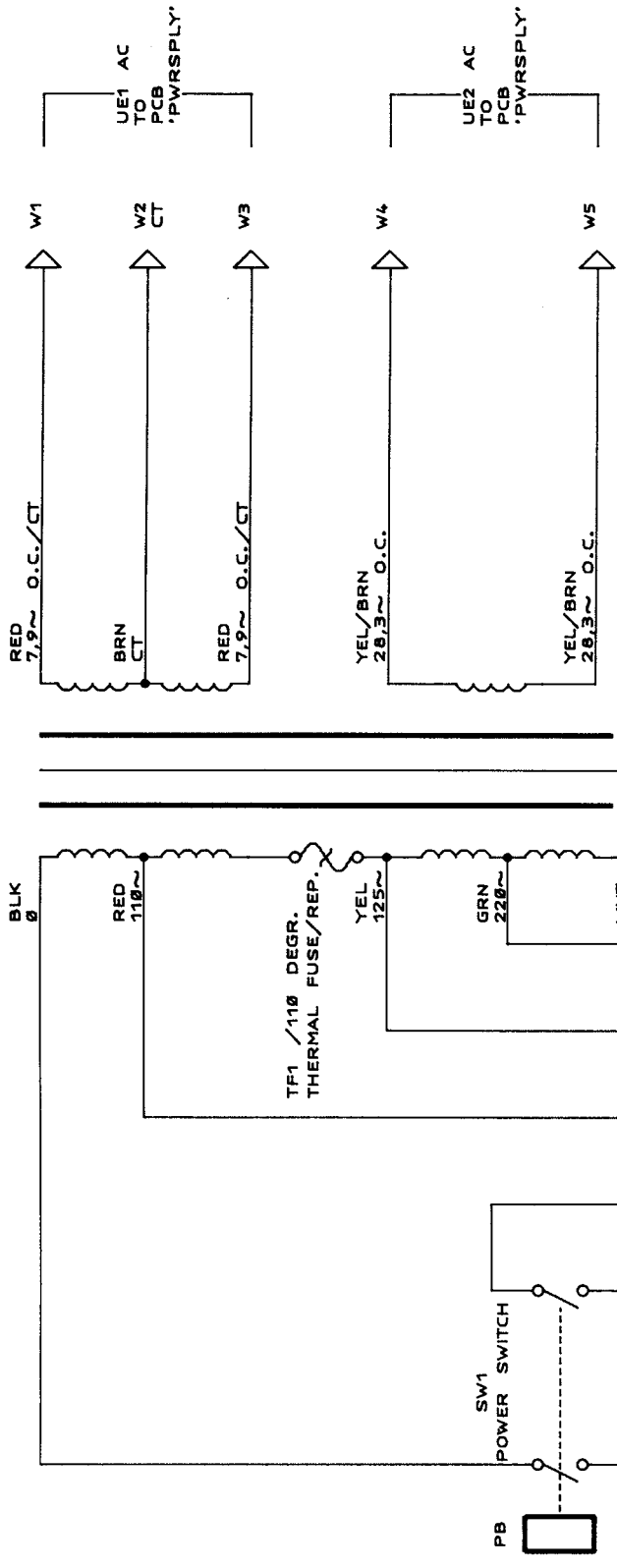


ON HS 1 == MOUNTED ON HEAT SINK I
 SUBJECT TO CHANGE WITHOUT NOTICE I

EXT. PARTS

GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size	A
Document Number	PS - BOARD
REV	1.0

TR1
K+G - 031/0004



SAFETY CLASS 1 ONLY 1
(WITH SAFETY EARTH CONDUCTOR)

AC 50...60HZ

POWER FUSE / 5x20mm,ML

110~ ML 1,6 A

125~ ML 1,6 A

220~ ML 0,8 A

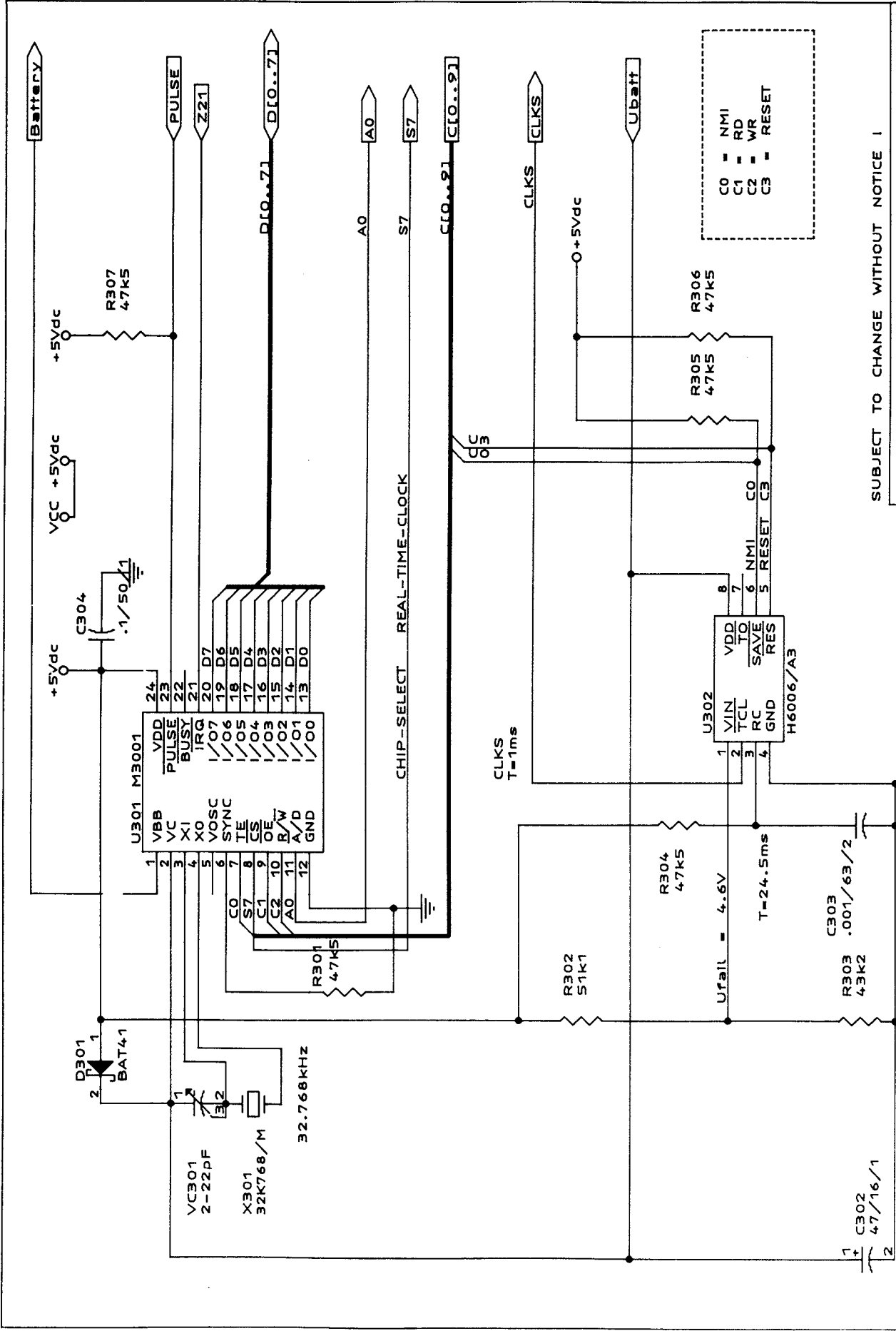
240~ ML 0,8 A

WATTS (TYP.): <30W ; (MAX.): 130W

GRAPHIC PRINTER	HM 0140	-	HAMEG GMBH/MHSN
Size	Document Number		
A	POWER TRANSFORMER - WIRING		
Date:	September 1, 1987	Sheet	1 of 1
REV			
	0		

SUBJECT TO CHANGE WITHOUT NOTICE I

PL1
PLUG AC MALE
TO LINEI



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GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size	Document Number
A	MAIN-PCB (3..)
Date:	November 19, 1987
Sheet	3 of 10
REV	1.0

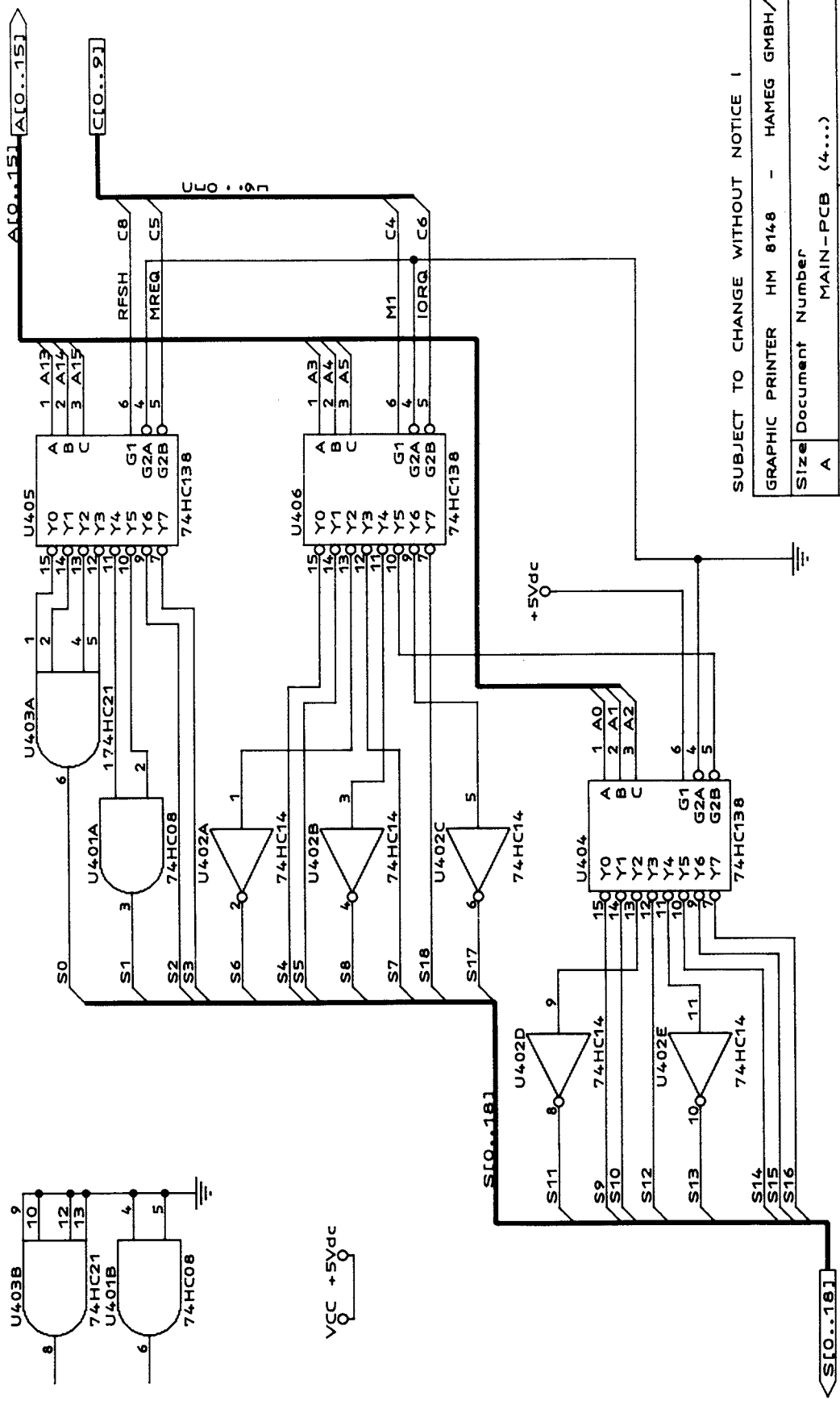
MEM - SELECT

0000..7FFF S0 (ROM1 32K)
 8000..BFFF S1 (ROM2 16K)
 C000..DFFF S2 (RAM1 8K)
 E000..FFFF S3 (RAM2 8K)

I/O - SELECT

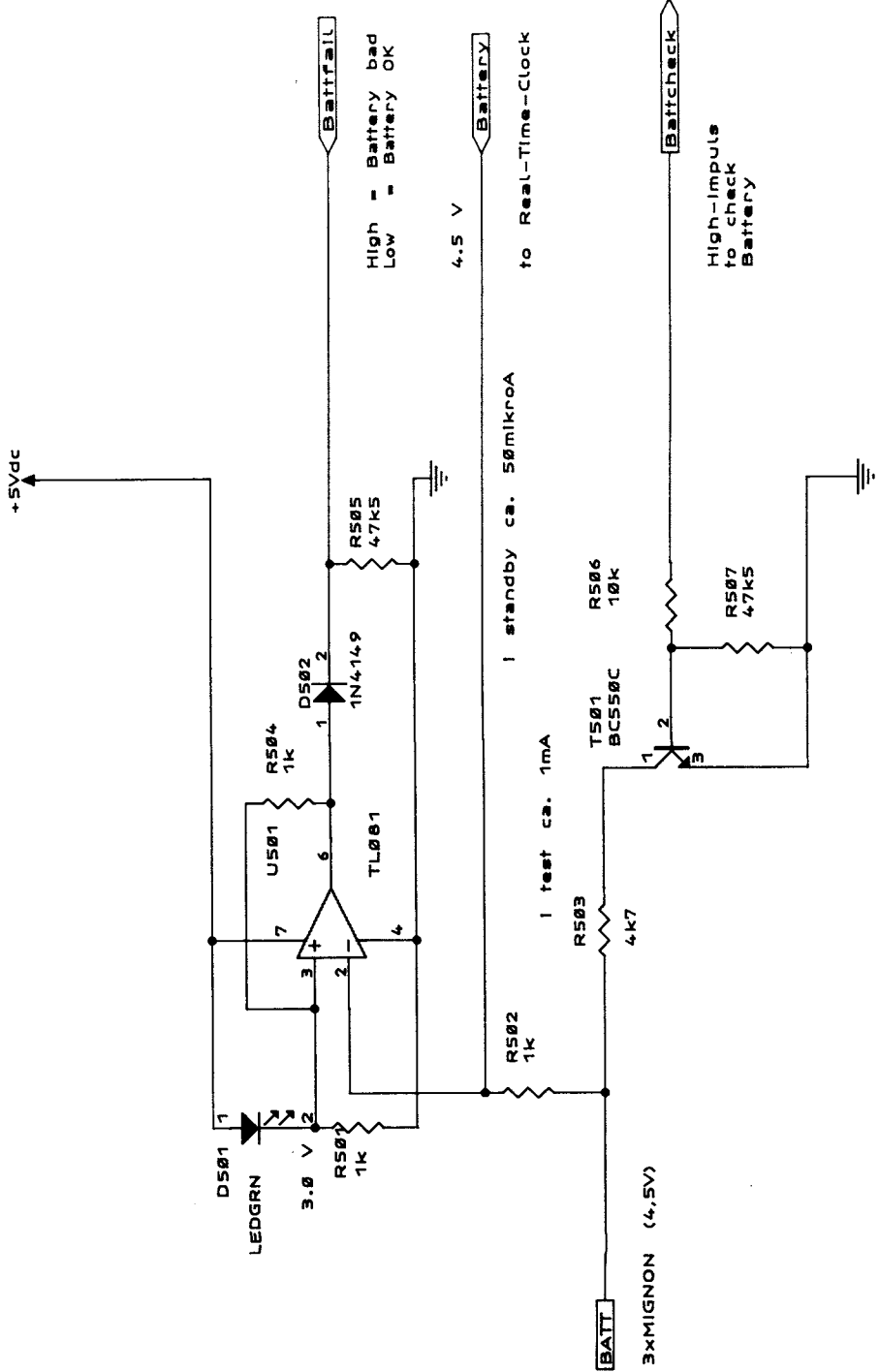
00..07 S04 (PIO-HAMEG)
 08..0F S05 (PIO-SYSTEM)
 10..17 S06 (DATA PRINTER)
 18..1F S07 (REAL-TIME-CLOCK)
 20..27 S08 (LED MODE0..7)
 28..2F S17 (LED-DISPLAY)
 30..37 S18 (KEYBOARD)

28 S09 (DIPSWITCH)
 29 S10 (HAMEG DATA IN)
 2A S11 (HAMEG DATA OUT)
 2B S12 (ERW.-LATCH INPUT)
 2C S13 (ERW.-LATCH OUTPUT)
 2D S14 (NOCH FREI)
 2E S15 (NOCH FREI)
 2F S16 (NOCH FREI)



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High - Battery bad
Low - Battery OK

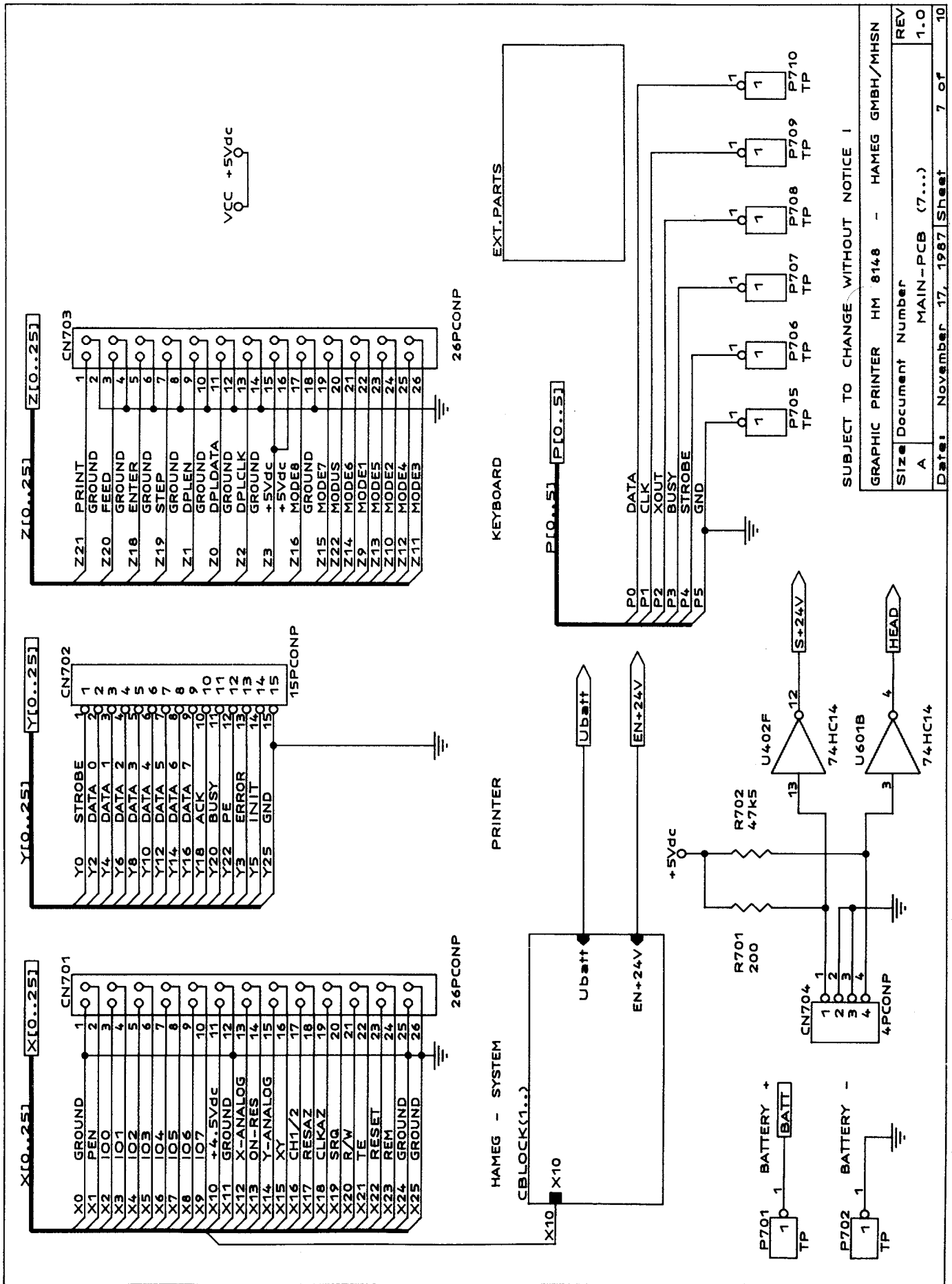
4.5 V

Battery to Real-Time-Clock

High-Impulse to check Battery

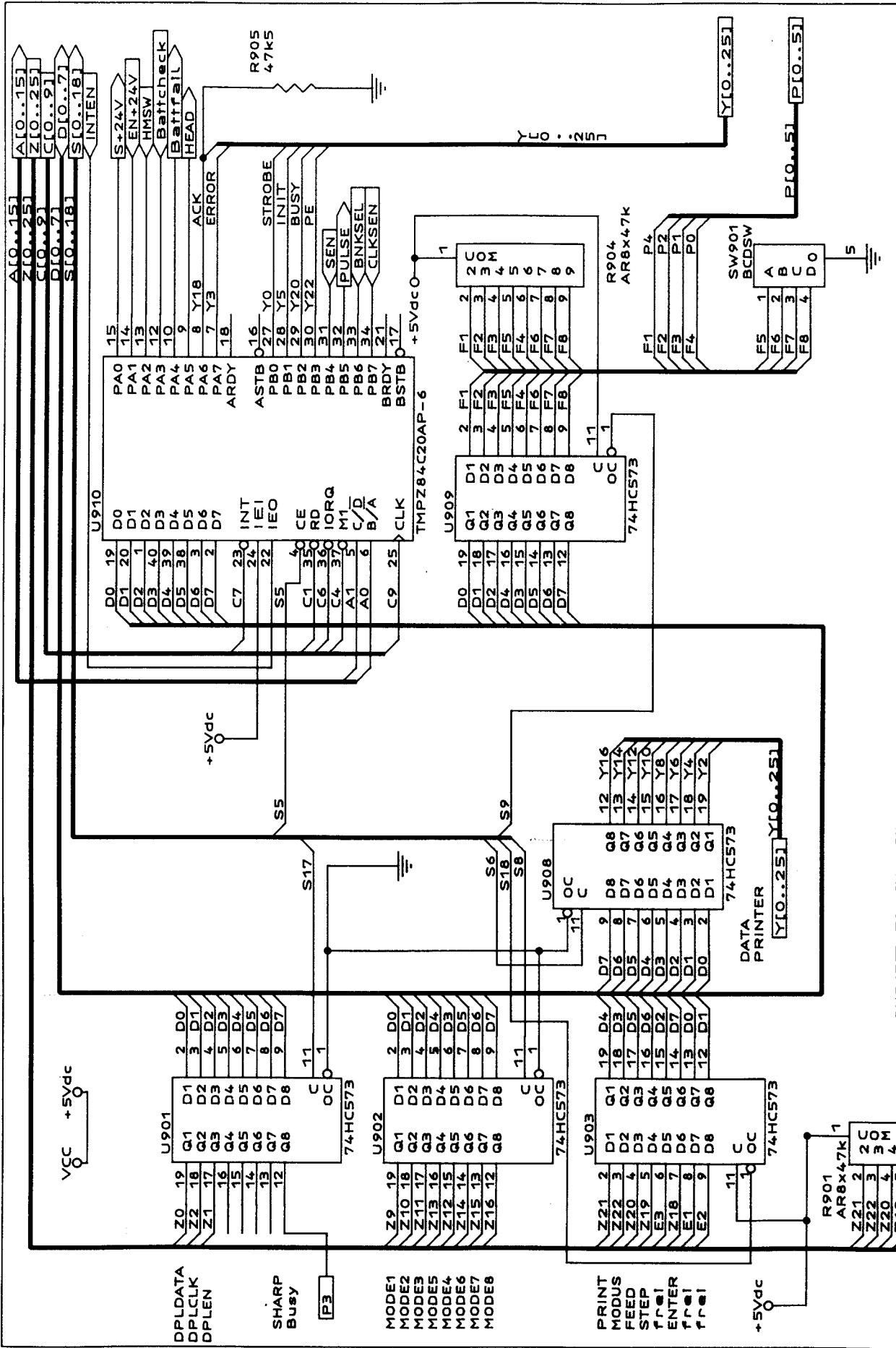
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GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size Document Number	REV
A BATTERY-CHECK - PCB (5...)	0
Date: August 21, 1987	Sheet 5 of 10



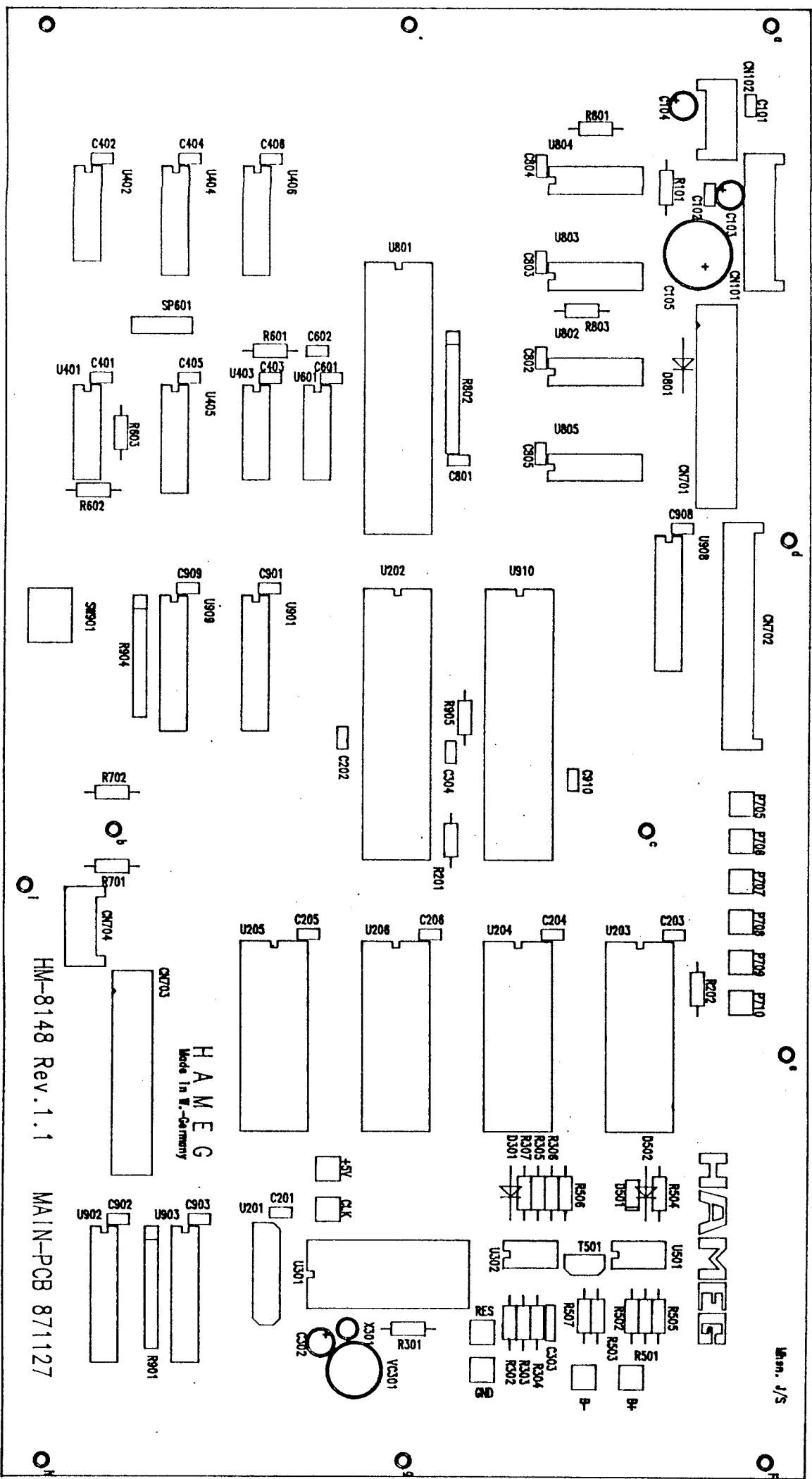
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GRAPHIC PRINTER HM 8148 - HAMEG GMBH/MHSN	
Size Document Number	MAIN-PCB (7...)
REV	1.0
Date:	November 17, 1987 Sheet 7 of 10



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Size	Document Number
A	MAIN-PCB (9...)
Date:	November 16, 1987
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REV	1.0



HAMMERS

H A M M E R S
 Made in W.-Germany

HM-8148 Rev. 1.1

MAIN-PCB 871127

Man. 1/5

HAMEG

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