

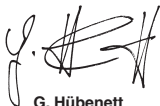


Universal Counter HM8021-4

Service-Manual



	Hersteller Manufacturer Fabricant	HAMEG Instruments GmbH Industriestraße 6 D-63533 Mainhausen	KONFORMITÄTSERKLÄRUNG DECLARATION OF CONFORMITY DECLARATION DE CONFORMITE	
	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 conformité du produit		EN 61326-1/A1 Störaussendung / Radiation / Emission: Tabelle / table / tableau 4; Klasse / Class / Classe B.	
Bezeichnung / Product name / Designation: Universal Zähler / Universal Counter / Compteur Universel		Störfestigkeit / Immunity / Imunitee: Tabelle / table / tableau A1.		
Typ / Type / Type: mit / with / avec: Optionen / Options / Options:		EN 61000-3-2/A14 Oberschwingungsströme / Harmonic current emissions / Émissions de courant harmonique: Klasse / Class / Classe D.		
mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes		EN 61000-3-3 Spannungsschwankungen u. Flicker / Voltage fluctuations and flicker / Fluctuations de tension et du flicker.		
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		Datum /Date /Date 22.07.2004	Unterschrift / Signature /Signature	
Niederspannungsrichtlinie 73/23/EWG ergänzt durch 93/68/EWG Low-Voltage Equipment Directive 73/23/EEC amended by 93/68/EEC Directive des équipements basse tension 73/23/CEE amendée par 93/68/CEE		 G. Hübenett Produktmanager		
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				

General information regarding the CE marking

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

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

1. Data cables

For the connection between instruments resp. their interfaces and external devices, (computer, printer etc.) sufficiently screened cables must be used. Without a special instruction in the manual for a reduced cable length, the maximum cable length of a dataline must be less than 3 meters and not be used outside 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 outside buildings. Signal lines must be screened (coaxial cable - RG58/U). A proper ground connection is required. In combination with signal generators double screened cables (RG223/U, RG214/U) must be used.

3. Influence on measuring instruments.

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

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

HAMEG Instruments GmbH

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1.6 GHz Universal Counter HM8021-4



Frequency range 0 Hz to 1.6 GHz

10 MHz time base with 0.5 ppm stability (TCXO)

Input A:
Input impedance 1 M Ω , maximum sensitivity 20 mV_{rms}

Input C:
Input impedance 50 Ω , maximum sensitivity 30 mV_{rms}

Time interval resolution up to 10 ps

Offset mode over the entire measurement range

Gate input (in combination with H0801)

Mainframe HM8001-2 required for operation

Mainframe HM8001-2



Option H085, a high-stability oscillator with a stability of $\pm 5 \times 10^{-9}$ per day



Option H0801



1.6 GHz Universal Counter HM8021-4

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

Measurement functions

Frequency A/C, Period A;
Totalize A;
Pulse width \square / \square (averaged);
Totalize A during ext. gate

Input characteristics (Input A)

Frequency range:
0 – 150 MHz: DC-coupled
10 Hz – 150 MHz: AC-coupled

Sensitivity: (normal triggering)
DC – 80 MHz: 20 mV_{rms} (sine wave)
80 mV (pulse)
80 MHz – 150 MHz: 60 mV_{rms} (sine wave)
20 Hz – 80 MHz (auto trig.): 50 mV_{rms} (sine wave)

Minimum pulse width: 5 ns

Input noise: 100 µV (typ.)

Coupling: AC or DC (switchable)

Input impedance: 1 MΩ || 40 pF

Attenuator: x 1, x 20 (switchable)

Max. input voltage:
0 to 440 Hz: 400 V (DC + AC_{peak})
1 MHz: decreasing to 8V_{rms}

Input characteristics (Input C)

Frequency range: 100 MHz – 1.6 GHz

Sensitivity:
to 1.3 GHz: 30 mV (typ. 20 mV)
to 1.6 GHz: 100 mV (typ. 80 mV)

Input impedance: 50 Ω nominal

Coupling: AC

Max. input voltage: 5 V (DC + AC_{peak})

Input characteristics (external gate)

Input impedance: 4.7 kΩ

Max. input voltage: ±30 V

High/low level: > 2 V / < 0.5 V

Min. pulse duration: 50 ns

Min. effective gate time: 150 µs

Frequency measurement (Input A)

LSD: $(2.5 \times 10^{-7} \text{ s} \times \text{freq.}) / \text{measurement time}$

Resolution: ±1 or 2 LSD

Period duration measurement

Range: 10000 sec to 66.6 ns

LSD: $(2.5 \times 10^{-7} \text{ s} \times \text{period}) / \text{measurement time}$

Resolution: ±1 or 2 LSD

Totalize (manual / external gated)

Range: DC to 20 MHz

Min. pulse duration: 25 ns

LSD: ±1 count

Resolution: LSD

Ext. gate error:
in manual mode only: 100 ns

Time interval (averaged)

LSD: 100 ns to 10 ps

Resolution: 1 or 2 LSD

Offset

Range: covers the entire measurement range

Gate time

(Gate time cannot be less than 1 period.)

Range: 100 ms – 10 s in 3 steps

External gate time: min. 150 µs

Timebase

Frequency: 10 MHz clock
10 MHz crystal

Accuracy (between 10° C and 40° C):
±5 × 10⁻⁷

Aging: ±3 ppm/15 years

General information

Display: 8-digit 7-segment LED display with
7.65 mm digit height, sign and exponent

Power consumption: approx. 7 Watt

Operating temperature: +10° C to +40° C

Max. relative humidity: 10% – 90%
(without condensation), 5% – 95% RH

Dimensions (W x H x D): 135 x 68 x 228 mm

Weight: approx. 0.6 kg

Accessories supplied: Operator's Manual

Optional accessories: HZ33/HZ34 BNC Test Cable, HZ24 Attenuators, HZ20 BNC banana adapter, H085 OCXO, HZ10 Silicone test leads

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Control elements

① OF (LED)

This LED is lit when an overflow occurs. This depends on the selected gate time and on the frequency of the signal applied.

② GT (Gate Open; LED)

The gate indicator is lit when the gate is open for measurements. This time equals the preselected gate time and a synchronization time. The gate cannot be open for a time smaller than 1 period of a signal.

③ GATE TIME (Gate time selector; pushbutton + LEDs)

The gate time is selectable in steps of 0.1s, 1s, 10s.

EXT. (LED)

In the gate external mode, the counter will expect an external control signal, and will not measure until such a signal is supplied.

④ DISP. HOLD (pushbutton + LED)

Depressing the DISP. HOLD pushbutton sets the display time to infinity and freezes the last measurement result. A new measurement can be initiated using the reset pushbutton. Measuring will restart when Display Hold is switched off. Display Hold starts and stops counting in the TOTALIZE function mode.

⑤ Function indicators (LEDs)

FUNCTION (pushbuttons)

The ◀ and ▶ pushbuttons select the desired function. The appropriate LED is lit when a function is selected. The default value when switching power on is FA (Frequency A).

⑥ OFFSET (pushbutton + LED)

The displayed value becomes the reference value. (Not available with the TOTALIZE function).

⑦ RESET (pushbutton + LED)

Stops a measurement and clears the display in normal measurement mode. When depressing the button in display hold-mode the counter performs a single measurement (one shot) on release of the button. When the offset-mode

is activated, depressing RESET shows the reference value (which is the actual offset). Reset is active as long as the button is depressed.

⑧ INPUT C (BNC-connector)

Frequency range: 100 MHz to 1.6 GHz
Input impedance: 50 Ω

Attention! Do not apply more than 5V (DC+AC_{peak}) to this input terminal.

⑨ DC (pushbutton)

Selection of AC or DC coupling of the signal input A. The bandwidth for low frequencies is as low as 10 Hz (3 dB) when the input is AC coupled. Input C has a fixed AC coupling. DC coupling = button depressed

⑩ 1:20 (pushbutton)

Selection of input signal attenuation. Pressing this button attenuates the input signal by 26 dB before it is applied to the input amplifier.

⑪ AUTO (pushbutton)

With Auto Trigger active the counter triggers in the middle of the input signal. Auto Trigger always uses AC-coupling. AC = pushbutton depressed.

⑫ INPUT A (BNC connector)

Signal input with a sensitivity of 20 mV up to 80 MHz and 60 mV up to 150 MHz. The input is protected against over-voltage up to 400V (DC+AC_{peak}).
Input impedance: 1 MΩ || 40 pF.

⑬ TRIGGER (adjusting knob)

Continuously adjustment of trigger level.

TRIGGER (LED)

Trigger indicator. The LED flashes when triggering is correct. The LED lights when the trigger level is above the input signal level, it is not activated when the trigger level is below the input signal level.

⑭ 8 digit display (7 segment LEDs, 7.65mm high)

for the measuring result (8 digit max. + exponent)

⑮ Hz (LED): Indicates the measurement of a frequency s (LED): Indicates the measurement of time

Adjustment

1) Threshold adjustment

- Select FA⑤, AUTO mode (Button ⑪ is depressed)
- Sine wave signal 30 mV_{rms} 1 kHz at INPUT A ⑫
- Adjust P1 in order to have square wave at U5, pin 11 output
- Check triggering at 100 Hz and 10 Hz

2) Auto-adjustment

Sine signal 10 MHz, 20 mV (GPS) at INPUT A ⑫

- Push and hold RESET ⑦ and GATE TIME ③ (RESET button first) until calibration mode is activated.
- Enter the calibration date: use the GATE TIME button ③ to change the date and the ← and → pushbuttons ⑤ to change the position of the cursor.
- Turn the instrument off and on for auto-test.

3) Functions verifications

- INPUT A ⑫: test from 10 MHz to 110 MHz with 10 MHz steps
- GATE TIME ③
 - 0.1 s
 - 1 s
 - 10 s + OF led
 EXT: test with external signal (the GATE TIME LED blinks).
- INPUT A ⑫: 100 MHz signal
- Select 0.1 s GATE TIME ③
- Push the DISP. HOLD button ④
- Check frozen display = 100.0000 6
- Push the RESET button ⑦
- Check display = 0.00
- Push the OFFSET button ⑥
- Check display = 000.000 6
- Push the RESET button ⑦
- Check display = 100.000
- Connect 150 MHz, 50 mV at INPUT A ⑫
- Push the DISP. HOLD button ④
- Check display = 050.0000 6
- Deselect OFFSET ⑥
- Check display = 150.0000 6
- Select PA mode ⑤
- Check display = 6.6666666 -9
- Connect pulse generator (HM8035: 20 MHz, width 200 ns)
- Select TI \square ⑤
- Check display = 200 -9
- Invert HM8035 pulse polarity
- Select TI \square ⑤
- Check display = 200 -9
- Connect signal generator at INPUT A ⑫
- Select TOT function ⑤
- Check moving display

- Push the DISP. HOLD button ④
- Check frozen display

- Push the RESET button ⑦
- Check display = 0

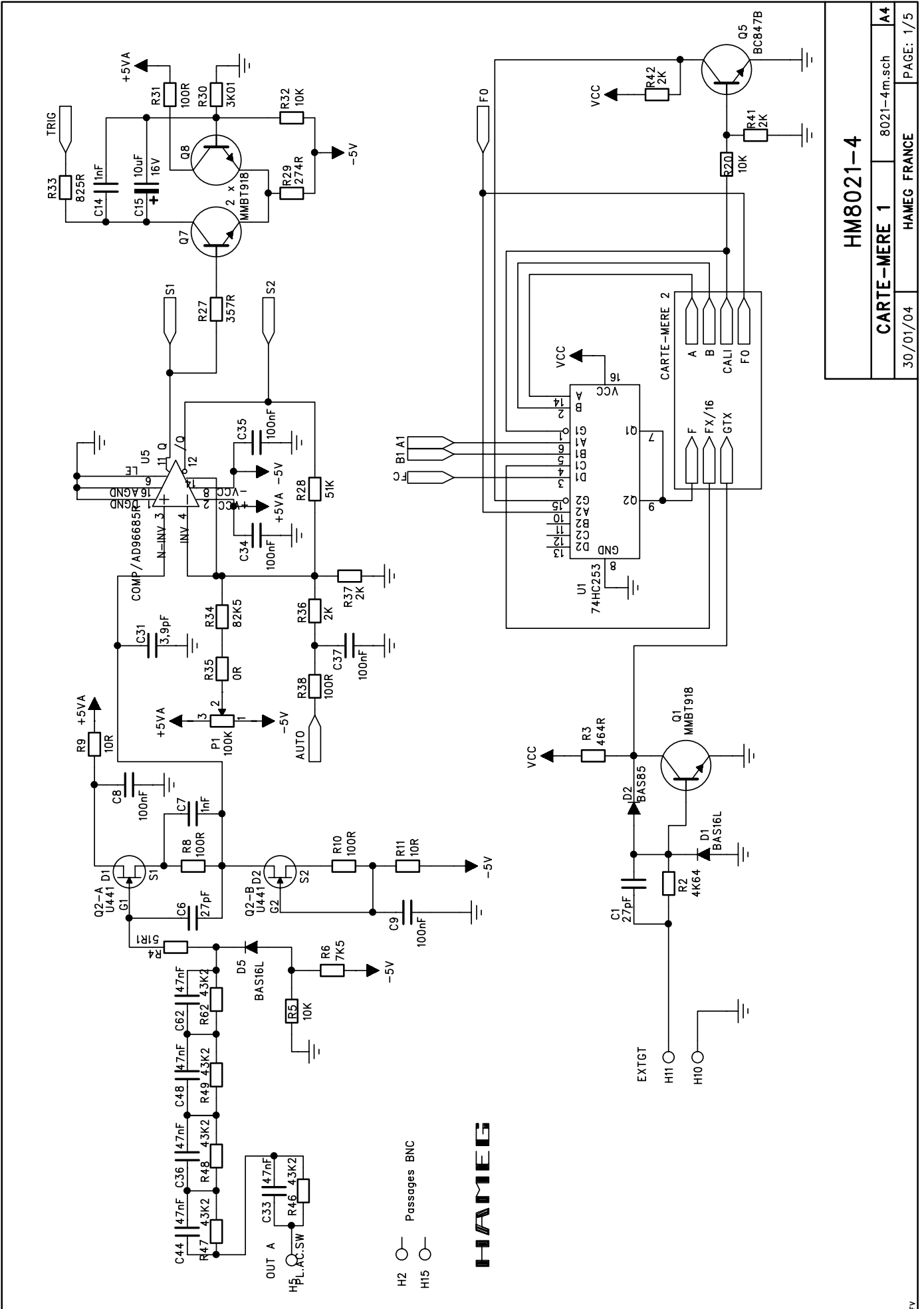
- Push the DISP. HOLD button ④
- Check moving display

4) Sensitivity

- Select FA⑤, AUTO mode (Button ⑪ is depressed)
- Check display with 50 mV at 150 MHz
- Select FA⑤, normal mode (Button ⑪ is released)
- Check display with 20 mV at 80 MHz
- Check display with 60 mV at 150 MHz
- Connect the signal generator with INPUT C ⑧ (no load)
- Check display with 50 mV at 100 MHz
- Check display with 50 mV at 1000 MHz
- Disconnect BNC cable
- Check display for no self-oscillation

5) Input circuits

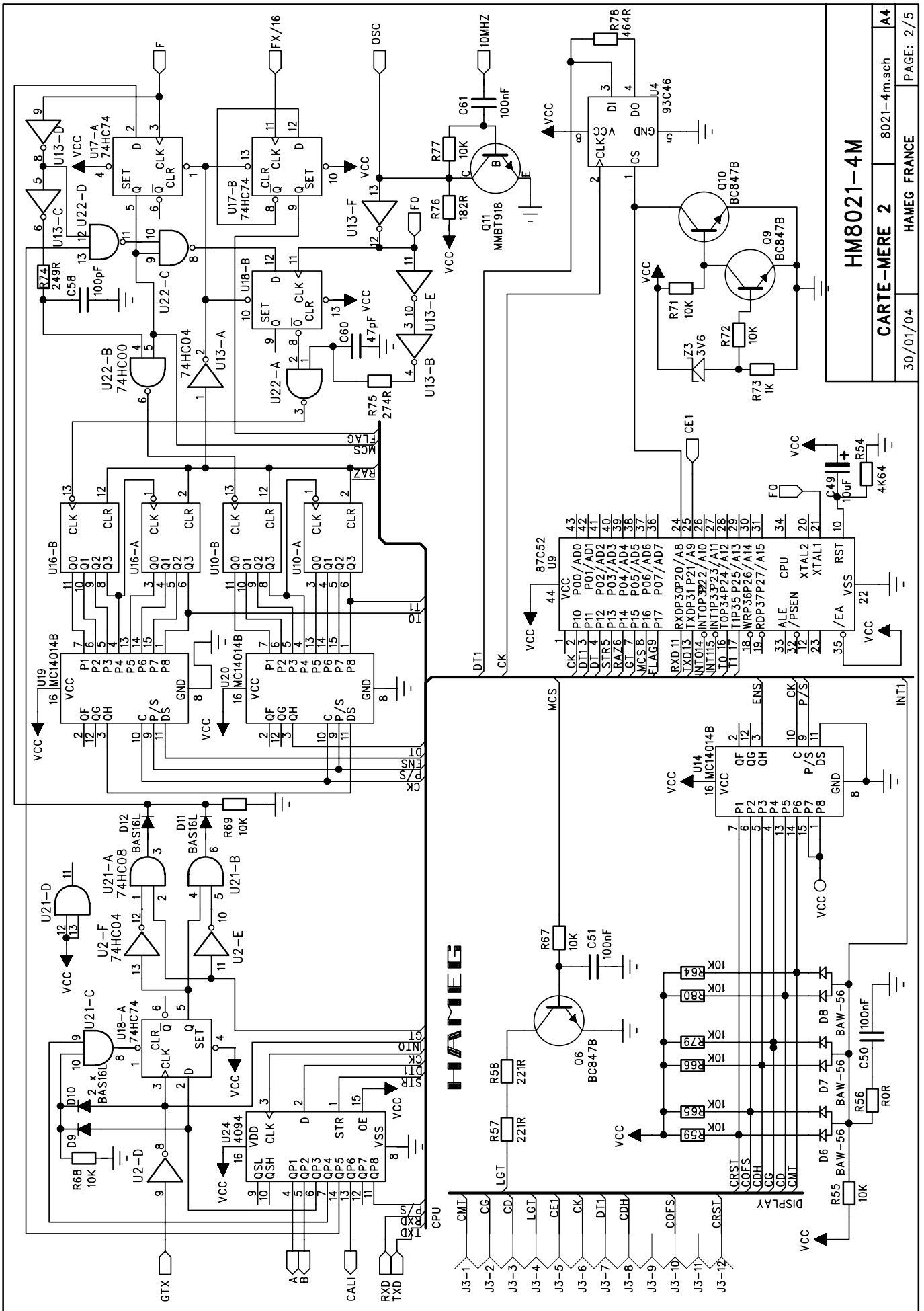
- Connect a function generator (1 kHz, 4V_{pp}, sine wave) with INPUT A ⑫.
- No attenuation (button ⑩ is released)
- Check TRIGGER ⑬ for large triggering area
- Select 1:20 attenuator, DC (buttons ⑨ and ⑩ are depressed)
- Check TRIGGER ⑬ for small triggering area
- Select DC, no attenuation (button ⑨ is depressed, ⑩ is released)
- Check the triggering for all position of TRIGGER potentiometer ⑬ (+/- slope)



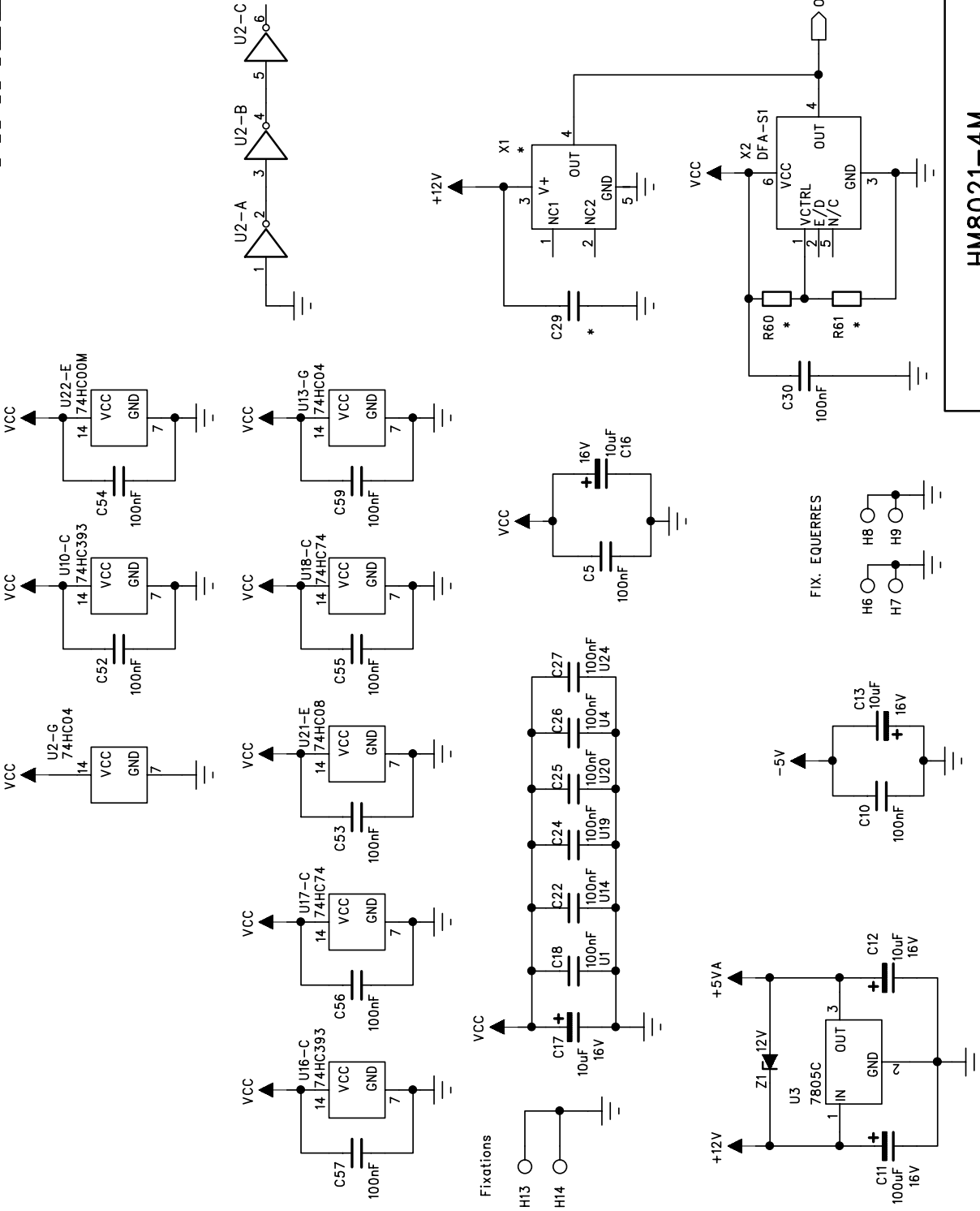
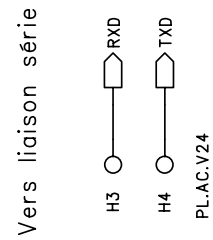
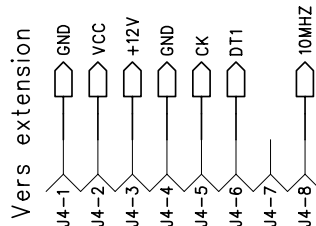
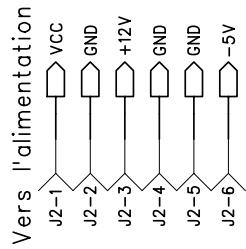
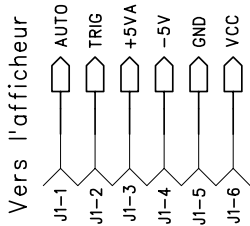
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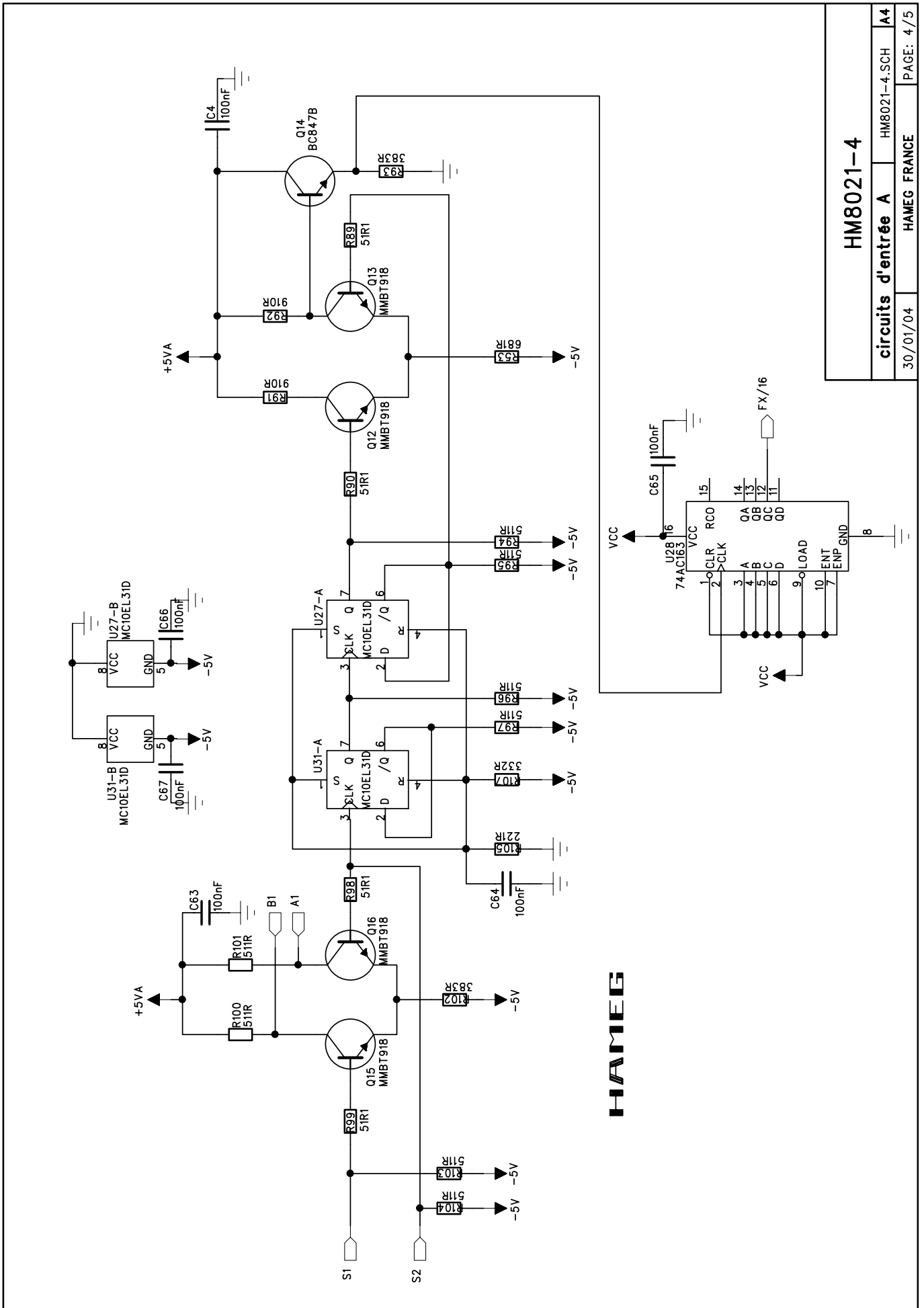


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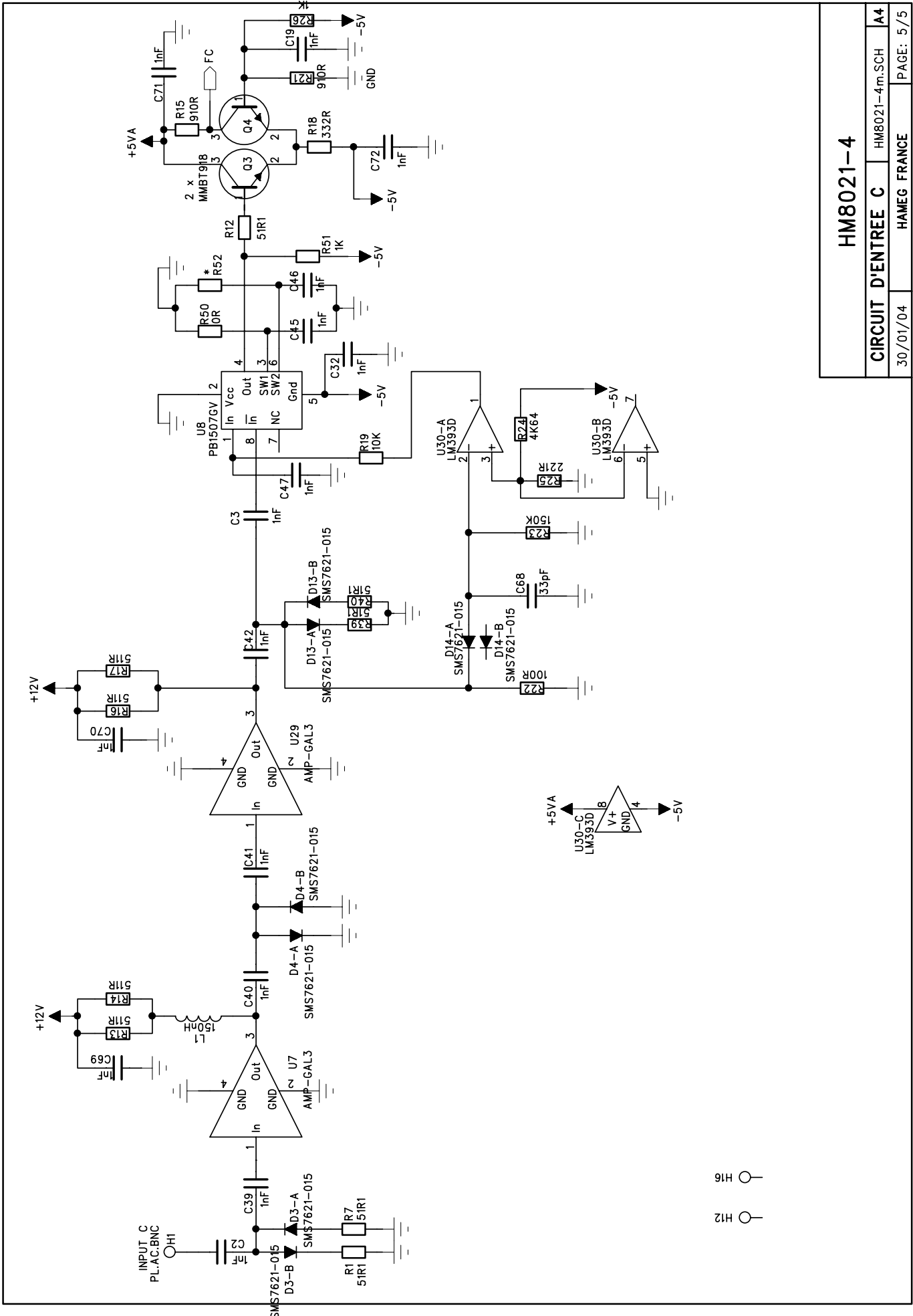
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Connexions_dlims	8021-4m.sch	A4
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HM8021-4

circuits d'entrée A	HM8021-4.SCH	A4
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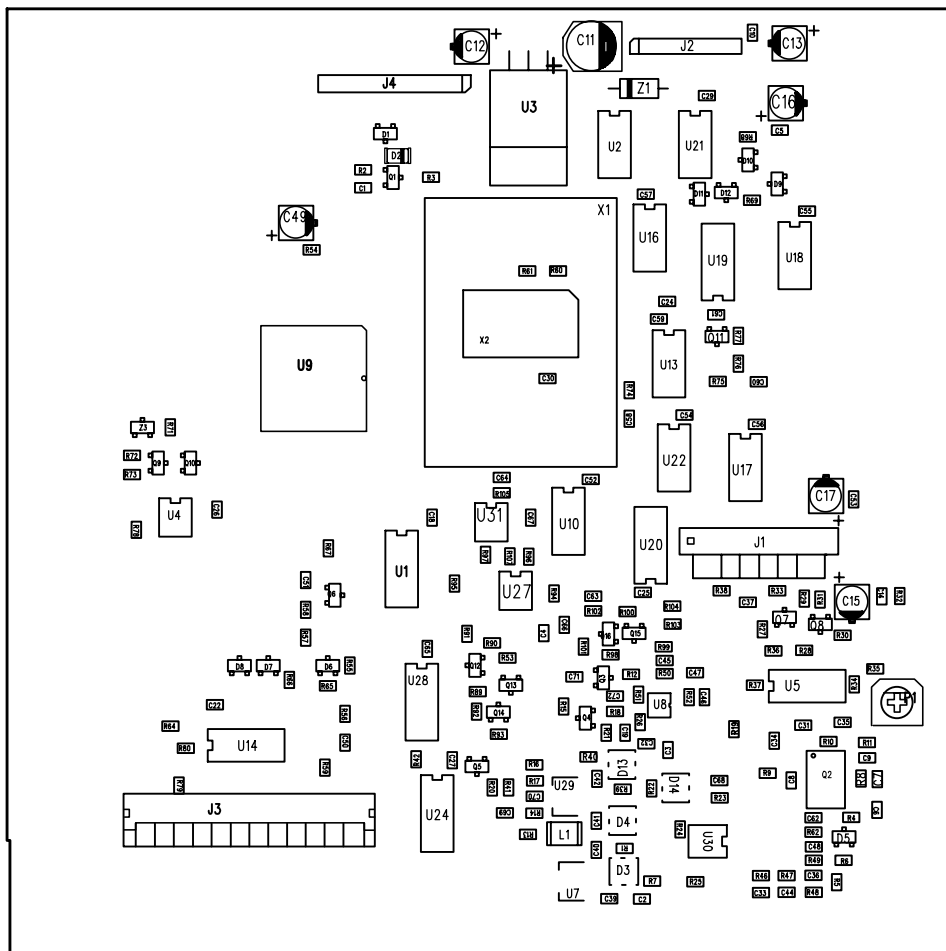


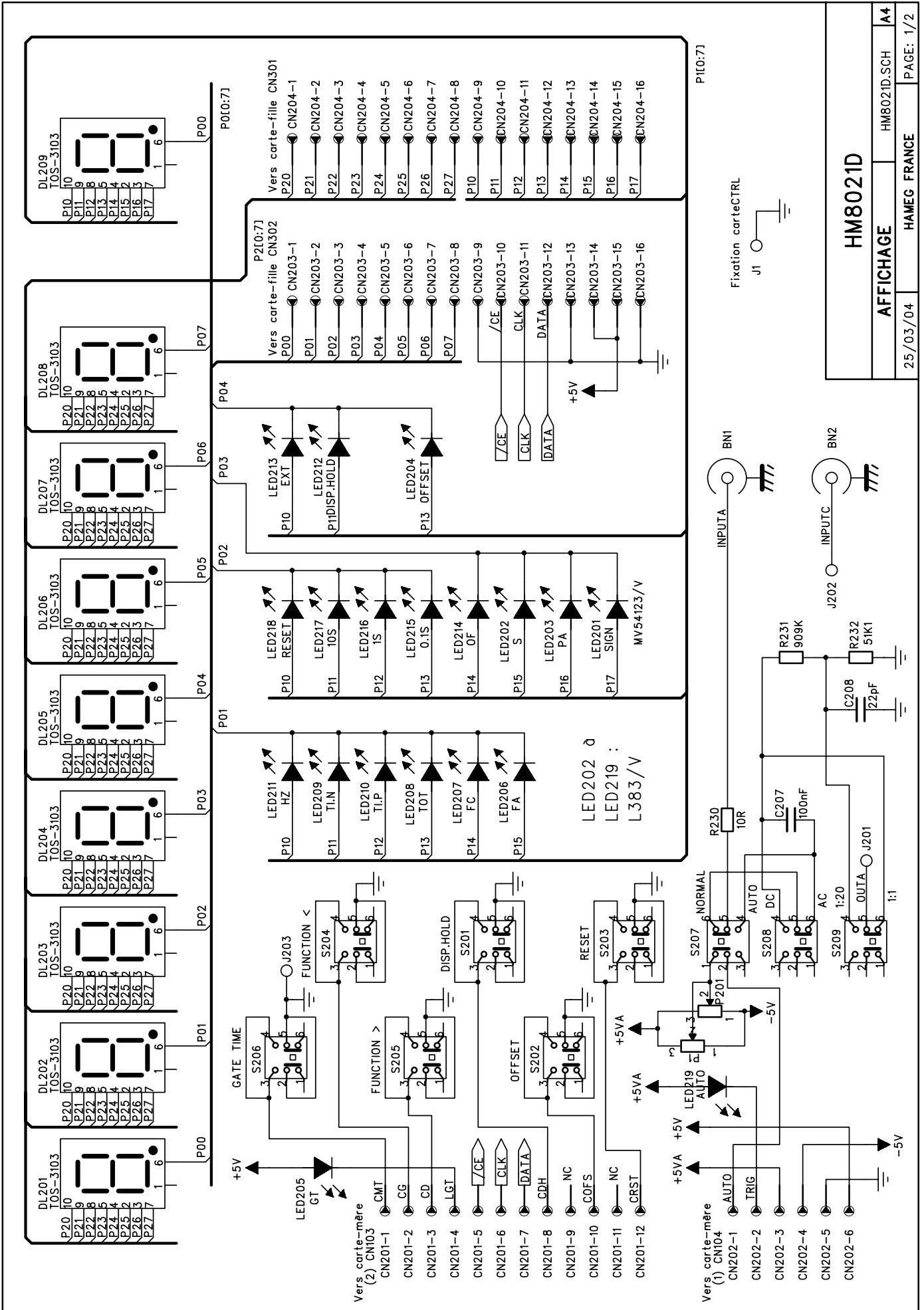
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CIRCUIT D'ENTREE C	HM8021-4 m.SCH	A4
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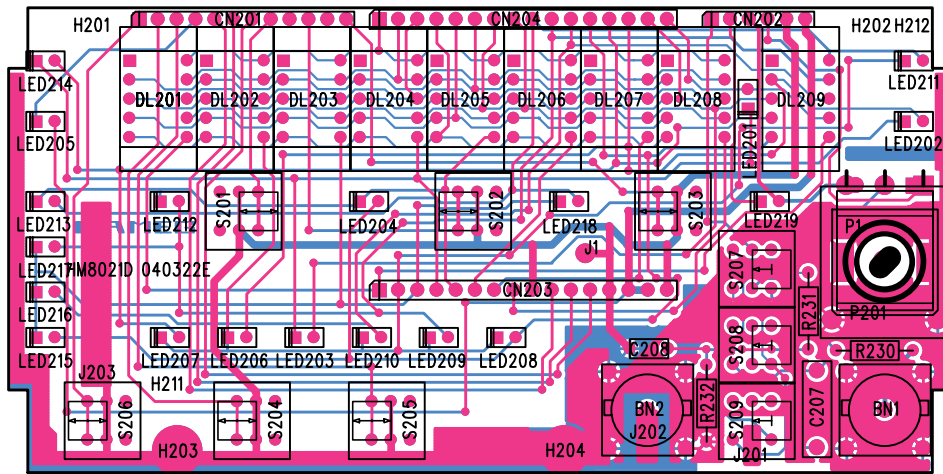


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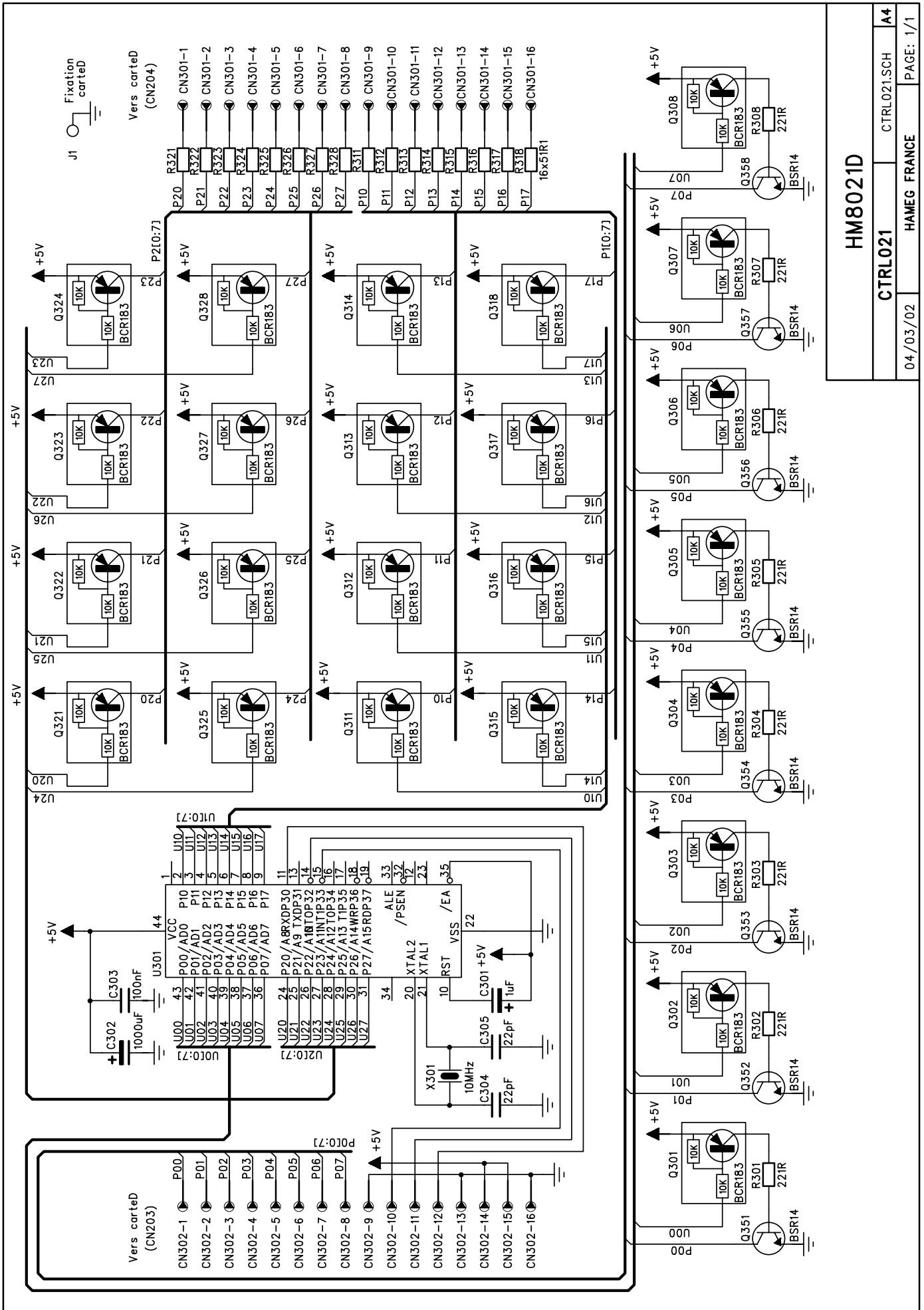




HM8021D CUIVRE COTE COMPOSANTS



HM8021D3.pcb



HM8021D

CTRL021

CTRL021.SCH

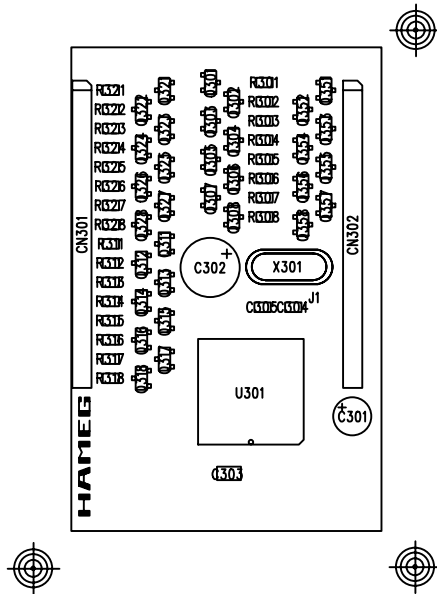
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HAMEG FRANCE

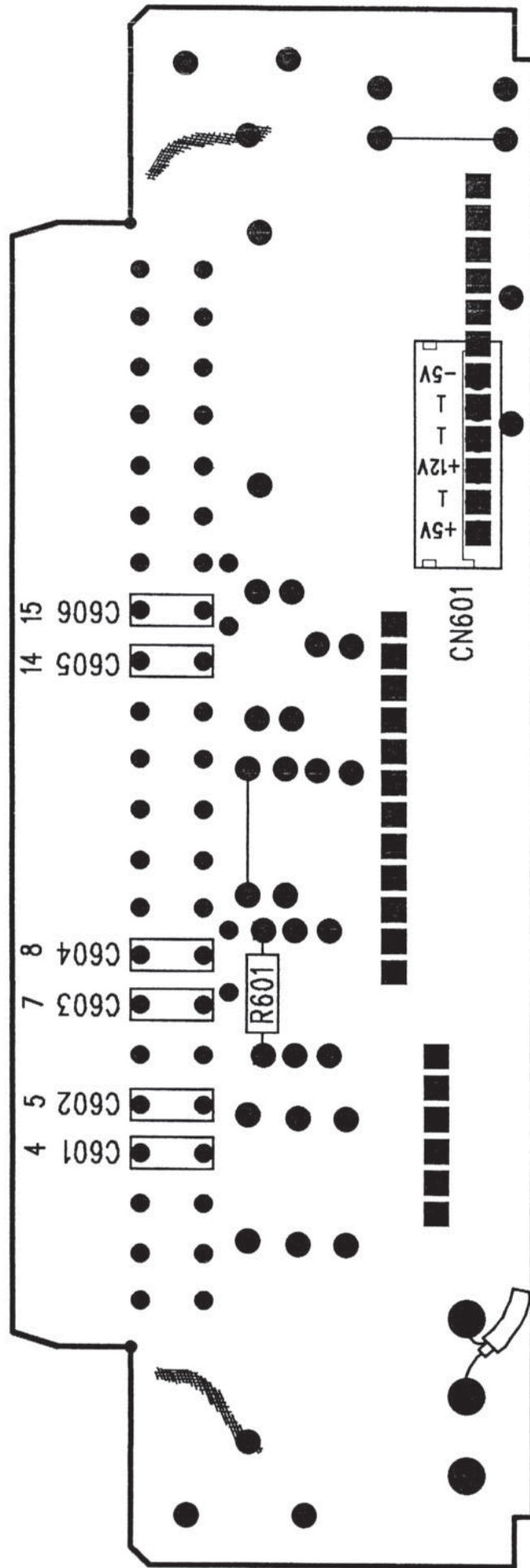
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CTRL021 020621 – IMPLANTATION COTE COMPOSANTS



HM8000-5 POUR HM8021-3



Oscilloscopes



Spectrum Analyzer



Power Supplies



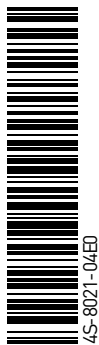
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8000 Series



Programmable Instruments
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