HAMEG Instruments

3 GHz Programmable Counter HM8123

Service-Manual



CE

HAMEG Instruments

KONFORMITÄTSERKLÄRUNG
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE
DECLARACIÓN DE CONFORMIDAD

Hersteller / Manufacturer / Fabricant / Fabricante:
HAMEG Instruments GmbH · Industriestraße 6 · D-63533 Mainhausen

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

Bezeichnung:	**Universal-Zähler**
Product name:	**Programmable Counter**
Designation:	**Compteur universel**
Descripción:	**Contador universal**
Typ / Type / Type / Tipo:	**HM8123**
mit / with / avec / con:	**–**
Optionen / Options / Options / Opciónes:	**–**

mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes / con las siguientes directivas:

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
Directiva EMC 89/336/CEE enmendada por 91/263/CEE, 92/31/CEE

Niederspannungsrichtlinie 73/23/EWG ergänzt durch 93/68/EWG
Low-Voltage Equipment Directive 73/23/EEC amended by 93/68/EEC
Directive des equipements basse tension 73/23/CEE amendée par 93/68/CEE
Directiva de equipos de baja tensión 73/23/CEE enmendada por 93/68/EWG

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées / Normas armonizadas utilizadas:

Sicherheit / Safety / Sécurité / Seguridad:

EN 61010-1: 1993 / IEC (CEI) 1010-1: 1990 A 1: 1992 / VDE 0411: 1994
Überspannungskategorie / Overvoltage category / Catégorie de surtension / Categoría de sobretensión: II

Verschmutzungsgrad / Degree of pollution / Degré de pollution / Nivel de polución: 2

Elektromagnetische Verträglichkeit / Electromagnetic compatibility / Compatibilité électromagnétique / Compatibilidad electromagnética:

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

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

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

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

Datum / Date / Date / Fecha
19. 08. 2005

Unterschrift / Signature / Signatur / Signatura



G. Hübenett
Product Manager

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 emmission and immunity and therefore on meeting the acceptance limits. For different applications the lines and/or cables used may be different. For measurement operation the following hints and conditions regarding emission and immunity should be observed:

1. Data cables
For the connection between instruments resp. their interfaces and external devices, (computer, printer etc.) sufficiently screened cables must be used. Without a special instruction in the manual for a reduced cable length, the maximum cable length of a dataline must be less than 3 meters and not be used 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 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

Declaration of Conformity 2

General information regarding the CE-marking 2

3 GHz Programmable Counter HM8123 4

Specifications 5

Control elements 6

Adjustment 8

Circuit and layout diagrams 9

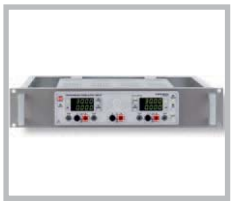
3 GHz Programmable Counter HM8123



HZ33, HZ34
Test cable BNC/BNC



HZ42 19" Rackmount kit 2RU



HZ20 Connector
BNC to 4 mm socket



- Frequency range from 0 Hz to 3 GHz
- 400 MHz time base with 0.5 ppm stability
- 2 identical inputs, up to 200 MHz each
- 9-digit resolution at 1 sec. gate time
- 9 measurement functions, external gate and arming
- Input for external time base (10 MHz)
- Display modes: numeric, histograms or trend plots
- OCXO optional
- RS-232 Interface
  optional: USB, IEEE-488



3 GHz Programmable Counter HM8123

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

Input characteristics (Input A and B)

Connection:	BNC socket	
Frequency range:		
0 – 200 MHz	(DC-coupled)	
10 Hz – 200 MHz	(1 MΩ, AC-coupled)	
500 kHz – 200 MHz	(50 Ω, AC-coupled)	
Input impedance:	1 MΩ II 30 pF or 50 Ω (switchable)	
Attenuation:	1:1, 1:10, 1:100 (selectable)	
Sensitivity: (normal triggering)		
0 to 80 MHz	25 mV_{rms} (sine wave), 80 mV_{pp} (pulse)	
80 MHz to 200 MHz	65 mV_{rms} (sine wave)	
20 Hz to 80 MHz	50 mV_{rms} (sine wave, auto trigger)	
Trigger (programmable via encoder or software)		
Attenuation:	**Trigger level:**	**Resolution:**
1:1	0 to ± 2 V	1 mV
1:10	0 to ± 20 V	10 mV
1:100	0 to ± 200 V	100 mV
Max. input voltage:		
Input 1 MΩ:	250 V (DC + AC_{peak}) from 0 to 440 Hz decreasing to 8 V_{rms} at 1 MHz	
Input 50 Ω:	5 V_{rms}	
Minimum pulse duration:	‹5 ns for single pulse	
Input noise:	(typ.) 100 µV	
Auto trigger (AC coupling):	trigger point: 50 % of peak-to-peak value	
Trigger slope:	positive or negative	
Filter:	100 kHz low-pass filter (switchable)	

Input characteristics (Input C)

Connection:	SMA socket	
Frequency range:	100 MHz - 3 GHz	
Input sensitivity:	up to 1 GHz:	30 mV_{rms} (typ. 20 mV_{rms})
	1 GHz-3 GHz:	100 mV_{rms} (typ. 80 mV_{rms})
Input impedance:	50 Ω nominal	
Max. input voltage:	5 V (DC + AC_{peak})	

Input characteristics

	External Reset	Reference	Gate/Arming
Input impedance:	5 kΩ	500 Ω	5 kΩ
Max. input voltage:	± 30 V	± 20 V	± 30 V
Input sensitivity:	-	typ. 2 V_{pp}	-
High level:	› 2 V	-	› 2 V
Low level:	‹ 0.5 V	-	‹ 0.5 V
Min. pulse duration:	200 ns	-	50 ns
Input frequency:	-	10 MHz	-
Min. eff. gate time:	-	-	20 µs

Measurement functions

Frequency A/B/C; period duration A; width A; duty cycle A; totalize A; RPM A; frequency ratio A:B; time interval A:B; time interval A:B (average); phase A to B; Duty cycle A; burst measurements

Frequency measurement (Inputs A, B, C)

Frequency range:	0 to 200 MHz (3 GHz)	
LSD:	(1.25 x 10^{-8} s x frequency) / measurement time	
Resolution:	± 1 or 2 LSD	
Accuracy:	± (resolution / frequency ± time inaccuracy ± trigger error[2] / measurement time)	

Period duration measurement

Range:	10000 sec. to 5 ns	
LSD:	(1.25 x 10^{-8} s x period) / measurement time	
Resolution:	1 or 2 LSD	
Accuracy:	± resolution / period ± (trigger error[2] B / measurement time)	

Totalization A

	(manual control)	(external control)
Range:	0 – 200 MHz	0 – 200 MHz
Min. pulse duration:	10 ns	10 ns
LSD:	1 count	± 1 count
Resolution:	LSD	LSD
Accuracy:	(resolution ± ext. gate time error x frequency A)/total	
Pulse resolution:	10 ns	10 ns
Ext. gate error:	-	100 ns

Time interval / Average time interval

(Input A = start; input B = stop)

LSD:	10 ns (10 ns to 1 ps in "average" mode)	
Resolution:	1 LSD (1 or 2 in "average" mode)	
Accuracy:	± (resolution + trigger error[2] + system error) / time interval ± time basis uncertainty (system error: ≤ 4 ns)	
Number of average:	N = 1-25	LSD = 10 ns
	N = 26-2500	LSD = 1 ns
	N = 2501-250000	LSD = 100 ps
	N = 250001 – 25000000	LSD = 10 ps
	N = › 25000000	LSD = 1 ps

RPM measurement

NPR[1] presetting:	1 – 65535 pulses per revolution
Gate time:	330 ms fixed
LSD:	7.5 x 10^{-8} revolution speed
Resolution:	1 or 2 LSD
Accuracy:	± (trigger error[2] / 0.33) ± time basis error

Offset

Range: Covers the entire measurement range

Resolution: Same resolution as in normal measurement.
If the gate time is changed in the offset mode, the offset resolution is the reference value resolution or the current reading resolution (whichever is less precise).

Gate time

Range:	1 ms – 65 sec.
Resolution:	1 ms
External gate time:	min. 20 µs

Time base

Frequency:	400 MHz clock rate; 10 MHz crystal
Stability:	± 5 x 10^{-7} between +10° C and +40° C
Ageing:	‹ 0.27 ppm per month, 0.05 ppm per day
External Reference:	10 MHz ± 20 ppm

Miscellaneous

Interface:	RS-232 (serial), IEEE-488 (optional), USB (optional)
Safety class:	Safety Class I (EN61010-1)
Display:	LCD display (83 x 21 mm)
Power supply:	115/230 V ± 10 %, 45-60 Hz, 40 VA
Operating temperature:	+10° C to +40° C
Max. relative humidity:	10 %-90 % (without condensation), 5 %-95 % RH
Dimensions (W x H x D):	285 x 75 x 365 mm
Weight:	approx. 4 kg

[1] NPR=number of pulses per revolution
[2] Trigger error= ± noise input (V_{pp}) / slew rate of the input signal

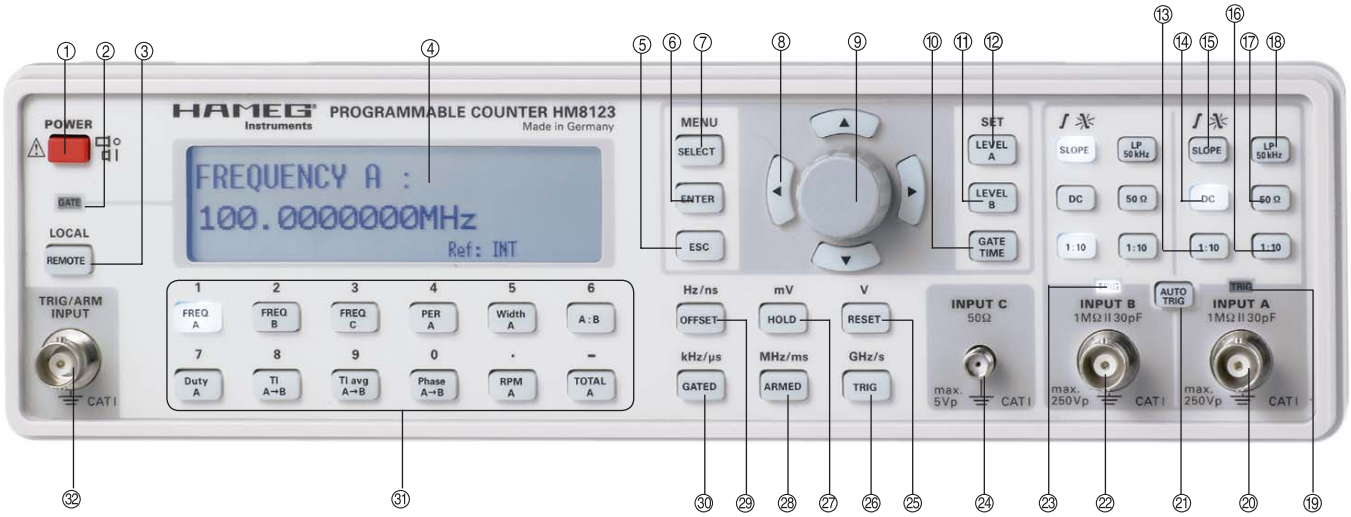
Accessories supplied: Operator's Manual and power cable
Optional accessories:
HZ10S/R Silicone test lead
HZ42 19" Rackmount kit 2RU
HZ33/34 Test cable 50 Ω (BNC-BNC)
HZ24 Attenuators 50 Ω
HZ20 Adapter plug
HO870 USB Interface
HO880 IEEE-488 interface
HO85 OCXO (Installation only ex factory)

www.hameg.com

HM8123E/151007/ce · Subject to alterations · © HAMEG Instruments GmbH · ® Registered Trademark · DQS-certified in accordance with DIN EN ISO 9001:2000, Reg.-No.: DE-071040 QM

HAMEG Instruments GmbH · Industriestr. 6 · D-63533 Mainhausen · Tel +49 (0) 6182 800 0 · Fax +49 (0) 6182 800 100 · www.hameg.com · info@hameg.com

A Rohde & Schwarz Company



Controls and display

Frontpanel controls

① **POWER (pushbutton)**
Power switch, mains input connector on rear panel

② **GATE (LED)**
The GATE LED will be on for the duration of the gate time and synchronisation time, i.e. for the duration of one complete measurement.

③ **REMOTE (LED and pushbutton)**
The REMOTE LED will be on if the instrument is under control via the interface. By pushing the REMOTE button operation will be returned to manual.

④ **Display (LCD)**
Display of measurement results and additional information

⑤ **ESC (pushbutton)**
Escape pushbutton (menu)

⑥ **ENTER (pushbutton)**
Enter pushbutton (menu)

⑦ **SELECT (pushbutton)**
Selects a menu or part thereof.

⑧ **▲▼◀▶ pushbuttons**
These arrow pushbuttons are used to control the menu and the parameters.

⑨ **Rotating knob**
Knob for entering parameters

⑩ **GATE TIME (pushbutton)**
Setting of gate time

⑪ **LEVEL B (pushbutton)**
Setting of channel B trigger level

⑫ **LEVEL A (pushbutton)**
Setting of channel A trigger level

⑬ ⑯ **1 : 10 pushbutton**
Input attenuator, total attenuation 100 times.

⑭ **DC (pushbutton)**
Selects the coupling of the corresponding channel.
Button DC lit = DC coupling
Button DC dark = AC coupling

⑮ **Slope (pushbutton)**
This pushbutton selects the trigger slope. A lighted pushbutton indicates triggering on the negative slope, an unlighted pushbutton indicates triggering on the positive slope.

⑰ **50 Ω (pushbutton)**
This pushbutton connects an internal 50 Ω resistor to the input in order to allow operation in 50 Ω systems.

⑱ **LP 50 kHz (pushbutton)**
This pusbuttons inserts a low pass filter in order to suppress hf signals from interfering with triggering from low frequency signals.

⑲ ㉓ **TRIG (LED)**
Indicate triggered operation

⑳ ㉒ **INPUT A, INPUT B (BNC connectors)**
Input connectors for measuring signals DC to 200 MHz

㉑ **AUTO TRIG (pushbutton)**
Selects automatic triggering operation indicated by the pushbutton lighting up.

㉔ **INPUT C (SMA connector)**
Input for measuring signals 100 MHz to 2.6 GHz

㉕ **RESET / V (pushbutton)**
Button with two functions:
1st Pressing this button will stop any measurement, erase the display and start a new measurement.
2nd Setting the trigger level with the numerical keys ㉛, the entered value will be accepted with the unit Volts (V).

㉖ **TRIG / GHz/s (pushbutton)**
Button with two functions:
1st Pressing this button will start a measurement in ARMED mode.
2nd Setting the gate time with the numerical keys ㉛, the entered value will be accepted with the unit seconds (s).

㉗ **HOLD / mV (pushbutton)**
Button with two functions:



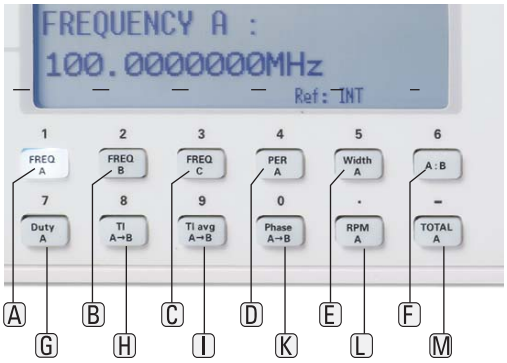
1st Pressing this button will freeze the display.
2nd Setting the trigger level with the numerical keys ㉛, the entered value will be accepted with the unit millivolts (mV).

㉘ ARMED / MHz (pushbutton)
Button with two functions:
1st Pressing this button will select the ARMED mode.
2nd Setting the gate time with the numerical keys ㉛, the entered value will be accepted with the unit milliseconds (ms).

㉙ OFFSET / Hz/ns (pushbutton)
Pressing this button will activate the OFFSET function.

㉚ GATED / kHz/us (pushbutton)
Pressing this button will activate the GATED mode.

㉛ Function pushbuttons Ⓐ to Ⓜ



These buttons have two functions:
1st The measurements function are called by operating these buttons. The corresponding button will light up.
2nd Setting the trigger level or the gate time, the desired value can be entered with this buttons and the unit buttons (mV㉗, V㉕ and ms㉘, s㉖). Also refer to chap. Gate time and Triggering. None of these button is lit.

Ⓐ	FREQ A	Frequency channel A
Ⓑ	FREQ B	Frequency channel B
Ⓒ	FREQ C	Frequency measurement channel C
Ⓓ	PER A	Period channel A
Ⓔ	Width A	Pulse width channel A
Ⓕ	A : B	Frequency ratio of channels A : B
Ⓖ	Duty A	Duty cycle channel A
Ⓗ	TI A→B	Time interval A→B
Ⓘ	TI avg A→B	Time interval A→B averaged
Ⓚ	Phase A→B	Phase difference A→B
Ⓛ	RPM A	Rpm measurement channel A
Ⓜ	TOTAL A	Event counting channel A

㉜ TRIG/ARM INPUT (BNC connector)
External gate control input

Rear Panel

㉝ Interface
RS-232 interface (Options: IEEE-488, USB)

㉞ A (BNC connector)
Trigger signal channel A output (e.g. for display on a scope). Signal level 0 to + 5 V (TTL level)

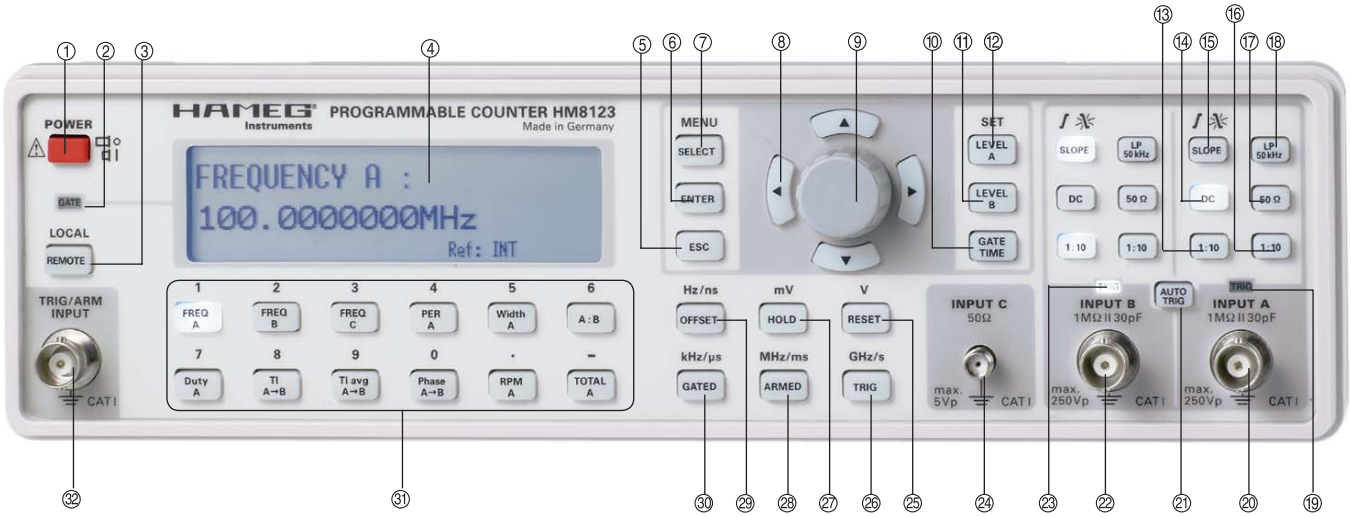
㉟ B (BNC connector)
Trigger signal channel B output (e.g. for display on a scope). Signal level 0 to + 5 V (TTL level)

㊱ GATE (BNC connector)
Gate view output. This output will be high as long as the gate is open during a measurement.

㊲ 10 MHz Ref. (BNC connector)
External reference input (10 MHz)

㊳ RESET (BNC connector)
External reset signal input (TTL level). The function is identical to that of the RESET pushbutton ㉕.

㊴ Mains input connector



Adjustment

Turn off the HM8123. Push and hold the ENTER button ⑥ and start the instrument again. Do not release the ENTER button until the initialisation of HM8123 is finished.

Frequency

1. The menu is called by pressing the pushbutton SELECT ⑦. The Calibrate submenu is called by using the rotating knob ⑨ or the 2 arrow keys ▲▼ ⑧.
2. The submenu will be opened by pressing ENTER ⑥.
3. The menu item Frequency is called by using the rotating knob ⑨ or the 2 arrow keys ▲▼ ⑧ and will be opened by pressing ENTER ⑥.
4. A 10 MHz reference signal (e.g. GPS) should be connected to the input A ⑳ and ENTER depressed ⑥.
5. The HM8123 will first check the frequency and then perform automatic calibration. The display will show „Calibration, please wait...“
6. A successful calibration will be indicated by „Calibration successful. Exiting...“, the menu will be left.

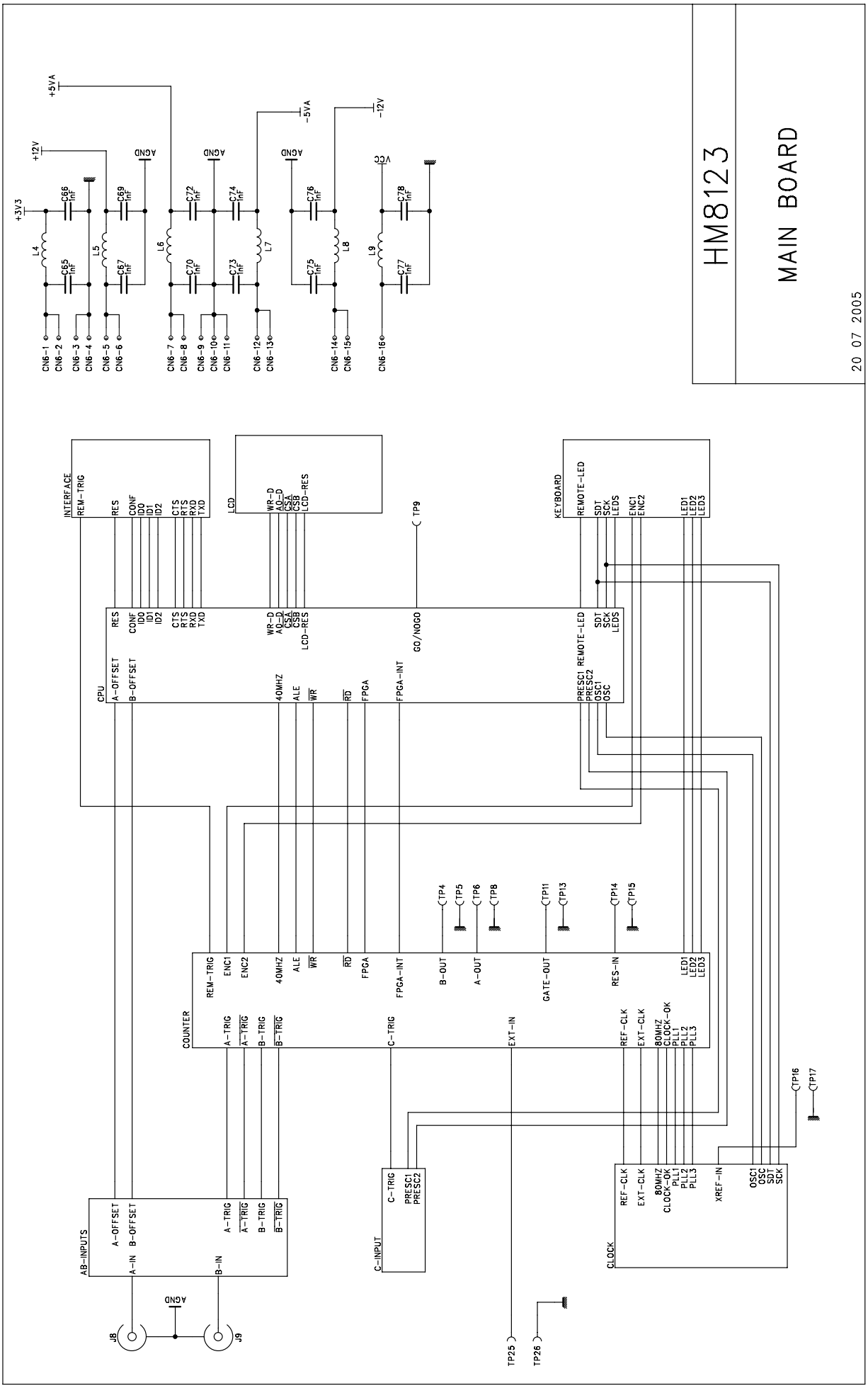
Level A

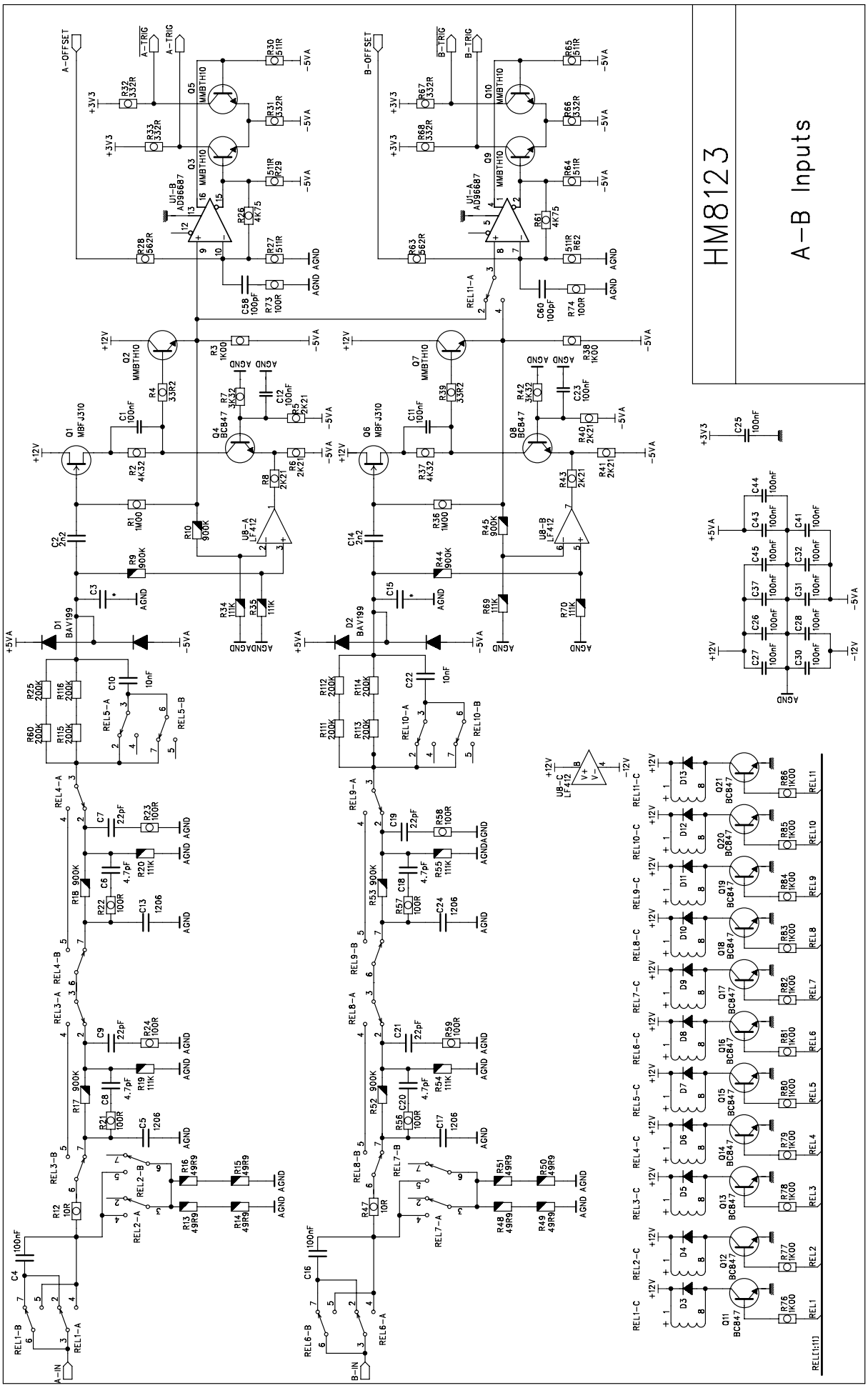
1. The menu is called by pressing the pushbutton SELECT ⑦. The Calibrate submenu is called by using the rotating knob ⑨(9) or the 2 arrow keys ▲▼ ⑧.
2. The submenu will be opened by pressing ENTER ⑥.
3. The menu item Level A is called by using the rotating knob ⑨ or the 2 arrow keys ▲▼ ⑧ and will be opened by pressing ENTER ⑥.
4. A 1 kHz sine wave signal (symmetric, without offset, 20 mV_{eff}) should be connected to channel A ⑳. By turning the knob ⑨ seek for the lower and the upper limit of the trigger level (DAC), where the trigger indicator ⑲ is blinking.
5. The middle of this range has to be entered and confirmed by pushbutton ENTER ⑥, the menu will be left.

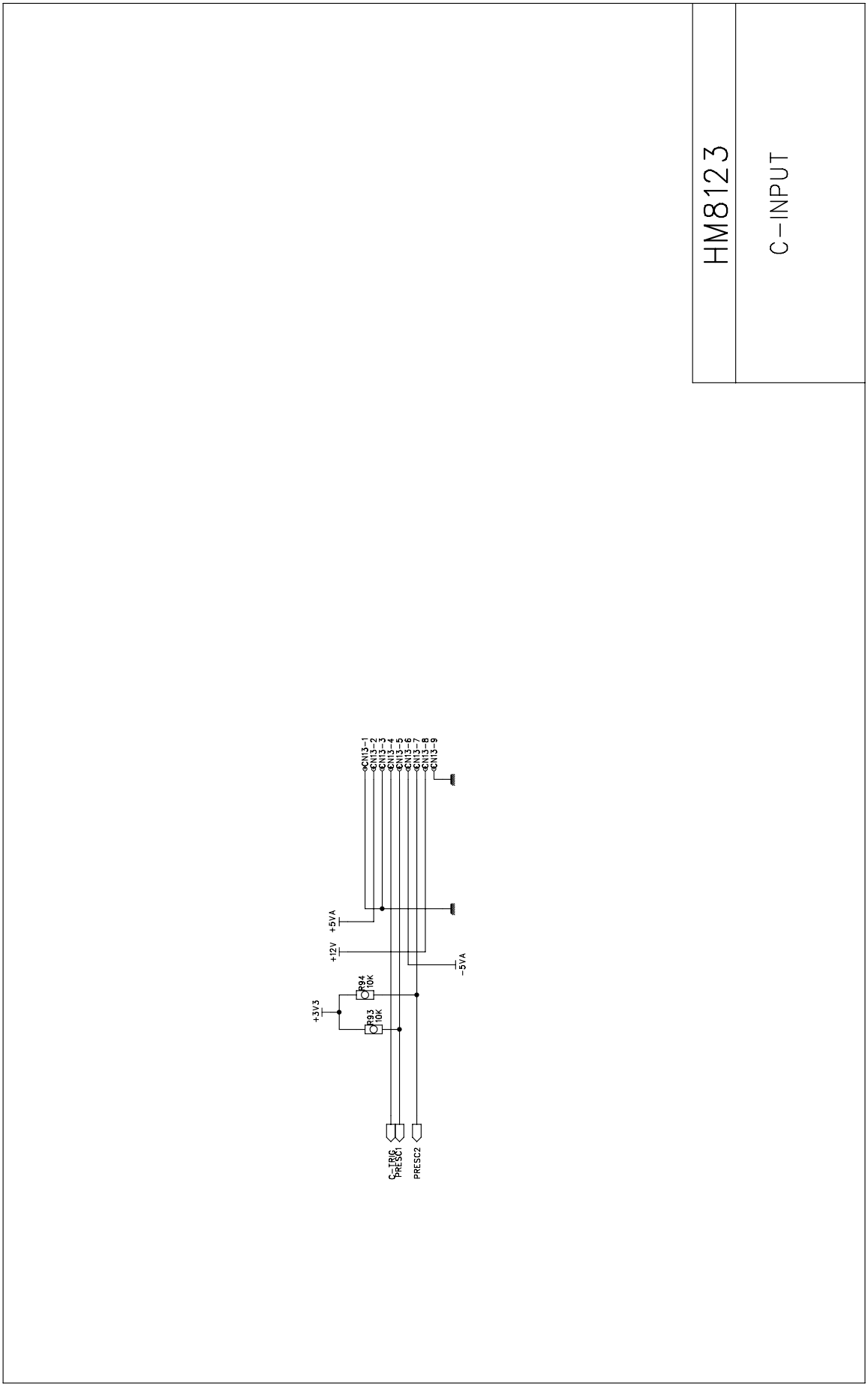
Level B

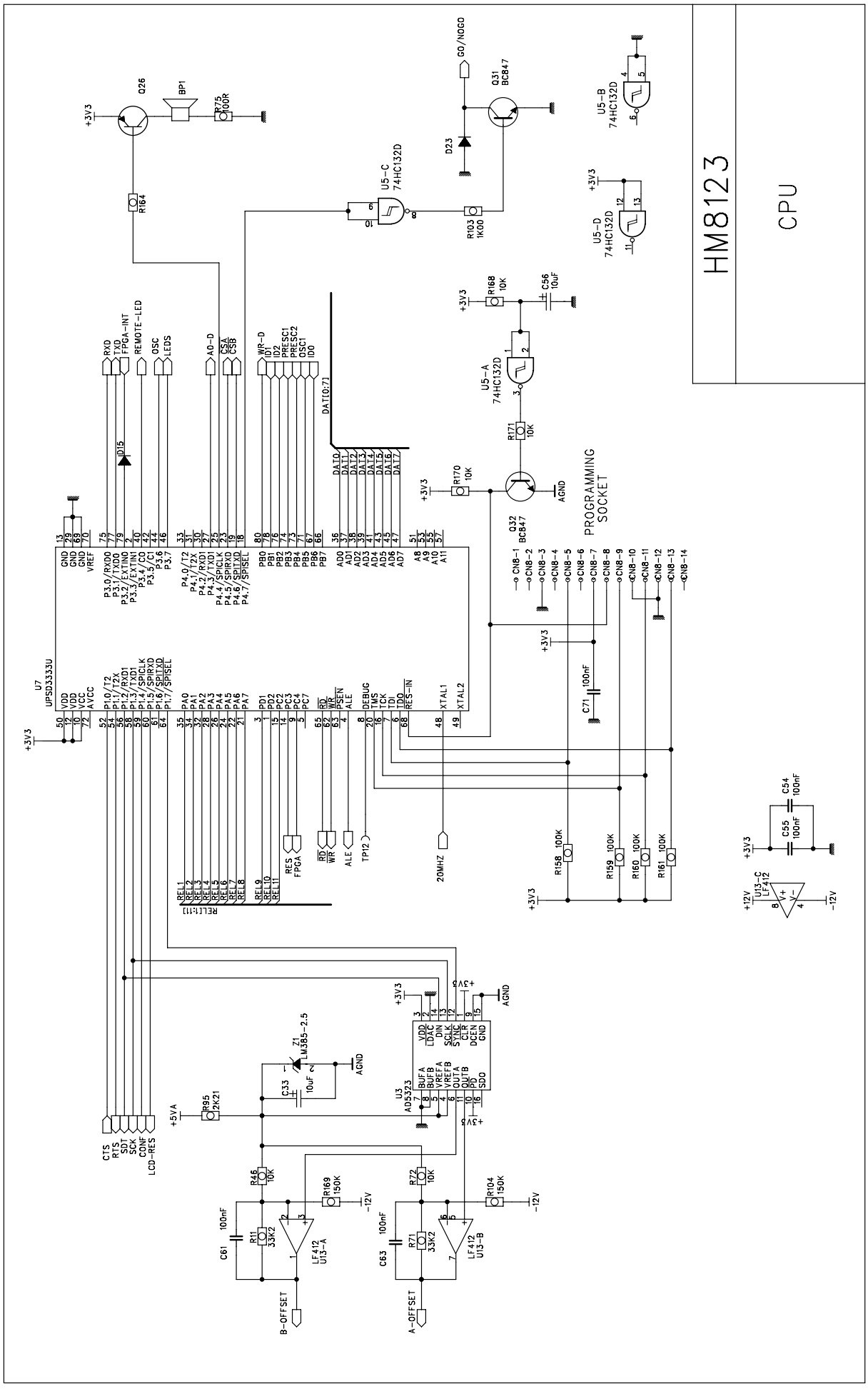
1. The menu is called by pressing the pushbutton SELECT ⑦. The Calibrate submenu is called by using the rotating knob ⑨ or the 2 arrow keys ▲▼ ⑧.
2. The submenu will be opened by pressing ENTER ⑥.
3. The menu item Level B is called by using the rotating knob ⑨ or the 2 arrow keys ▲▼ ⑧ and will be opened by pressing ENTER ⑥.
4. A 1 kHz sine wave signal (symmetric, without offset, 20 mV_{eff}) should be connected to channel B ㉒. By turning the knob ⑨ seek for the lower and the upper limit of the trigger level (DAC), where the trigger indicator ㉓ is blinking.
5. The middle of this range has to be entered and confirmed by pushbutton ENTER ⑥, the menu will be left.

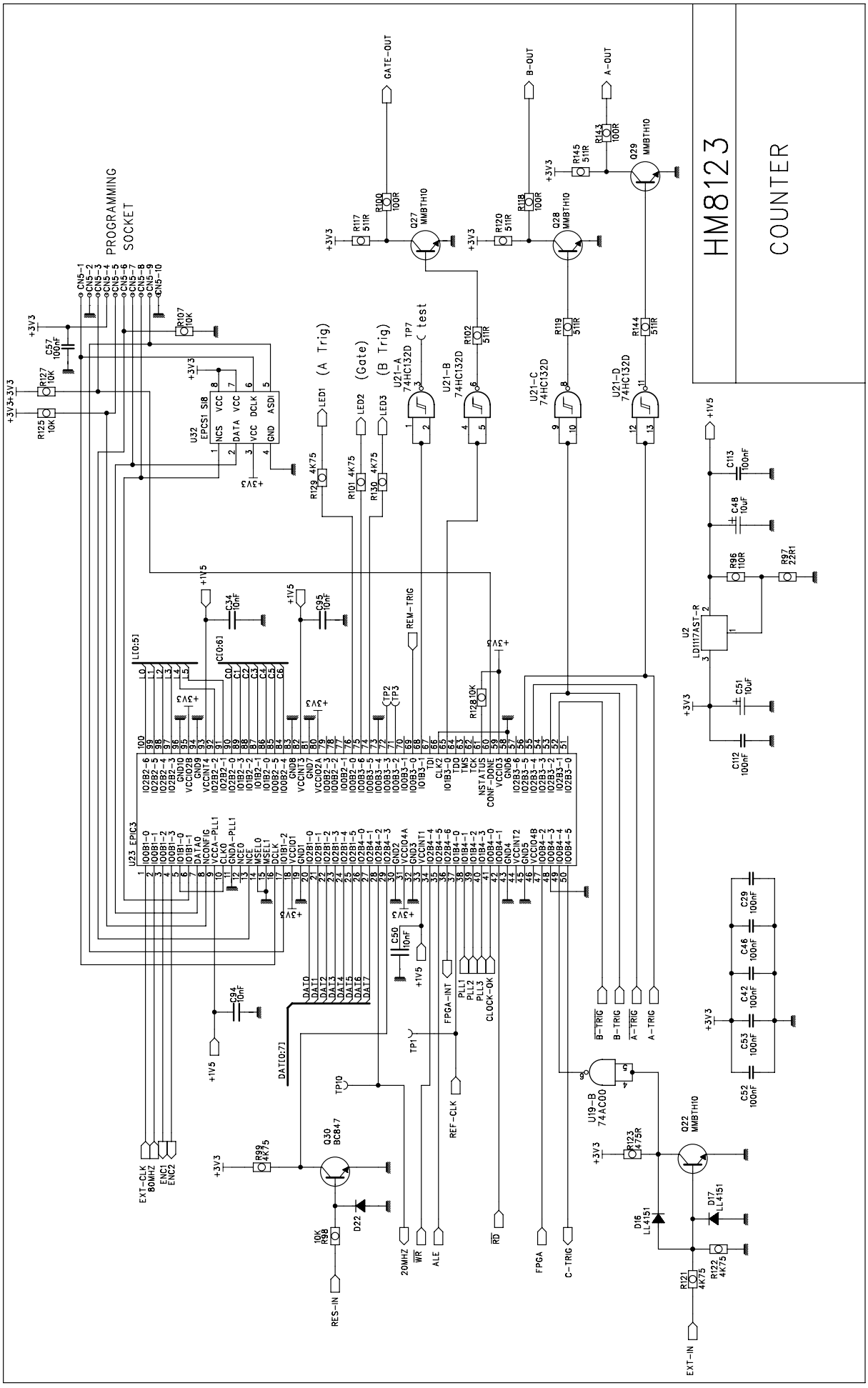
Example:
Lower limit: DAC = 2079
Upper limit: DAC = 2099
Calibration value: DAC = 2089

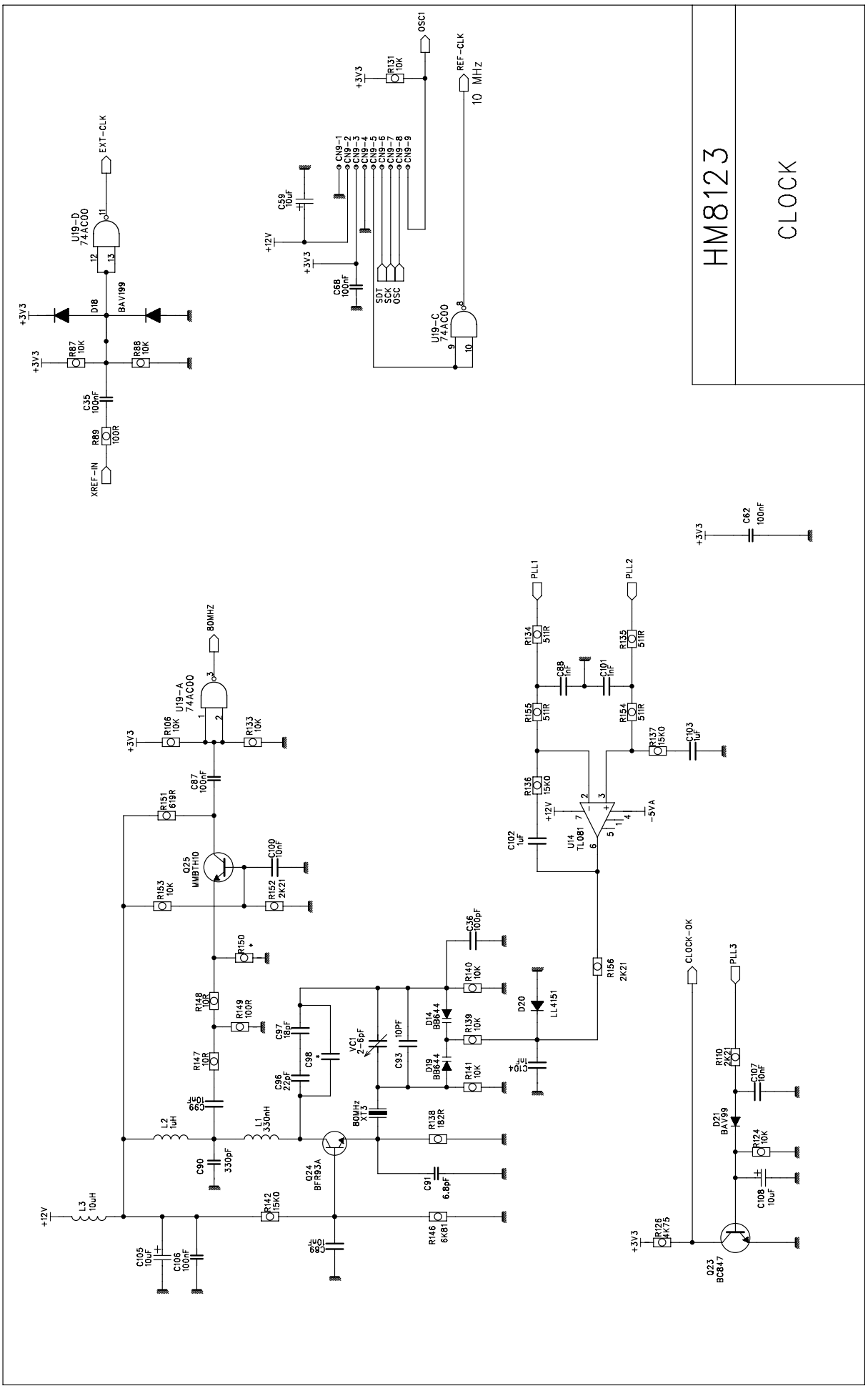

HM8123
MAIN BOARD
20 07 2005
+5VA
+12V
+3V3
AGND
-5VA
-12V
VCC
L4
L5
L6
L7
L8
L9
C65 1nF
C66 1nF
C67 1nF
C69 1nF
C70 1nF
C72 1nF
C73 1nF
C74 1nF
C75 1nF
C76 1nF
C77 1nF
C78 1nF
CN6-1
CN6-2
CN6-3
CN6-4
CN6-5
CN6-6
CN6-7
CN6-8
CN6-9
CN6-10
CN6-11
CN6-12
CN6-13
CN6-14
CN6-15
CN6-16
INTERFACE
REM-TRIG
RES
CONF
ID0
ID1
ID2
CTS
RTS
RXD
TXD
LCD
WR-D
A0-D
CSA
CSB
LCD-RES
KEYBOARD
REMOTE-LED
SDT
SCK
LEDS
ENC1
ENC2
LED1
LED2
LED3
TP9
CPU
A-OFFSET
B-OFFSET
40MHZ
ALE
WR
RD
FPGA
FPGA-INT
GO/NOGO
PRESC1
PRESC2
OSC1
OSC
COUNTER
ENC1
ENC2
A-TRIG
A-TRIG
B-TRIG
B-TRIG
C-TRIG
EXT-IN
B-OUT
A-OUT
GATE-OUT
RES-IN
REF-CLK
EXT-CLK
80MHZ
CLOCK-OK
PLL1
PLL2
PLL3
TP4
TP5
TP6
TP8
TP11
TP13
TP14
TP15
TP16
TP17
AB-INPUTS
A-IN
B-IN
C-INPUT
CLOCK
XREF-IN
OSC1
OSC
SDT
SCK
J8
J9
TP25
TP26

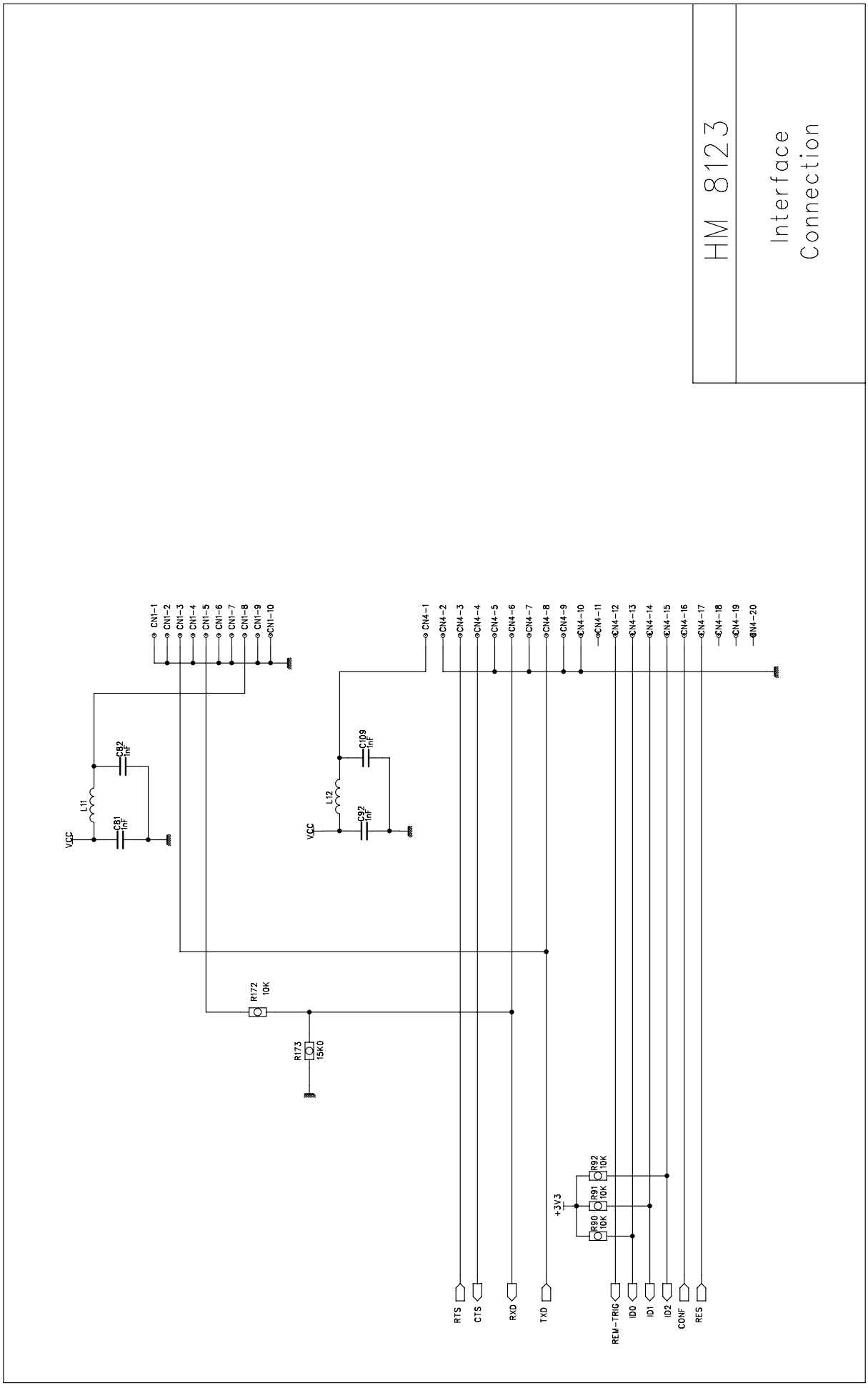

HM8123
A–B Inputs
A-OFFSET
B-OFFSET
A-TRIG
B-TRIG
A-IN
B-IN
+12V
-12V
+5VA
-5VA
+3V3
AGND

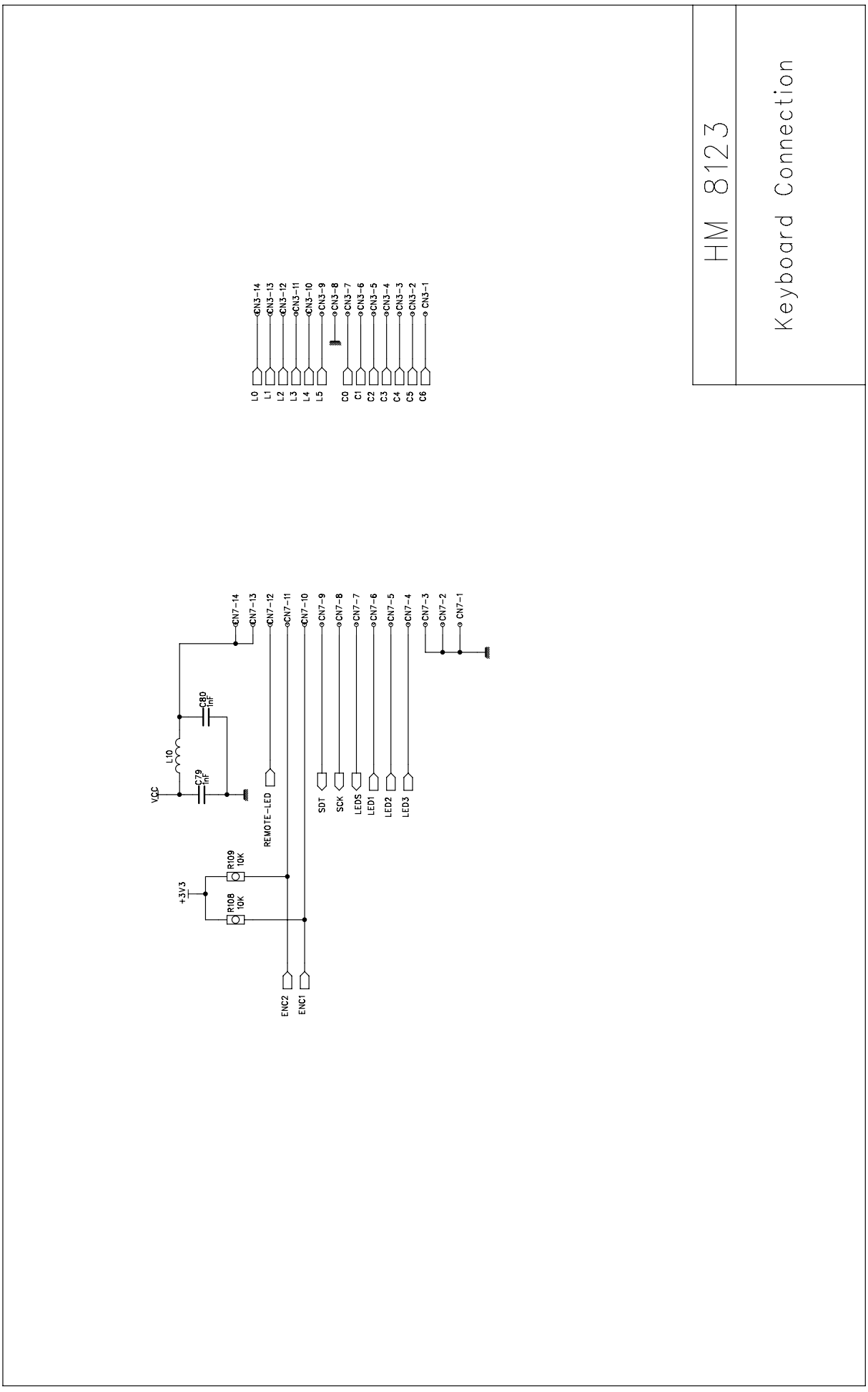

HM8123
C-INPUT
CN13-1
CN13-2
CN13-3
CN13-4
CN13-5
CN13-6
CN13-7
CN13-8
CN13-9
+5VA
+12V
-5VA
+3V3
R94
10K
R93
10K
C-TRIG
PRESC1
PRESC2

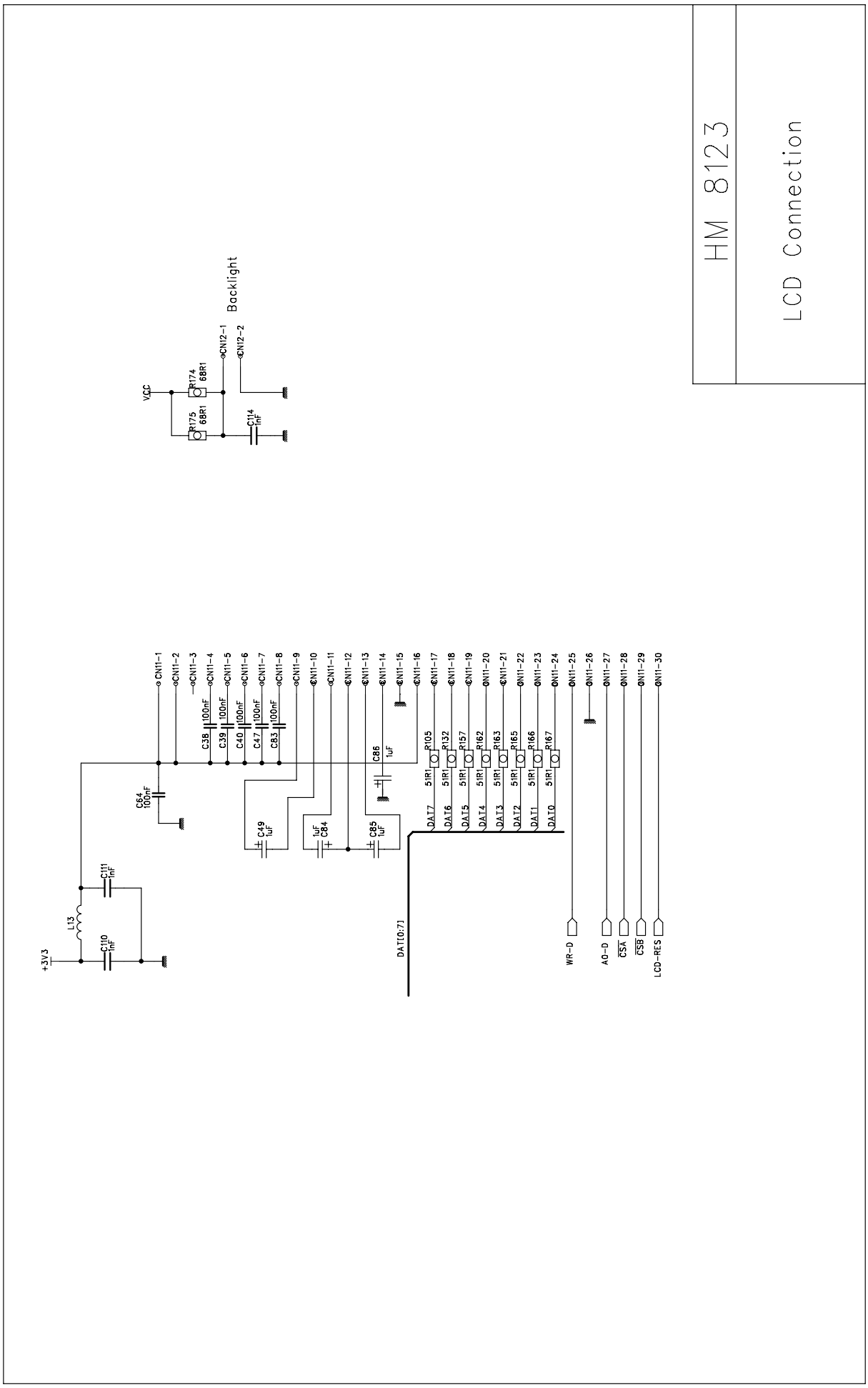

HM8123
CPU
PROGRAMMING SOCKET
U7 UPSD3333U
U3 AD5323
Q26 BP1 R75 100R
Q31 BC847
Q32 BC847
D23
GO/NOGO
U5-A 74HC132D
U5-B 74HC132D
U5-C 74HC132D
U5-D 74HC132D
R164
R103 1K00
R168 10K
C56 10uF
R171 10K
R170 10K
D15
RXD
TXD
FPGA-INT
REMOTE-LED
OSC
LEDS
A0-D
CSA
CSB
WR-D
ID2
ID1
ID0
PRESC1
PRESC2
OSC1
DAT[0:7]
REL[1:11]
RES FPGA
RD
WR
ALE
TP12
20MHZ
DEBUG
TMS
TCK
TDI
TDO
RES-IN
XTAL1
XTAL2
C71 100nF
R158 100K
R159 100K
R160 100K
R161 100K
C54 100nF
C55 100nF
U13-C LF412
CTS
RTS
SDT
SCK
CONF
LCD-RES
+5VA
R95 2K21
C33 10uF
Z1 LM385-2.5
R46 10K
R169 150K
R72 10K
R104 150K
C61 100nF
C63 100nF
R11 33K2
R71 33K2
U13-A LF412
U13-B LF412
B-OFFSET
A-OFFSET
+3V3
AGND
-12V
+12V

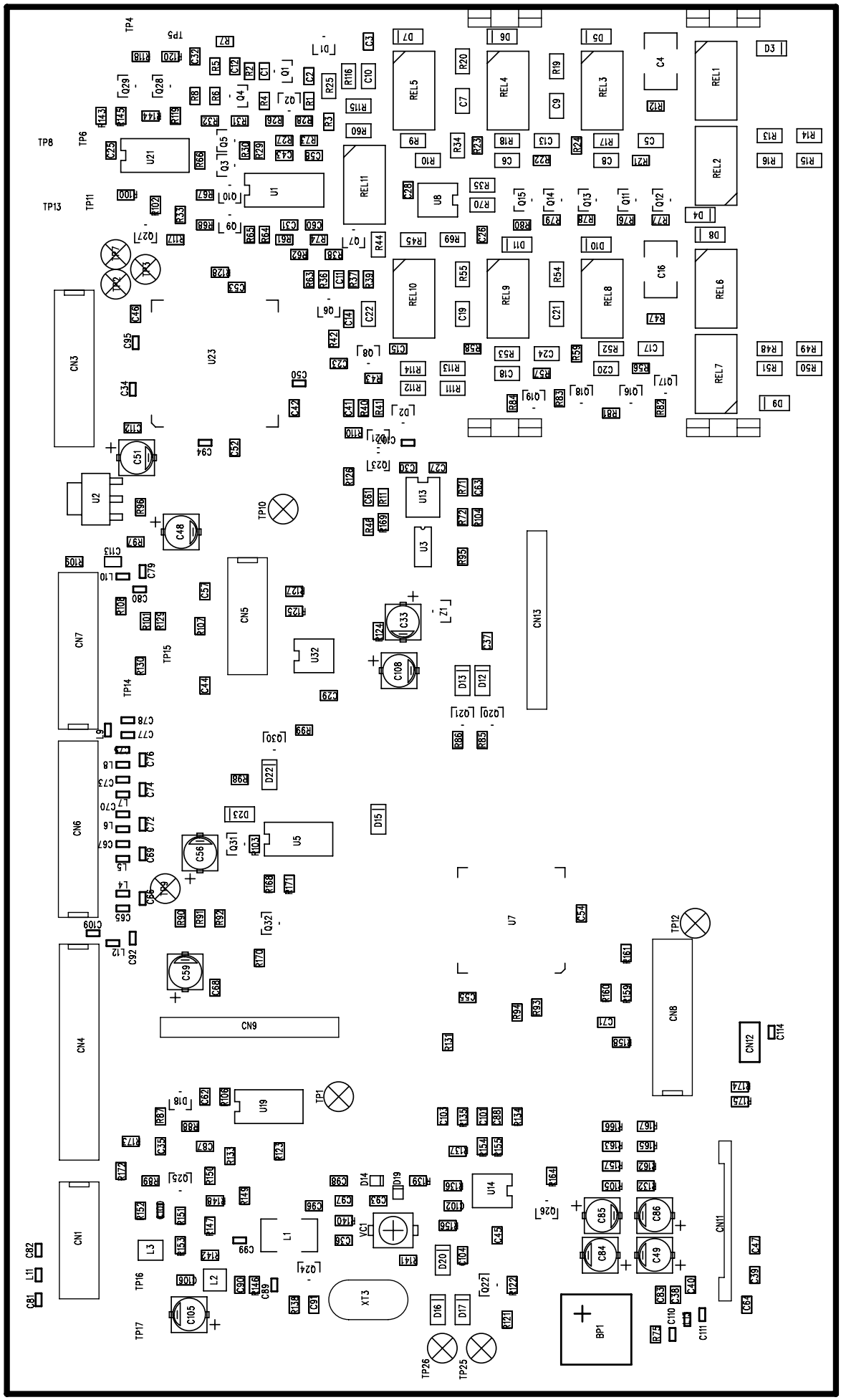

HM8123
COUNTER
PROGRAMMING SOCKET
U23 EPIC3
U32 EPCS1 SI8
U21-A 74HC132D
U21-B 74HC132D
U21-C 74HC132D
U21-D 74HC132D
U19-B 74AC00
U2 LD1117AST-R
Q27 MMBTH10
Q28 MMBTH10
Q29 MMBTH10
Q22 MMBTH10
Q30 BC847
GATE-OUT
B-OUT
A-OUT
LED1 (A Trig)
LED2 (Gate)
LED3 (B Trig)
test
REM-TRIG
FPGA-INT
REF-CLK
CLOCK-OK
EXT-CLK 80MHZ
ENC1
ENC2
RES-IN
EXT-IN
20MHZ
WR
ALE
RD
FPGA
C-TRIG
B-TRIG
A-TRIG
DAT[0:7]
LI[0:5]
CI[0:6]

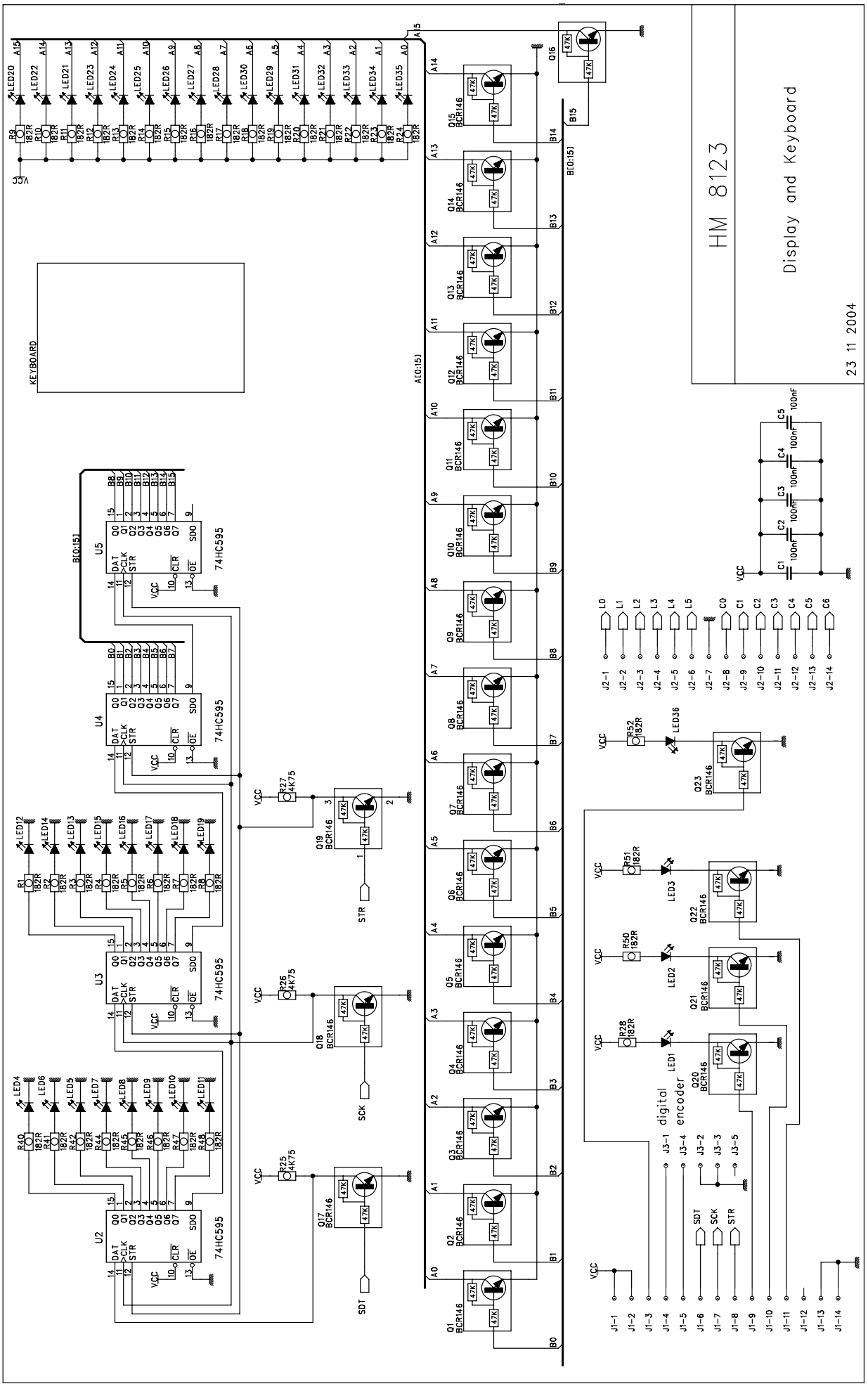

HM8123
CLOCK
OSC1
REF-CLK
10 MHz
EXT-CLK
XREF-IN
SDT
SCK
OSC
CLOCK-OK
PLL1
PLL2
PLL3
80MHZ
+3V3
+12V
-5VA

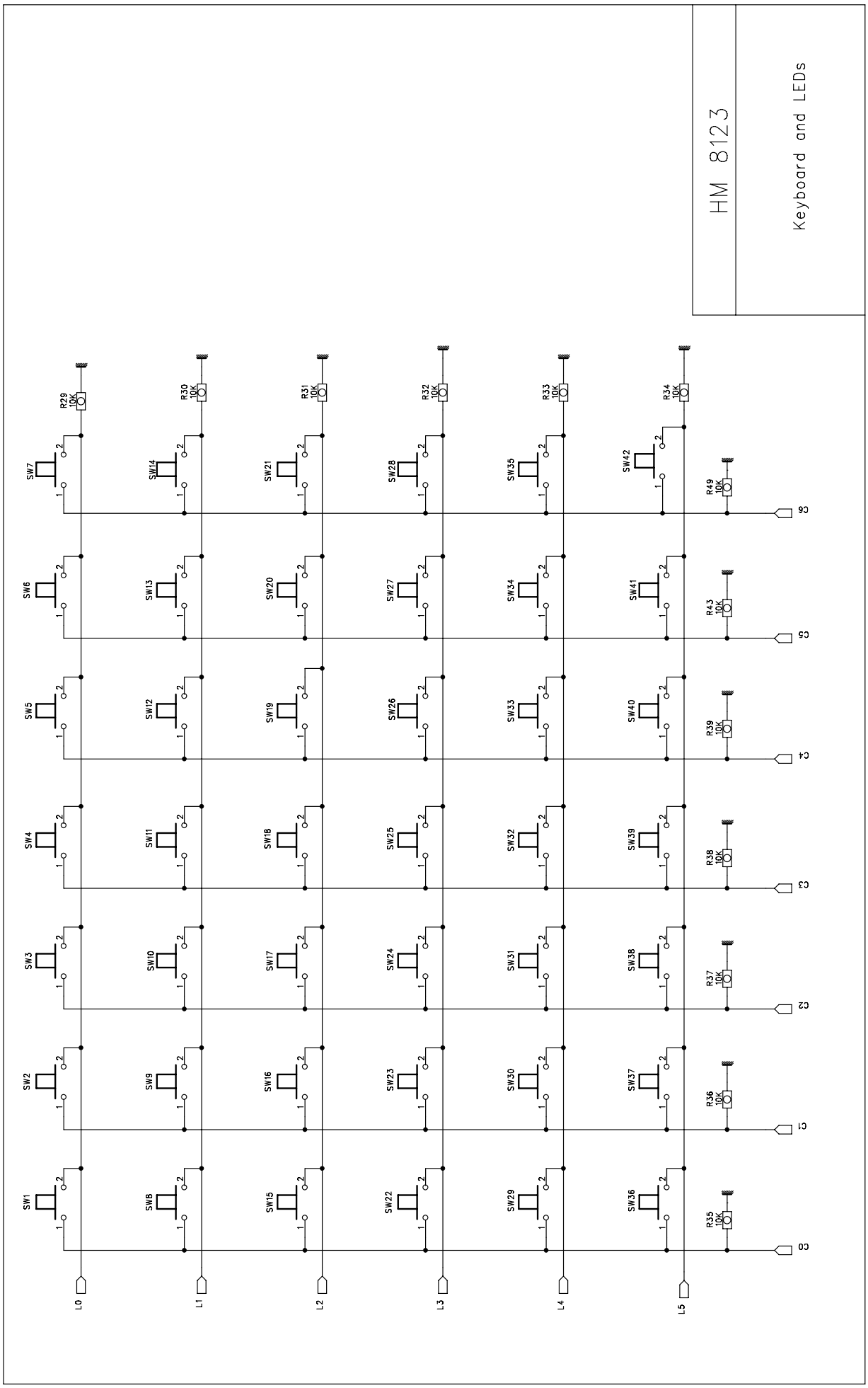

HM 8123
Interface
Connection
CN1-1
CN1-2
CN1-3
CN1-4
CN1-5
CN1-6
CN1-7
CN1-8
CN1-9
CN1-10
CN4-1
CN4-2
CN4-3
CN4-4
CN4-5
CN4-6
CN4-7
CN4-8
CN4-9
CN4-10
CN4-11
CN4-12
CN4-13
CN4-14
CN4-15
CN4-16
CN4-17
CN4-18
CN4-19
CN4-20
L11
C82 1nF
C81 1nF
VCC
L12
C109 1nF
C92 1nF
VCC
R172 10K
R173 15K0
+3V3
R92 10K
R91 10K
R90 10K
RTS
CTS
RXD
TXD
REM-TRIG
IDD
ID1
ID2
CONF
RES

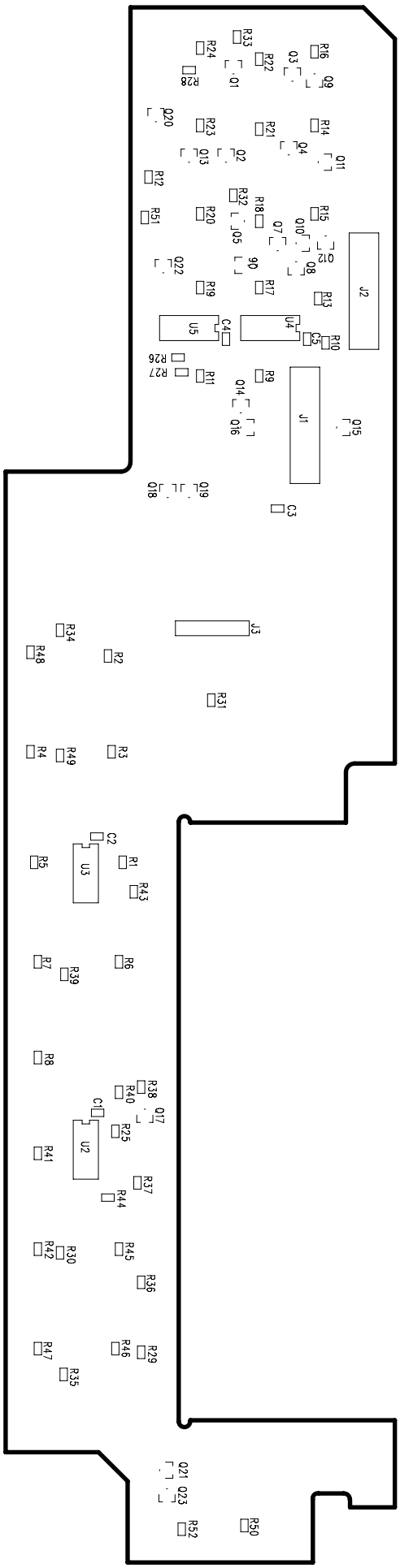

HM 8123
Keyboard Connection
CN3-14
CN3-13
CN3-12
CN3-11
CN3-10
CN3-9
CN3-8
CN3-7
CN3-6
CN3-5
CN3-4
CN3-3
CN3-2
CN3-1
L0
L1
L2
L3
L4
L5
C0
C1
C2
C3
C4
C5
C6
CN7-14
CN7-13
CN7-12
CN7-11
CN7-10
CN7-9
CN7-8
CN7-7
CN7-6
CN7-5
CN7-4
CN7-3
CN7-2
CN7-1
C80
1nF
L10
C79
1nF
VCC
REMOTE-LED
SDT
SCK
LEDS
LED1
LED2
LED3
R109
10K
R108
10K
+3V3
ENC2
ENC1

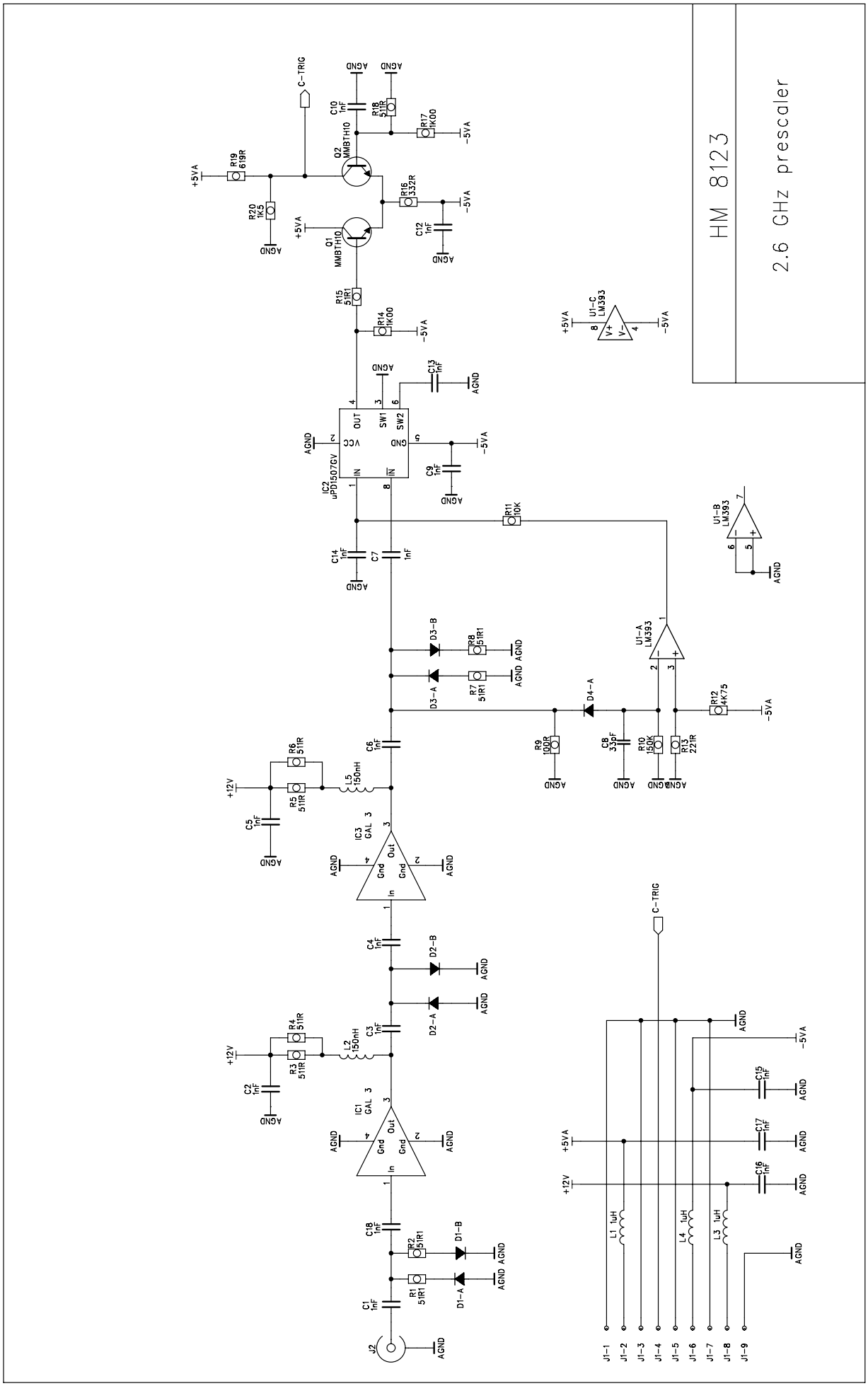

LCD Connection
HM 8123
Backlight
CN12-1
CN12-2
VCC
R174 68R1
R175 68R1
C114 1nF
CN11-1
CN11-2
CN11-3
CN11-4
CN11-5
CN11-6
CN11-7
CN11-8
CN11-9
CN11-10
CN11-11
CN11-12
CN11-13
CN11-14
CN11-15
CN11-16
CN11-17
CN11-18
CN11-19
CN11-20
CN11-21
CN11-22
CN11-23
CN11-24
CN11-25
CN11-26
CN11-27
CN11-28
CN11-29
CN11-30
C38 100nF
C39 100nF
C40 100nF
C47 100nF
C83 100nF
C64 100nF
C49 1uF
C84 1uF
C85 1uF
C86 1uF
R105 51R1
R132 51R1
R157 51R1
R162 51R1
R163 51R1
R165 51R1
R166 51R1
R167 51R1
DAT7
DAT6
DAT5
DAT4
DAT3
DAT2
DAT1
DAT0
DAT[0:7]
+3V3
L13
C111 1nF
C110 1nF
WR-D
A0-D
CSA
CSB
LCD-RES

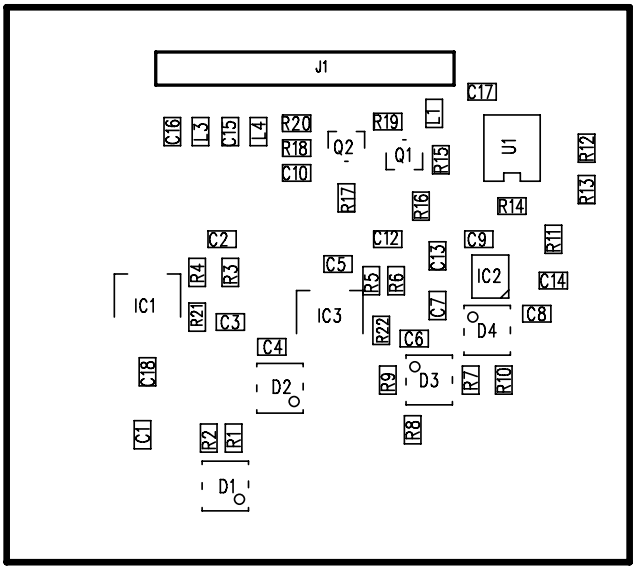


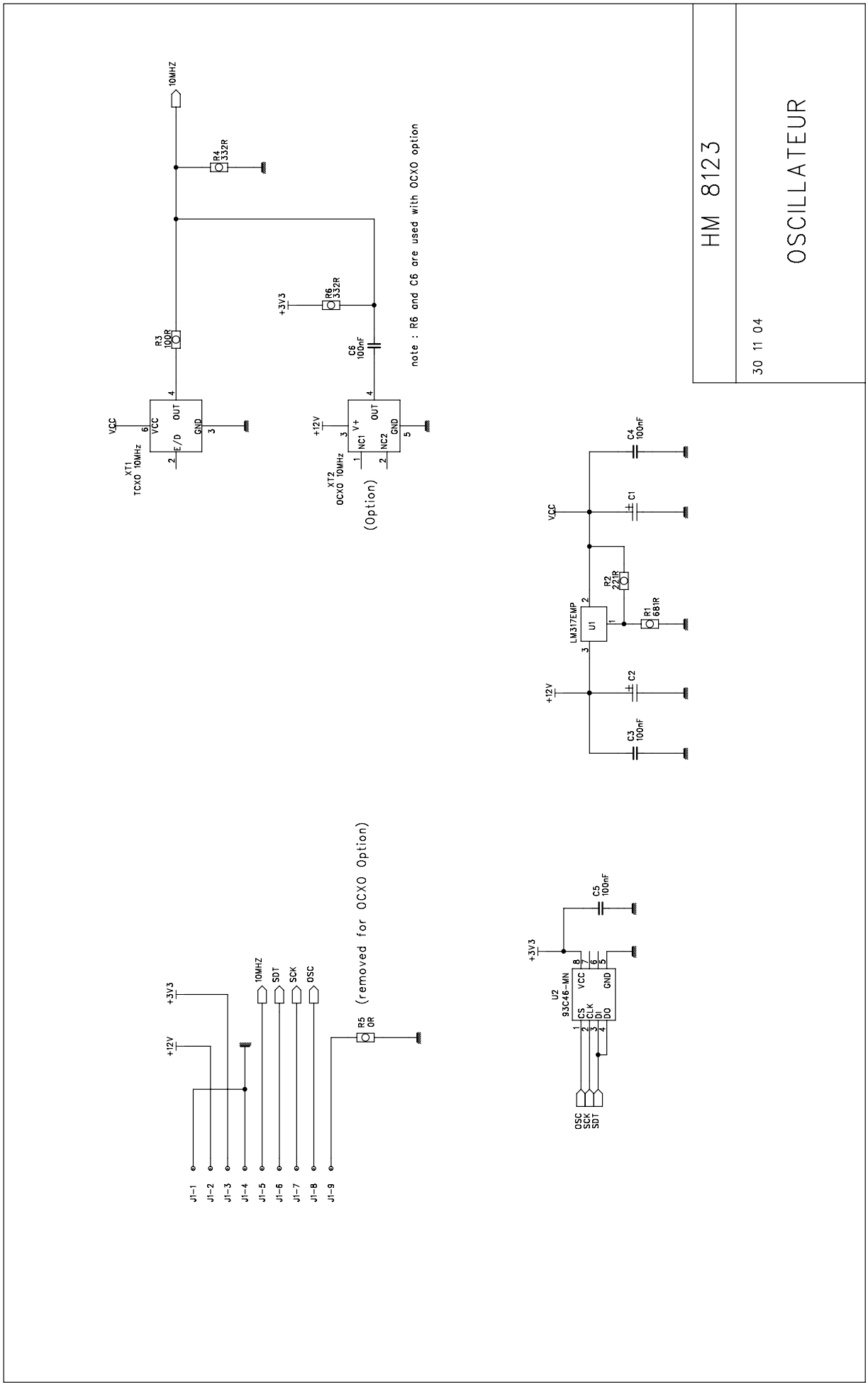

HM 8123
Display and Keyboard
23 11 2004
KEYBOARD
digital encoder
74HC595
BCR146
LED1
LED2
LED3
LED36
SDT
SCK
STR

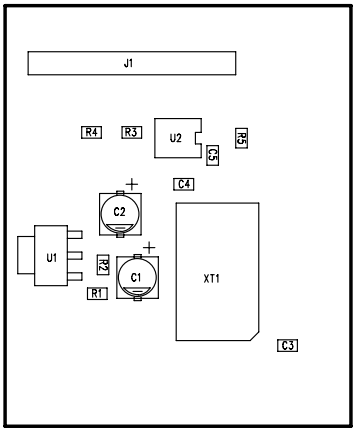

HM 8123
Keyboard and LEDs
L0
L1
L2
L3
L4
L5
C0
C1
C2
C3
C4
C5
C6
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
SW16
SW17
SW18
SW19
SW20
SW21
SW22
SW23
SW24
SW25
SW26
SW27
SW28
SW29
SW30
SW31
SW32
SW33
SW34
SW35
SW36
SW37
SW38
SW39
SW40
SW41
SW42
R29 10K
R30 10K
R31 10K
R32 10K
R33 10K
R34 10K
R35 10K
R36 10K
R37 10K
R38 10K
R39 10K
R43 10K
R49 10K


R33
R24
R22
Q3
R16
Q9
Q1
R28
Q20
R23
R21
R14
Q4
Q13
Q2
Q11
R12
R32
R18
R15
R51
R20
Q7
Q10
Q5
Q12
Q22
90
Q8
R19
R17
R13
J2
U5
C4
U4
C5
R10
R26
R27
R11
R9
Q14
Q16
J1
Q15
Q18
Q19
C3
J3
R34
R48
R2
R31
R4
R49
R3
C2
R5
U3
R1
R43
R7
R39
R6
R8
R38
R40
Q17
C1
R25
U2
R41
R37
R44
R42
R30
R45
R36
R47
R46
R29
R35
Q21
Q23
R52
R50


HM 8123
2.6 GHz prescaler
C-TRIG
AGND
+5VA
-5VA
+12V
U1-C LM393
U1-B LM393
U1-A LM393
IC2 uPD1507GV
IC3 GAL 3
IC1 GAL 3
Q2 MMBTH10
Q1 MMBTH10
J2
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9


J1
C17
L1
C16
L3
C15
L4
R20
R19
R18
Q2
Q1
R15
U1
R12
C10
R13
R17
R16
R14
C2
C12
C9
R11
C5
C13
R4
R3
R5
R6
IC2
C14
IC1
IC3
C7
R21
C3
R22
C6
C8
D4
C4
C18
D2
R9
D3
R7
R10
R8
C1
R2
R1
D1


HM 8123
OSCILLATEUR
30 11 04
10MHZ
R4 332R
R3 100R
+3V3
R6 332R
C6 100nF
note : R6 and C6 are used with OCXO option
VCC
XT1 TCXO 10MHz
+12V
XT2 OCXO 10MHz
(Option)
C4 100nF
C1
R2 221R
R1 681R
LM317EMP
U1
C2
C3 100nF
(removed for OCXO Option)
R5 0R
J1-1
J1-2
J1-3
J1-4
J1-5
J1-6
J1-7
J1-8
J1-9
SDT
SCK
OSC
C5 100nF
U2 93C46-MN
CS
CLK
DI
DO
GND


J1
R4
R3
U2
C5
C4
C2
U1
R2
C1
R1
XT1
C3

HAMEG Instruments

Oscilloscopes



Spectrum Analyzer



Power Supplies



Modular System
8000 Series



Programmable Instruments
8100 Series



authorized dealer

4S-8123-00E0

www.hameg.com

Subject to change without notice
4S-8123-00E0 / 03-11-2005-gw
© HAMEG Instruments GmbH
A Rohde & Schwarz Company
® registered trademark

DQS-Certification: DIN EN ISO 9001:2000
Reg.-Nr.: 071040 QM

HAMEG Instruments GmbH
Industriestraße 6
D-63533 Mainhausen
Tel +49 (0) 61 82 800-0
Fax +49 (0) 61 82 800-100
sales@hameg.de