

3 1/2 - Digit LCR - Meter HM8018

Service-Manual





**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 conformité du produit
HAMEG Instruments GmbH certifica la conformidad para el producto

Bezeichnung: LCR-Meter
Product name: LCR meter
Designation: LCR mètre
Descripción: Medidor de LCR

Typ / Type / Type / Tipo: HM8018

mit / with / avec / con: HM8001-2

Optionen / Options /
Options / Opciones: -

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 équipements 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 / classe 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
22.07.2004

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 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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3½ - Digit LC Meter HM8018



Measurement functions: L, C, R

3½-digit display with 2,000 counts, basic accuracy 0.5 %

4-wire measurement

Max. resolution: 0.1 pF, 0.1 µH, 10 mΩ, 0.01 µS

Internal bias for electrolytic capacitors selectable

Offset adjustment of cable capacity for the “Kelvin test lead”

AC voltage signal at rear-panel BNC connector proportional to value shown in the display (with Option H0801 only)

Mainframe HM8001-2 required for operation

Option H0801



Mainframe HM8001-2



Option HZ18 Kelvin test lead



3 1/2 -Digit LC Meter HM8018
Valid at 23 °C after a 30 minute warm-up period

Operating modes

C measurement
L measurement
Series inductance L, Shunt capacitance C
Series resistance R, Parallel conductance G

Measurement ranges

	L: 200 µH-200 H (7 ranges)
	Rs: 20 Ω-200 kΩ (5 ranges)
	C: 200 pF-200 µF (7 ranges)
	G: 20 µS-200 mS (5 ranges)
Max. resolution:	0.1 pF 0.1 µH 0.01 Ω 0.01 µS
Measurement frequencies:	[sine wave signal] ~160 Hz, 1.6 kHz, 16 kHz ($\omega = 10^3, 10^4, 10^5 \text{ s}^{-1}$)
Measurement voltage:	max. 1 V _{pp}
Measurement current:	max. 36 mA (eff.)
Power output to device under test:	max. 3.2 mW
Measurement accuracy:	± [0.5% of reading + [3 digit s + 0.5 pF / 0.5 µH / 10 mΩ / 0.01 µS]]

Measurement error resulting from separation of the real and imaginary part
≤ 1% at $\tan\phi \geq 1$

Display

Sampling rate: 3 1/2-digit 7-segment LED display
2 measurements per second
Type of measurement: 2- or 4-wire measurement

Miscellaneous

Inputs are short-circuit-proof and overvoltage protected up to 100 V with a maximum energy consumption of 10 mJ (Δ capacitor 2 µF, charged to 100 V).

Polarization voltage for C measurement: 2 V

Zero point correction for display
Compensation of probe capacitance (HZ18)
AC voltage signal at rear-panel BNC connector proportional to value shown in the display (HM8001 with option H0801)

Power supply (from mainframe): +5 V/200 mA
-13 V/130 mA
+13 V/130 mA
[Σ = 4.5 W]

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

Max. relative humidity: 80% (without condensation)

Dimensions (W x H x D) (without 22-pole flat plug):

135 x 68 x 228 mm

Weight: approx. 0.65 kg

Accessories supplied: Operator's Manual

Optional accessories: HZ18 Kelvin test lead

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Alignment procedure HM8018

Measuring equipment required:

- Oscilloscope 20 MHz (e.g. HM303)
- Frequency counter (e.g. HM8021)
- Digital Multimeter DMM (e.g. HM8012)
- Load 100 k Ω 0.1%,
- Load 1 k Ω 0.1%
- Capacitor 470 pF (PP or Polysulfon)
- Capacitor with known value between 10...16 nF 0.1%

Presettings:

To start the calibration, first adjust the R-trimmer „Probe comp.“ and „Display Zero“ at the front panel to center position. Disconnect all cables of the frontpanel HM8018.

1. Test of oscillator frequency:

Connect frequency counter (TI measuring) to testpoint „Synchro“. Set LC-Meter to range 2 pF, „G“. Adjust period to 6280 ps \pm 25 ps with R111.

2. Adjustment of measuring frequency:

Set LC-Meter to the ranges described below. Adjust period time as following:

2 μ F	VR103 (3)	6283 μ s \pm 1 μ s
200 nF	VR102 (2)	628.3 μ s \pm 1 μ s
200 pF	VR101 (1)	62.83 μ s \pm 1 μ s

3. Adjust offset (PD):

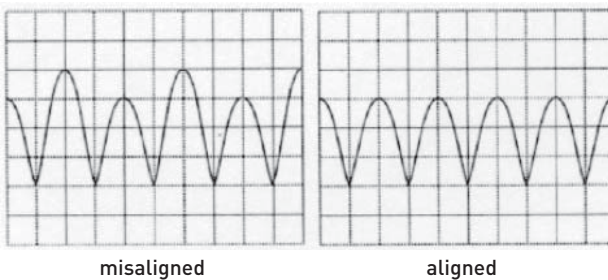
Connect oscilloscope (AC-coupling, max. sensitivity) to TP5 and set LC-Meter to range 200 nF, „G“. Adjust amplitude to minimum with VR106 (6).

4. Adjust offset (Uref):

Connect DMM (VDC) to TP5. Set LC-Meter to 200 mH. Adjust VR109 (9) to 0 \pm 1 mV.

5. Symmetry:

Set LC-Meter to 200nF, „G“. Connect resistance 100 k Ω to the banana jacks and the oscilloscope (AC, 10 mV/Div., 0,1 ms/Div.) to TP7. Adjust VR108 (8) for same amplitude.



6. Adjust offset (Vin):

Disconnect all cables from the instrument. Set LC-Meter to range 200 nF, „G“. Connect DMM (VDC) to TP7. Adjust VR110(10) to 0 \pm 1 mV.

7. Range selection und gain:

Connect resistance 1 k Ω to the banana jacks. Set LC-Meter to 200 mH. Repeat the following steps several times.

- a) Set range to „Rs“. Adjust the display of LC-Meter to 1000 \pm 1 Digit by means of VR105 (5).
- b) Set range to „G“. Adjust the display of LC-Meter to 1000 \pm 1 Digit by means of VR401 (21).

8. Adjustment of input capacitance:

Connect capacitor 470 pF to banana jacks. Set LC-Meter to 200 pF, „G“. To adjust the input capacitance, it is necessary to close the module housing (a. and b.).

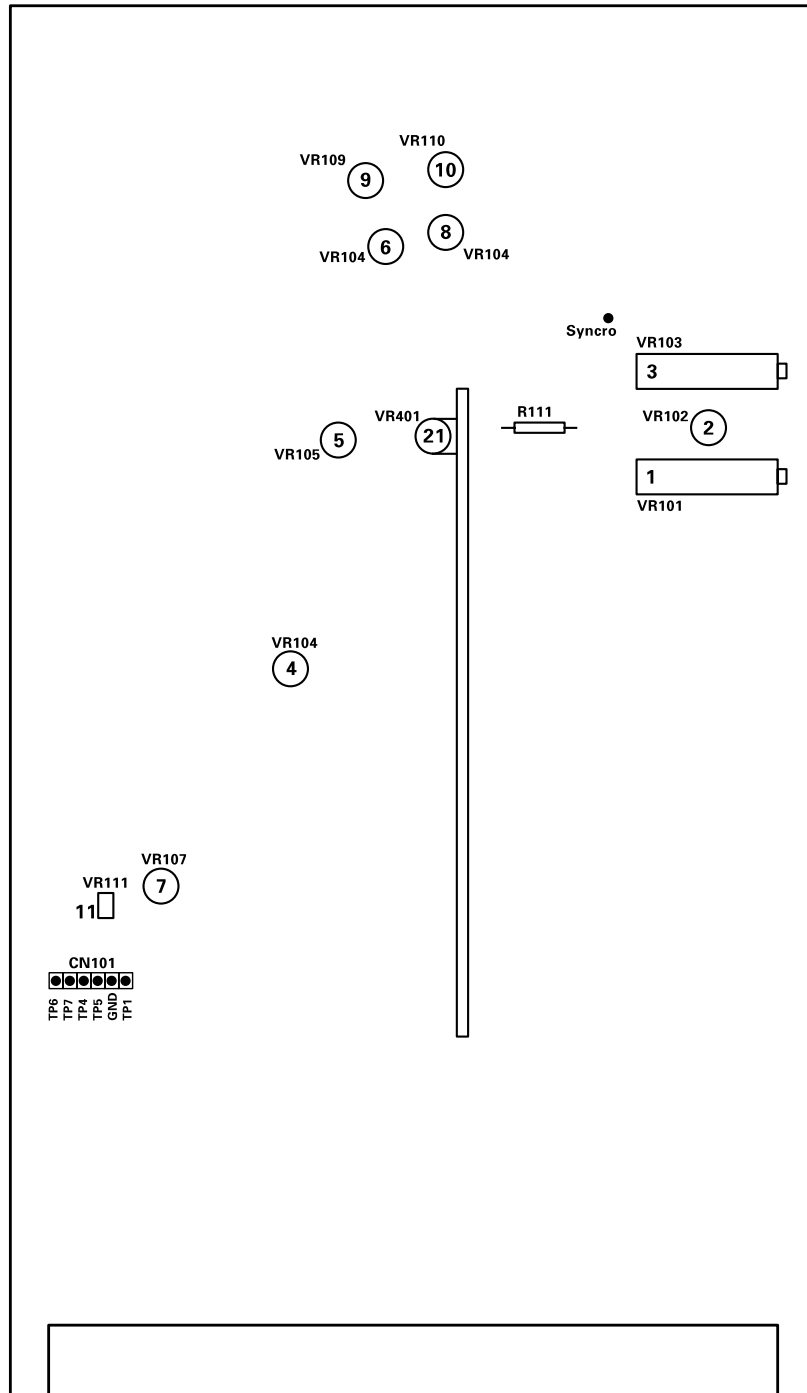
- a) Connect oscilloscope (AC-coupling) to TP5, with modul cover closed. Pass the cable through holes in the module cover. Reduce amplitude to minimum by means of VR107 (7).
- b) Connect oscilloscope to TP4 [same way as a)]. Remove capacitor 470 pF. Reduce amplitude to minimum by means of VR111 (11).

9. Range selection „C“, „L“:

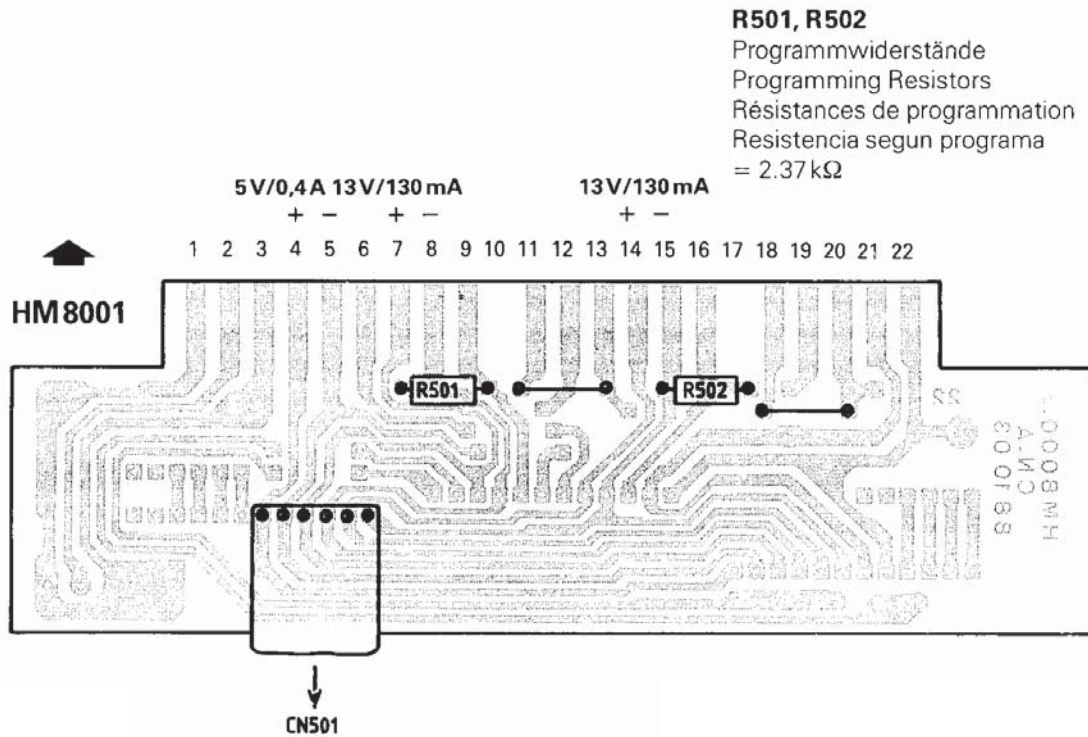
Remove all cables from HM8018. Set LC-Meter to 200 pF, „C“. Adjust „Display Zero“ (front panel) to 0 \pm 3 digit on the display of HM8018.

- a) Connect Kelvin probe HZ18 to Kelvin input (5-pin diode jack) and reduce the reading to 0 \pm 3 digit via „Probe comp.“ on front panel.
- b) Disconnect HZ18 and connect a known capacitor between 10 nF and 16 nF to the banana jacks. Set LC-Meter range to 20 nF, „C“. Adjust VR104 (4) for same reading as value of the capacitor.

Mainboard HM8018

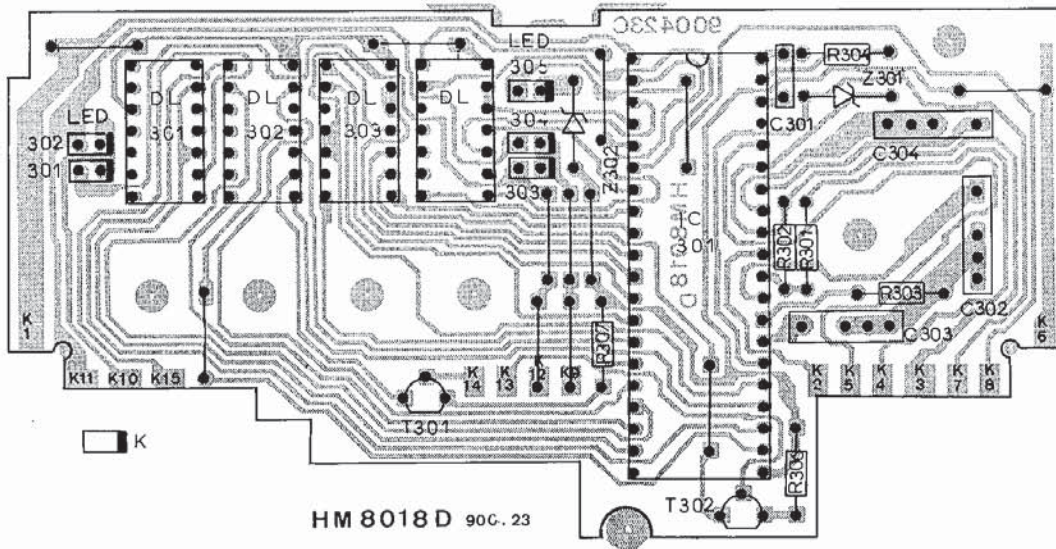


Steckerleiste, Versorgungsspannungen
Multipoint connector, supply voltages
Carte connecteur, tensions d'alimentation
Placa connector de los voltajes de alimentacion



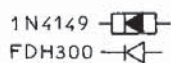
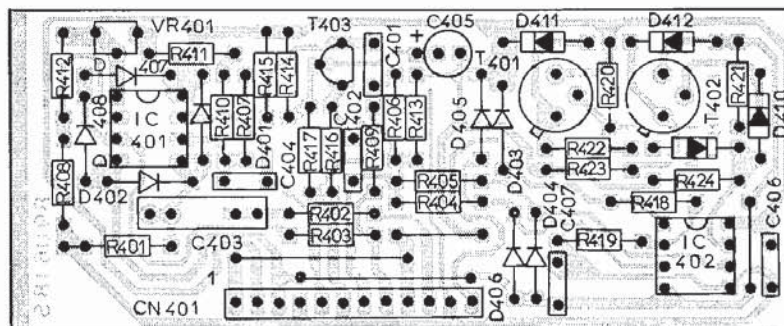
Bestückungsplan, Digitalanzeige
Implantation des composants,
Affichage numérique

Component Locations, Digital Display
Localizacion de componentes,
Indicador digital



Bestückungsplan, Eingangsverstärker
Implantation des composants,
Amplificateur d'entrée

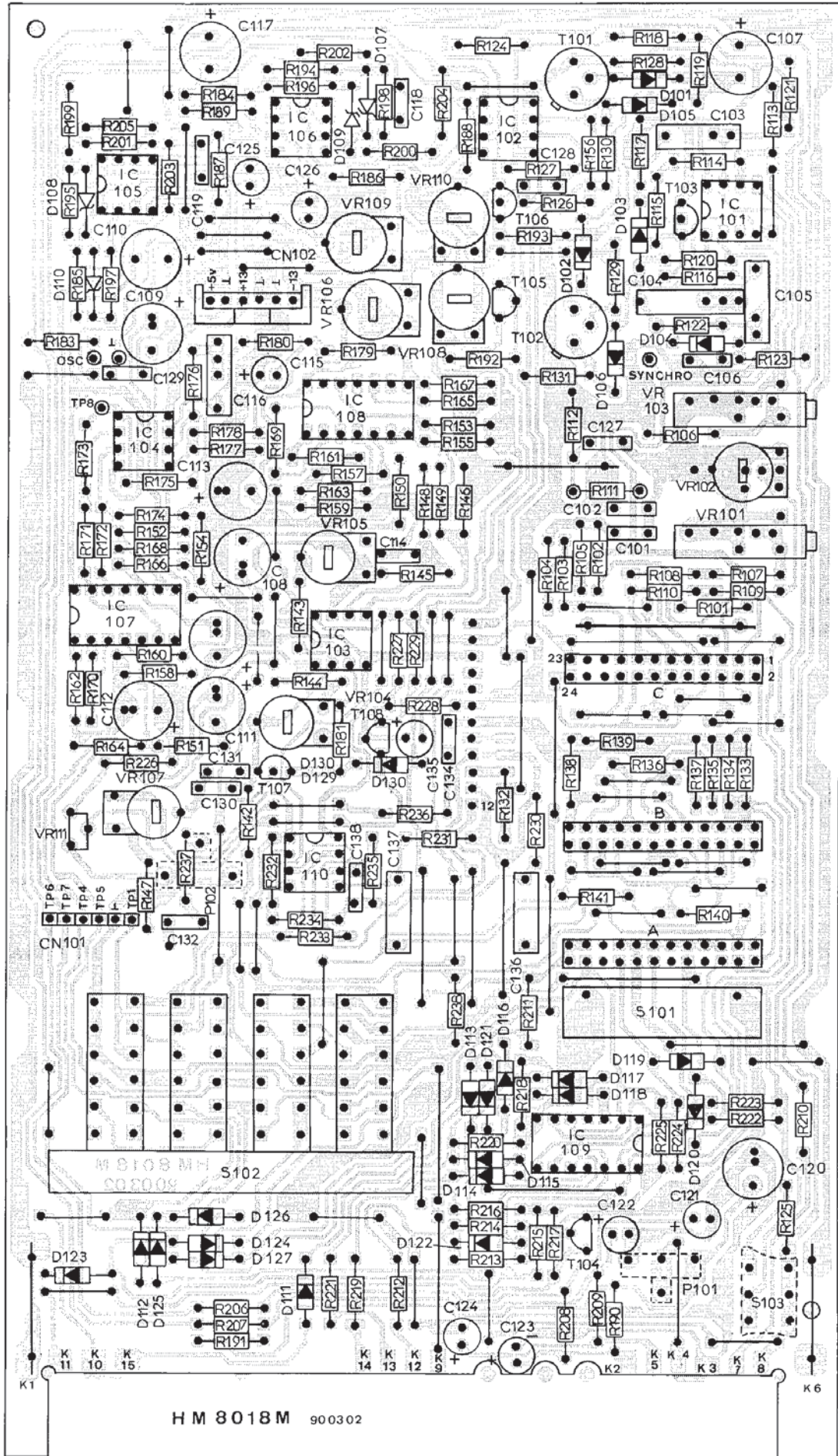
Component Locations, Input Amplifier
Localizacion de componentes,
Amplificador de entrada

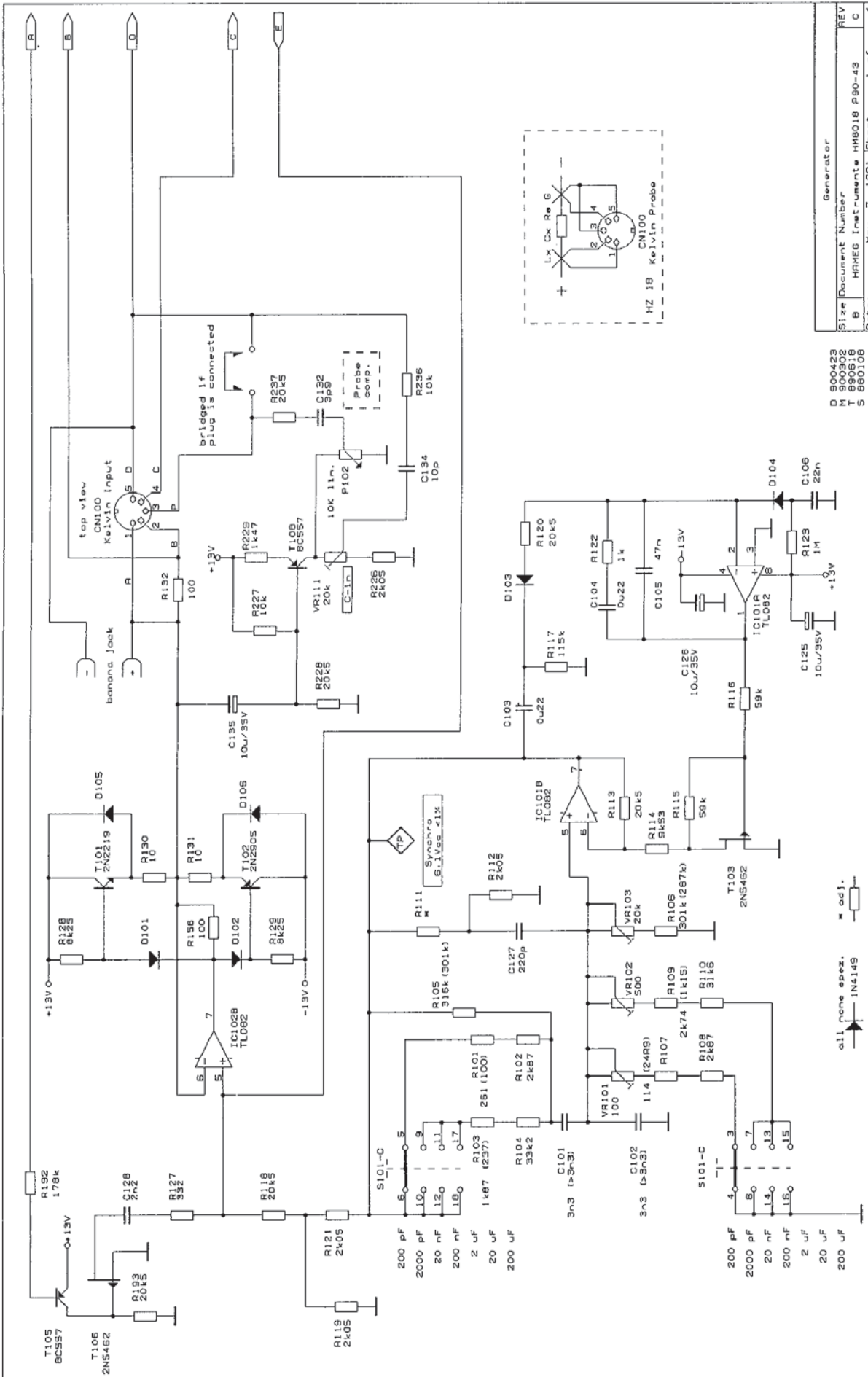


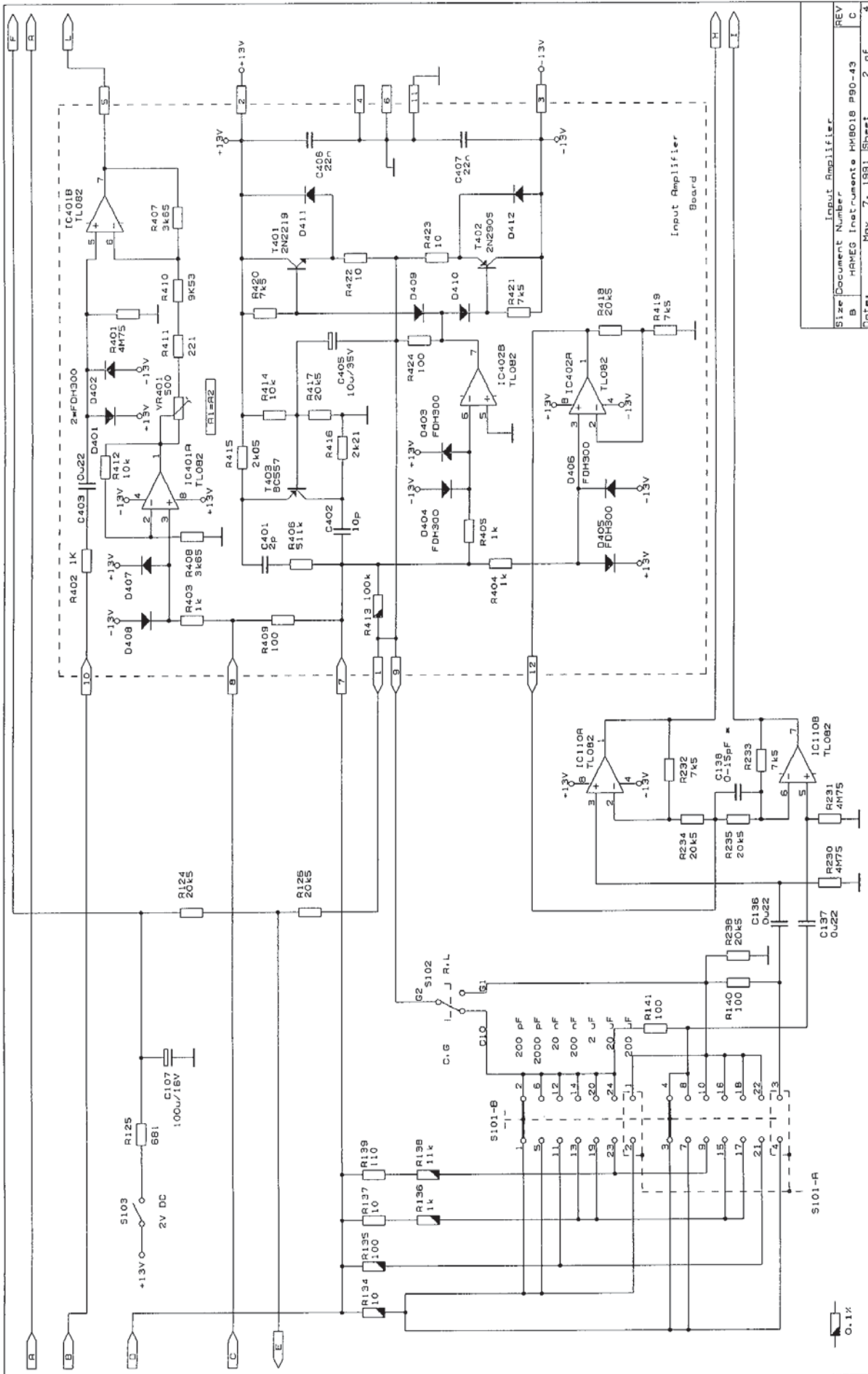
HM 8018 T 89 06 18

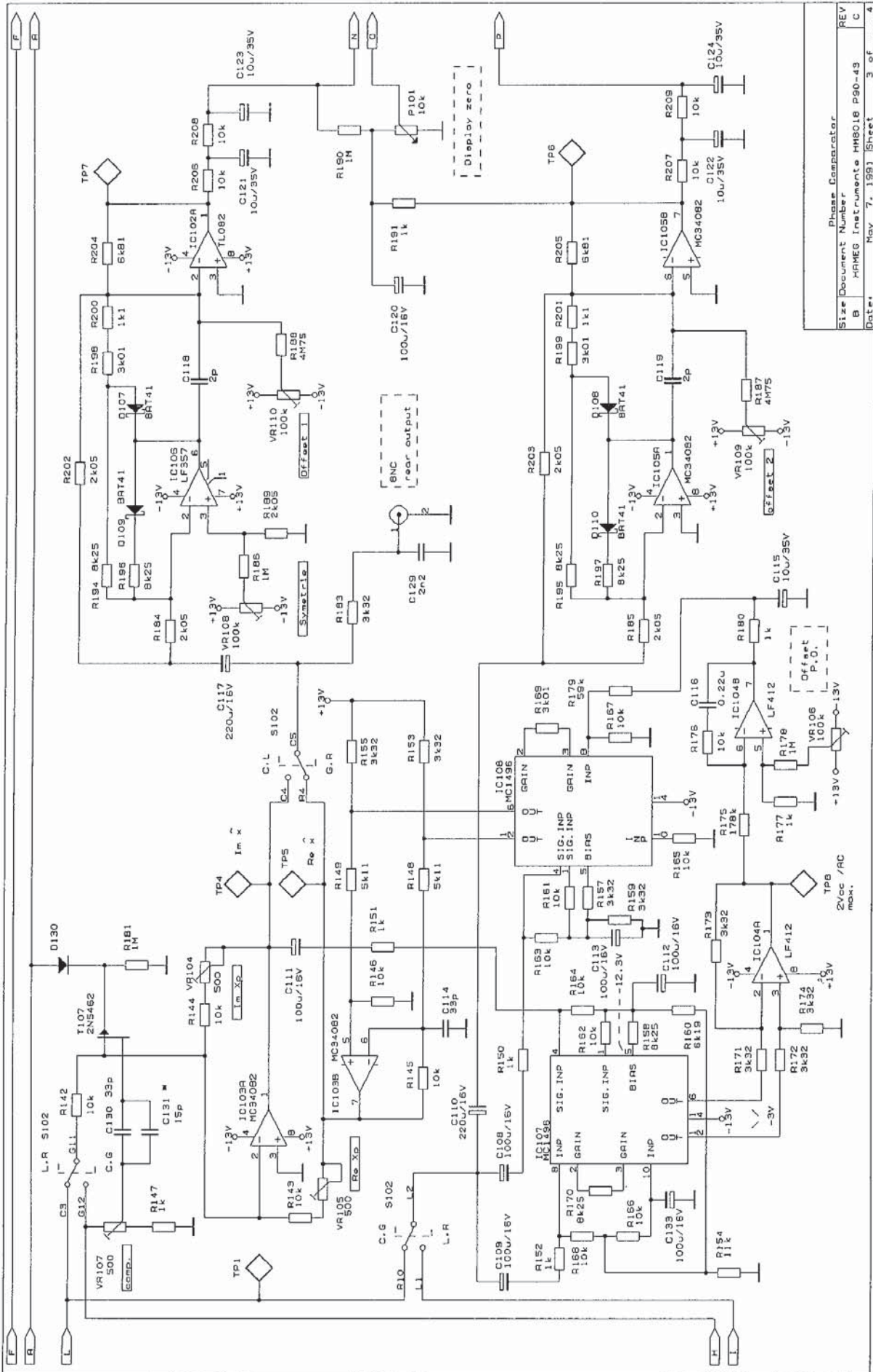
Component Locations, Main Board
Localizacion de componentes,
Placa base

Bestückungsplan, Grundplatte
Implantation de composants,
Circuit principal

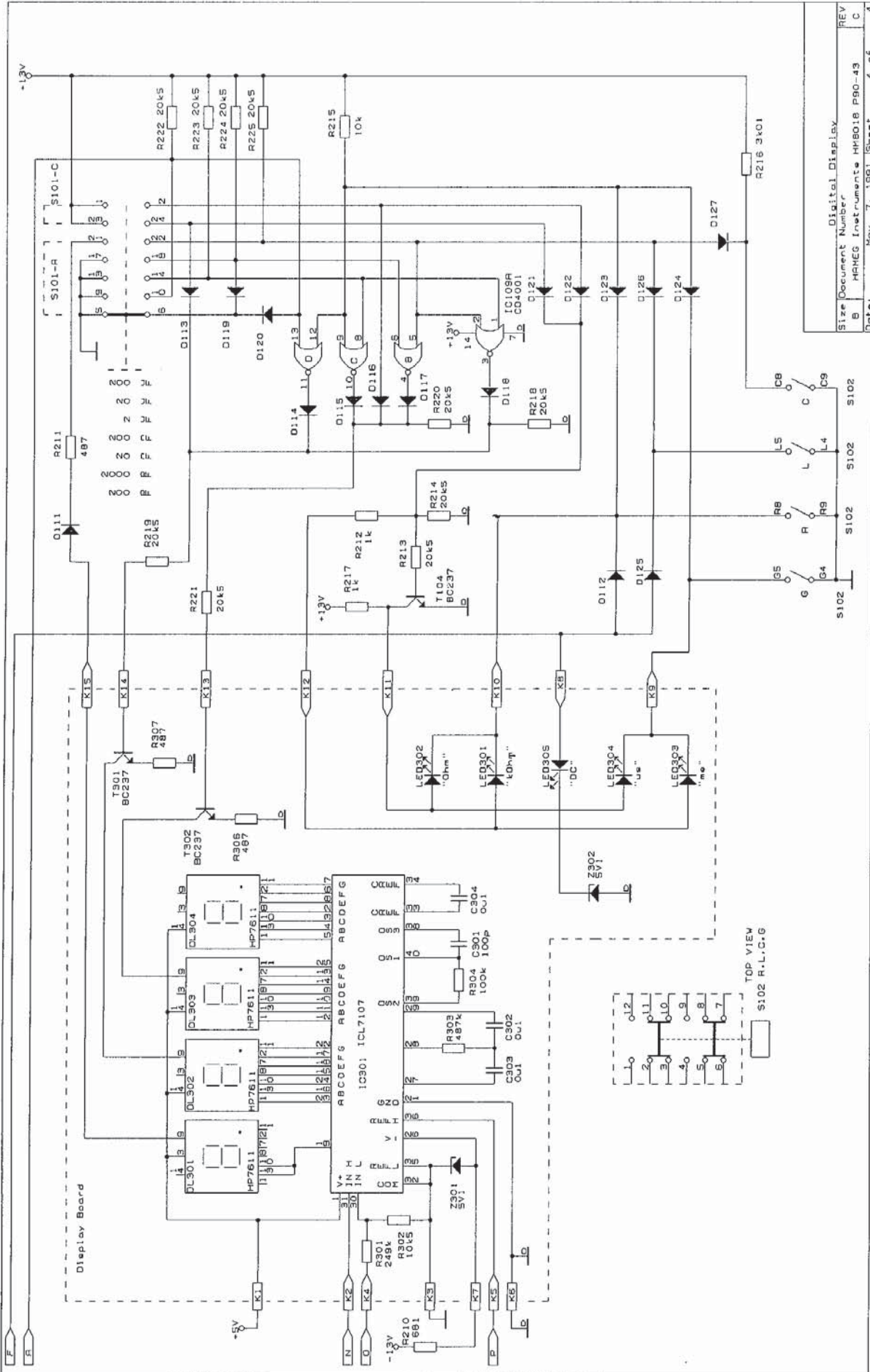








Phase Comparator	REV
Size Document Number	B
HAMEG Instruments HM8018 P90-43	C
Date: May 7, 1983	Sheet 3 of 4



Oscilloscopes



Spectrum Analyzer



Power Supplies



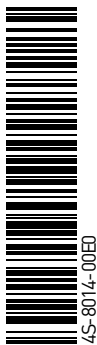
Modular System
8000 Series



Programmable Instruments
8100 Series



authorized dealer



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