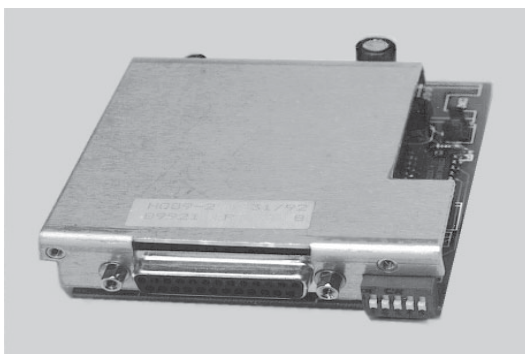


H089-2



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 long. 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 long.

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.

KONFORMITÄTSERLÄRUNG
DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE



HAMEG[®]
Instruments

Name und Adresse des Herstellers
Manufacturer's name and address
Nom et adresse du fabricant

HAMEG GmbH
Kelsterbacherstraße 15-19
D - 60528 Frankfurt

HAMEG S.a.r.l.
5, av de la République
F - 94800 Villejuif

Die HAMEG GmbH / HAMEG S.a.r.l. bescheinigt die Konformität für das Produkt
The HAMEG GmbH / HAMEG S.a.r.l. herewith declares conformity of the product
HAMEG GmbH / HAMEG S.a.r.l. déclare la conformité du produit

Bezeichnung / Product name / Designation: L-C Meter / LC-METRE / Medidor LC

Typ / Type / Type: **HO89**

mit / with / avec: HM8122 / HM8130/HM8131/

Optionen / Options / Options: HM8133/HM8134/HM8142

mit den folgenden Bestimmungen / with applicable regulations / avec les directives suivantes

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

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

Angewendete harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées

Sicherheit / Safety / Sécurité

EN 61010-1: 1993 / IEC (CEI) 1010-1: 1990 A 1: 1992 / VDE 0411: 1994
Überspannungskategorie / Overvoltage category / Catégorie de surtension: II
Verschmutzungsgrad / Degree of pollution / Degré de pollution: 2

Elektromagnetische Verträglichkeit / Electromagnetic compatibility / Compatibilité électromagnétique

EN 50082-2: 1995 / VDE 0839 T82-2
ENV 50140: 1993 / IEC (CEI) 1004-4-3: 1995 / VDE 0847 T3
ENV 50141: 1993 / IEC (CEI) 1000-4-6 / VDE 0843 / 6
EN 61000-4-2: 1995 / IEC (CEI) 1000-4-2: 1995 / VDE 0847 T4-2: Prüfschärfe / Level / Niveau = 2

EN 61000-4-4: 1995 / IEC (CEI) 1000-4-4: 1995 / VDE 0847 T4-4: Prüfschärfe / Level / Niveau = 3

EN 50081-1: 1992 / EN 55011: 1991 / CISPR11: 1991 / VDE0875 T11: 1992

Gruppe / group / groupe = 1, Klasse / Class / Classe = B

Datum /Date /Date
20.09.2000

Unterschrift / Signature / Signatur

E. Baumgartner
Technical Manager
Directeur Technique

RS 232 C (V.24) Interface

HO 89

General information
Installation
Standards
V.24 interface signals
Description of lines
Logic definitions
Synchronization procedures
Handshake procedures
HO 89 commands

Deutsch – English – Français

The RS-232C (V.24) Interface HO 89

The test instruments of the HAMEG Series HM8100 have all been designed to permit their use in automated testing environments. In order to connect them to a serial bus, the interface HO 89 (option) is required.

If the HO 89 interface is ordered together with a HM81.. instrument, it is installed within it at the factory. The HO 89 interface is also available as a separate option for retrofitting purposes at a later time.

Software service

For operation of the Series 8100 instruments, HAMEG will be issuing software at irregular intervals. This software will be supplied free of charge to the owners of these instruments. In addition, updates of the firmware contained in the instruments will be provided in the form of new EPROMs at cost price.

In order to benefit from this software service, it is sufficient to register by sending in your name and address and the serial number of your HAMEG instrument.

Safety

Every instrument is manufactured and tested according to IEC 348 Part1 and 1a (Safety requirements for electronic test and measurement equipment). All case and chassis parts are connected to the safety earth conductor. ***Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the instrument dangerous. Intentional interruption is prohibited.***

The instrument must be disconnected and secured against unintentional operation if there is any suggestion that safe operation is not possible. This may occur:

- if the instrument has visible damage,
- if the instrument has loose parts,
- if the instrument does not function,
- after long storage under unfavourable circumstances (e.g. outdoors or in moist environments),
- after excessive transportation stress (e.g. in poor packaging)

When removing or replacing the metal case, the instrument must be completely disconnected from the mains supply.

Warranty

Before being shipped, each HO 89 must pass a 24 hour quality control test. Provided the instrument has not undergone any modifications HAMEG warrants that all products of its own manufacture conform to HAMEG specifications and are free from defects in material and workmanship when used under normal operating conditions and with the service conditions for which they were furnished.

The obligation for HAMEG shall expire two (2) years after delivery and is limited to repairing, or at its option, replacing without charge, any such product which in HAMEG's sole opinion proves to be defective with the scope of this warranty. The instrument should be returned in its original packaging for maximum protection. We regret that transportation damage due to poor packaging is not covered by this warranty.

Installation

The HM81.. can be easily and unproblematically retrofitted by the user with the HO 89 Interface. The first step is to remove the instrument enclosure. To do so, unscrew the 6 screws on the rear panel of the instrument and take off the plastic back cover; the enclosure can then be pulled off towards the back.

Looking at the instrument from the back, the interface card is installed with its soldering side facing to the case.

The interface card is attached using the 3 supplied self-tapping screws.

First, however, the two cables for power supply and data transfer are inserted into the corresponding flat socket connectors on the circuit board of the instrument. The short cable (CON3) is the power supply for the interface. The longer cable (CON1) connects the interface card with the electrically isolated serial interface of the instrument itself.

The enclosure is then slid back on. When doing so make sure that the edges of the metal enclosure slide exactly into the grooves of the plastic covers on the front and back. After the rear plastic cover has been replaced and fastened, the unit is again ready for operation.

All data and signal lines are electrically isolated from ground (even after installation in a Series HM 8100 instrument)! When the V.24 cable is unconnected there is no electrically conductive path to the instrument chassis or the grounded wire of the power supply!

Standards

Serial data transmission is widely used with microcomputers for transfer of data to peripherals or other computers. Several different interface standards exist for this:

- CCITT recommendation V.10 (corresponds to the U.S. standard RS-423-A)
- CCITT recommendation V.11 (corresponds to the U.S. standard RS-422-A)
- CCITT recommendation V.24 (corresponds to the U.S. standard RS-232C)
- Current-loop interface, also known as 20-mA interface and TTY interface.

CCITT = Comité Consultatif International Télégraphique et Téléphonique (International Telegraph and Telephone Consultative Committee), an advisory committee established under the United Nations to recommend worldwide standards.

EIA = Electronic Industries Association, an American association of electronics manufacturers and others that sets standards, among other functions.

Description of the V.24 interface

The interface standards RS-423A and RS-422A are both contained in the American standard RS-449; they were conceived for transmission of data at high frequencies over large distances. The RS-423A standard (corresponding to CCITT V.10) describes an asymmetrical interface for transmission rates up to 100 kbits/sec.

The V.24 (RS-232C) interface standard was originally intended for transmission of data over telephone lines using modems (short for modulator-demodulator). Today it is primarily used for linking together microcomputers and for control of peripherals such as monitors, plotters and printers.

The connectors used are stipulated by the international standard ISO 2110, which has also been adopted as part of DIN 66020. The better-known American standard RS-232C (Recommended Standard Number 232, Revision C) specifies all of the functions and electrical attributes of the interface, but describes only part of the interface lines defined in the V.24 recommendation.

Connectors

The V.24 interface uses D-subminiature connectors as described in ISO 2110, e.g. Cannon type 7529. The pin configuration is shown in Fig. 1.

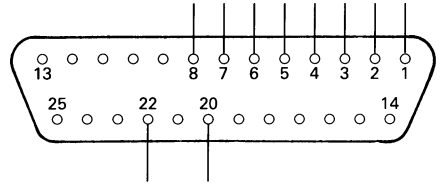


Fig. 1: V.24/RS-232C connector and its most important signals.

Pin

- 1 = Frame GND (protective ground)
- 2 = Transmitted data
- 3 = Received data
- 4 = Request to send
- 5 = Ready to send¹⁾
- 6 = Data set ready
- 7 = Signal GND (common ground)
- 8 = Data carrier detect
- 20 = Connect data set to line²⁾
- 22 = Calling indicator³⁾

¹⁾ EIA: Clear to send

²⁾ CCITT V.24: Connect data set to line EIA
+ CCITT V.24: Data terminal ready

³⁾ EIA: Ringing indicator

V.24 interface signals

The V.24 recommendation lists a total of 55 different interface lines, divided up into two series:

- The 100 series for general applications (43 lines)
- The 200 series for automatic dialing (12 lines)

The user can freely select from among all of these lines to put together an individually tailored configuration.

The interface lines defined in DIN 66020 Part 1 correspond to those of the V.24 100 series, and are grouped into seven categories:

	Codes:	(RS-232)
– Protective ground and commonground	E	(A)
– Data lines	D	(B)
– Control lines	S	(C)
– Signal lines	M	(C)
– Timing lines	T	(D)
– Auxiliary channel lines	H	(S)
– Analog signal lines	A	

Pin	Code			Abbr.	Meaning
	CCITT V.24	EIA RS-232	DIN 66020		
1	101	AA	E1	PG	Protective ground Signal / common ground
7	102	AB	E2	SG	
2	103	BA	D1	TxD	Transmitted data Received data
3	104	BB	D2	RxD	
4	105	CA	S2	RTS	Request to send Clear to send
5	106	CB	M2	CTS	
6	107	CC	M1	DSR	Data set ready Data terminal ready
20	108	CD	S1	DTR	
22	125	CE	M3	RI	Ringing indicator Data carrier detector
8	109	CF	M5	DCD	
21	110	CG	M6	–	Reception quality High transmission rate ON
23	111	CH	S4	–	
11	126	CK	S5	–	High transmission frequency range ON
24	113	DA	T1	–	Transmitting signal element timing Transmitter signal element timing Receiver signal elemnt timing
15	114	DB	T2	–	
17	115	DD	T4	–	
14	118	SBA	HD1	–	Auxiliary Tx channel Auxiliary Rx channel Auxiliary channel RTS Auxiliary channel CTS Auxiliary channel DCD
16	119	SBB	HD2	–	
19	120	SCA	HS2	–	
13	121	SCB	HM2	–	
12	122	SCF	HM5	–	

Standard configuration of the V.24 (RS-232) interface

In practice, V.24 (RS-232) interfaces for microcomputers have the configuration shown in Fig. 2, which is also supported by most serial components.

The timing lines (pins 15, 17 and 24) support synchronous data transmission. For data transmission using the asynchronous start-stop approach, the number of required interface lines is reduced to 9 (pins 1 through 8 and pin 20).

Description of the interface lines

On the basis of their functions, the lines used for the interface can be assigned to 5 groups:

Signal ground and protective ground

- Data lines
- Control lines
- Signal lines
- Timing lines

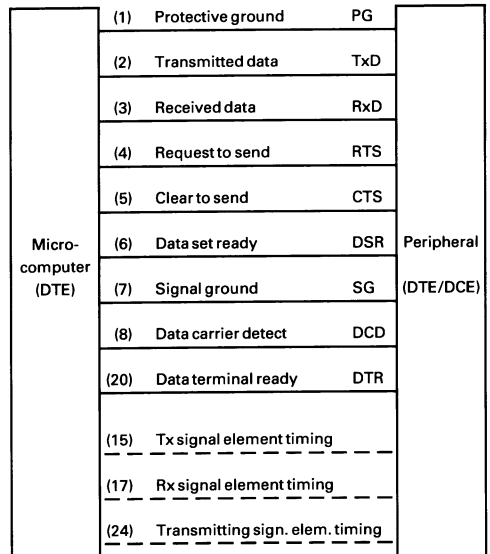


Fig. 2: Lines of the V.24 (RS-232) interface.

Protective ground and signal ground

- **PG** (Protective Ground) **Pin 1**
The protective ground is connected with the chassis and grounded wires of both data transmission equipments. The signal (common) ground must be isolated from the protective ground!
- **SG** (Signal Ground) **Pin 7**
The signal or common ground has a potential of 0 V.

Data lines

- **TxD** (Transmit Data) **Pin 2**
This line is used to carry the data to the receiving equipment in the form of serially transmitted bits. Data transmission is only possible, however, when the control lines RTS and DTR (pins 4 and 20) and both signal lines (CTS and DSR, pins 5 and 6) are all asserted. During the breaks in transmission the TxD line is in its logic 1 state.
- **RxD** (Receive Data) **Pin 3**
The DTE (data terminal equipment) receives data over this line.

Control lines

- **RTS** (Request to Send) **Pin 4**
When a modem is employed, the RTS line is used to control the modem's transmitter circuit. If this line is ON, the modem is switched to transmission mode and stays that way until the line is toggled back to its logic 0 state. The RTS line can, for example, be used together with the CTS line as a handshake line in a direct computer-to-computer link.
- **DTR** (Data Terminal Ready) **Pin 20**
When this line is asserted, it tells the modem that the data terminal is switched on and ready (on-line). If the DTR line is set to OFF, the modem is isolated from the data transmission line.

Signal lines

- **CTS** (Clear to Send) **Pin 5**
The modem asserts this line to indicate to the data terminal that it is ready to send data over the transmit data line.
- **DSR** (Data Set Ready) **Pin 6**
By setting this line to ON, the modem tells the data terminal that it is connected to the data transmission channel and on-line.

- **DCD** (Data Channel Received Line Signal Detector) **Pin 8**
When this line is ON, it communicates to the data terminal that the level of the received signal is within certain defined tolerances. If two devices are directly linked by a cable (without interpolation of a modem and a transmission channel), as soon as the two interfaces are activated the DCD line indicates the state of the cable connection (Cable connected? Yes/No).

Timing lines

For synchronous data transmission, reference signals can be assigned to the transmitted data for synchronization purposes.

- **DCD** (Transmitter signal element timing) **Pin 15**
The modem uses this line to send a clock signal to the other data terminal for clocking the data sent by it (TxD) back to the modem.
- **DCE** (Receiver signal element timing) **Pin 17**
The modem uses this line to send a clock signal to the other data terminal for clocking the data sent to it (on the RxD line) by the modem.
- **DTE** (Transmitting signal element timing) **Pin 24**
The signal for clocking the data transmitted by the other data terminal to the modem (on the TxD line) is generated either by the data terminal itself or an external clock source.

Definition of levels

All signals applied to the V.24 interface are bipolar voltages, and are normally within the range from -15 V to $+15\text{ V}$.

The range between -3 V and $+3\text{ V}$ is transitional between the two logic states; voltages in this range are undefined.

Logic definitions for data lines

Definition: If the difference in potential between the voltage of a signal on a data line (RxD or TxD) and that of the signal ground (SG) is greater than 3 volts, and if it is:

- *negative*, then the signal state is logic 1; it is also referred to as MARK (marking condition) or idle state;
- *positive*, then the signal state is logic 0, also referred to as SPACE (spacing condition) (see Fig. 3).

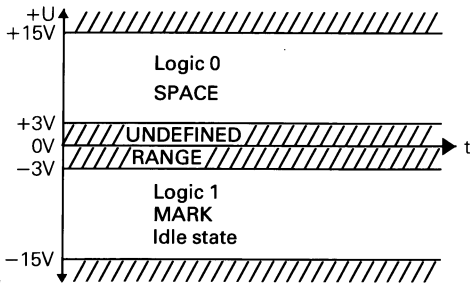


Fig. 3: Logic definitions for data lines.

Logic definitions for control and signal lines

Definition: If the difference in potential between the voltage of a signal on a control or signal line and that of the signal ground (SG) is greater than 3 volts, and if it is:

- negative, then the signal state is OFF;
- positive, then the signal state is ON (see Fig. 4).

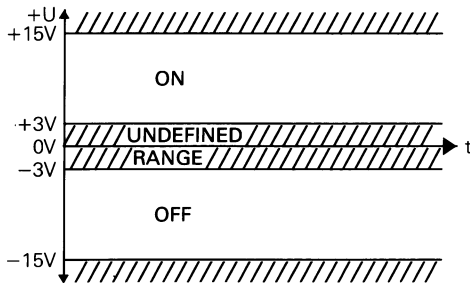


Fig. 4: Logic definitions for control and signal lines.

Synchronization procedures

In serial data transmission each data word is transferred as a bit string, serial-by-byte and parallel-by-byte. In order to guarantee reliable transmission, two prerequisites must be met: the clock rates used for transmission of the bits must be the same at the sending and receiving ends, and the beginning of each data word must be unambiguously designated and correctly detected. This makes it necessary to synchronize the transmitting and receiving stations.

Two different procedures exist for synchronizing data transmission:

- The asynchronous start-stop approach
- The synchronous transmission procedure

Asynchronous start-stop transmission

In this system, no additional control or timing lines are required for synchronization purposes. The synchronization information is attached to each transmitted character, yielding an asynchronous character frame consisting of the following elements:

- 1 start bit; the start bit is placed in front of the data bits that are to be transmitted, and indicates the start of the data byte. The start bit has a logic 0 state (= SPACE).
- 5 - 8 data bits; depending on the encoding scheme used, the actual data spans between 5 and 8 bits, with the least significant digit (LSD) being transmitted first.
- 1, 1½ or 2 stop bits; the stop bits have a logic 1 state (= MARK) and have the effect of putting the data transfer line back into its idle state.

In addition, a parity bit can be inserted into the character frame for error detection purposes. In a parity check, the number of data bits having a logic 1 state is determined and then incremented if necessary to yield either an even number (with even parity) or an odd number (with odd parity). After the data arrives, the receiving terminal then also performs a parity check. If the result does not agree with the transmitted parity bit, then a transmission error is assumed to have occurred.

The character frame is transmitted using a fixed timing scheme, i.e. a defined amount of time, the bit time, is allotted to each frame element. Since each character contains its own synchronization information, characters can be sent as they become available. During the breaks in transmission the data transmission line is put into its idle state (logic 1 or MARK). In order to ensure that the bit stream will be reliably strobed in by the receiver, a whole-number multiple of the transmission frequency is used to read them in. Scanning rates 16, 32 or 64 times the selected transmission frequency are typically employed.

Baud rate

The most important parameters governing serial data transmission include:

- Modulation rate
- Character rate
- Transmission rate (baud rate)
- Data throughput rate or efficiency

Modulation rate

The modulation rate v_m is the reciprocal of the units interval (time interval per transmitted unit) measured in seconds T_u expressed in bauds:

$$v_m = \frac{1}{T_u} \text{ (bauds)} \quad 1 \text{ baud} = 1 \text{ unit per second}$$

The use of bauds as a unit of signalling speed has been adopted from telegraphy, where one baud is equal to the number of discrete conditions or signal events per second.

Character rate

The character rate indicates the performance of a data transmission device:

$$v_c = \frac{1}{T_c} = \frac{1}{C \cdot T_u} = \frac{v_m}{C} \text{ (characters/s)}$$

Where

C = no. of units in a character frame

T_c = time required to transmit one character frame

Transmission rate (baud rate)

The transmission rate v_t tells us how many bits are contained in the characters transmitted each second:

$$v_t = v_m \cdot \text{lb } n = C \cdot v_c \cdot \text{lb } n \text{ (bits/sec)}$$

$$\text{lb } n = \frac{\lg n}{\lg 2} \quad \left(\begin{array}{l} \text{ratio of the logarithm of } n \\ \text{to the logarithm of } 2 \end{array} \right)$$

n = base ($n = 2$ with binary transmission)

The maximum transmission rate achievable with the V.24 interface is 19,00 bit/sec. The standard baud rates are listed in the table below.

Baud rates for asynchronous serial transmission		
Bauds	Char./sec	Bit time (ms)
110	10	9.091
150	15	6.667
300	30	3.333
600	60	1.667
1200	120	0.833
2400	240	0.416
4800	480	0.208
9600	960	0.104
19200	1920	0.052

Baud rates

Handshake Procedures

Different handshake procedures can be used with the V.24 interface for controlling data transmission. The following two handshaking types are generally distinguished:

- Software handshaking
- Hardware handshaking

Software handshaking

In this approach, one transmitting device controls a second by means of the “data contents”. For this purpose, certain control characters are embedded in the serially transmitted bits. Two well-known types of software handshake are the – XON/XOFF protocol and the – ETX/ACK protocol.

XON/XOFF protocol

When it is ready to accept data, the receiving station sends an XON code to the transmitter. As soon as the transmitter has detected this code, it initiates a data transmission. If the receiver is no longer able to accept any more data, it notifies the transmitter of this by sending an XOFF code. The transmitter then halts transmission until another XON code is received.

The XON and XOFF signals can be encoded in different ways. Usually, the ASCII device control character “DC1” (11H) is used for XON, and the ASCII character “DC3” (13H) for XOFF.

This software handshaking system is also used for the HO 89 interface, and is activated by the command #1 (X0 is used to disable it).

Only three lines are needed for the XON/XOFF protocol, namely the transmit data line TxD, the receive data line RxD, and the signal ground SG (see Fig. 5).

The RTS and CTS lines are also present, but CTS is automatically asserted and RTS is not queried.

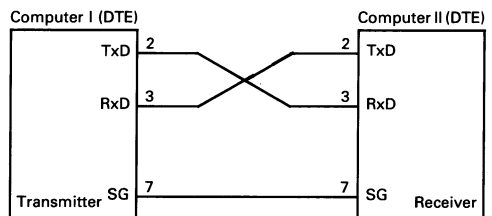


Fig. 5: Configuration for XON/XOFF.

ETX/ACK protocol

In this protocol, “data packets” of a certain length are transmitted, with their length depending on the capacity of the receiving station’s data buffer. It is essential to prevent buffer overflow! If the receiver is ready to accept data, it indicates this readiness to the other station by pulling its DTR output control line high. At the same time, the receiver transmits the ASCII transmission

transmission control character "ACK" (06H), whereupon the transmitter dispatches a data block, terminating it with the ASCII character "ETX" (03H). As soon as the receiver has accepted the data and is ready for more, it responds with "ACK". The transmitter can now send the next data packet.

One control line is required, in contrast to the XON/XOFF protocol.

Hardware handshaking

In hardware handshaking, control of data transmission is performed by the interface itself; the V.24 control lines are used for this purpose.

The interface provides the line pairs TRS/CTS and DSR/DTR and the DCD line for handshaking. This can lead to considerable problems when attempting to set up a data link without using a modem, contrary to the purpose for which the V.24 interface was originally conceived and standardized.

The reason for this is that most computer manufacturers only use subsets (and different ones at that) of the V.24 interface lines in their equipment. Consequently, trying to connect two machines whose makers claim they are "RS-232-compatible" can turn out to be a time-consuming and frustrating undertaking.

Our advice: Always take into account that all interface lines, without exception, must be connected!

Interface implementation

The data to be transmitted are passed by the computer over the data bus to the interface, using serial (sequential) transfer of bytes but parallel transmission of their component bits. The interface is thus faced with the job of serializing the parallel data, i.e. converting it into serial-by-bit form, and then transmitting it at a given clock rate to a receiving device at the other end of the transmission path. Conversely, the interface must also be capable of strobing in a serial stream of bits and converting it back into a format that can be utilized by the computer. To perform these vital tasks, namely serial-to-parallel and parallel-to-serial conversion of data, complex interface ICs are employed that can do this work more efficiently than the system's microprocessor. These circuits are called UARTs (for Universal Asynchronous Receiver-Transmitter). HAMEG uses a type 8250 UART in the HO 89 interface.

HO 89 commands

The HO 89 interface is a serial, full-duplex interface that complies with the V.24 and RS-232C standards. The baud rate is automatically recognized by means of a defined start character (SPACE). The operating system of the card is designed to respond to the following commands:

- * # VR Send version message
- * # CR Send copyright message
- # X1 Enable XON/XOFF protocol
- # X0 Disable XON/XOFF protocol
- # BC Clear all input and output buffers
- + # BD Enable newly programmed baud rate
- + # W7 Select 7-bit word length
- + # W8 Select 8-bit word length
- + # S1 Select one stop bit
- + # S2 Select two stop bits
- + # PN No parity
- + # PE Even parity
- + # PO Odd parity
- * # ST Send status
- # XMT Send data

The commands indicated in the table with * cause responses to be output. Their formats are:

- a) # VR Hameg HO89 Version 1.0 220290
- b) # CR (c) 88/89 by MTE-Software
- c) # ST HO89 W(7/8)S(1/2)P(N/E/O)X(1/0)
e.g. HO89W7S2PNX0

Setting the transmission parameters

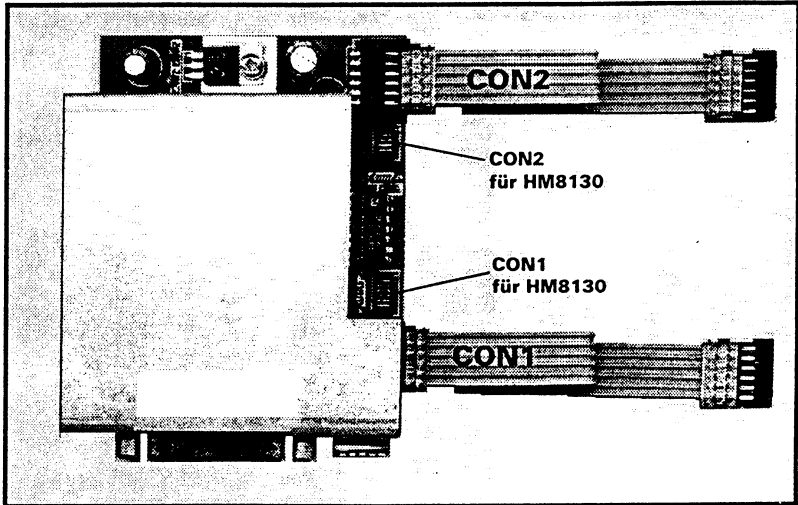
The commands marked with "+" in the above list are used for this purpose. A command string is passed to the interface, the end of which is marked by the #BD command. Upon receipt of this command, all other commands contained in the string are enabled together. This procedure is also used to reset the baud rate.

Automatic baud rate detection

The first character that must be sent to the interface after it has been switched on (and after the #BD command) is a space (20H). The interface uses it to calculate the baud rate that is being used by the other device and automatically adjusts to it. If any other character or an incomplete character is received, the interface is disabled.

DIP switch settings

No	on	off	Function
1	7	8	Word length
2	1	2	Stop bit(s)
3	on	off	Parity
4	even	odd	Parity
5	CR	CR+LF	End-of-transmission character

Installation in System Instruments HM8122, HM8130, und HM8142

Nach Abnehmen des Rückdeckels (6 Schrauben) kann der Gehäuserahmen entfernt werden. Die Schnittstellenkarte kann nun mittels im Set befindlichen Schrauben am Rückschassis befestigt werden. Für die Geräte HM8122 und HM8142 sind die beigefügten Verbindungskabel zu verwenden.

Im HM8130 sind die Anschlusskabel vorhanden und mit einer Testbuchse verbunden. Die Testbuchse muß entfernt werden und an deren Stelle wird die Schnittstellenkarte eingebaut.

Die Anschlußbelegung entnehmen Sie folgender Tabelle.

HO88/89	HM8122	HM8130	HM8142
CON1	CN604	CN11	CN109
CON2	CN606	CN10	CN108

After removing the 6 screws on the rear panel, the metal case of the instrument can be pulled off. Now the interface card can be attached to the rear chassis with the screws provided. For HM8122 and HM8142, the ribbon cables delivered with the interface card can be used for connection to the instrument.

In the HM8130, connecting cables are already installed but linked to a test connector. This connector must be replaced by the interface card, the already existing cables are to be plugged into the respective sockets CON1 and CON2.

The ribbon cable connections are as follows:

From	To		
HO88/89	HM8122	HM8130	HM8142
CON1	CN604	CN11	CN109
CON2	CN606	CN10	CN108

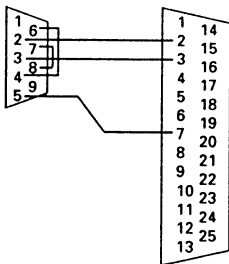
RETURN

'Binäre Konfigurationsdaten entsprechend Bios-Routinen

```
Bit0-1 : Datenlänge
          10      =7 Bit
          *11     =8 Bit
Bit 2 :   Anzahl der Stop-Bits
          0       =1 stop-Bit
          *1      =1,5 oder 2 Stop-Bit (je nach Baudrate)
Bit 3-4 : Paritätsprüfung
          *00     =keine
          01      =ungrade
          11      =gerade
Bit 5-7 : Baudrate
          000     =110 Baud
          001     =150 Baud
          010     =300 Baud
          011     =600 Baud
          *100    =1200 Baud
          101     =2400 Baud
          110     =4800 Baud
          111     =9600 Baud
-----
'Werte mit * =
          10000111      =HEX 87
-----
```

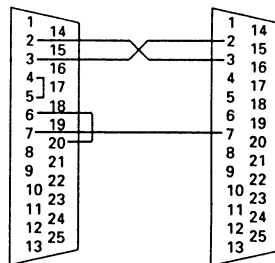
'Bei dem HM8122 wird nach dem gesendeten Befehl XMT der Zähler
'ausgelesen und der Wert zur Anzeige gebracht.

Beispiel eines RS232-Verbindungskabels



COMPUTER

HO89



Computer

HO89

'Baudrate initialisieren; senden von Space zum Einstellen der Baudrate

einreg.ax = &H120: 'funkt 01 20=chr\$(32) Space übertragen
einreg.dx = serialport
CALL INTERRUPT(&H14, einreg, ausreg)

'Beim Öffnen der Schnittstelle kann ein unerwünschtes Zeichen gesendet # '
'werden
'darum wird empfohlen die oben angeführte Routine zum Einstellen der
'Baudrate
'zu benutzen.

'Terminal Programm

COLOR 7, 1 ' Setze Bildschirmfarbe.

CLS
Ende\$ = CHR\$(0) + CHR\$(48) ' Von INKEY\$ angegebener
' Wert, wenn Alt+b betätigt
' wird.

LOCATE 24, 1, 1
PRINT STRINGS(80, "_");
LOCATE 25, 1
PRINT TAB(30); "Drücke Alt+b zum Beenden";
VIEW PRINT 1 TO 23 ' Ausgaben zwischen den Zeilen 1
' & 23.

OPEN "COM1:1200,N,8,1" FOR RANDOM AS #1 LEN = 512
DO ' Hauptschleife der Datenübertragung.

TastEingab\$ = INKEY\$ ' Überprüfe Tastatur.

PRINT TastEingab\$;

IF TastEingab\$ = Ende\$ THEN ' Verlasse die
' Schleife, wenn der
' Benutzer Alt+q
' betätigt hat.

EXIT DO
ELSEIF TastEingab\$ <> "" THEN ' Andernfalls, wenn
' der Benutzer eine
' Taste betätigt hat,
' sende das einge-

PRINT #1, TastEingab\$; ' tippte Zeichen zum
END IF ' Modem.

' Überprüfe das Modem. Wenn Zeichen warten (EOF(1)
' ist wahr), hole diese und gib sie auf den
' Bildschirm aus:

IF NOT EOF(1) THEN

'LOC(1) gibt die Anzahl der wartenden Zeichen an:

ModemEingab\$ = INPUT\$(LOC(1), #1)

PRINT ModemEingab\$; ' schreibe dann.

END IF

LOOP
CLOSE ' Ende der Datenübertragung.

CLS

END

taste:

was = INKEY\$: IF was = "" THEN GOTO taste:

Softwaretool zu HAMEG HO89

Die RS232 Schnittstelle HO89 wird mit einem gesendeten SPACE(CHR\$32) auf Ihre BAUD-RATE eingestellt. Beim Öffnen der Schnittstelle muß stets vermieden werden, daß unbeabsichtigt ein Zeichen gesendet wird. Jedes Zeichen, das beim Öffnen der Schnittstelle oder Einschalten des Computers (z.B. der Initialisierungs Reset) gesendet wird, und von der HO89 interpretiert werden könnte kann zu

einer unbeabsichtigten Baudrateneinstellung führen. Ist eine Einstellung auf ungewollte Art erfolgt, kann das System nur mit einem Neustart die vom Anwender programmierte Baudrate übernehmen. Das nachfolgende Software Tool sendet das SPACE Zeichen auf der Interrupt-Ebene und vermeidet somit alle anderen Öffnungsfunktionen.

```
-----
'Betreiben der seriellen Schnittstelle HO89 über INTERRUPT 14
'ein HAMEG Software-Tool zu verwenden unter Microsoft QuickBasic >V4.0
'Starte QuickBasic mit QB /1
'Eingestellte Parameter COM1: 1200Baud, no-Parity, 8Bit-Daten, 1Stop-bit
-----
TYPE RegType
    ax    AS INTEGER
    bx    AS INTEGER
    cx    AS INTEGER
    dx    AS INTEGER
    bp    AS INTEGER
    si    AS INTEGER
    di    AS INTEGER
    flags AS INTEGER
    ds    AS INTEGER
    es    AS INTEGER
END TYPE

DECLARE SUB INTERRUPT (inum AS INTEGER, inreg AS RegType, outreg AS RegType)
DECLARE SUB INTERRUPTX (inum AS INTEGER, inreg AS RegType, outreg AS RegType)
CLS
PRINT
PRINT ' Zähler einschalten und nach Initialisierung'
PRINT ' eine Taste drücken '
GOSUB taste:
CLEAR
-----
'Initialisierung der Variablen und Register
-----
DEFINT A-Z
DIM einreg AS RegType, ausreg AS RegType
serialport = &H0: '0 = COM1: 1 = COM2:
-----
'Schnittstelle konfigurieren
-----
einreg.ax = &H87: 'Funktion 00 siehe binäre Konfigurationsdaten
einreg.dx = serialport
CALL INTERRUPT(&H14, einreg, ausreg)
```

Liste elektronischer Teile

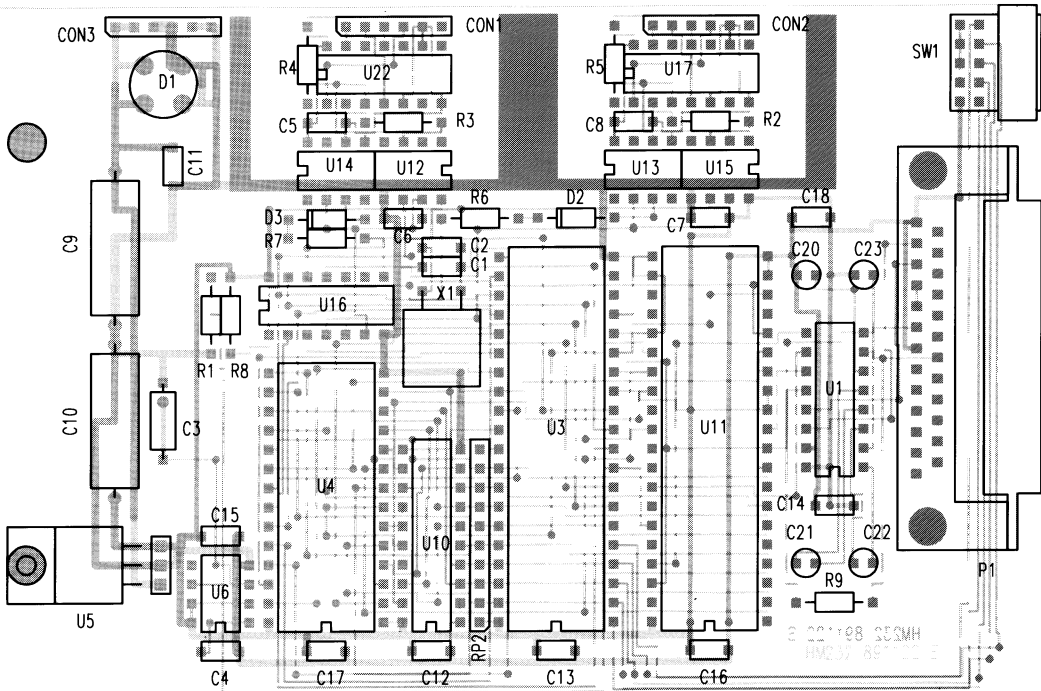
Electronic Parts List

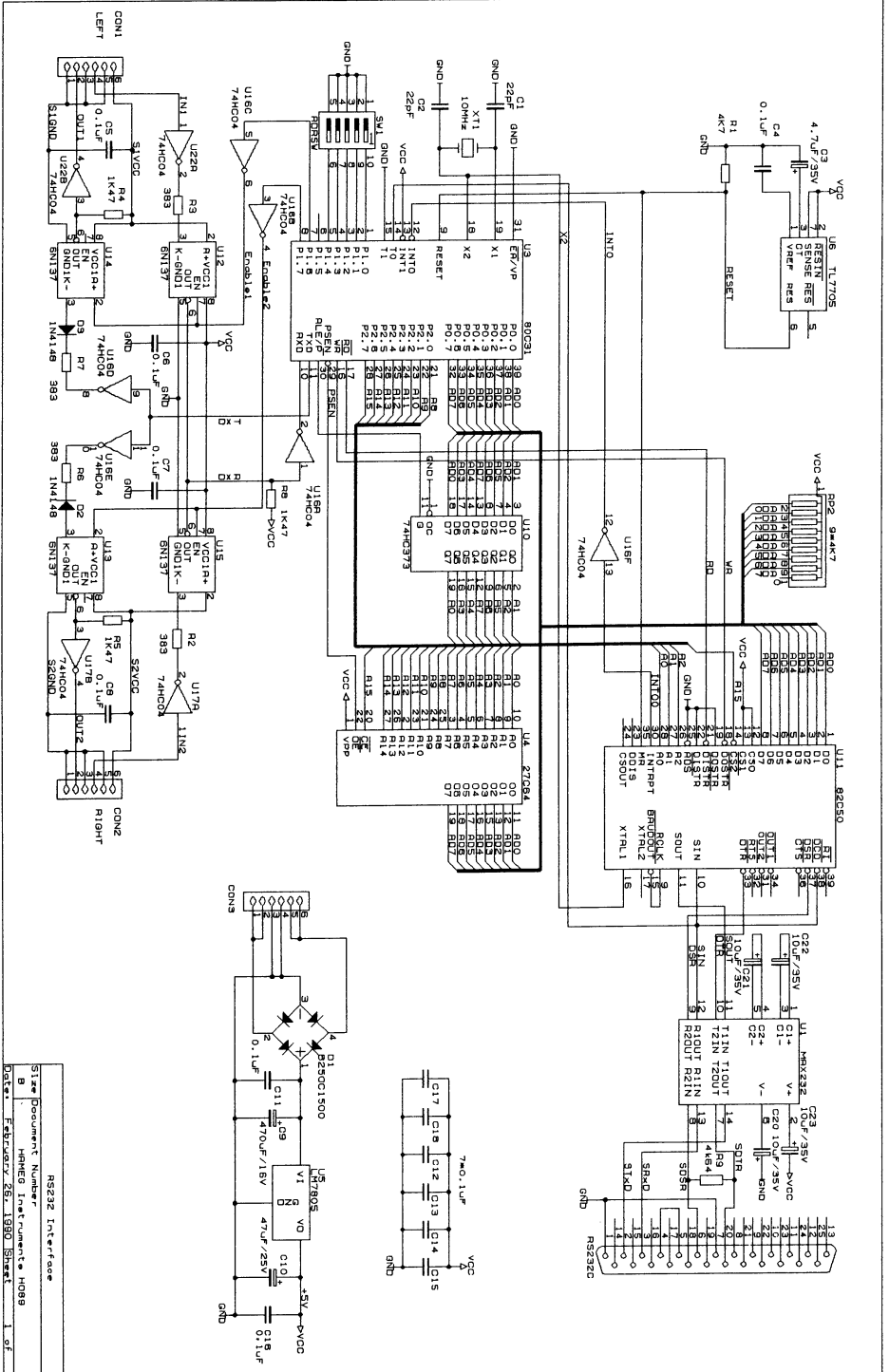
Ref. No.	Description	Ref. No.	Description
C1, C2	22 pF/63V	R6, R7	383R
C3	4.7 μF/10V	R8	1k47
C4-C8	0.1 μF/50V	R9	4k64
C9	470 μF/16V	RP2	9x4k7
C10	47 μF/25V	U1	MAX232
C11-C18	0.1 μF/50V	U3	80C31
C20	10 μF/16V	U4	27C64
C21, C22	10 μF/10V	U5	LM7805
C23	10 μF/16V	U6	TL7705
D1	B250C1500	U10	74HC373
D2, D3	1N4184	U11	82C50
R1	4k7	U12-U15	6N137
R2, R3	383R	U16, U17	74HC04
R4, R5	1k47	U22	74HC04
		XT1	10MHz

Bestückungsplan

Component Locations

DATE COMPOSANT 3RV IUC ETOC HM232 891122





Size Document Number
 HMEG Instruments H089
 Rev. 1 of 1
 RS232 Interface
 HMEG Instruments H089
 Rev. 1 of 1
 RS232C

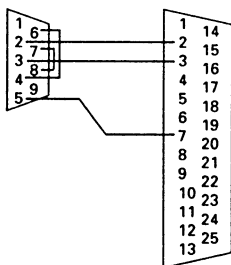
RETURN

'Binäre Konfigurationsdaten entsprechend Bios-Routinen

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'         *11     =8 Bit
' Bit 2 : Anzahl der Stop-Bits
'         0       =1 stop-Bit
'         *1      =1,5 oder 2 Stop-Bit (je nach Baudrate)
' Bit 3-4 : Paritätsprüfung
'         *00     =keine
'         01      =ungrade
'         11      =gerade
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'         011     =600 Baud
'         *100    =1200 Baud
'         101     =2400 Baud
'         110     =4800 Baud
'         111     =9600 Baud
'-----
'Werte mit * =
'         10000111 =HEX 87
'-----
```

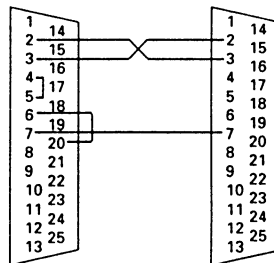
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Beispiel eines RS232-Verbindungskabels



COMPUTER

HO89



Computer

HO89

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