HERMANN
PIERBURG-GRUPPE
Hermann Electronic GmbH
Fürth

Remote Interface Protocol

Betreff:	Protocol specification RIP/02
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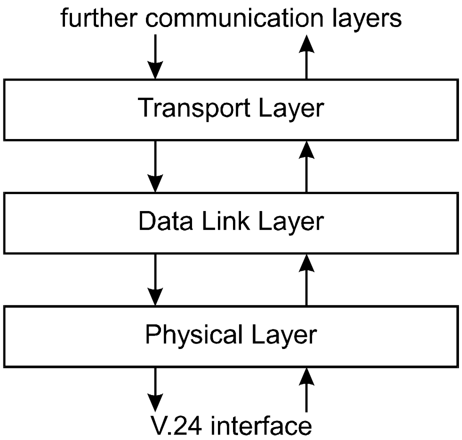
1 Architecture

The RIP/02 protocol is designed for connecting Hermann measurement equipment to PC applications using a standard V.24 interface. To keep the data flow well structured, the communication is divided in layers according to the ISO/OSI open communication standard. The RIP/02 protocol defines layers 1 through 4, but Network Layer is omitted.

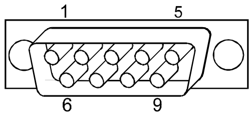


2 Physical Layer

Data transmission is performed over a serial asynchronous connection at a baud rate of 9600 bit/sec. Data transmission follows the communication standard CCITT V.24 resp. EIA RS-232. One start bit, 8 data bits (LSB first) and 1 stop bit is transmitted. No parity bit is transmitted.

Nor hardware handshake neither software handshake is performed. Input signals CTS, DSR and DCD have no effects on the transmission protocol. Not connecting theses signals does not influence data transmission, i.e. a simple 3-wire interface cable can be used.

The interface connector at the rear of HGA200/HGA400 is a 9-pin male SUB-D connector. The pin assignment follows the IBM-PC standard.



Pin	Signal	Direction
1	n/c	—
2	RxD	Input
3	TxD	Output
4	n/c	—
5	GND	—
6	n/c	—
7	RTS	Output
8	CTS	Input
9	n/c	—

The Physical Layer receives a block of transmit data bytes from a higher layer (Data Link Layer). These bytes will be transmitted byte by byte without interpreting them.

Received bytes are transferred to the Data Link Layer byte by byte.

3 Data Link Layer

For transmission, the Data Link Layer receives a block of data bytes from the Transport Layer. These bytes are not interpreted by the Data Link Layer, but wrapped in a frame. This frame is delivered to the Physical Layer.

The receiving Data Link Layer collects the data bytes which are delivered by the Physical Layer. When a frame is completely received and free of errors, contained data is extracted and transferred to the Transport Layer.

A frame consists of a synchronization byte, length information, payload data and a frame check sequence (checksum).

3.1 Length

A length information is transferred to specify the length of the frame. To reduce frame overhead but also allow large frames, length information is transmitted in the following format.

There is always used a length byte (8 bit). If this length byte contains zero, an additional length word (16 bit) will follow. If the value of the length byte is not zero, the length word will be omitted.

The value of the length information denotes the number of bytes in the payload data block, but not the checksum. Bytes which are replaced by a escape sequence (see later) are counted as a single byte.

The length word is transferred with the least significant byte first.

3.2 Frame check sequence

A checksum is generated at the end of the frame to let the receiver know whether the frame was successfully transferred. The checksum consists of a single byte and is calculated in a way that the sum of length information, payload and checksum is zero.

Calculation is done before bytes are replaced by escape sequences. So the checksum can only be checked after decoding the escape sequences.

3.3 Synchronization

The first byte in a frame is the synchronization byte (SYNC). The value of this byte is AA_{hex}.

To make the synchronization character unique, any other byte in the frame must not have the same value. Any other appearance of AA_{hex} is replaced by an escape sequence by the transmitter.

Because this replacement is reversed in the receiver's Data Link Layer, this mechanism is transparent to higher communication layers.

Escape sequences are started with the ESC character. So this character must be replaced by a escape sequence itself. The following replacements are used.

Raw	Replaced
AA	1B 55
1B	1B 1B

Escape sequences are used for length information, payload data and checksum.

3.4 Frame structure

3.4.1 standard frame

SYNC	LEN	PAYLOAD	FCS

3.4.2 extended frame

SYNC	0	EXTLEN	PAYLOAD	FCS

4 Transport Layer

4.1 Confirmation

The Transport Layer introduces confirmed data transmission. The sender gets a receipt that the data was successfully received. In addition a maximum time is defined when the receiver must have confirmed the received data. The Transport layer is also responsible for re-transmission in case of transmission faults.

If a message is passed to the Transport Layer for transmission, a CMD-header is generated. This resulting new data block is passed to the Data Link Layer. Subsequently the timeout mechanism is activated. If maximum response time has expired, the data block is passed to the Data Link Layer again and timeout is started again. After three timeouts without receiving any response, the actual message is rejected and a transmission failure is reported.

Timeout should be 1 sec.

When the Transport Layer has received an error-free message, an ACK message is passed to the Data Link Layer. A NAK message will be passed if an error is detected. If the system is still processing the previous message and is not able to accept a new message, the Transport Layer will send a BUSY message.

If a NAK messages is received three times, the actual message is rejected and a transmission failure is reported. There are no such restrictions on BUSY messages.

4.2 Data Stream

Confirming every message causes a lot of communication overhead. There is also an unconfirmed alternative using STREAM messages. These messages are not confirmed by the receiver.

4.3 Message Formats

4.3.1 message

CMD	PAYLOAD

4.3.2 stream mode

STREAM	PAYLOAD

4.3.3 confirmation

ACK

4.3.4 Rejection

NAK

4.3.5 BUSY response

BUSY

Used control characters:

CMD	43_{hex} (‘C’)
STREAM	53_{hex} (‘S’)
ACK	06_{hex}
NAK	15_{hex}
BUSY	FF_{hex}

5 Document revision

Date	Name	Changes
22.06.1998	MV	- First version
14.09.1998	MV	- English version - HGA pin assignment added - Network Layer omitted