

INTERFACING EIA TERMINAL EQUIPMENT TO EuroCUBE SERIAL PORTS

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A) INTRODUCTION

This note will be of use to Control Universal customers who wish to utilise the integral serial port to generate customised asynchronous serial links to their own EIA terminals, or terminal equipment.

EuroCUBE may be used in RS-423 mode, which is interconnectable with RS-232. The protocol is asynchronous - i.e. one character at a time using start and stop bits, and an optional parity bit.

The ACIA may be re-programmed for various baud-rates, character length (Ref., 3), and parity. Due consideration must be given to the ACIA software drivers on EuroCUBE, whether the drivers are specialised designs, or whether the user elects to utilise the standard routines provided in the MOS ROMs (Refs. 4 and 5).

NOTE: MOS-B (for 6502) and MOS-F/G (for 6809) Machine Operating Systems handle the ports slightly differently.

Serial communications software drivers will be the subject of a future application note. This document explains the physical/functional interface (level 1 protocol).

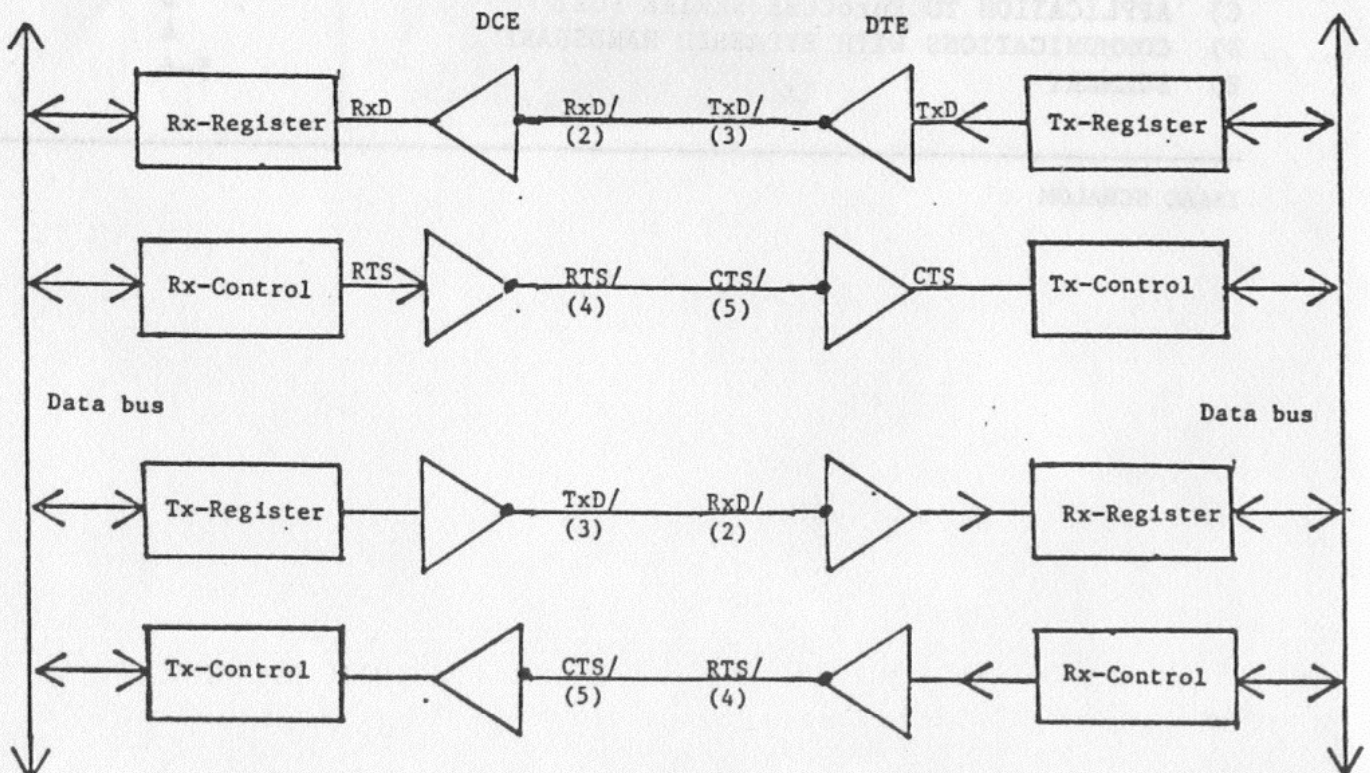


FIGURE 1 : Typical EIA Interface with use of Handshake Lines

B) EIA SERIAL COMMUNICATION WITH HANDSHAKE

- 1) The RECEIVER CONTROLLER is ready to receive data, activating its RTS line (Request to Send : Pin 4 on 25-pin EIA RS-232 D-type Connector).
- 2) The TRANSMITTER CONTROLLER, at the other end, senses the received CTS line (Clear to Send : Pin 5 on EIA Connector) and sends out the subsequent data character on its TxD line.
- 3) Upon receiving the data, the RECEIVER CONTROLLER disposes of it in a buffer. It then decides whether it is ready to receive another character and signals to the transmitter at the other end, using its RTS line.

Care should be taken to ensure that RTS-CTS is not de-activated while a character is being sent out. If it is de-activated, the transmitter may stop the character in the middle and cause a framing error.

This condition cannot ordinarily be ensured by the receiver during 'continuous' transmissions, and may only be prevented by the transmitter completing the 'byte in process' prior to stopping the next byte.

C) APPLICATION TO EuroCUBE SERIAL PORT

The EuroCUBE design uses the 6551 ACIA. Although a CTS input is provided, this may cut off the current transmitted character, so that it is less than useful as an interactive handshake line. However, our design engineers have remedied this problem by connecting the external CTS input (pin 5 on EIA D-connector equivalent to pin 5 on the 7-pin serial port DIN connector on EuroCUBE) to the DSR line on the ACIA.

The effect of this is to flag a status bit on the ACIA and to generate an interrupt request (IRQ). In this way, the MOS software receives an indication that the receiver at the other end of the line is ready to receive the next character - or is busy - prior to loading that character into the ACIA transmit register.

A similar process - but in reverse - takes place between the terminal equipment and EuroCUBE, when EuroCUBE is receiving data. Once again the ACIA provision, namely RTS, is inadequate. This is because manipulating the control register RTS line (bits 2 and 3) has the side-effect of disabling interrupts undesirably. The solution offered by EuroCUBE is CA2 from the VIA (pin 39 on IC11), which is connected to pin 4 of the DIN connector and acts as an RTS line for the EuroCUBE receiver mechanism. This may be connected to pin 4 on EIA connectors.

D) COMMUNICATIONS WITH BYPASSED HANDSHAKE

Interactive handshake mechanisms are particularly useful when transferring large blocks of characters at high baud rates, using simple asynchronous protocols. For lower baud rates, or short transfers, the interactive handshake lines may be bypassed for simplicity. This must be done for the controllers to work, simply by shorting pins 4 and 5 locally on the DIN connector (similarly pins 4 and 5 on the 25-pin EIA DIN connector).

In EIA applications other pins are often encountered, namely:-

DSR	-	(pin 6)	-	Data Set Ready	-	(input)
DCD	-	(pin 8)	-	Data Carrier Detect	-	(input)
DTR	-	(pin 20)	-	Data Terminal Ready	-	(output)

The common solution is to bypass pin 20 to both pins 6 and 8, or simply to activate pins 6 and 8 in a constant manner.

These signals are not required by EuroCUBE externally, although similar signals are used on the ACIA internally.

NOTE: EIA signals are 'Active Negative' by convention, i.e. MARK is a negative voltage and SPACE is a positive voltage on either RS-232 or RS-423 standards.

E) SUMMARY

1) INTERCONNECTION WITH HANDSHAKE

1.1)

Terminal Equipment

EuroCUBE

(Using RS-232 or RS-423)

(In RS-423 mode)

Signal Name	EIA-Connector	DIN-Connector	Signal Name
Rx-Data	PIN 2	PIN 1	Tx-Data
Tx-Data	PIN 3	PIN 3	Rx-Data
CTS	PIN 5	PIN 4	BUSY (RTS)
RTS	PIN 4	PIN 5	CTS
Signal Ground	PIN 7	PIN 2	0V
DSR	PIN 6	Not Used	
DCD	PIN 8		
DTR	PIN 20		
Protective Ground	PIN 1		

Short as required

1.2)

EuroCUBE

EuroCUBE

(In RS-423)

(In RS-423)

Signal Name	EIA-Connector	DIN-Connector	Signal Name
Rx-Data	PIN 3	PIN 1	Tx-Data
TX-Data	PIN 1	PIN 3	Rx-Data
CTS	PIN 5	PIN 4	BUSY (RTS)
BUSY (RTS)	PIN 4	PIN 5	CTS
0V	PIN 2	PIN 2	0V

E) SUMMARY (Cont)

2) INTERCONNECTION WITH BY-PASSED HANDSHAKE

2.1)

Terminal Equipment

EuroCUBE

Signal Name	EIA-Connector	DIN-Connector	Signal Name
Rx-Data	PIN 2	PIN 1	Tx-Data
Tx-Data	PIN 3	PIN 3	Rx-Data
CTS	PIN 5	PIN 4	BUSY (RTS)
RTS	PIN 4	PIN 5	CTS
Signal Ground	PIN 7	PIN 2	0V
DSR	PIN 6		
DCD	PIN 8		
DTR	PIN 20		

2.2)

EuroCUBE

EuroCUBE

Signal Name	EIA-Connector	DIN-Connector	Signal Name
Rx-Data	PIN 3	PIN 1	Tx-Data
TX-Data	PIN 1	PIN 3	Rx-Data
CTS	PIN 5	PIN 4	BUSY (RTS)
BUSY (RTS)	PIN 4	PIN 5	CTS
0V	PIN 2	PIN 2	0V

NOTE: Pin 1 on RS-232 EIA connectors is termed 'Protective Ground', and is normally connected to the cable shield (when available) and to the equipment 'Chassis Ground', hence to 'Mains Earth'.

REFERENCES:

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- 1) EuroCUBE-65 and EuroCUBE-09 User Manuals
 - 2) AMD Application Note on RS-422/423 methods
'Use of the AM26LS29, 30, 31 and 32 QUAD Driver/Receiver Family in EIA RS-422 and 423 Applications'
Advanced Micro Devices, Linear and Interface Data Book, 1979, AMD Inc.,
(CU-Application Note 1)
 - 3) 6551 ACIA Data Sheet (Rockwell or Synertek)
 - 4) EuroBEEB User Manual
 - 5) MOS-F and MOS-G User Manuals
 - 6) Electronics Industry Association RS-232C Standard

1. Introduction and Scope of Work

2. Objectives of the Study

3. Methodology

4. Results and Discussion

5. Conclusions and Recommendations

6. References

7. Appendix

8. Glossary

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