
RCSL No: 52-AA664

Edition: October, 1977

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Title:

Programmer's reference manual for RC 35-103/104

Keywords:

RC 3500, RC 35-103/104, LAM 108/116

(16 pages)

Abstract:

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Printed by A/S Regnecentralen af 1979, Copenhagen

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The LAM (low Speed Asynchronous Multiplexer Character-informed) interface is connected to 1 I/O channel on RC 3500.

The LAM performs multiplexing of 8 or 16 asynchronous transmission lines to this I/O channel on RC 3500. RC 35-103 covers 8 lines, RC 35-104 covers 16 lines.

By means of this interface the program can control the transmission of asynchronous serial data on 8 or 16 output lines and can receive asynchronous serial data over 8 or 16 input lines simultaneously.

The LSAM contains V 24 interfaces for 8 or 16 modems.

The communication mode is HALF DUPLEX or FULL DUPLEX.

By means of the program the following modes are individual selectable for each transmission line:

- a) no parity
- b) even/odd parity.
- c) number of data bits/char. (5-6-7-8).
- d) 1 or 2 STOP-elements.
- e) Transmission-speed (110 bps. - 300 bps - 600 bps - 1200 bps).

For details refer to fig. 1.

The LAM interface is constructed around 8 or 16 U-ART circuits (AY-5-1012). One for each multiplexer channel.

This circuit contains mainly of 4 registers:

- a) a parallel to serial shift register, which transmits serial information to the modem.
- b) a serial to parallel shift register, which receives serial information from the modem.
- c) an input buffer register.
- d) an output buffer register.

A character is loaded into the output buffer (d); if the transmitter register (a) is empty the contents of the output buffer is loaded into the transmitter register and the character is supplied with START/STOP elements and perhaps a parity-bit. The contents of the transmitter buffer is shifted serial by bit to the modem with the selected transmission speed.

Serial information from the modem is shifted into the receiver register (b) with the selected transmission speed. When a whole character is received, START/STOP elements are removed from the character, the parity is checked if selected, and the data bits are loaded into the input buffer (c).

In addition the U-ART circuit contains two FLAGS:

INPUT READY indicating that a character is ready to RC 3500 in the input buffer.

OUTPUT READY indicating that the next character may be loaded into the output buffer.

By means of a SCANNER every channel is scanned in turn; if a channel is found with INPUT READY = 1 or OUTPUT READY = 1, the SCANNER is stopped and interrupt is sent to RC 3500. RC 3500 must always answer an interrupt from the LAM interface with a READ DATA command. The word transferred to RC 3500 contains the channel number, on which the SCANNER is stopped, information about the type of the interrupt (INPUT READY interrupt or OUTPUT READY interrupt), and if it was an INPUT READY interrupt, the contents of the input buffer belonging to the channel in question.

If it was an OUTPUT READY interrupt, the READ DATA command will suppress further OUTPUT READY interrupts from this channel until RC 3500 sends a WRITE DATA command to the LAM containing the correct channel number and a data character to be transmitted by this channel.

After serving the interrupt RC 3500 starts the SCANNER again by means of a WRITE CONTROL command.

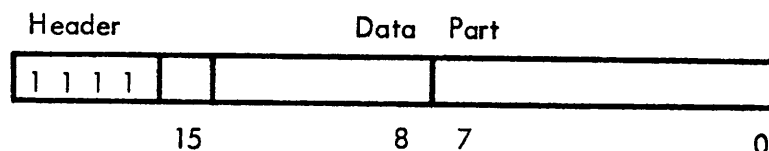
In the 8 channel version of the LAM interface the worst case situation is when all channels transmit full duplex, 1200 bps, 5 data bits + 1 stop element simultaneously. In this case the 3500 is interrupted every 350 μ S. For a 16 channel LAM the time between interrupts would be 175 μ S.

CONVENTIONS FOR THE TRANSMISSION BETWEEN LAM AND RC 3500

3.0

Write control,
from RC 3500 to LAM

3.1



bit 15: START SCANNER.

bit 15 = 1 starts the SCANNER.

When bit 15 = 1 in a WRITE

CONTROL COMMAND bit 14 - 9

and bit 7 - bit 0 are disabled.

bit 14 -

bit 11 : Multiplexer channel address.

11	12	13	14	Multipl. chan. Add.	
0	0	0	0	0	
0	0	0	1	1	
0	0	1	0	2	
0	0	1	1	3	
0	1	0	0	4	
0	1	0	1	5	
0	1	1	0	6	
0	1	1	1	7	
1	0	0	0	8	
1	0	0	1	9	
1	0	1	0	10	
1	0	1	1	11	only 16 channel
1	1	0	0	12	LAM
1	1	0	1	13	
1	1	1	0	14	
1	1	1	1	15	

- bit 10: CONNECT TO LINE (CTL).
 bit 10 = 1 commands the modem selected by bit 14 - bit 11 to connect to the communication line.
 bit 10 = 0 commands the modem selected by bit 14 - bit 11 to disconnect from the communication line.
- bit 9: REQUEST TO SEND (REGITS).
 bit 9 = 1 commands the modem selected by bit 14 - bit 11 to transmit carrier to the remote station.
 bit 9 = 0 commands the modem selected by bit 14 - bit 11 to remove the carrier.
- bit 8: MASTER RESET.
 bit 8 = 0 produces a CLEAR-pulse in the LAM interface with the following effect:
- a) Clear all registers in the U-ART circuits.
 - b) disconnect all communication lines.
 - c) stopping the SCANNER.
- bit 7: NO PARITY.
 bit 7 = 1 results in no parity bit in the character transmitted on the communication line. The STOP-element is transmitted immediately after the last data bit. In this situation the status bit PARITY ERROR is always = 0.
 bit 7 = 0 the characters are transmitted with the parity mode selected by bit 6.
- bit 6: PARITY MODE.
 bit 6 = 1 selects EVEN parity.
 bit 6 = 0 selects ODD parity.
- bit 5: Number of STOP-elements.
 bit 5 = 1 2 STOP-elements.
 bit 5 = 0 1 STOP-element.

bit 4 -

bit 3: Number of Data bits/char.

4	3	Data bits/char
0	0	5
1	0	6
0	1	7
1	1	8

bit 2

bit 1: Transmission Speed.

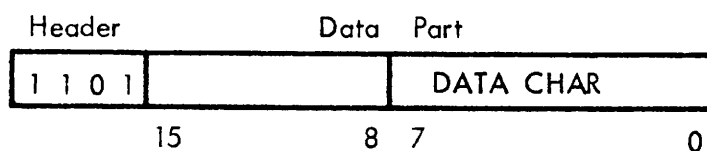
2	1	Speed
0	0	110 bps
1	0	300 bps
0	1	600 bps
1	1	1200 bps

bit 0: Not used.

WRITE DATA

3.2

from RC 3500 to LAM



bit 15: NOT USED.

bit 14-

bit 11: Multiplexer channel address.
as mentioned in section 3.1.

bit 10-

bit 8: NOT USED.

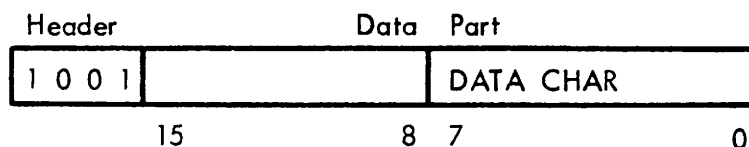
bit 7 -

bit 0: Data character.
bit 7 is the least significant data bit
sent immediately after the START-element
on the transmission line.

READ DATA

3.3

from LAM to RC 3500.

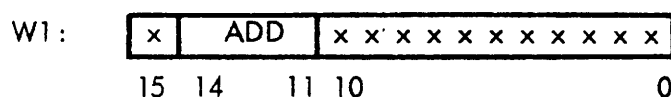


- bit 15: I/O Interrupt.
bit 15 = 1 indicates that the interrupt received was an INPUT READY interrupt. If bit 15 = 1 then bit 7 - bit 0 contain a data character from the multiplexer channel indicated by bit 14 - bit 11. Bit 15 = 0 indicates that the interrupt received was an OUTPUT READY interrupt. If bit 15 = 0 then the multiplexer channel indicated by bit 14 - bit 11 is ready to transmit a character.
- bit 14 -
bit 11: Multiplexer channel address, as mentioned in section 3.1. bit 11 is always = 0 in the 8 channel version.
- bit 10: ERROR.
bit 10 = 1 indicates that the data character (bit 7 - bit 0) is invalid as a result of an error occurred on the communication line or during receiving of the data character. Further specification of the ERROR - situation is obtained by a READ STATUS command. See section 3.4.
- bit 9 -
bit 8: NOT USED.
- bit 7 -
bit 0: The received data character from the multiplexer channel indicated by bit 14 - bit 11. bit 7 is the data bit received immediately after the START-element.

3.4

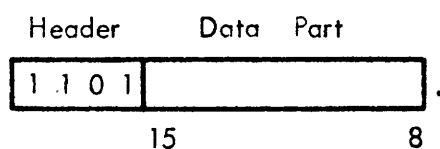
Because the contents of the working register W 1 for the interrupt level in question is sent from RC 3500 during READ INSTRUCTIONS the following program sequence may be used to read status from a particular multiplexer channel.

- 1°. Ldr W1 d1; d 1 multiplexer channel address.
- 2°. rsc WxXx d2; d2 RC 3500 I/O channel number.



bit 11: the multiplexer channel address from which RC 3500 wants to read status.

The status word from the LAM to RC 3500 contains the following information.



bit 15 - bit 13 contain a further specification of the ERROR-situation mentioned in section 3.3.

bit 15 - bit 13 is only valid after an interrupt, where the SCANNER is stopped, and has only relation to the multiplexer channel address upon which the SCANNER is stopped.

bit 15: **OVERRUN.**
bit 15 = 1 if the previously received character from the communication line is not read by RC 3500 before the present character is transferred to the input buffer register.

bit 14: FRAMING ERROR.
bit 14 = 1 if the received character has no valid STOP-element.

bit 13: PARITY ERROR.
 bit 13 = 1 if the received character parity
 does not agree with the parity selected by
 bit 6 in the WRITE CONTROL WORD.
 bit 13 always = 0 if NO PARITY
 (bit 7 in the WRITE CONTROL WORD)
 is selected for the multiplexer channel in
 question.

bit 15 = 1 or
 bit 14 = 1 or
 bit 13 = 1 or
 Data Carrier Detector (bit 10) = 0
 gives the ERROR-situation mentioned in section 3.3.

bit 12 - bit 10 contain modem-status for the multiplexer channel
 addressed by W 1.

bit 12: DATA SET READY (DSR).
 Response signal from the modem to
 CONNECT TO LINE.
 bit 12 = 1 if the modem power is switched on
 and the modem is not in test mode.

bit 11: READY FOR SENDING (RDYES).
 Response signal from the modem to
 REQUEST TO SEND.
 bit 11 = 1 if REQTS = 1 and DSR = 1.
 bit 11 = 0 blocks output interrupts from the
 multiplexer channel in question.

bit 10: DATA CARRIER DETECTOR (DCD).
 bit 10 = 1 if the received data channel line
 signal from the remote station is within appropriate
 limits as specified in the relevant recommendation
 for data communication equipment.
 bit 10 = 0 if for example the transmission line is
 cut off.



RETURN LETTER

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