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RC3682 Asynchronous Multiplexor Driver

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Abstract:

This manual describes the RC3600 AMX-driver.
The manual is relevant for driver release 8
and up.

(26 printed pages)

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1. General Description. 1.

Control, input and output messages are accepted.

The driver exists in 10 versions:

title	AMX's	max speed
AM00n	1	4800 bps
AM10n	2	4800 bps
AM20n	3	4800 bps
AM30n	4	4800 bps
AM80n	5	4800 bps
AM40n	1	9600 bps
AM50n	2	9600 bps
AM60n	3	9600 bps
AM70n	4	9600 bps
AM90n	5	9600 bps

where n is current revision of the driver.
This manual covers the AMX driver i revision 8 and up.
The driver name is always AMX.

1.1 Lines and Channels. 1.1

Each AMX comprises of 8 full or half duplex channels. Logical channel numbers 0:7, 16:23, 32:39, 48:55, and 64:71 are used for the first, second, third, fourth, and fifth AMX respectively.

A channel is represented by a pair of linedescriptors:

Input line no. = channel no.
Output line no. = channel no. + 8

For 1, 2, 3, 4, and 5 AMX devices, the range of legal line numbers will be 0:15, 0:31, 0:47, 0:63 and 0:79 respectively.

The line number is given as left byte value of Mess0:

Mess0(0:7) = lineno.

1.2 Half / Full Duplex. 1.2

In full duplex mode the channel receiver (the input line) and the channel transmitter (the output line) constitute a set of two logically independent lines and will be operated according hereto except for the following cases:

- Input terminated with attention, see section 3 .
- Input specifying echo operation, see section 3.4 .
- Input with flow control, see section 3.5 .
- Output with flow control, see section 4.1 .

The default (initialization) value of mode state is full duplex with receier and transmitter in recieve and transmit mode respectively (running) .

In half duplex mode the channel receiver and transmitter are logically operated via the input line only. To initiate half duplex mode an output message should be sent to the input line.

Summarized:

In full duplex mode input messages are to be sent to the input line and output messages are to be sent to the output line.

In half duplex mode all transput messages should be sent to the input line.

1.3 Initialization. 1.3

At load time the user controlled set of channel (line) parameters are given the below listed default values:

- Channel character format:
  (controlled by position)
  2 stop bits, no parity, 8 data bits.

- Data Terminal Ready (DTR):
  (controlled by reservation/disconnect)
  Cleared.

- Receiver/transmitter bitrate:
  (controlled by position)
  2400 bits/sec.

- Line conversion table:
  (controlled by conversion)
  No conversion.

- Line timers, t0 and t1:
  (controlled by position)
  30 seconds.

- Input and output flow control:
  (controlled by position)
  No flow control.

- All channels are initialized as full duplex.

1.4 Break, Power Restart. 1.4

Whenever a break process or a power restart occurs all pending messages are returned with status disconnected. The channels are reset with cleared hardware buffers.

All channel (line) parameters mentioned in section 1.3 will retain their latest current value and the channels are initialized according hereto.

1.5 Modem Signals. 1.5

DTR Data Terminal Ready signals to a modem that the actual line is available.

DCD Data Carrier Detect is a modem status signal indicating that the other end of the communication requests transmission of data.

CI Calling Indicator is a modem status signal indicating a call toward the modem (automatic call/dial up reply).

RTS Request To Send signals to the modem that the actual line wants to transmit data. The modem will transmit a carrier signal to the other end (where the DCD signal will be set) and as reply the modem status signal RFS will be set towards the actual line.

RFS Ready For Sending (also called Clear To Send (CTRS)) is a modem status signal indicating that data may be transmitted from the actual line. This modem signal is not visible to the driver, but controls the hardware transmission of characters, i.e. absense of RFS may cause output messages to be returned with status timeout. In half duplex mode clearing of DCD is awaited and RTS is set each time transmit mode is entered and cleared again after transmission.

DSR Data Set Ready is a modem status signal indicating that the modem is turned on and working.

When a low state on the modem signal DSR or a high state on the modem signal CI is detected, this is interpreted as an error and will cause input/output operations for the line to be terminated.
Note however that the modem signal DCD is ignored totally except for the case of half duplex output, in which case a low state of DCD is awaited before initiation of the half duplex output operation.

2. Control Messages. 2.

Reservation, conversion, position, and disconnect are executable.
Erase is used to control the execution of conversion.
Termination have no effect.

A control message with Mess0(8:15) equal zero is always accepted, and returned with zero status as such a message may be generated by the I/O system.

A control message with Mess0 equal -1 is treated as a control message with Mess0 equal zero for backward compatibility reasons.

All other messages will suspend input messages held by the line, see section 3.6.

2.1 Reservation. 2.1

In case of output line and Mess1 non-zero, Data Set Ready will be set.

2.2 Conversion. 2.2

Input, output and echo conversion is supported by the driver.

Mess2 when non-zero is taken as a byte or word address of a defined conversion table. If erase (1b8) is also set, mess2 is taken as a word address; else mess2 is taken as a byte address.
A conversion table should not be placed in word address 37777 to 40001 (octal).
The table must start on an even byte (full word boundary) .

Mess2 equal zero means no conversion.

2.3 Position. 2.3

Mess2 is taken as new timer values (t0 , t1) for the specified line.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
timer 0								timer 1							

Timer 0 and timer 1 are given in second from 1 to 255 specifying the timer intervals:

(0..1) .... (254..255) .

A zero timer value means no timeout supervision.

A position message sent to the input line defines the input timers and sent to the output line defines the output timer.

For input operations timer 0 is the maximum time allowed before the first character and timer 1 the maximum time allowed between characters.

For output operations timer 0 is the maximum allowable time for the total output operation and timer 1 is not used.

Mess3 is ignored when positive or zero.

A negative Mess3 is used to define the channel characteristics in the following format:

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	FC		S	P		L		REC BPS				XMT BPS			

FC specifies input and/or output flow control, see sections 3.5 and 4.1 .

bit 1	bit 2	input fc	output fc
0	0	no	no
0	1	yes	yes
1	0	yes	no
1	1	no	yes

S specifies the number of stop bits to be used:

bit 3	number of stop bits
0	1 stopbit
1	2 stopbit

P Specifies the parity condition:

bit 4	bit 5	Parity
0	0	odd
0	1	even
1	0	none
1	1	none

When even or odd parity is specified, the parity bit (most significant bit) will be supplied by the transmitter and checked and removed by the receiver.

L specifies the character length of the channel excluding a possible parity bit:

bit 6	bit 7	char. length
0	0	5
1	0	6
0	1	7
1	1	8

REC BPS and XMT BPS specifies the receiving and xmitting line transmission bit rate respectively:

bit 8:11 bit 12:15	bit rate (bps)	t(EOT) mSec
0000	9600	80
0001	4800	80
0010	2400	80
0011	1200	80
0100	600	120
0101	300	160
0110	220	160
0111	200	200
1000	150	240
1001	134.5	240
1010	110	280
1011	75	400
1100	50	560
1101	40	680
1110	40	680
1111	40	680

When continous input or output at 9600 bps is to be supported a high speed version of the driver should be used, see section 1. However usage of the high speed driver will increase the CPU load sligtly.

2.4 Disconnect.

2.4

In case of output line, Data Terminal Ready (DTR) is cleared and the channel receiver is stopped.

An input or attention message held by the line is returned with its present status, see sect. 7 .

3. Input. 3.

Mess0 (0:7) = line.

Mess0 (8:15) :

1	normal input
17	attention
33	input continued
+4	soft parity check for even parity of characters, see sect. 6 .
+8	echoing of input (not allowed in half duplex mode).
+64	echo conversion enabled.
+128	word address mode, i.e. mess2 is taken as a word address instead of a byte address.

Data buffers should not be placed in word address 37777 to 40001 (octal).

The channel receiver is kept in receive mode regardless of buffer changes. In half duplex operation (output messages sent to the input line) the channel receiver is stopped during output and afterwards restarted without loss of characters that arrived before the output operation. When no input message is present, characters received are buffered in the device (max. 32 characters per channel).

Termination by attention on an input line terminates concurrent full duplex output. The output message is returned with status attention.

3.1 Normal Input. 3.1

When a normal input message is activated, the hardware input buffer is cleared for characters.

The message will be returned when:

1. An attention or termination character arrives.

2. The specified number of characters have been stored.

3. A timeout occurs.

4. Control with disconnect arrives.

5. A modem signal status error is detected.

3.2 Input Continued. 3.2

Characters previously buffered in the channel receiver are accepted. If this previous input exceeds 32 characters or demands echo exceeding 32 characters, the message will be returned with status character lost.

Note however that enabled output flow control will supersede input continued operation.

The message is returned as described for normal input.

3.3 Attention. 3.3

A current attention message will accept all characters. Only the terminating attention character will be delivered.

The message will be returned when:

1. An attention character is met.

2. Control with disconnect arrives. The attention message is then returned with zero status.

3. A modem signal status error is detected.

3.4 Echo. 3.4

The echo feature is available in full duplex mode only. If the output line is idle when the channel transmitter is requested for the first echo character, the input line will delay the corresponding output line (echo reservation) until input termination. Otherwise (output line busy) the input message is returned with status character lost. If echo and echo conversion enabled both are true in the operation and the output conversion table address is non-zero, the echo characters are converted using the output conversion table, see sect. 6 .

An input operation specifying echo sent to an input line in half duplex mode will cause unpredictable results.

3.5 Input Flow Control. 3.5

Input flow control is supported in full duplex mode only. When input flow control is enabled by a position message, a DC3 (X-OFF) character is transmitted. After driver break or power restart the input flow control is maintained and a DC3 (X-OFF) character is transmitted. However when input flow control is cleared, no flow control character is transmitted.

When input flow control is enabled the following actions are taken:

1. When an input or input continued message (i.e. not an attention message) arrives, a DC1 (X-ON) character is transmitted.

2. When an input or input continued message (i.e. not an attention message is returned, a DC3 (X-OFF) character is transmitted.

3. Transmission of input flow control characters are subject to the same conditions as echoing of characters received, i.e. if the output line is executing output when an input message arrives, the input message will be returned immediately with status character lost.

4. The input flow control characters are transmitted regardless of input echo specification.

5. The input flow control characters will not be converted using an optional output conversion table.

3.6 Input Suspension. 3.6

A current input message may be temporarily suspended, being replaced by some later message for the line (subqueue look ahead). Attention messages are suspended by any later message for the line. Other input messages are suspended by any later control or (half duplex) output message for the line.

When the current message has been returned, the oldest item in the line subqueue will be the next current message. A previously suspended input message will be resumed with character buffer erased.

4. Output. 4.

Operation (0:7) = line .

Operation (8:15) :

3: write, characters are output until but not including a character value of 128.

+4: enable output conversion (full duplex mode only) . The characters are converted if the output line conversion table address is non-zero. If write with bytecount is not specified characters are output until a converted character value of 128 is encountered. N.B: Output conversion is performed as table lookup giving a value byte for each character.

+8: write with bytecount, as operation = 3 except that output is terminated when Mess1 characters have been output, i.e. a character value of 128 may be output.

+128: word addressing mode, i.e. mess2 is taken as a word address rather than a byte address. Data buffers should not be placed in word address 37777 to 40001 (octal).

67: break, a break is output during (Mess1 * 40) mSec.

An output message is returned when:

1. A character value of 128 is to be output or the specified number of characters have been output depending on operation. If output conversion is specified, the value 128 regards the converted character value.

2. Control with disconnect arrives.

3. A modem signal status error is detected.

4. An output timeout occurs.

5. A character with class attention is recieved by the corresponding input line.

4.1 Output Flow Control. 4.1

When output flow control is specified, the output operation will be suspended when a DC3 (X-OFF) character is received at the corresponding input line. The output operation will be continued when a DC1 (X-ON) character is received at the input line.
Output flow control specification will cause the input line to be supervised contnously. When no input operation is present, characters received will be inspected for DC1 and DC3 value and then discarded. This causes a subsequent input continued operation to work as a normal input operation.
The output operation will be returned and output reenabled when:

1. a DC1 character is received

2. a character with class attention is received and an input or attention message is present at the input line

3. an output timeout occurs

5. Mode Shifts. 5.

When initialization is carried out all channels are in full duplex mode with the receiver and the transmitter in receive and transmit mode respectively (running).

Whenever a channel is left idle the channel receiver is kept in receive mode and if full duplex mode is specified the channel transmitter will be in transmit mode.
The channel transmitter will be stopped only when a half duplex output operation is terminated. When the channel transmitter is stopped the modem signal RTS is set low.

A stopped channel transmitter will be restarted and RTS set high in case that:

1. An output operation is initiated on an output line (full duplex mode) or an input operation specifying echo is initiated on an input line.

2. An output operation is initiated on an input line.
   In this case the receiver is stopped, clearing of the modem signal DCD is awaited and the transmitter started.
   Within t(EOT) mSecs after output termination, the transmitter will be stopped and the receiver restarted without loss of characters previously received, see section 2.3 .

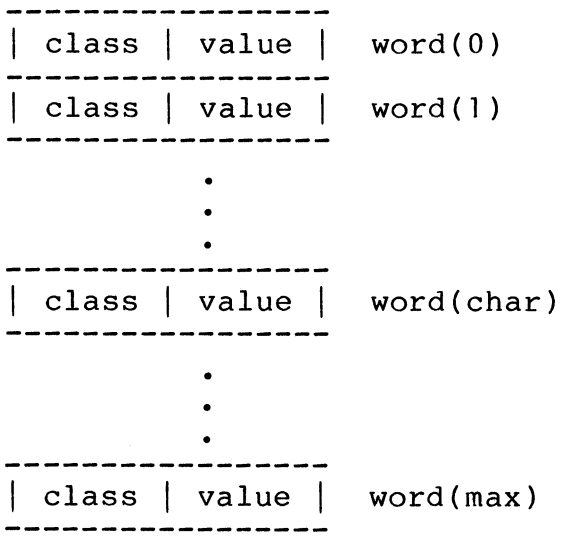
6. Input Mapping of Characters. 6.

When a character is received, parity check is performed as specified for the receiving channel and, if a parity error is detected, the value 26 (SUB) is substituted. When parity chacking is specified, the parity bit (the most significant bit) is cleared.

When the mode of the input operation specifies soft parity check and the channel parameters are set to 8 data bits and no parity, a software parity check is performed, and the 7 least significant bits are taken as character value. If a parity error is detected, the value 26 (SUB) is substitited.

When the conversion table address is non-zero, conversion is performed as table lookup giving a class and a value byte for each character. The value is delivered and echoed, if specified.

Convtab // 2 :



The class byte may include zero or more class idents decoded left to right.

Class = 0 Normal character. The value is delivered and, if specified, echoed.

Classid 128 — Attention character. Input is terminated and the input or att buffer returned with status attention. If an output operation is in procress on the correspomnding output line, it is stopped and returned with status attention.

Classid 64 — Termination character. Input is terminated with this character.

Classid 32 — Subclass format, see sect. 6.1 .
Note that this classid is mutual exclusive with classid 8 and classid 4 .

Classid 16 — Mark, the mark answer status bit is set.

Classid 8 — Shift character, conversion table address is changed as follows:

```
convtab:= (convtab // 2 +
           if classid 4 = 0
           then value
           else -value ) * 2;
```

The conversion procedure is repeated.

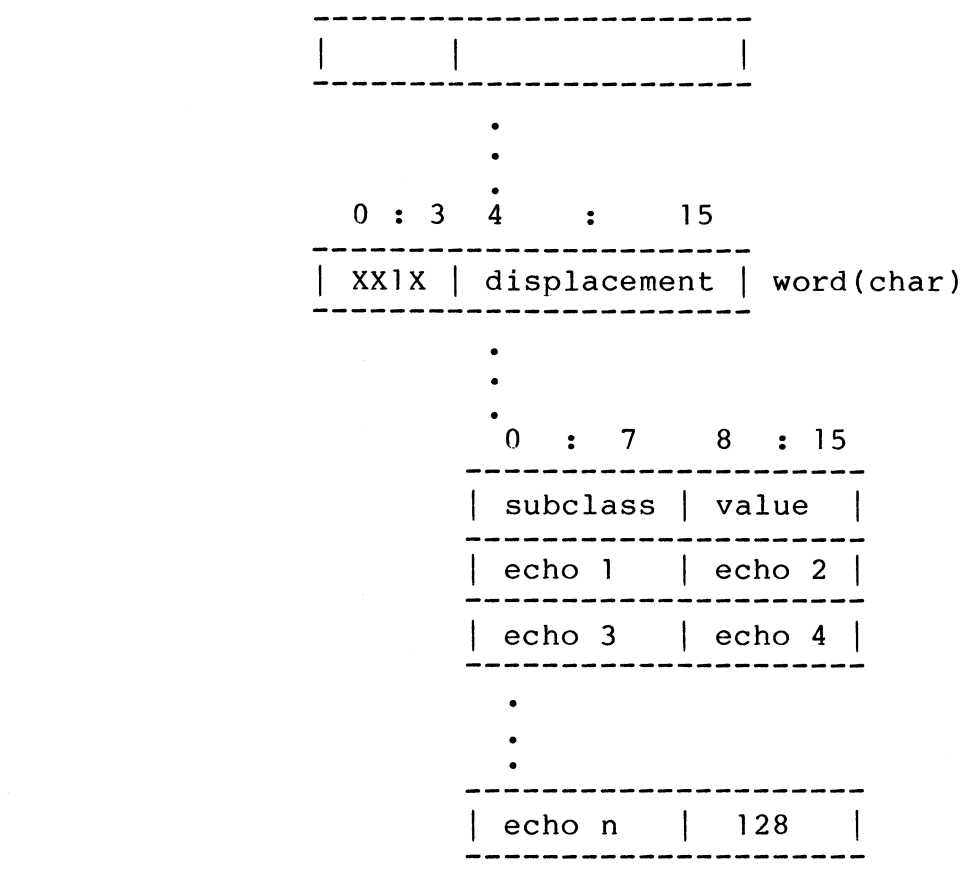
Classid 4 — See classid 8.

6.1 Subclass format. 6.1

Classid 32 Word (4:15) is used as a displacement in words pointing from convtab // 2 to a subtable. In the subtable the value found is delivered and the string (echo1,...,echo n), which always should be terminated with ´128´, is echoed on the output line, if echo is specified.

Special Echo:

Convtab//2:



subclassid 128 Erase current input buffer.

subclassid 64	Erase last character if any from input buffer. If the input buffer is empty, no echoing is performed.
subclassid 32	Value is not delivered. Note that classid 64 (termination) will be suppressed by this subclassid.

7. Answer. 7.

Mess2 of an answer contains the line number except when the line is unknown. In this case Mess2 equals 1B6 .
When half duplex is initiated (i.e. an output operation is sent to an input line) and DCD is on, the output message is returned with status 1B8 : Carrier On.
If DSR goes off or CI goes on any current transput message is terminated returning status.
During input the error will be detected within 40 mSec (20mSec for the high speed version of the dribver) and during output within 1 second.
A Break signal received will terminate an input operation only, and status 1B11: Break Received will be set in the answer.

7.1 Status. 7.1

1B0 Disconnected (power restart)

1B1 DSR off.

1B2 CI on.

1B3 Not used.

1B4 Mark, the input buffer returned contains a character with class 16.

1B5 Attention received.

1B6 Line unknown.

1B7 Character lost.

1B8 DCD on (half duplex output only).

1B10 Parity or stop bit error.

1B11 Break received.

1B14 Timeout.

RETURN LETTER

Title: RC3682 Asynchronous Multiplexor Driver

RCSL No.: 99-0-00752

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