BLACK BOX® France

SHORT HAUL,
ASYNCHRONOUS / SYNCHRONOUS
4 WIRE MODEM FOR PRIVATE LINES
1.2 to 128 Kbps

SHM® 128

RECOMMANDATIONS

The line circuit as well as the interface circuits at the back of the product are SELV circuit. Compliance with EN60950 is only maintained if they are connected to line or port on other equipments which only contain SELV circuit as specified in EN60950.

DISCONNECTING THE PRODUCT

Before opening the housing servicing, product must be disconnected from the main power supply. To enable this, power must be installed near the product and must be easily accessible.

AETA.COM reserves the right to modify the products described in this guide at any time and without prior notice.

DECLARATION OF CONFORMITY

The manufacturer declares that the AEMOD 128 short haul modem conforms to the following standards :
EN 55022 Ed. 94 Electromagnetic radiations
EN 55024 Ed. 98 Electromagnetic immunity
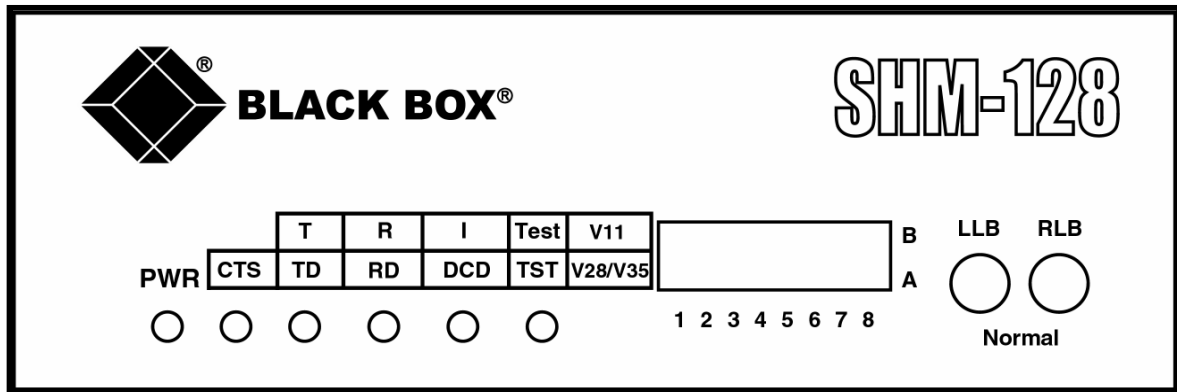EN 60950 Ed. 98 Safety requirements

CE MARK

The CE mark on this product applies to the EMC directive 89/336/EEC and to the Low Voltage Directive 73/23/EEC.

CONTENTS

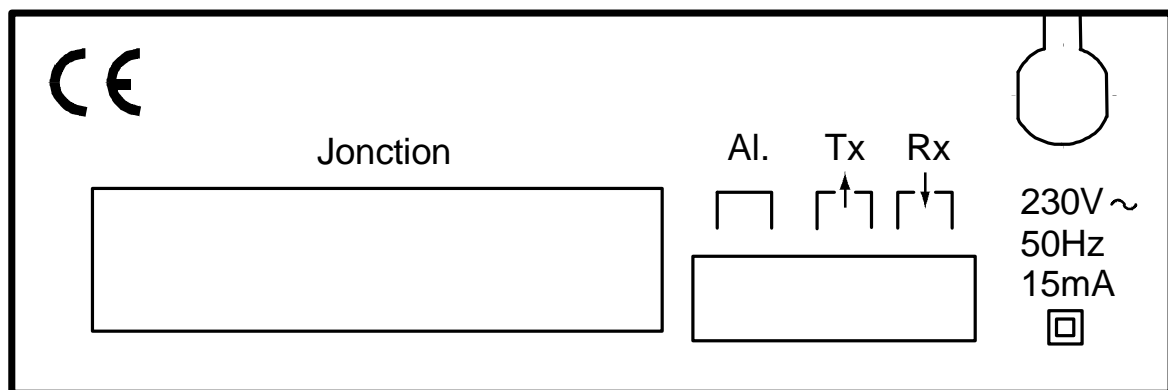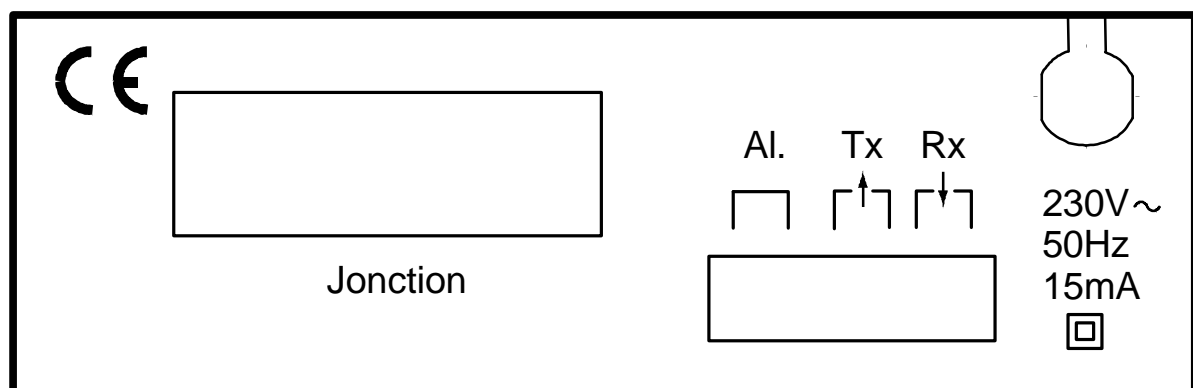## I – PRESENTATION

Front panel

Rear panel V28,V35 and 230V~ unpluggable terminal block

Rear panel V11 and 230V~ unpluggable terminal block

Chassis front panel
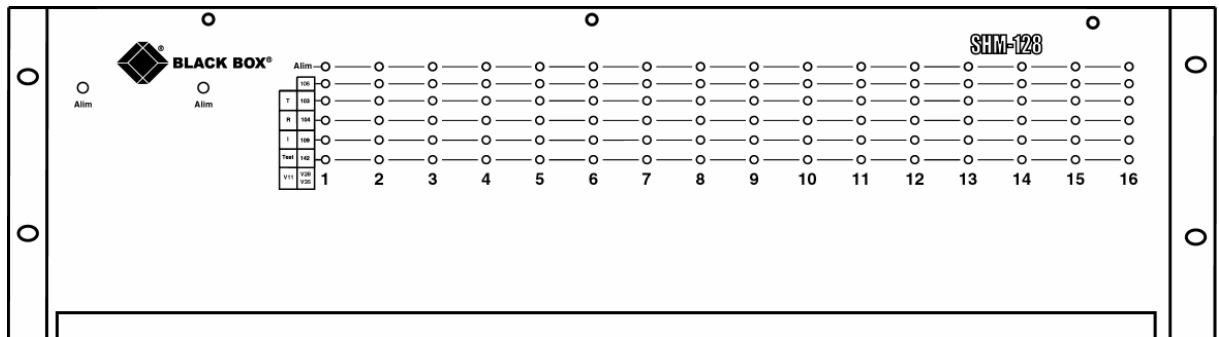
The rack-mount chassis can contain:
   up to 16 modem cards
   up to 2 power cards

II - INSTALLATION

1. Power supply

Connect all secondary supply wires before connecting the mains power plug.

Standalone versions:

Standalone 230V version: plug the power cord to the mains power socket.
The "Alim" LED must light on. If it does not, check the F1 fuse on the board (250V delayed 400mA).

Standalone 48V version : connect the 48V supply to the 48V screw terminals (polarity doesn't matter).
The "Alim" LED must light on. If it does not, check the F1 fuse on the board (250V delayed 63mA).

Rack-mount versions:

Rack-mount 230V version:
Plug the 230V power card in slot A or B of the chassis.
For backup, plug a second 230V power card in the other slot.
Plug the mains cord in the outlet at the back of the chassis and in the mains power socket.
The "Alim" LED of the power card must light on. If it does not, check the F1 fuse on the board (250V delayed 1A).
The "Alim" LED of a modem card must light on. If it does not, check the F1 fuse on the board (250V delayed 400mA).

Rack-mount 48V version:
Plug the 48V power card in slot A or B of the chassis.
For backup, plug a second 48V power card in the other slot.
Connect the +48V wire of the power supply to the screw connector block tagged 0B and located at the back of the chassis.
Connect the 0V wire of the power supply to the screw connector block tagged –48V and located at the back of the chassis.
The "Alim" LED of the power card must light on. If it does not, check the F1 fuse on the board (250V delayed 2A).
The "Alim" LED of a modem card must light on. If it does not, check the F1 fuse on the board (250V delayed 400mA).

2. Line wiring:

Warning: The efficiency of AEMOD 128 is guaranteed only with a two twisted pairs cable.

The two Tx line wires are connected to the two Rx line wires of the other end.

Screw connector block standalone or chassis version:

The transmit line is connected to the terminals :

Tx
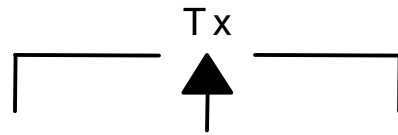
The receive line is connect to the terminals :

Rx
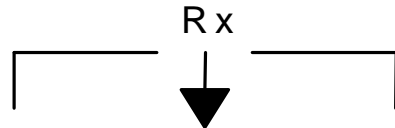
RJ45 standalone unit:

RJ45 pinouts:

RJ45 receptacle pin number	Description
1	Not used
2	Not used
3	Rx
4	Tx
5	Tx
6	Rx
7	Not used
8	Not used

REMARK:
The way of plugging the two Tx wires has no importance. The same for the way of plugging the two Rx wires.

NOTE: As an option, a 3 meter long cord fitted with a RJ45 plug at one end and a spade lug at the other end can be delivered.

3. Terminal connection:

V28 version: connect directly the terminal to AEMOD 128 using a DB25 female connector .

V35 version: connect the DB25M / M34F adaptor cord (delivered with the device) to the 'Jonction' connector of AEMOD 128. Then use a M34 cord to connect the terminal to AEMOD 128.

V11 version: connect the DB25M / DB15F adaptor cord (delivered with the device) to the 'Jonction' connector of AEMOD 128. Then use a DB15 M34 cord to connect the terminal to AEMOD 128.

4. Alarm contact:

A 2 pins contact ('Al.') is available at the rear side of AEMOD 128.
The device provide a loop which is open when no line signal is detected by the modem.

III - INTERFACES

1. V28 interface

ITU-T :   V24 + V28 (RS232)
ISO   :   2110

Circuit		Pin	Meaning	Name	Signal source
ITU-T	EIA				
102	AB	7	Signal ground	GND	
103	BA	2	Transmit data	TD	®
104	BB	3	Receive data	RD	¬
105	CA	4	Request to send	RTS	®
106	CB	5	Clear to send	CTS	¬
107	CC	6	Data set ready	DSR	¬
108	CD	20	Data terminal ready	DTR	®
109	CF	8	Data carrier detect	DCD	¬
113	DA	24	External transmit clock	ExtClk	®
114	DB	15	Modem transmit clock	TC	¬
115	DD	17	Modem receive clock	RC	¬
140	RL	21	Remote loop back	RLB2	®
141	LL	18	Local loop back	LLB3	®
142	TM	25	Test indicator	TI	¬

® Terminal signal source

¬ Modem signal source

2. V11 interface

ITU-T :   V11 (RS422)
ISO   :   4903

Circuit	Pin	Meaning	Name	Signal source
G	8	Signal ground		
T	2	Transmit data wire (a)	Ta	®
	9	Transmit data wire (b)	Tb	®
R	4	Receive data wire (a)	Ra	¬
	11	Receive data wire (b)	Rb	¬
C	3	Control wire (a)	Ca	®
	10	Control wire (b)	Cb	®
I	5	Indicator wire (a)	Ia	¬
	12	Indicator wire (b)	Ib	¬
S	6	Transmit and receive clock signal wire (a)	Sa	¬
	13	Transmit and receive clock signal wire (b)	Sb	¬
X	7	Ext. Clock wire (a)	Xa	®
	14	Ext. Clock wire (b)	Xb	®

® Terminal signal source

¬ Modem signal source

V11 *Adaptator*

DB25M			DB15F

1 Protective ground   1

2 Tx(a) ←————————— T(a) 2

3 Rx(a) —————————→ R(a) 4

4 RTS(a) ←———————— C(a) 3

5 CTS(a)

6 DSR(a)

7 GND ——————————— GND 8

8 DCD(a) —————————→ I(a) 5

9 Hrec(b) —————————→ S(b) 13

10 DCD(b) —————————→ I(b) 12

11 Hext(b) ←———————— X(b) 14

12

13

14 Tx(b) ←————————— T(b) 9

15 Hem(a)

16 Rx(b) —————————→ R(b) 11

17 Hrec(a) —————————→ S(a) 6

18

19 RTS(b) ←———————— C(b) 10

20

21

22

23

24 Hext(a) ←———————— X(a) 7

25

3. V35 interface

ITU-T : V35
ISO : 2593

Circuit	Pin	Meaning	Name	Signal source
101		Protective ground		
102	B	Signal ground	GND	
105	C	Request to send	RTS	®
106	D	Clear to send	CTS	¬
107	E	Data set ready	DSR	¬
109	F	Data carrier detect	DCD	¬
108	H	Data terminal ready	DTR	®
104	R	Receive data wire (a)	RD	¬
	T	Receive data wire (b)		¬
115	V	Receive clock wire (a)	RC	¬
	X	Receive clock wire (b)		¬
114	Y	Transmit clock wire (a)	TC	¬
	AA	Transmit clock wire (b)		¬
103	P	Transmit data wire (a)	TD	®
	S	Transmit data wire (b)		®
113	U	Ext. transmit clock wire (a)	ExtClk	®
	W	Ext. transmit clock wire (b)		®
140	N	Remote loop back	RLB	®
141	L	Local loop back	LLB	®
142	NN	Test indicator	TI	¬

® Terminal signal source

¬ Modem signal source

V35 *Adaptator*

DB25M		M34F
1	Cable screen	A
2	Tx(a)	P
3	Rx(a)	R
4	RTS	C
5	CTS	D
6	DSR	E
7	GND	B
8	DCD	F
9	Hrec(b)	X
10		
11	Hext(b)	W
12	Hem(b)	AA
13		
14	Tx(b)	S
15	Hem(a)	Y
16	Rx(b)	T
17	Hrec(a)	V
18	Bcl3	L
19		
20	DTR	H
21	Tbcl2	N
22		
23		
24	Hext(a)	U
25	Test	NN

4. RS530 interface

ISO : 2110

Pin	Meaning	Name	Signal source
7	Signal ground		
2	Transmit data	TD a	®
14	Transmit data	TD b	®
3	Receive data	RD a	¬
16	Receive data	RD b	¬
4	Request to send	RTS a	®
19	Request to send	RTS b	®
5	Clear to send	CTS a	¬
13	Clear to send	CTS b	¬
6	Data set ready	DSR a	¬
22	Data set ready	DSR b	¬
8	Signal detector	SD a	¬
10	Signal detector	SD b	¬
20	Data terminal ready	DTR a	®
23	Data terminal ready	DTR b	®
15	Transmit clock	TC a	¬
12	Transmit clock	TC b	¬
17	Receive clock	RC a	¬
9	Receive clock	RC b	¬
24	External clock	ExtClk a	®
11	External clock	ExtClk b	®
18	Local loop back	LLB	®
21	Remote loop back	RLB	®
25	Test mode	T	¬

® Terminal signal source

¬ Modem signal source

IV – DISPLAYS AND TESTS FEATURES

1. leds

Led "Alim" lights up when the modem is powered on.
Led "106" lights up when CTS signal is on.
Led "103/T" lights up when transmitted data is "0".
Led "104/R" lights up when received data is "0".
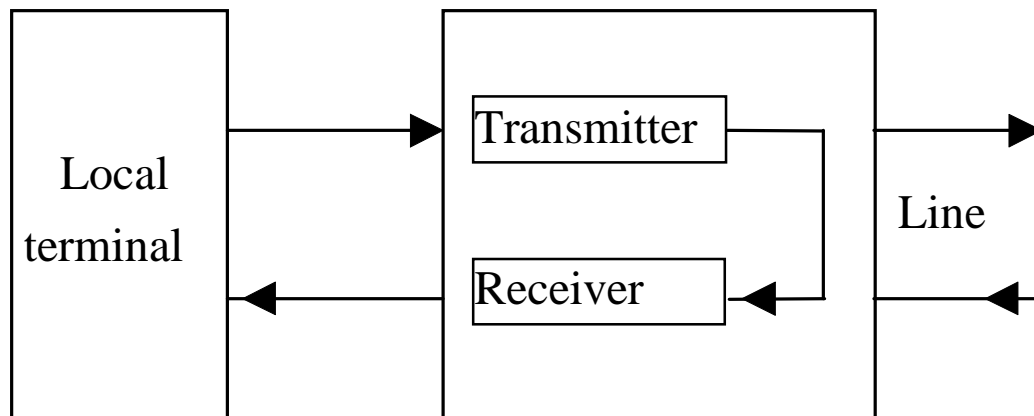Led "109/I" lights up when line signal detector is on.
Led "142/Test" lights up when a local or remote loop back
is in progress.

2. Loop facility

Complying with ITU-T V54, two loops are possible:

A – Analog loop (Loop 3)

Controlled by the switch Bcl3 (or the micro switch S9 for the chassis version) or by the CT141 circuit.
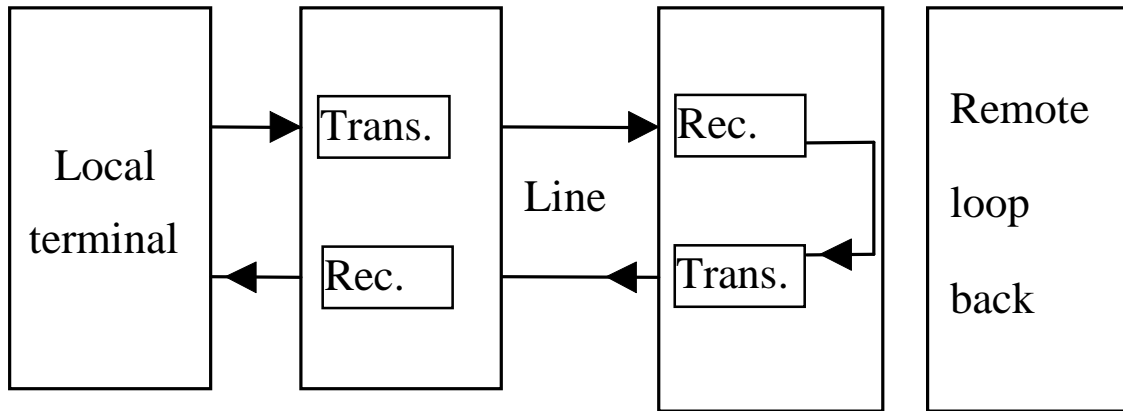

Local loop type 3

Local modem is disconnected from the line. Transmit line is looped to receive line on local modem. Data transmitted by the terminal are sent back by local modem. This loop back only allows to test the local modem.

B – Remote digital loop (RDL2)

Controlled by the switch Tbcl2 (or the micro switch S8 for the chassis) or by the CT140 circuit.

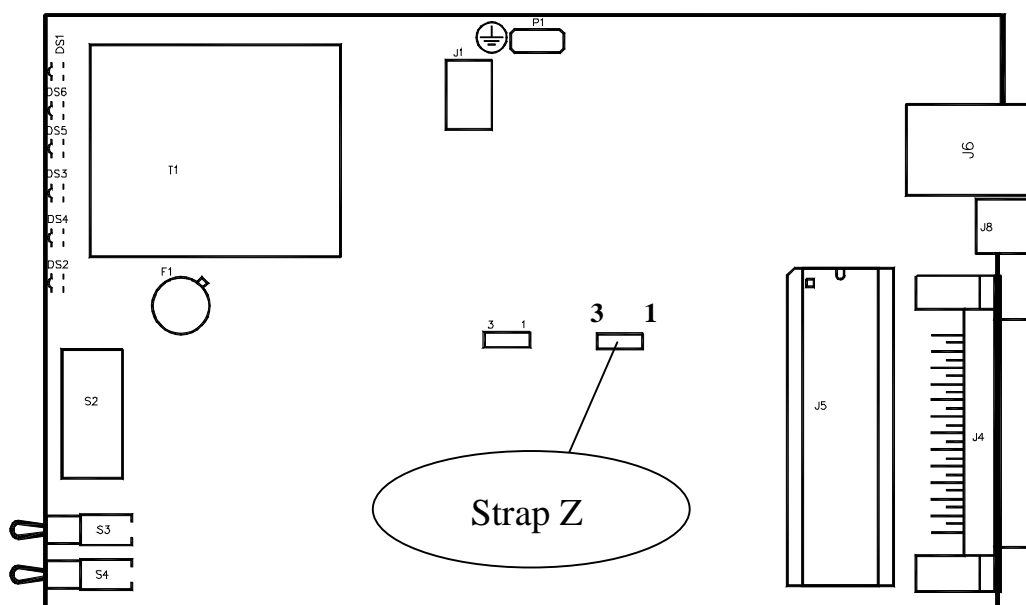Remote digital loop type 2

The remote modem is looped. Data transmitted by local terminal, via the local modem, are send to and returned from the remote modem. This test can verify the integrity of the local modem, the communication link and the remote modem.

Strap Z on position 2-1 inhibits loop back. On position 2-3 strap Z allows CT140 controlled loop back.

Strap Z has no influence on S8 command.

This strap in only accessible when the standalone box is opened.
This strap moving in only possible when opening the box.
To do it, just pinch one side of the front panel black frame, and pull out the frame. (Pinching must be done on the stripped zones of the frame side).

Strap 'Z' location:

Warning:
It is not possible to initiate a RDL2 loop from a modem actually using the receive clock as the transmit clock.

C - Remote digital loop inhibition

S8 switch (or S10 switch for the chassis version) makes the modem to ignore the remote digital loop request from the remote modem.

A position: loop back allowed
B position: loop back inhibited

V - OPERATION
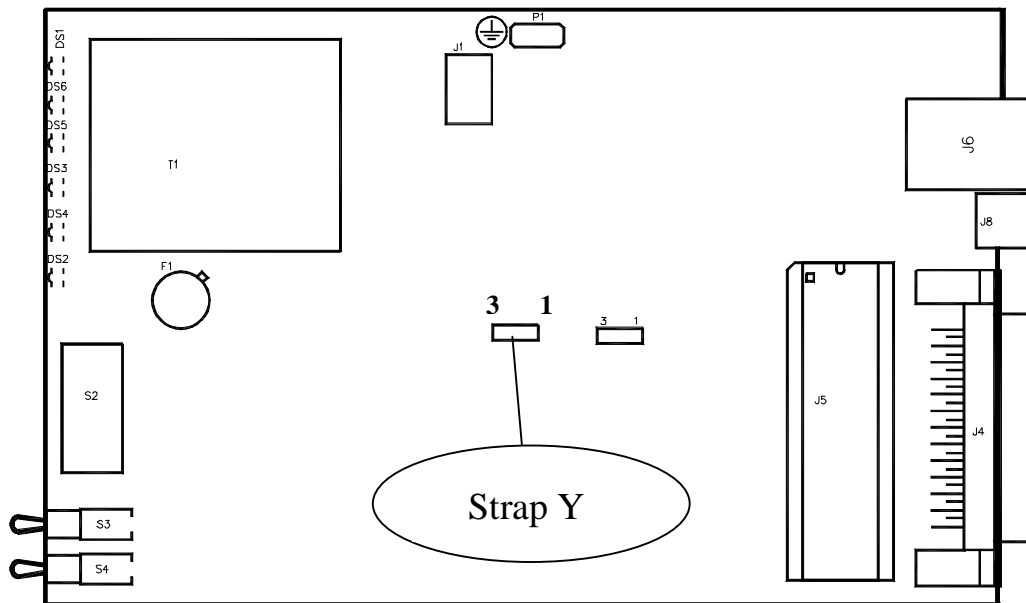
1. Transmit control

Line transmit signal may be:

- controlled by RTS (S7 on position A)
- permanent (S7 on position B)

DTR interface signal may be used or not by the modem depending on strap Y:
- Y 1-2 : DTR is ignored (Factory setting)
- Y 2-3 : DTR must be at space level

Strap 'Y' location :

CTS/RTS delay is controlled by S6 micro switch and operating mode.

S 6	Operating mode	Delay time CTS/RTS
B	Synchronous 4 800 bd to 38 400 bd	Delay time 25ms
A	Synchronous 4 800 bd to 38 400 bd	Delay time 50ms
B	Synchronous 64 000 bd to 128 000 bd	Delay time 4,5ms
A	Synchronous 64 000 bd to 128 000 bd	Delay time 15ms
B	Asynchronous	Delay time 5ms
A	Asynchronous	Delay time 17ms

2. Synchronous mode - Transmit clock setup

A - Internal clock : CT114

Internal clock is supplied by the modem on CT114 (TC).
Micro switch S4 on position B and S5 on position A.
Data rate (micro switch S1, S2, S3).

B - External clock : CT113

Transmit clock is supplied by terminal on CT113 (ExtClk).
Micro switch S4 on position A and S5 on position A.
Data rate can range from 1,2 to 128 Kbps.

C - Receive clock : CT115

Receive clock is used by the modem as transmit clock and applied on TC pin (CT114). Micro switch S4 on position A and S5 on position B.

D – RS422 specific feature

As there is only one clock (S) on the interface, there are only 2 ways to configure the transmit clock of the AEMOD 128 RS422:
  a) one modem in internal clock and the other in receive clock mode.
  b) both modems in external clock.

Warning:
In case a), when one modem uses the receive clock as transmit clock, the range is shortened.

3. Asynchronous mode

Asynchronous mode is obtained in placing micro switch S4 and S5 in position B.

VI - RANGE

The distances indicated below correspond to a guaranteed minimum range for twisted pairs of ⌀ 4mm (AWG26).
For other diameters multiply roughly by:
    1.3 for ⌀ 0.5 mm (AWG24) ; 1.5 for ⌀ 0.6 mm (AWG22);
    2.0 for ⌀ 0.8 mm (AWG20)

The range depends on the transmit clock used by modems:

1) TC = internal clock for both modems (RS232, V35).
  TC = receive clock for both modems (RS232, V35, R422).

Rate (bps)	Point to point
1.200	9.000 m
2.400	7.000 m
4.800	6.500 m
9.600	5.500 m
19.200	4.500 m
64.000	3.800 m
128.000	3.400 m

2) RS232, V35, RS422

TC = internal clock on one side and,

TC = receive clock on the other side.

Rate (bps)	Point to point
1.200	8.000 m
2.400	6.800 m
4.800	5.600 m
9.600	4.000 m
19.200	3.400 m
64.000	2.500 m
128.000	1.500 m

3) Asynchronous (V28).

Rate (bps)	Point to point
1.200	8.700 m
2.400	7.000 m
4.800	6.600 m
9.600	5.000 m
19.200	3.800 m

VII – MICRO SWITCH POSITIONS SUMMARY

* Factory settings

1. Standalone version

Synchronous mode:

S 1	S 2	S 3	Data rate (bps)
A	A	B	128.000
B	A	B	64.000
A	B	A	19.200*
B	B	A	9.600
A	A	A	4.800
B	A	A	2.400
A	B	B	1.200

S 4	S 5	Transmit clock
A	A	External clock
B	A	Internal clock*
A	B	Receive clock

Asynchronous mode:

S 1	S 2	S 3	Data rate (bps)
A	A	B	115.200 57.600 28.800 14.400
B	A	B	38.400
A	B	A	19.200
B	B	A	9.600
A	A	A	4.800
B	A	A	2.400
A	B	B	1.200

S 4	S 5	Transmit clock
B	B	Asynchronous mode

S 6	Delay time CTS / RTS
B	Low delay *
A	Significant delay

S 7	Transmit control
A	Controlled by RTS*
B	Permanent

S 8	Remote loop inhibition
A	Remote loop allowed*
B	Remote loop inhibited

Bcl3	Analog loop 3
A	No*
B	Yes

Tbcl2	Remote digital loop 2
A	No*
B	Yes

Strap Y	DTR management
1-2	Used by the terminal
2-3	Ignored*

Strap Z	Remote loop inhibition
1-2	Yes
2-3	No*

2. Rack-mount version

Synchronous mode:

S 1	S 2	S 3	Data rate (bd)
A	A	B	128.000
B	A	B	64.000
A	B	A	19.200*
B	B	A	9.600
A	A	A	4.800
B	A	A	2.400
A	B	B	1.200

S 4	S 5	Transmit clock
A	A	External clock
B	A	Internal clock*
A	B	Receive clock

Asynchronous mode:

S 1	S 2	S 3	Data rate (bd)
A	A	B	115.200 57.600 28.800 14.400
B	A	B	38.400
A	B	A	19.200
B	B	A	9.600
A	A	A	4.800
B	A	A	2.400
A	B	B	1.200

S 4	S 5	Transmit clock
B	B	Asynchronous mode

S 6	Delay time CTS / RTS
B	Low delay *
A	Significant delay

S 7	Transmit control
A	Controlled by RTS*
B	Permanent

S 8	S 9	Loop mode
B	A	Remote digital loop 2
A	B	Analog loop 3
A	A	NONE*

S 10	Remote loop inhibition
A	Remote loop allowed*
B	Remote loop inhibited

Strap Y	DTR management
1-2	Used by the terminal
2-3	Ignored*

Strap Z	Remote loop inhibition
1-2	Yes
2-3	No*

GENERAL CHARACTERISTICS

Power:
- 160 to 245 VAC/50 to 60Hz
  or
- 36 to 72 VDC

Consumption:
4W maximum

Temperature tolerance :
  Operating: -5° to +50°C
  Storage   : -40° to +70°C

Size :
  Standalone:
   H : 5cm - W : 12,5cm - D : 18,7cm
  Rack:
   H : 13,3cm - W : 43,9cm - D : 20,5cm

Weight:
  Standalone : ≤ 750 g
  Rack (full) : ≤ 5 Kg

MTBF: 714,000 hours

NOTES

AETA.COM

HEAD OFFICE and SALES DEPARTMENT
Immeuble KEPLER, Hall 3
18-22 Avenue Edouard Herriot
F-92350 LE PLESSIS ROBINSON - FRANCE
Tel: +33 1 41 36 12 12
Fax: +33 1 41 36 12 13

TECHNICAL DEPARTMENT
Les Pleiades 1, Batiment B
860 Rue Rene Descartes
F-13857 AIX EN PROVENCE CEDEX 3 - FRANCE
Tel: +33 4 42 12 60 50
Fax : +33 4 42 12 60 39