AC31 technical documentation

Chapter 17

Ethernet Interface
e-AC31

Ethernet Interface
e-AC31

Ethernet Interface
e-AC31

This chapter gives information for connection and basic configuration of e-AC31, Ethernet interface for series 40 & 50

1. Presentation

1.1. Description

This interface realizes the connection of the AC31 40 and 50 series to the Ethernet network via TCP/IP connection RJ45 connector for 10/100 Base T link.
The interface is able to work in slave MODBUS/TCP protocol (server mode), direct connection (tunnel) in server or client mode. It is also able to send mail via SMTP protocol using a simple HAYES command on the serial line.

Specific functions are available on the product particularly in MODBUS/TCP:
- Asynchronous mode
- AC31 programming
- Modbus Easy Net
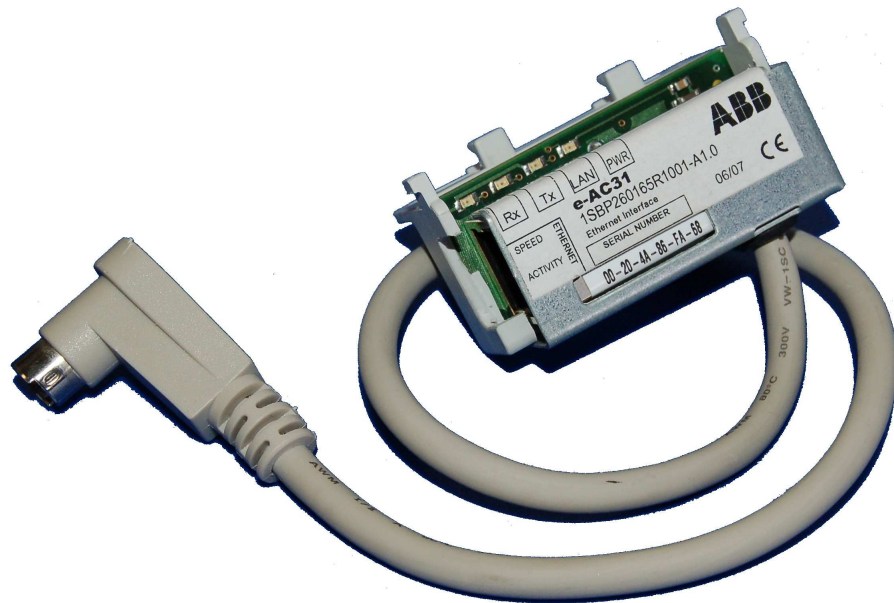
Ethernet Interface
e-AC31

1.2. General operating conditions

The e-AC31 was developed according to the European EC directives, the main national and international IEC 1131-1 and IEC 1131-2 standards and the EN61131-2 product standard concerning automation devices.

Ambient conditions	
- Temperature:	
operation: horizontal	0°C to + 55°C
vertical	0°C to + 40°C
storage	- 40°C to + 75°C
transport	- 25°C to + 75°C
- Humidity:	DIN 40040 class F without condensation
annual average	≤ 75%
up to 30 days per year	95%
occasionally	85%
- Atmospheric pressure:	DIN 40050
operation	≥ 800 hPA (≤ 2000 m)
storage	≥ 600 hPA (≤ 3500 m)
Mechanical data	
- Protection index	IP20
- Vibration stress	CEI68-2-6 test Fc
- Shock stress	CEI68-2-27 test Ea
Mains voltages	
- 5 V d.c.	Provide by the CPU (COM1)
Creepage distances and clearances	IEC 664 and DIN VDE0160
Insulation test	IEC 1131-2
Electromagnetic compatibility	
Immunity tests against:	
- Electrostatic discharge	IEC 1000-4-2 (level 3)
- Radiated fields	IEC 1000-4-3 (level 3)
- Fast transient bursts	IEC 1000-4-4 (level 3)
- High energy pulse	IEC 1000-4-5
- Conducted high frequencies	IEC 1000-4-6 (level 3)
Mountings	
- Direct on PLC	Mechanical mounting
Connections	
Power supply	Provide through MinDin by CPU.
RJ45	Ethernet connection : 10/100 Base T link.
MiniDin	RS232 connection to the PLC

Ethernet Interface
e-AC31

2. Technical specifications

Products	Description	References
e-AC31	Ethernet Interface	1SBP260165R1001

	e-AC31
Width x Height x Depth (in mm)	56 x 25,4 x 37,9
Weight	61 g
Power supply	
- Mains voltage:	
Nominal value (Provide by CPU)	5 V d.c.
- Consumption:	<2 W
- Cable length:	36 cm

3. Connection

3.1. Startup sequence

3.1.1. Power supply

Ethernet interface e-AC31 is powered by PLC through Mini din (circle) connector. This connector is also used for communication serial link. Connect cable into Mini din to power on the e-AC31

3.1.2. Power on sequence

- At startup the four LED are switched on during one second, then only PWR LED is on

- After nearly 6 seconds, e-AC31 starts a sequence to read data on serial communication port.

- During this phase the e-AC31 try different speed until communication is correct. During this exchange the slave number is read on PLC and, if this option is set (see Set IP paragraph), reads the memory zone where is stored the IP address.

3.2. Ethernet connection

Connect the RJ45 cable on e-AC31, the speed LED will be switch on and activity LED will blink depending on the network activity.

Color on speed LED indicates Network speed, amber color indicates a 10 Mb network, and green color indicates a 100 Mb network speed

Network activity LED indicates full or half duplex possibilities; amber color indicates half duplex network and green color indicates full duplex communication

3.3. MiniDin connection

The product has to be connected to the PLC by the MinDin on COM1

Ethernet Interface
e-AC31

3.4. Fixation on PLC

e-AC31 could be connected on the 2 sides of the PLC, top or bottom by a simple mechanical click. (see Figure bellow)

Position 2

e-AC31

Ethernet Cable

Ethernet Cable

e-AC31

Position 1

Example of the connection mostly used.

4. Basic configuration

4.1. Configuration in PLC on COM1

AC31Graf is used to program the AC31 40/50 series and in same time to configure communication port. It's possible with e-AC31 module to pass through the RJ45 via Ethernet connection, to program the CPU.

If any changes have been done in e-AC31 for serial connection, connect directly the e-AC31 on the CPU and change only the IP Address to connect the product to specific network (see , it will work.

To change the communication parameters from the serial link, use SINIT function.

For Modbus communication, only followings parameters are allowed by the protocol:

8 bit   No parity   1 stop bit.

In AC31Graph/Control Panel/PLC configuration, verify that communication mode is Modbus Slave. e-AC31 will automatically read the slave number.

Communication mode	MODBUS slave 1
RTS signal delay	Standard

WARNING 907AC1131 could only program CPU communication parameters and is not working through e-AC31.

4.2. IP address

IP address is stored in e-AC31. When power on, the parameters are verified in the PLC. If IP address is different from 0.0.0.0, e-AC31 will automatically keep this address.

4.2.1. IP address set by menu

During manufacturing IP address is set to default value which is:

10.33.152.76

Even if this address probably not allowed in your network, this address allows a local connection with computer where IP address has been manually set to fit to the subnet mask. Very near address such as 10.33.152.77 could be chosen for the computer.

Connect the computer to e-AC31 directly with a cross cable or using Ethernet switch.

The e-AC31 has integrated, easy to use, menu that gives possibility of setting all needed parameters.

This menu uses TELNET functionality, to connect to the e-AC31 use TELNET command in the DOS emulation command mode, or use Hyperterminal (select port 23 in the communication panel)

In DOS emulation command mode, enter TELNET 10.33.152.76, 10.33.152.76 is the default value of IP address. A first menu gives you information about software version; press enter to come to the main menu.

When arrived into the main menu, enter 0, this select the "Network configuration" then, as required, enters the IP address and all other information needed. Just press enter if you don't want to change the original value stored into parenthesis.

If this method is used, verify that in AC31Graph/Control Panel/PLC configuration, No IP address is already used.

| ➜ IP address for e-AC31 | No IP address |
| Cycle time declaration | 10 |

IP Address of e-AC31 is not stored in the PLC.

In this IP configuration menu, you can choose a specific topic that gives opportunity of reading the IP address into the PLC. Select Y (Yes) to validate this topic and refer to the following chapter.

4.2.2. IP address read into PLC memory

When the flag "Get IP address from PLC" is set to Yes, at startup, after nearly 6 second (the time leave for PLC initialization). The e-AC31 read information from PLC, then if information on IP configuration has changed the e-AC31 reboot other time.

During this procedure, the e-AC31 reads value stored into a specific system constant from central unit. This value identifies the MODBUS address of the first variable of area where are located the twelve Words used for IP configuration (four Words for IP settings, four Words for subnet mask and four Words for gateway IP address)

This procedure is available only when e-AC31 is set in MODBUS / TCP mode (mode 0 in TELNET menu 2)

1. With AC31GRAF programming software :

Since version V2.13,
this option is available via AC31GRAF/on-line/Control Panel/PLC Configuration: parameter "IP address for e-AC31" (see picture below)
(without use its value of MODBUS address, it is possible to select directly the first variable of area reserved for IP configuration)

Communication mode	MODBUS slave 1	MODBUS slave 1
RTS signal delay	Standard	Standard
➜ IP address for e-AC31	IP in MW0.0 ▼	No IP address
	No IP address	
	IP in MW0.0	
Cycle time declaration	IP in MW1.0	10
	IP in MW2.0	
	IP in MW3.0 ▼	

Store IP address from MW0.0(MSB) to MW0.3, subnet mask from MW0.4(MSB) to MW0.7, gateway IP from MW0.8(MSB) to MW0.11

Ethernet Interface
e-AC31

2. Words area available:

Parameter selection	IP address for e-AC31	System constant KW 00.14
No IP address	IP address configuration no stored in PLC	KW0.14 = 0
IP in MW0.0	Store the IP address from %MW0.0 to %MW0.11	KW0.14 = 8192
IP in MW1.0	Store the IP address from %MW1.0 to %MW1.11	KW0.14 = 8208
IP in MW2.0	Store the IP address from %MW2.0 to %MW2.11	KW0.14 = 8224
IP in MW3.0	Store the IP address from %MW3.0 to %MW3.11	KW0.14 = 8240
IP in MW4.0	Store the IP address from %MW4.0 to %MW4.11	KW0.14 = 8256
IP in MW5.0	Store the IP address from %MW5.0 to %MW5.11	KW0.14 = 8272
IP in MW6.0	Store the IP address from %MW6.0 to %MW6.11	KW0.14 = 8288
IP in MW7.0	Store the IP address from %MW7.0 to %MW7.11	KW0.14 = 8304
IP in MW8.0	Store the IP address from %MW8.0 to %MW8.11	KW0.14 = 8320
IP in MW9.0	Store the IP address from %MW9.0 to %MW9.11	KW0.14 = 8336
IP in KW22.0	Store the IP address from %KW22.0 to %MW22.11	KW0.14 = 12640
IP in KW23.0	Store the IP address from %KW23.0 to %KW23.11	KW0.14 = 12656
IP in KW24.0	Store the IP address from %KW24.0 to %KW24.11	KW0.14 = 12672
IP in KW25.0	Store the IP address from %KW25.0 to %KW25.11	KW0.14 = 12688
IP in KW26.0	Store the IP address from %KW26.0 to %KW26.11	KW0.14 = 12704
IP in KW27.0	Store the IP address from %KW27.0 to %KW27.11	KW0.14 = 12720
IP in KW28.0	Store the IP address from %KW28.0 to %KW28.11	KW0.14 = 12736
IP in KW29.0	Store the IP address from %KW29.0 to %KW29.11	KW0.14 = 12752
IP in KW30.0	Store the IP address from %KW30.0 to %KW30.11	KW0.14 = 12768
IP in KW31.0	Store the IP address from %KW31.0 to %KW31.11	KW0.14 = 12784

3. <u>With 907AC1131 programming software</u> :

This option is also available in 907AC1131, this configuration is realized with system constant %MW3000.14 to select the value of MODBUS address of the first variable of area reserved for IP configuration.

Words area available:

Parameter selection	IP address for e-AC31	System constant %MW3000.14
No IP address	IP address configuration no stored in PLC	%MW3000.14 = 0
IP in MW1000.0	Store the IP address from %MW1000.0 to %MW1000.11	%KW3000.14 = 8192
IP in MW1001.0	Store the IP address from %MW1001.0 to %MW1001.11	%KW3000.14 = 8208
IP in MW1002.0	Store the IP address from %MW1002.0 to %MW1002.11	%KW3000.14 = 8224
IP in MW1003.0	Store the IP address from %MW1003.0 to %MW1003.11	%MW3000.14 = 8240
IP in MW1004.0	Store the IP address from %MW1004.0 to %MW1004.11	%MW3000.14 = 8256
IP in MW1005.0	Store the IP address from %MW1005.0 to %MW1005.11	%MW3000.14 = 8272
IP in MW1006.0	Store the IP address from %MW1006.0 to %MW1006.11	%MW3000.14 = 8288
IP in MW1007.0	Store the IP address from %MW1007.0 to %MW1007.11	%MW3000.14 = 8304
IP in MW1008.0	Store the IP address from %MW1008.0 to %MW1008.11	%MW3000.14 = 8320
IP in MW1009.0	Store the IP address from %MW1009.0 to %MW1009.11	%MW3000.14 = 8336
IP in MW3022.0	Store the IP address from %MW3022.0 to %MW3022.11	%MW3000.14 = 12640
IP in MW3023.0	Store the IP address from %MW3023.0 to %MW3023.11	%MW3000.14 = 12656
IP in MW3024.0	Store the IP address from %MW3024.0 to %MW3024.11	%MW3000.14 = 12672
IP in MW3025.0	Store the IP address from %MW3025.0 to %MW3025.11	%MW3000.14 = 12688
IP in MW3026.0	Store the IP address from %MW3026.0 to %MW3026.11	%MW3000.14 = 12704
IP in MW3027.0	Store the IP address from %MW3027.0 to %MW3027.11	%MW3000.14 = 12720
IP in MW3028.0	Store the IP address from %MW3028.0 to %MW3028.11	%MW3000.14 = 12736
IP in MW3029.0	Store the IP address from %MW3029.0 to %MW3029.11	%MW3000.14 = 12752
IP in MW3030.0	Store the IP address from %MW3030.0 to %MW3030.11	%MW3000.14 = 12768
IP in MW3031.0	Store the IP address from %MW3031.0 to %MW3031.11	%MW3000.14 = 12784

5. Basic Operation mode

e-AC31 is plug and play module for AC31 range Ethernet connection.

At startup it automatically set serial speed according to the PLC defined speed.

It is possible to set IP address from PLC memory (only with MODBUS operating mode)

Default mode configuration is set to MODBUS/TCP mode

5.1. Connection through MODBUS/TCP

e-AC31 acts as a converter from MODBUS/TCP to MODUBS RTU, to uses this connection you should set the serial link COM1 of PLC into MODBUS mode. This is the factory default value.

Then you should configure your master (supervision) with IP address of the slave (defined in the e-AC31 of into PLC memory zone), set the slave number (defined in the PLC)

MODBUS/TCP communication uses TCP port 502, this is recommended standard value, this is default value set in the e-AC31.If necessary this could be changed in the TELNET menu.

The e-AC31 is ready to run, just connect the master and read or write data in the PLC using the same address as in RTU (see documentation for details), as example MW0.0 is stored in address 8192.

e-AC31 is able to manages communication coming from two master at the same time.

5.2. Programming through Ethernet

e-AC31 gives opportunity of programming through Ethernet. As soon as a communication coming from AC31Graf is detected, all the master MODBUS/TCP communications are suspend. The PLC is automatically switched from MODBUS communication into programming mode.

The last version of AC31Graf has additional feature to manage Ethernet communication, for previous version, it will be necessary to uses some specific software known as "com port redirector" easy to use and download on internet. The function of this kind of software is to transfer all data normally directed to physical serial port to new virtual Ethernet connection.

WARNING :

Pay attention that with Reset (WARM) or Cold Start (KALT) commands, the answer from the PLC (confirmation message) can not be returned to AC31GRAF, so Time out message appears.
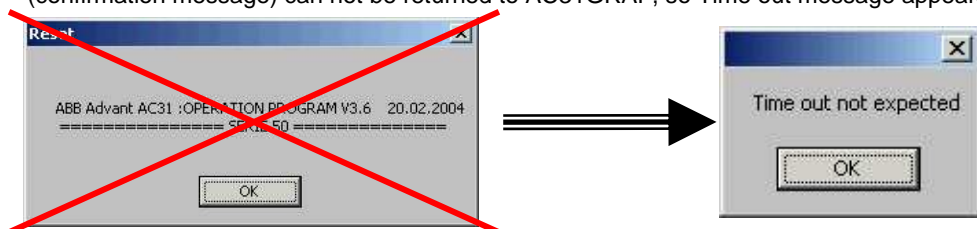
Click on OK and the following message will appear. Click a second time on OK to valid.

5.3. Ethernet software configuration

Software configuration is accessible using the network.

5.3.1. Connection to configuration menu with network connection

To connect to the e-AC31use the TELNET software. TELNET is a terminal mode under network connection and is always included in the Windows software package. The command to call TELNET is as follows (from the DOS command window):

TELNET <IP> <port>

where <IP> is the IP address in decimal mode separated by dots, e.g. 10.33.152.77

where <port> is the TCP port used for connection. The default standard is 23, so it is not necessary to add this value in the command. For example to connect to a brand new e-AC31(with default factory-set values):

TELNET 10.33.152.76

On some recent Windows packages (WIN2000 ….) hyper terminal mode gives the possibility of network connection using Win sock instead of COMx connection. This software can be used to configure e-AC31(in this case TCP channel can be set to 23)

5.3.2. Entering the setup menu

Immediately after connection, e-AC31displays an interface enabling you to select setup or monitor mode. Monitor mode is an advanced menu that allows you to read and write data from and to the setup memory. This is an expert mode and fairly complex. It will be described in another specific document.

In the first configuration menu wait a few seconds before pressing the enter key to switch to setup menu. Some interesting information is displayed. See in the following line some examples of this display:

```
*************   ABB ------  e-AC31 *************


MAC address xxxxxxxxxxxx
Software version xxxxxxxxxx (xx/xx/xx)


Press Enter to go into Setup Mode
```

the MAC address is the unique hardware address of each e-AC31,

In the second line the software version is displayed (with date in parentheses) followed by the library version number.

After pressing ENTER the display goes to setup menu mode as the following lines show:

Ethernet Interface
e-AC31

```
*************  ABB ------  e-AC31 *************


******** Network parameters ********
IP Address : 10.33.152.76
No gateway set
e-AC31 is in slave MODBUS/TCP mode
Source Port     : 00502
******** Serial communication port ********
Baudrate 9600 Bauds
 8 Bits, No parity, 1 Stop bit, No flow control


******** Configuration menu ********
  0: Network configurations
  1: Serial line parameters
  2: Operation mode
  3: Factory defaults
  4: Exit without save
  5: Save and exit
  6: English/Francais
```

The first part displays the current configuration values, with current IP address, current working mode (in the example e-AC31is in MODBUS/TCP slave mode) and the serial lines parameters.

Then the choice menu is displayed, with the number and the corresponding choice:

5.3.3. Network configurations

The menu is used to configure the e-AC31to be recognized by your network. Please ask your local network manager before setting values.

IP Address:

Enter this menu by pressing "0" + "Enter". e-AC31asks you for the IP address, and the current value of each byte is displayed in parentheses. If you don't want to change the byte value, just press the Enter or period key. The system displays the next byte. If modification is necessary just enter the new value in decimal mode followed by the Enter or period key.

Gateway address:

This address is used when you need to go out of the internal network, using a server or a router. You must enter the address specified in our server or router. If you need this option, answer Y to the following question: "Set Gateway IP Address and subnetmask <N>". The current value is displayed in parentheses. If no modification is needed just press the Enter key.

The procedure for changing the gateway IP address is the same as for setting the IP address.

Netmask

Netmask defines your local sub network. e-AC31checks if the required address fits this sub netmask to check if the remote module is in your local sub network. If not, the Gateway IP address is used to route to the final destination.

The procedure for entering the netmask is the same as for entering an IP address.

Get IP parameters from PLC <Y>

Get IP parameters from PLC, defines that e-AC31 will take IP address in the PLC.

Change ID name

It's possible to add a name to the product.

5.3.4. Serial line parameters

This menu is used to determine serial link parameters. Some parameters are not accessible if switch 1 is set to the on position (see chapter on switch configuration). For each parameter, the current value is shown in parentheses. If no modification is needed, just press Enter.

Setting the baudrate: enter the required baudrate value from the following list

300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200

If there is no modification of the current value, just press the Enter key. This setting is not accessible if switch 1 is on.

Setting character size: enter the character size (7 or 8 bits). This value is not accessible if switch 1 is on.

Input parity (0, 1, 2): 0: no parity, 1: Odd parity, 2: Even parity, this value is not accessible if switch 1 is on.

Input number of stop bit (1 or 2). This value is not accessible if switch 1 is on

Input flow control: 0 no flow control, 1 XON/XOFF control

5.4. Software operating mode configuration

You can choose between the 4 following modes. In addition, in Modbus® /TCP slave mode you will be able to use two additional functions, to improve system performance: Asynchronous mode and Modbus® Easy Net mode (more detailed description in the next chapter).

This menu is used to select the working mode from the following menu that is displayed afterwards:

---

e-AC31 is in slave MODBUS/TCP mode

    0: slave MODBUS/TCP mode
    1: transparent server mode
    2: transparent client mode
    3: MAIL mode

Each selected menu displays a new menu with the parameters required for the selected operation. The first line indicates the current operating mode. If no modifications are required just press Enter.

5.4.1. Slave MODBUS/TCP mode, simple use

Choose "0". The subsequent menu requests:

Source port: This is the TCP channel used for MODBUS/TCP communication. Usually the value is 502, but this value can be changed (any number from 1 to 65536, except 23 which is reserved for TELNET configuration), to correspond to the master configuration.

Slave Timeout: This is the timeout value expressed in ms for receiving the slave response. This value is specifically used when there are two masters. This time is allowed to elapse before sending the request from the second master if there is no response. This timeout value is also used to manage the concentrator mode

Enable automatic switch MODBUS-DIRECT mode <Y>: This parameter enables functioning of automatic switch mode from MODBUS/TCP to transparent mode. See Chapter 5.4.4 If the parameter is Y (Yes) the next parameter line is displayed, otherwise the next parameter is not necessary.

5.4.2. Asynchronous mode : Modbus® Data table exchange

Asynchronous list<Y>: This parameter validates the concentrator operation mode. If Yes is selected, the following parameters are requested to define a list of MODBUS requests managed asynchronously from the Ethernet communication. The result catch from the serial slave is built in a data table in the e-AC31. This table can be read with a limited number of requests. The limitation is 119 Words for each request. Response time is then fully optimized

Frame delay: Enter the wait time generated between each request in ms. Default value is 0, so it will depend on the CPU cycle time.

Result address: Enter MODBUS address of the result table. The default value is **31000**. This value can be modified if it is not in the supervisor range. Table is 1200 words in length, but only 119 words can be read in the same request (MODBUS limitation).

Request address: Enter MODBUS address of the configuration table. The default value is **30000.** The table contains 12 requests: each request uses 4 words; the first is the function code, the second is the MODBUS address, and the third is data size. The table should be read or write only with one MODBUS request, starting at the <Request address> value. Warning! The data modified using the MODBUS write command are not stored in flash memory and will be lost if the power supply is interrupted.

Request: this value is only displayed. it indicates, from 1 to 12, the number of request which parameter follows

Function: Enter the MODBUS function code. The following table shows the permitted function code in the request table:

Function code	Function description
1 or 2	Read bit
3 or 4	Read word
15	Write bit
16	Write word

```
 0: slave MODBUS/TCP mode
 1: transparent server mode
 2: transparent client mode
 3: MAIL mode
         0
Source Port     : 00502
Slave timout (2000)
Enable automatic switch MODBUS-DIRECT mode <N>
Asynchronous list <Y>
Frame delay:0
Result address:31000
Request address:30000
Request:1
  Function:15 Modbus address:5088 Data size:16
Request:2
  Function:0
```

Enter 0 in this parameter to end the input table.

Modbus address: Enter Modbus address of the slave data

Data size: Enter amount of data exchanged, limited to 100 words for each request, i.e. 1600 bit in the case of function codes 1, 2 and 15.

Example:

15 function: Write in Modbus, one bit in address 5088.

Minimum size for bit is 16, and modulo 16.

Afterwards, end the table configuration by 0 for function.

5.4.3. Specific Modbus Easy Net function.

This mode allows data exchange between any MODBUS slave connected to e-AC31, without Modbus master operation. Data are exchanged between the different e-AC31participants connected to the Modbus/TCP network using specific data tables. These tables are updated with slave data using the asynchronous mode.

The first step is to create the data exchange table, as in Asynchronous mode. Please refer to last paragraph

After creating the data exchange table, follow the menu.

Data Exchange <N>: type "Y" for Yes

Destination port: 00025 by default. All the e-AC31which exchange data together must have the same port. You can use 1 to 65536.

Destination IP: <000> Enter the address you want. Press Enter or "." to validate or go to the next parameter.

Destination IP: <010> <33> <152> <076>, "0" at the end is used to send to all the addresses of the network which are on the same port.

Refresh delay <250>: Delay between 2 transmissions of tables in milliseconds. Minimum value "0" means as far as possible, do not overload the network. Maximum value: 65636. This refresh delay has to be less than all the timeouts from the other e-AC31.

Refresh timeout <512>: If no answer is received from anyone when this timeout has elapsed, 2 choices are available: reset or keep the values. The choice is made using the next parameter.

Reset Value on timeout : <Y> Choose between "Y" to reset the values or "N" to not reset the values.

Number of blocks exchanged < 12> From 1 to 12 is the result of the Table. You can send just a part of the table (always from the beginning).

You come back to the Menu. Save and Exit by pressing "5" option.

Function code associations:

Function code	Function description	Associated function	Associated function code
1 or 2	Read bit	Write bit	15
3 or 4	Read word	Write word	16
15	Write bit	Read bit	1 or 2
16	Write word	Read word	3 or 4

Ethernet Interface
e-AC31

Example:

In this example, we will use 3 different products, which exchange some variables.

e-AC31N°1 : IP 10.33.153.76 Will give access to all the information from the table to the 2 other e-AC31s

e-AC31N°2 : IP 10.33.153.77 Will give access to all the information from the table to the 2 other e-AC31s

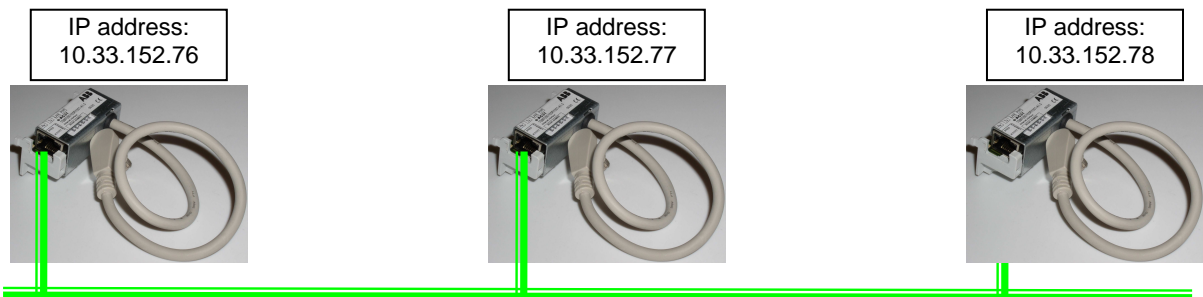**e-AC31N°3** : IP 10.33.153.78 Will give access to all the information from the table to e-AC31N°2

IP address: 10.33.152.76	IP address: 10.33.152.77	IP address: 10.33.152.78

Table 1

Read word: f 4
Write word: f 16
Write word: f 16
Write word: f 16
Read word: f4

This table will be exchanged with all tables

Table 2

Write word: f 16
Write word: f 16
Read word: f4
Read word: f4
Write word: f 16

This table will be exchanged with all tables

Table 3

Write word: f 16
Read word: f4
Write word: f 16
Read Bit: f 1

Restriction on the IP address 10.33.152.77, so it will be able to send to the e-AC31 N°2, only what it read in the slave.
Only the 3 first requests will be sending. But it can receive all the information when the requests are corresponding.

Source Port   : 00502
Slave timout (2000)
Enable automatic switch MODBUS-DIRECT mode <Y>
Asynchronous list <Y>
Frame delay: 0
Result address:31000
Request address:30000
Request:1
  Function:4 Modbus address:5088 Data size:1
Request:2
  Function:16 Modbus address:3000 Data size:4
Request:3
  Function:16 Modbus address:992 Data size:2
Request:4
  Function:16 Modbus address:0476 Data size:1
Request:5
  Function:4 Modbus address:1233 Data size:1
Request:6
  Function:0
Data Exchange <N>
Destination Port : **01000**
Destination IP   : (010). (033). (152). (0)
Refresh delay (250)
Refresh timeout (512)
Reset value on timeout <Y>

Source Port   : 00502
Slave timout (2000)
Enable automatic switch MODBUS-DIRECT mode <Y>
Asynchronous list <Y>
Frame delay: 0
Result address:31000
Request address:30000
Request:1
  Function:16 Modbus address:88 Data size:1
Request:2
  Function:16 Modbus address:300 Data size:4
Request:3
  Function:4 Modbus address:502 Data size:2
Request:4
  Function:4 Modbus address:76 Data size:1
Request:5
  Function:16 Modbus address:233 Data size:1
Request:6
  Function:0
Data Exchange <N>
Destination Port : 01000
Destination IP   : (010). (033). (152). (0)
Refresh delay (250)
Refresh timeout (512)
Reset value on timeout <Y>

Source Port   : 00502
Slave timout (2000)
Enable automatic switch MODBUS-DIRECT mode <Y>
Asynchronous list <Y>
Frame delay: 0
Result address:31000
Request address:30000
Request:1
  Function:16 Modbus address:588 Data size:1
Request:2
  Function:4 Modbus address:100 Data size:4
Request:3
  Function:16 Modbus address:3572 Data size:2
Request:4
  Function:1 Modbus address:650 Data size:16
Request:5
  Function:0
Data Exchange <N>
Destination Port : 01000
Destination IP   : (010). (033). (152). (077)
Refresh delay (250)
Refresh timeout (512)
Reset value on timeout <Y>
Number of block exchanged (3)

WARNING: The e-AC31 will compare the table request by request. So beginning your tables always by the information you want to exchange with the others e-AC31

5.4.4. Automatic switch from MODBUS/TCP to direct mode

This mode enables automatic switching from MODBUS mode to direct (transparent mode). The change is performed when the connection is in MODBUS mode and it arrives with a frame that is not a MODBUS frame.

When this new connection or new frame is received by the e-AC31, it sends a specific frame to convert the PLC to programming mode. When the connection is closed, the e-AC31 returns to MODBUS mode, after sending a frame to switch the PLC back to MODBUS mode.

While the direct connection is open, if a MODBUS connection already exists, exception code 6 (device busy) is sent to the master when each request is made. This normally generates no timeout and the whole network's efficiency is maintained.

5.4.5. Transparent server mode

Choose 1 in the menu. The menu displayed asks for:

Source port: This is the TCP channel (from 1 to 65536, except 23 which is reserved for TELNET configuration) used to communicate in transparent mode.

1st ASCII code for pack data (0): This is the ASCII code that is check for Ethernet sending decision. The e-AC31 makes it possible to group characters before sending the frame to Ethernet. One or two characters can be defined. The main example is to send the frame when a Carriage return followed by a line feed needs to be detected to send the frame to Ethernet. If both the 1st and 2nd characters are set to 0 the Ethernet frame is generated for each received character.

2nd ASCII code for pack data (0): second ASCII code for pack decision.

5.4.6. Transparent client mode

Choose "2" in the menu. The menu displays asks for:

Destination IP: Enter the server IP address, using the same procedure as entering your own IP address.

Destination Port: Enter server destination port (from 1 to 65536)

Connection with HAYES command <Y>: Enter the HAYES command used for connection. If the response is N (No), the subsequent menu lines ask for the characters (1 or 2) needed for connection

1st ASCII code for connection command (13): 1st character for connection decision

2nd ASCII code for connection command (0): 2nd character for connection decision. The procedure is the same as for the packing decision. If both parameters are set to 0, connection is generated with any character.

1st ASCII code for pack data (0): this character is used for the packing decision (generate Ethernet frame) when connection is established. The procedure is the same as in server mode.

2nd ASCII code for pack data (0): second character for pack decision, using the same procedure as in server mode

5.4.7. Mail mode

In this mode e-AC31is able to send simple and limited text mail to two different receivers with a simple text command.

Choose "2" in the menu. The menu displayed asks for:

SMTP server IP address: enter the SMTP server IP address (procedure is the same as entering your own IP address)

Mail server TCP port: Enter the TCP port for mail server, default value 25. This value can be modified to correspond to a specific SMTP server

Mail recipient 1: (mail1@fr.abb.com): Mail recipient 1: Enter (with limit of 48 characters) mail addresses of the first mail recipient. To delete the value just press the space bar and Enter key. If no modification is required, press Enter

Mail recipient 2: (mail2@fr.abb.com): Enter (with limit of 48 characters) mail addresses of the second mail recipient. To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Domain name (e-ILPH.com): Enter (with limit of 23 characters) the domain name of e-AC31(sender of message). To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Unit name (e-ILPH): Enter (with limit of 23 characters) the unit name of e-AC31(sender of message). The mail sender address will be generated by adding the Domain name and unit name separated by @ such as UnitName@ DomainName. To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Message 1 (Subject): Enter (with limit of 23 characters) the subject of the message. To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Message 2 (First line): Enter (with limit of 23 characters) the first line of the message. To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Message 3 (Second line): Enter (with limit of 23 characters) the second line of the message. To delete the value just press the space bar and Enter key. If no modification is required, press Enter.

Connection with HAYES command <N>: Enter the HAYES mode command is used for connection. If the response is N (No), the next menu lines ask for the characters (1 or 2) needed for connection

1st ASCII code for connection command (13): 1st character for connection decision. If the connection is successful it will automatically send mail

2nd ASCII code for connection command (0): 2nd character for connection decision. The procedure is the same as for the packing decision. If both parameters are set to 0, connection is generated by any character.

5.5. Factory setting

Name	Value	Description
IP Address	10.33.152.76	IP Address from e-AC31
Speed	9600	Speed of serial line, valid if switch configuration is inactive
Size	8	Size of serial line character
Parity	No	No parity in the character frame, valid if switch configuration is inactive
Stop bit	1	One stop bit in the frame, valid if switch configuration is inactive
Flow control	0	No flow control
MODBUS	Yes	e-AC31is in server configuration mode with MODBUS/TCP protocol
Source port	502	Default value for MODBUS/TCP protocol
Asynchronous list	No	Flag for concentrator mode operation
Frame delay	0	Delay between two asynchronous requests
Result address	31000	MODBUS address of result table
Request address	30000	MODBUS address of asynchronous list configuration table
Request table	0	All request table values are set to 0
Remote port	25	Remote destination port in client mode
CarCon1	13	Character trigger 1 for connection (default value is carriage return)
CarCon2	0	Character trigger 2 for connection, only one character will be checked
CarPack1	0	Character 1 for pack decision (TCP frame will be created on each character received on serial line)
CarPack1	0	Character 0 for pack decision, (TCP frame will be created on each character received on serial line)
SMTP Port	25	Port number of remote mail SMTP server
Recipient1	mail1@fr.abb.com	First mail recipient for automatic mail transfer
Recipient2	mail2@fr.abb.com	Second mail recipient for automatic mail transfer
Domain	e-ILPH.com	Default domain name of sender
Unit	e-ILPH	Default mail address sender will be e-ILPH@e-ILPH.com
Subject	This is the subject	Subject of the mail
First line	This is first line	First line in the text of mail
Second line	This is second line	Second line in the text of mail

All IP addresses will be kept as previously defined

5.6. Exit without save

Choose "4" to cancel all modifications. All the parameters are stored during the configuration in volatile memory.

5.7. Save and exit

Choose "5", to validate all modifications. After saving, the e-AC31will reset automatically. If connections are still active, they will be cancelled.

5.8. English/Français

This menu allows you to change configuration menu language; the value will be kept in non-volatile memory for the next connection.

Choose "6" to change the language and 0 for English or 1 for French

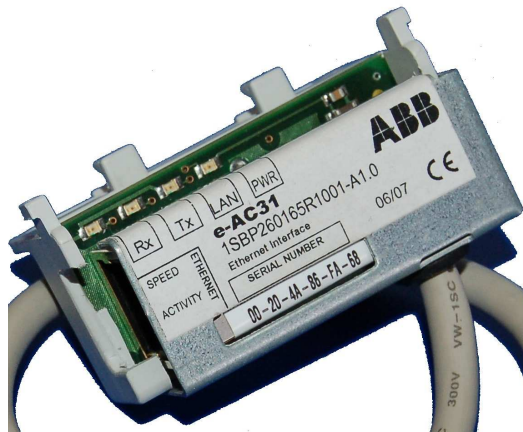The menu is displayed again, in the selected language.

6. Display (LED) description

Power: indicates correct power supply on the product

LAN: indicates TCP connection is currently active on this e-AC31

TXD: light during transmission on serial port

RXD: Light during reception on serial port

Ethernet speed: indicates current network speed:

Amber color: 10 base-T connection, Green color: 100 base-T connection

Ethernet activity: Momentary amber color:

Half duplex activity, Momentary green color: Full duplex activity

7. Hayes commands (In mail mode)

Hayes commands are used in Mail mode; there is a command for configuration, display values and a command for connection. The commands are not case-sensitive

7.1. Configuration command:

ATM1 or ATM2: Set mail recipient 1 and 2, followed by 48 characters max. If the command is sent alone (with no following characters) the mail recipient will be deleted

ATMU: set unit name, followed by 23 characters max. If the command is sent alone (with no following characters) the unit name will be deleted

ATMD: set domain name followed by 23 characters max. If the command is sent alone (with no following characters) the domain name will be deleted.

ATMS1, ATMS2, and ATMS3: set message 1, 2 or 3, message 1 is the subject of mail, others are lines of body. Limited to 23 characters. If the command is sent alone (with no following characters) the message will be deleted.

7.2. Display command:

ATL: Display command; shows the current configuration (IP address of server mail recipient etc.)

7.3. Connection command:

ATDT: Connection command. This command will automatically generate connection to the remote SMTP server and send mail to the recipients

8. Monitor mode

Monitor mode is an expert mode that makes it possible to set configurations more efficiently than in the configuration menu.

8.1. Enter monitor mode with Ethernet connection

Connect to the e-AC31using TELNET or hyper terminal with a sock IP connection. In the first menu, instead of the Enter key press the M key to switch automatically to monitor mode

8.1.1. Command Response Codes

Response	Meaning
0>	OK; no error
1>	No answer from remote device
2>	Cannot reach remote device or no answer
8>	Wrong parameter(s)
9>	Invalid command

All the commands accessible in monitor mode are described in detail in a specific document. Here is the description of the most important one as is it can be used often to set the IP address for production or installation tools.

8.1.2. Command co:

This command is used to set the IP address and gateway address, and also to define the port number and number of host bits. The command memorizes the new value and then generates a reset. Communication will be lost because of this reset. An X is sent by e-AC31before reset if the command is successful

  co IP1.IP2.IP3.IP4 N GIP1.GIP2.GIP3.GIP4 P

Where:

IP1.IP2.IP3.IP4 is the e-AC31IP address

N is the number of host bits

GIP1.GIP2.GIP3.GIP4 is the gateway IP address

P is the port number. Entering 0 will generate the factory default configuration after the reset.

8.1.3. Command NC:

This command shows the current network configuration

Here is an example of a result given by the NC command on an e-AC31whose IP address is 010.033.152.077, with no gateway set and a mask definition of 255.000.000.000 (network class A)

IP 010.033.152.077 GW 000.000.000.000 Mask 255.000.000.000

8.1.4. Command QU

This command quits the monitor mode. This is not necessary when using the co command.

9. Expert debugging mode

9.1.1. Trace debug with telnet

Telnet connectivity makes it possible to debug serial communication by tracing communication exchanged on the serial port. This debug tool is accessible on the main menu by entering menu 66 (this menu command is not shown on the list to reserve access for the expert team).

9.1.2. Trace debug in MODBUS communication

The following trace shows an example that could be encountered in MODBUS communication:

Connection established

From TCP:[73][2][0][0][0][6]<1><3><0><99><0><10><53><211>Wait:31

(1)(3)(20)(0)(110)(110)(101)(99)(116)(105)(0)(0)(0)(0)(0)(110)(101)(99)(116)(105

)(111)(110)(32)(101)(115)(0)(0)(0)(0)(0)(110)(101)(99)(116)(105)(111)(110)(32)(1

01)(115)(116)(97)(98)(108)(105)(0)(0)(0)(0)(0)(101)(99)(116)(105)(111)(110)(3

2)(101)(115)(116)(97)(98)(108)(105)(115)(104)(101)(100)(13)(10)(0)(0)(0)(163)(10

3)(0)(101)(99)(116)(105)(111)(110)(32)(101)(115)(116)(97)(98)(108)(105)(115)(104

)(101)(100)(13)(10)(0)(32)(67)(111)(110)I = 31/CRC OK /Packed

From TCP:[74][2][0][0][0][6]<1><3><0><99><0><10><53><211>Wait:31

(1)(3)(20)(0)(0)(0)(101)(99)(116)(105)(111)(0)(0)(0)(0)(0)(101)(99)(116)(105

)(111)(110)(32)(101)(115)(116)(0)(0)(0)(0)(0)(101)(99)(116)(105)(111)(110)(32)

(101)(115)(116)(97)(98)(108)(105)(115)(0)(0)(0)(0)(0)(0)(0)(163)(103)(111)(11

0)(32)(101)(115)(116)(97)(98)(108)(105)(115)(104)(101)(100)(13)(10)(0)(32)(67)(1

11)(110)I = 31/CRC OK /Packed

From TCP:[75][2][0][0][0][6]<1><3><0><99><0><10><53><211>Wait:31

(1)(3)(20)(0)(0)(0)(0)(163)(103)(111)(0)(0)(0)(0)(0)(0)(0)(163)(103)(111)(

110)(32)(101)(115)(116)(0)(0)(0)(0)(0)(0)(0)(163)(103)(111)(110)(32)(101)(115

)(116)(97)(98)(108)(105)(115)(0)(0)(0)(0)(0)(0)(0)(163)(103)(111)(110)(32)(10

1)(115)(116)(97)(98)(108)(105)(115)(104)(101)(100)(13)(10)(0)(0)(0)(163)(103)(0)

(0)(0)(163)(103)(111)(110)(32)(101)(115)(116)(97)(98)(108)(105)(115)(104)(101)(1

00)(13)(10)(0)(32)(67)(111)(110)I = 31/CRC OK /Packed

Trace:

Passive mode: Listen for Connection on port: 502

All data are displayed in decimal mode. Each byte is inserted in **( )** or **[ ]**. Data in **( )** are exchanged physically on the serial line, data in **[ ]** are additional byte exchanges on the TCP level.

The byte following the indication **From TCP** is the request. This message is followed by **Wait: nn**. This is the number of bytes to wait for a response. This number is calculated from the function code and the amount of data requested

The trace which follows this request line contains the byte received on the serial line. At the end of the frame **I=nn** indicates the number of received characters, **CRC OK** indicates that CRC coming from serial line is OK, and **Packed** indicator shows the message has been sent to the TCP connection.

When the connection is stopped a message indicates on which port TCP connection can occur.

9.1.3. Trace debug in SMTP communication

The following example shows an exchange between e-AC31and SMTP server mode

```
DEBUG TELNET Press any key to exit
Trace:<10><13>Active mode : Connection to port : 25
Trace:<13><10>Connection established<13><10>
From TCP:220 ArGoSoft Mail Server Freeware, Version 1.8 (1.8.6.0)<13><10>
To TCP:HELO e-AC31.com<13><10>
From TCP:250 Welcome  [10.33.152.77], pleased to meet you<13><10>
To TCP:MAIL FROM:e- AC31@e- AC31.com<13><10>
From TCP:250 Sender "e- AC31@e- AC31.com" OK...<13><10>
To TCP:RCPT TO:michel.combat@fr.abb.com<13><10>
From TCP:250 Recipient "michel.combat@fr.abb.com" OK...<13><10>
To TCP:DATA<13><10>
From TCP:354 Enter mail, end with "." on a line by itself<13><10>
To TCP:Subject: This is the subject<13><10><13><10>
To TCP:This is first line<13><10>
To TCP:This is second line<13><10>
To TCP:<13><10>.<13><10>
From TCP:250 Message accepted for delivery. <vfohn5tzvdms0uo.220720041023@FR-W-K
KHMN9F><13><10>
To TCP:QUIT<10><13>
From TCP:221 Aba he<13><10>
Trace:<13><10>Disconnect<10><13>
```

In this trace text we can see trace information, such as **Active mode: Connection to port: 25** when the connection starts.

Some messages are specific to the SMTP protocol, such as commands like HELO, MAIL FROM etc.

At the end of the connection we see the information trace for Disconnect.

10. Update firmware

Firmware update is performed via the Ethernet connection. The functionality uses the tftp function implemented into the Windows package. The firmware update is a ROM extension file. To update, launch this command in the DOS window (Start/execute and type "cmd") from the directory where the e-xxx01-06-2007V200.ROM file is located. "01-06-2007" is the date and "200" the version number (example with 2.0 version number).

    tftp -i 10.33.152.76 PUT e-xxx01-06-2007V200.ROM X2

Where 10.33.152.76 is the remote IP address of the e-AC31to be updated

The update time is about 1 second using the 100 Mb network. The e-AC31will be automatically reset once the update is finished.

Ethernet Interface
e-AC31

11. Dimensions

360 mm

25,4 mm

Rx   Tx   LAN PWR

e-AC31 **ABB**

1SNA684254R0400
Ethernet module for
AC31 serie 40&50

Front view

Side view 1

56,0 mm

Back view

Side view 2

37,9 mm