



AUTOMATIC CALL MODEM

GEN Indus



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TABLE OF CONTENTS

NOTE AT THE REQUEST OF THE REGULATION AUTHORITIE.....	6
I - GENERAL INFORMATION.....	7
II - DESCRIPTION.....	8
III - INSTALLATION.....	8
III.1 - INTRODUCTION	8
III.2 - CONNECTION TO THE PSTN (PUBLIC SWITCHED TELEPHONE NETWORK)	8
III.3 - CONNECTION TO THE COMPUTER.....	9
III.4 - POWER SUPPLY	9
3.4.1 - <i>Operating principle</i>	9
3.4.2 - <i>Power consumption</i>	10
3.4.2.1 <i>Mother board</i>	10
3.4.2.2 <i>Extension board</i>	10
III.5 - CONNECTIONS (SCREW CONNECTORS)	11
III - 6 CONNECTIONS (EXTENSION BOARD)).....	12
IV - CONFIGURATION.....	12
IV.1 - MODEM CONFIGURATION	13
V - FUNCTIONS CONTROLLED.....	14
V.1 - ENUMERATION.....	14
V.2 - GENERAL OPERATION.....	14
V.3 - AUTOMATIC ANSWERING	15
V.4 - AUTOMATIC CALLING	16
V.5 - V23 TURNAROUND	17
V.6 - HALF DUPLEX.....	17
V.7 - RS485A.....	20
V.8 - TRANSMISSION ON TIMEOUT	21
VI - LEASED LINE OPERATION	22
VI.1 - POINT TO POINT LEASED LINE.....	22
VI.2 - MULTI-POINT LEASED LINE.....	22
VII - OPERATION OF THE INPUTS/OUTPUTS.....	23
VII.1 - INPUTS.....	23
VII.2 - OUTPUTS	23
VIII - HAYES COMMANDS	24
VIII.1 - GENERAL PRINCIPLES.....	24
VIII.2 - AT COMMAND.....	24
VIII.3 - ESCAPE COMMAND +++	24
VIII.4 - AT COMMANDS IN ALPHABETICAL ORDER	25
8.4.1 - <i>AT command</i>	25
8.4.2 - <i>AT& command</i>	29
8.4.3 - <i>AT% command</i>	33
8.4.4 - <i>AT\ command</i>	34
8.4.5 - <i>AT* command</i>	37
8.4.6 - <i>AT- command</i>	38
8.4.7 - <i>AT+ command</i>	39
8.4.7 - <i>AT! command</i>	46
IX - TABLE OF MESSAGES TRANSMITTED BY THE MODEM.....	50
X - HAYES REGISTERS.....	53
XI - SUMMARY OF THE COMMANDS BY ACTIONS.....	62

XI.1 - DCD, DTR, DSR, RTS SIGNAL HANDLING	62
XI.2 - OPERATIONS ON THE NON-VOLATILE MEMORY	62
XI.3 - SPEED / FORMAT / MODE COMMANDS	62
XI.4 - COMMANDS INFLUENCING THE CONNECTION.....	62
XI.5 - OPERATIONS ON THE REGISTERS.....	62
XI.6 - COMMANDS ON MODEM MESSAGES	62
XI.7 - GENERAL OPERATING COMMANDS	63
XI.8 - FLOW CONTROL.....	63
XI.9 - ERROR CORRECTION.	63
XI.10 - DATA COMPRESSION	63
XI.11 - SECURE CONNECTION	63
XII - LINE INACTIVITY CLOCK.....	64
XIII - LINE BAUD RATE – V24 BAUD RATE	64
XIV - SECURE CONNECTION FUNCTION	64
XIV.1 - INTRODUCTION.....	64
XIV.2 - PRINCIPLE USED	64
XIV.3 - SECURE CONNECTION BY PASSWORD	65
XIV.4 - SECURE CONNECTION BY CALL-BACK.....	65
XIV.5 - TO TAKE CONTROL OF A REMOTE MODEM	67
XIV.6 - MANUAL SECURE CONNECTION.....	67
XIV.7 - ADDITIONAL COMMANDS	68
XV - CONTROL OF INPUTS AND OUTPUTS.....	68
XV.1 - CALLING PRINCIPLE.....	70
XV.2 - TRANSFER PROTOCOLS.....	70
XV.3 - ALARM ACKNOWLEDGEMENT.....	71
XV.4 - PROGRAMMING.....	71
15.3.1 - Via the menu	72
15.3.2 - Via the Hayes® commands.....	83
XV.5 - INPUT TO OUTPUT REMOTE COPY FUNCTIONALITY.....	93
15.5.1 - Case 1 Copy between GEN INDUS (PSTN: Public Switched TelephNetwork.....	94
15.5.2 - Case 2 - GEN 44 i compatible copy (PSTN and GSM network).....	94
15.5.3 - Case 3 - Copy between GEN INDUS modems (Leased Line and V32 to V34 modulation	95
15.5.4 - Case 4 - Data transfer and re-transmission of inputs between Gen Indus (LL networks).....	96
15.5.5 - Case 5 - Data transfer and transmission of inputs to a Gen Indus (LL network).....	96
15.5.6 - Case 6 - Data transfer and reception of inputs from a Gen Indus (LL network).....	97
15.5.7 - Case 7 - Data transfer and copy of inputs between Gen Indus (LL multipoint network).....	98
XV.6 - CONTROL OF OUTPUTS BY DTMF CODES.....	98
15.6.1 - Application dedicated to the direct control of outputs.....	98
15.6.2 - Modem application and control of outputs.....	98
15.6.3 - Control method of outputs.....	98
XVI - CCITT V25 BISCOMMANDS.....	99
XVI.1 - GENERAL PRINCIPLES	99
XVI.2 - DIALLING COMMOMMANDAND	99
XVI.3 - DIAL WITH MEMORY COMMAND.....	100
XVI.4 - REPORTS	101
XVII - MODBUS® OPERATION	102
XVII.1 - SLAVE MODE	103
17.1.1 - Call sequence.....	104
17.1.1.1 - Outgoing call.....	104
17.1.1.2 - Incoming call.....	105
17.1.2 - Registers.....	105
17.1.3 - Function codes.....	106
17.1.4 - Description of the useable addresses.....	107
17.1.4.1 - Control of outputs.....	107
17.1.4.2 - Control of inputs	107
17.1.4.3 - Control of operating registers	108
17.1.4.4 - Control of input registers	111

17.1.5 - Command examples.....	113
XVII.2 - MASTER MODE.....	116
17.2.1 - Operation.....	117
XVII.3 - PROGRAMMING VIA THE MENU.....	117
XVIII - VOCAL MANAGEMENT	126
XVIII - 1 - PRINCIPLE.....	126
XVIII- 2 - COMMUNICATION.....	126
XVIII - 3 - IMPLEMENTATION.....	127
XIX - SCRIPT MANAGEMENT	128
XVIII - GENERAL COMMANDS.....	128
XX.1 - CHANGE PROTOCOL	128
XX.2 - DISPLAY THE CONFIGURATION	128
XX.3 - DISPLAY ERRONEOUS OR INEFFECTIVE NUMBERS.....	128
XX.4 - MODEM IDENTIFICATION COMMANDS.....	128
XXI - DOWNLOADING PROCEDURE	129
XXII - TECHNICAL DATA	130
XXII.1 - SCHEMATIC DIAGRAM OF AN INPUT.....	130
XXII.1 - SCHEMATIC DIAGRAM OF AN OUTPUT.....	130
XXII.2 - ANALOGUE INPUT CHARACTERISTICS	
XX.3 - CONNECTION EXAMPLE.....	131
20.3.1 - Inputs.....	131
20.3.2 - Outputs.....	132
22.3.3 - ANALOGUE INPUTS 4-20 mA.....	132
XXII.4 - TRANSMISSION FORMAT	132
XXII.5 - MODULATION TYPE.....	132
XXII.6. - INFORMATION BAUD RATE	133
XXII.7 - CARRIER FREQUENCIES.....	133
XXII.8 - OPERATING MODE.....	133
XXII.9 - LINE IMPEDANCE	134
XXII.10 - TRANSMISSION LEVEL	134
XXII.11 - RECEPTION LEVEL	134
XXII.12 - LINE CURRENT REGULATION	134
XXII.13 - DIALLING.....	134
XXII.14 - LOW POWER MODE.....	134
XXII.15 - OPERATING CONDITIONS AND MISCELLANEOUS INFORMATION.....	135
APPENDIX I.....	136
RS 232 CONNECTOR SIGNALS	136
FRONT VIEW OF THE RS232 "FEMALE" CONNECTOR ON THE GEN INDUS.	136
APPENDIX II.....	137
LIST OF CCITT COMMANDS BY FUNCTION	137
ALPHABETICAL INDEX.....	138

WARNING

- TO AVOID ANY RISK OF ELECTROCUTION, DO NOT OPEN THE MODEM
- NO USER-SERVICEABLE PARTS INSIDE
- THE MODEM MUST BE RETURNED TO THE FACTORY FOR ALL REPAIR WORK
- CONNECTION TO THE MAINS MUST BE A POWER SUPPLY ARRANGEMENT (NEUTRAL TO EARTH). A DIFFERENTIAL DEVICE MUST ASSURE THE PROTECTION OF THIS CONNECTION POINT
- THE MODEM MUST BE PLACED IN A NORMALLY VENTILATED PLACE, WELL AWAY FROM ANY HEAT SOURCES.
- IN ORDER TO GUARANTEE ELECTROMAGNETIC COMPATIBILITY, THE LENGTH OF THE V24 (RS232) CABLE MUST NOT EXCEED 3 METRES.

To make this documentation easier to use, you will find an alphabetical index at the end of it that resumes all the generally used terms.

In order to improve its products, GENER reserves the right to modify them at any moment and without prior notice

MNP is a registered trademark of Microcom Inc.
Hayes is a registered trademark of Hayes Microcomputer Product Inc.
ModBus[®] is a registered trademark of Modicon.

To differentiate between the 33600 and 14400 modem versions, refer to the markings on the side of the unit.

Identification: GEN INDUS -> 33600

Identification: GEN INDUS 144 -> 14400

Or use the software command AT10 that returns the maximum possible on-line speed 14400 or 33600.

Note at the request of the regulation authorities.

This equipment has received approval in compliance with decision 98/482/CE of the European Council, concerning the pan-European connection of a unique terminal to PSTN (Public Switched Telephone Network). Nevertheless, as PSTN differ from one country to another, the approval in itself does not constitute an absolute guarantee for optimal operation at each termination point in the PSTN.

In case of problem, you should first contact your supplier.

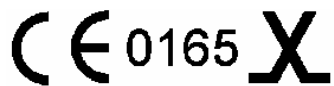
Declaration of network compatibility.

Our equipment is compatible with the networks in the following countries:

- | | | |
|-----------|---------------|------------------|
| - Germany | - France | - Portugal |
| - Austria | - Greece | - United Kingdom |
| - Belgium | - Ireland | - Sweden |
| - Denmark | - Italy | - Switzerland |
| - Spain | - Luxembourg | |
| - Finland | - Netherlands | |

In its original form, our equipment is configured to operate on the French network, but it can easily be adapted to the diverse national parameters by using the software parameters. Please contact us for these operations.

Statutory labels.



These markings appear on the underside of the unit.

- Decision ART n° 98423D dated the 28th July 1999.
- Address: Autorité de régulation des télécommunications
7 square Max Hymans
75730 Paris Cedex 15
Internet: www.art-telecom.fr
E-mail: courrier@art-telecom.fr

I - GENERAL INFORMATION

The GEN-INDUS is a multi-speed modem designed for asynchronous binary data transmission. This modem complies with the U.I.T.'s recommendations.

- V24, V28, V25 and V25 bis.
- full duplex, 2-wire: V21, V23, V22, V22 bis, V32, V32 bis, V34¹, V34+*
- half duplex, 2-wire: V23, V27ter, V29 and V17. (short train option in V17 and V27ter)

The GEN INDUS has successfully passed the conformance inspection according to the CTR21 and CTR15 specifications.

The GEN INDUS complies with the CE standards (electromagnetic compatibility).

The GEN INDUS complies with the EN 60950 standard (electrical safety).

The GEN INDUS also operates on a Leased Line (2 wires) in asynchronous mode

The GEN INDUS operates in automatic calling and answering mode according to the HAYES and V25 bis protocols of the CCITT. Many functionalities can only be accessed by using the HAYES commands (MNP protocol, secure connections, non volatile memory control, flow control, etc.)

This modem is also equipped with the following functions:

- 4 Alarm inputs that can trigger calls.
- 2 NO isolated outputs that indicate the call status.
- Error correction device according to the MNP4 protocol.
- Flow control between the modem and computer.
- Connection protected by password and/or call back.
- Remote control of the modem.
- Programmable clock for automatic disconnection in case of prolonged line inactivity.
- Automatic dialling from numbers stored in non-volatile memory.
- Automatic dialling on RTS or DTR signal.
- Dialling on change of state of an alarm input.
- Sound indicator for call monitoring and initialisation.
- Supply voltage monitor and watchdog.
- STN line protection

Additional functions provided by the extension board

- 4 Analogue inputs, 4-20 mA type
- Additional 8 digital inputs
- Additional 8 free potential NO inputs
- Real time clock for control of fixed date call.(Please consult us)

Available version

1. 4 Analogue inputs, 4-20 mA and 8 free potential digital NO inputs .

For other configurations, please consult us.

¹ Not available on the GEN INDUS 144.

II - DESCRIPTION

The GEN INDUS modem consists of a PCB placed in a box, designed to be fixed on a symmetrical rail with the following dimensions:

- Height: 120 mm
- Width: 45 mm
- Length: 135 mm

On the front panel there are:

- 4 light emitting diodes that indicate:
 - Presence of power PWR
 - Data reception RXD Circuit 104
 - Data transmission TXD Circuit 103
 - Signal detection DCD Circuit 109
- The connector for the V24 link
- The connector for the PSTN (Public Switched Telephone Network) or Leased Line

On the underside of the unit there are:

- The connectors for:
 - the protective earth
 - the RS485 interface
 - two control outputs
 - 4 digital inputs and their common point
 - the power supply.
- Micro-switches to configure the modem.
- The modular 8-pin jack for the extension boards via I2C bus.

On the side of the box is:

- The approval label.

III - INSTALLATION

III.1 - Introduction

Before doing anything, it is worthwhile checking that the modem is correctly configured and that all the elements required for its operation are present.

The modem is delivered in its packaging with:

- A telephone cable and plug
- Brief documentation.

III.2 - Connection to the PSTN (Public Switched Telephone Network)

The GEN INDUS modem is connected to the telephone line using the cable supplied with the unit.

This cable has a telephone plug that must be plugged into the wall socket of your telephone installation instead of the telephone. This telephone can then be plugged into the female part of the telephone plug.

III.3 - Connection to the computer

To connect to the computer via the V24 link, use a straight, 9-way - 9-way cable (AT compatible).

In order to guarantee electromagnetic compatibility, the length of the V24 cable must not exceed 3 metres.

To obtain detailed information on the signals used, please refer to appendix I.
It is advisable to connect the unit without power.

III.4 - Power supply

3.4.1 - Operating principle

Micro-switch 4, when set to ON, allows the modem to be woken up via hardware switching when alarm input 1 is closed. In this way, the GEN INDUS only consumes power when this input is active, inevitably by transition from OPEN to CLOSED. The GEN INDUS can only return into low power consumption mode if the alarm input becomes inactive.

Micro-switch 5, drives the modem power supply.

If it is ON, power is always supplied to the modem.

If it is OFF, the power supply is driven by the V24 DTR signal, the arrival of a ringing train or alarm input 1 switching into the closed state (if micro switch 4 is ON).

See paragraph "Low power consumption mode".

Micro-switch 6 selects the power supply type,

5 VDC or 7.5 to 48 VDC power supply via the converter implanted directly on the board.

- With micro-switch 6 ON, the converter is running and the modem can be supplied by a voltage of 7.5 to 48 VDC, via the pin of the marked screw terminal block.
- With micro-switch 6 OFF, the modem must only be supplied with 5 VDC, via the pin of the marked screw terminal block.

When the GEN INDUS is turned on, it emits a melody to indicate that the main functions are operational.

Comment: The GEN INDUS has resettable protective devices that normally prevent the unit from being damaged if it is connected incorrectly. When the protective devices have tripped, they must be left to cool down for a moment once the fault has disappeared, before being using the unit again.

TO AVOID MAKING A MISTAKE:

To ensure that all connections are made correctly, proceed as follows:

- Screw the wires into the terminals of the connector that is disconnected from the fixed connector,
- Set micro-switch 5 to ON,
- Set micro-switch 6 to OFF,
- Supply power to the connector,
- Connect the connector in the modem,
- Check the state of the green PWR led on the front panel straight away.
 - If it is supplied with +5VDC, the indicator must be lit
 - If it is supplied with +7.5 to 48 VDC, the indicator must be off
 - Set micro-switch 6 to ON
 - The indicator must light up

If the indicator does not operate according to the explanations above, check your assembly.

Warning: If the power supply voltage is higher than 5 volts (on the +5VDC input) and the indicator lights up while micro-switch 6 is OFF, cut the power off immediately; the life of the protective device in this case is about ten seconds at most; after this time, the unit is completely destroyed!

3.4.2 - Power consumption

The power consumption also depends on the type of terminal connected to the V24 link. This may vary by 15 % or more.

- GEN INDUS with 5 VDC power supply –2.5% +10%

210 mA in communication mode

240 mA in transfer mode

- GEN INDUS with 7.5 to 48 VDC power supply

12 VDC: 145 mA in transfer mode

24 VDC: 80 mA in transfer mode

48 VDC: 50 mA in transfer mode

In standby mode, the board consumes less than 10 µA.

Each closed alarm input adds 1.6 mA at 5 VDC, 4 mA at 12 VDC, 8 mA at 24 VDC and 17 mA at 48 VDC. To reduce power consumption, a resistance can be added to guarantee a current of at least 2 mA in the input photo-coupler.

3.4.2.2 – Extension board

When an extension board is added, the current drain is increased in the following proportions

Mother board + standard extension board (no connected cable, off-line)

Board1 HTR 4 EANA 8 ETOR 8 OUTPUTS

300 mA at 5 V 136 mA at 12 V 75 mA at 24 V 50 mA at 48 V

- Each closed alarm input adds up
4 mA at 5 V 2,5 mA at 12 V 1 mA at 24 V 0,35 mA at 48 V.
- Each closed alarm adds up
4 mA at 5 V 1,1 mA at 12 V 0,7 mA at 24 V 0,1 mA at 48 V.
- Maximum consumptions with all active inputs, activated outputs and maximum current for analogue inputs.
5 V 420 mA (2,1W)
12 V 190 mA (2,25 W + 0,19 W resulting from the 4 inputs of the mother board)
24 V 126 mA (2,4 W + 0,77 W resulting from the 4 inputs of the mother board)
48 V 130 mA (3,04 W + 3,26 W resulting from the 4 inputs of the mother board)

III.5 - Mother board connections (Screw connectors)

These are made via the 3.5 mm pitch plug-in connectors located underneath the appliance.
Under the unit from front to back the following information is located :

TP	Protective earth. To guarantee optimal operation for the protective components, it is strongly recommended to connect this terminal to the nearest earth via an earth wire (yellow/green) of 2.5 mm diameter.
Nc	Not connected, do not connect anything to this terminal.
B- A+	Connects the RS485A link. If it doesn't work, try reversing the wires. Do not forget the appropriate software.
S2	Connection terminals for output 2 contact. Position Normally Open in release condition and when not powered.
S1	Connection terminals for output 1 contact. Position Normally Open in release condition and when not powered.

I2C bus: RJ45 connector provided for functionality extension by adding a daughterboard.

Sw1 – Sw6: Encoding switch.

E4 / E3 / E2 / E1	Alarm input n. Connect the active pin of your installation contacts to these terminals. See diagram below.
Com	Alarm common; do not connect this terminal to ground. It is only provided as a common pin for the alarm inputs. See the diagram below.
+ 7.5 to 48 VDC	7.5 to 48 volt DC power connection terminal. See position of micro-switch 6 above.
+5 VDC (-2.5 to +10%)	5 VDC power connection terminal. Tolerance 4.87 to 5.5 VDC. See position of micro-switch 6 above.
GND	Connection terminal for the power supply ground

III.6 - Mother board connections (Screw connectors)

Below the unit , on the right side, from front to back, the following information is located:

E12/E11/E10 E9	n Alarm input. Connect to these terminals the active point of your installation contacts. See diagram below
Com	Alarm common Do not ground this terminal. It is only used as a common for all alarm inputs. See diagram below.
E8/E7/E6/E5	N Alarm input. Connect to these terminals the active point of your installation contacts. See diagram below.
Com	Alarm common Do not ground this terminal. It is only used as a common for all alarm inputs. See diagram below.

Two 4-pin connectors

Gnd	
EANA4 / EANA 3	4-20 mA input
+10V	Supply output for current loop contact
Gnd	
EANA2 / EANA 1	4- 20 mA input

+ 10V

Supply output for current loop current

IV - CONFIGURATION

IV.1 - Modem configuration

The GEN INDUS modem has 6 micro-switches located on the underside of the unit that allow it to be configured during power up.

The first 3 micro-switches are used to define the transmission mode.

It should be noted that the transmission mode can be modified at any moment by a software command.

The default configuration is shown in grey.

1	2	3	CONFIGURATION	MODE
Off	Off	Off	10-bit asynchronous (1 start + 8 bits + 1 stop)	V21, V22, V22bis, V23, V32, V32bis, V34 ¹ , v34+ ¹
On	Off	Off	Activate remote control*	As above
Off	On	Off	11-bit asynchronous (1 start + 8 bits + even parity + 1 stop)	As above
On	On	Off	11-bit asynchronous (1 start + 8 bits + odd parity + 1 stop)	As above
Off	Off	On	Leased CALL line	As above
On	Off	On	Leased ANSWER line	As above
Off	On	On	Alarm transmitter	As above
On	On	On	10-bit asynchronous (1 start + 8 bits + 1 stop) with forced DTR	As above

* Note: This function is reserved for the distributors' After Sales Departments. Please consult us for information on how to use it.

Micro switch 4:

ON Alarm input 1 is enabled to wake the modem when it closes.

OFF Alarm input 1 does not wake the modem when it closes.

Micro switch 5:

ON Permanently on

OFF Power up controlled by DTR, an incoming call or alarm input 1 (see above).

Micro switch 6:

ON **Power via the internal 7.5 to 48-volt converter.**

OFF Direct 5-volt power

Comments:

With the exception of micro-switches 4, 5 and 6 that have immediate effect, the other micro-switches are only read during power up.

¹ Not available on the GEN INDUS 144.

Make sure that the unit is switched off then on again after changing the configuration of these micro-switches (the modem emits the self-test melody).

V - CONTROLLED “MODEM” FUNCTIONS

V.1 - Enumeration

Detection of the different tones:

- Dialling tone
- Busy
- Call-back
- Answering tone

Dialling:

- Decimal or by voice frequency (DTMF)

Management of ineffective calls and erroneous calls:

- A memory (static CMOS) can be used to stock up to 20 forbidden or ineffective numbers.
- When this memory is full, all dialling requests are refused and only a manual intervention (power off) can revalidate it.

Comment:

- Ineffective call: call that did not lead to the correspondent answering.
- Erroneous call: call that resulted in an answer but without recognising an automatic answering modem.

Modem disconnection:

- Before setting up communication:
 - wait 11 seconds for dialling tone
 - wait 135 seconds for the required correspondent to answer.
- After communication has been set up:
 - carrier loss: 150 ms (by default)
 - wait 20 seconds for carrier (by default)
 - DTR signal disappears for more than 50 ms (by default)
 - end of the inactivity period if it is activated.

Starting procedure for data transmission sessions in compliance with the CCITT's V8 notice.

Automatic answering in compliance with the CCITT's V25 notice.

Interpretation of the commands (V25 bis or HAYES)

V.2 - General operation

The GEN INDUS modem operates according to the V8, V21, V23, V22, V22 bis, V27ter, V17, V29, V32, V32 bis, V34¹ and V34+¹ notice of the CCITT.

Two operating modes can be considered:

- Command mode, where the computer can communicate with the modem to configure it or to make it carry out a certain number of operations (example: dialling) from HAYES or V25 bis commands.

-

¹ Not available on the GEN INDUS 144.

- Connected mode, where the modem can transmit and receive data via the telephone line.

Command mode is the initial state on power up. In this mode, the GEN INDUS automatically adapts to the speed and format of the commands that it receives.

The detected speeds are:

- | | |
|---------------|------------------|
| - 300 bits/s | - 19.2 k bits/s |
| - 1200 bits/s | - 38.4 k bits/s |
| - 2400 bits/s | - 57.6 k bits/s |
| - 4800 bits/s | - 115.2 k bits/s |
| - 9600 bits/s | |

The detected formats are:

- 7 bits, even parity
- 8 bits, no parity

This is achieved by analysing the first character of a received command. However, this system can only operate on commands where bit b0 of the first character is 1 (ex. "A").

The list of first characters interpreted at the start of command is the following: A, a, C, c, M, E and carriage return (0D_H).

The **GEN INDUS** can also be programmed to detect the following formats :

- 7 bits, even parity
- 8 bits, no parity
- 8 bits, even parity
- 8 bits, odd parity

But, in that case, the only characters interpreted at the command start are as follows :
AT, AT, A/or a/ (see !Kn command)

V.3 - Automatic answering

If circuit 108 is active (DTR) , the modem connects to the telephone line within a 2 to 5-second delay when it receives the call (S0 register=1). It remains silent for 2 seconds then emits the 2100 Hz answering tone for 3 seconds or the V8 sequence for 4 seconds.

After sending one of these tones, the modem is in auto-adaptation), phase on the calling carrier and it controls hanging up.

In automatic answering mode, the GEN INDUS automatically adapts to the different notices: V21, V23 server, V22, V22 bis, V32, V32bis, V34¹ and V34+¹ (by default). (Contact us for V23 Minitel).

A command can be used to cancel this auto-adaptation),. In this case, the modem only answers on the modulation that corresponds to the speed or selection requested (see MODERx and ATNx commands).

¹ Not available on the GEN INDUS 144.

The transmission order of modulations in answering mode, where auto-adaptation during the V8 phase was not successful, is as follows : V34+, V32 bis, V22 bis, V21 then Server V23; It is possible to modify this order, the duration or the modulation type. Thus, we can have a phase with V23 minitel, V23 half-duplex or a waiting phase for a DTMF code.

V.4 - Automatic calling

The user sends the dialling command. The modem then checks the validity of the number (not forbidden, no delay) then it picks up the telephone line and performs the dialling sequence with tone detection.

Once dialling has terminated, the modem emits 1300 Hz beeps in compliance with the V25 bis notice of the CCITT. At the same time, it monitors the line in order to supervise the routing of the communication (maximum monitoring time 135 seconds (S7 register)).

If the line is busy, or if there is a call-back or continuous routing, the modem frees the line and informs the user. There can only be 15 unsuccessful attempts for the same number per time slot; a 60-minute delay is then attributed to this number. If a new request is made on this number, the modem refuses to dial and sends back the ERROR message in HAYES format or DLCxx (xx is the delay) in the CCITT format, before accepting a new call.

Between two calls, the modem does not accept to dial within a 6-second delay after freeing the line in order to facilitate incoming calls. **If the same number is called, the delay is increased to 5 seconds.**

If the modem has detected that the remote has answered without recognising the 2100 Hz signal, it frees the line then increments the ineffective counter and informs the user with a message.

Ineffective numbers are revalidated by re-initialising the modem by cutting the power.

If the answering tone is detected, the modem clears the ineffective call counter for this number, enters data transmission mode and controls hanging up.

A command can be used to activate recognising the answering modem modulation (see ATNx (HAYES) or MODEAx (CCITT)).

Comments: For the V21, V22, V22 bis, V32, V32 bis, V34¹, V34+¹ notices:

If the communication speed is 115.2 k bps, 57.6 k bps or 38.4 k bps, the modem tries to set up transmission in V34+¹ (V32bis for the GEN INDUS 144).

- If the communication speed is 19.2 k bps, the modem tries to set up transmission in V34¹ (V32bis for the GEN INDUS 144).
- If the communication speed is 9.6 k bps, the modem tries to set up transmission in V34¹, V32 or V32bis.
- If the communication speed is 4800 bps or higher, the modem tries to set up transmission in V34¹ or V32.
- If the communication speed is 2400 bps, the modem tries to set up transmission in V34¹ or V22 Bis.
- If the communication speed is 1200 bps, the modem tries to set up transmission in V22.
- If the communication speed is 300 bps, the modem tries to set up transmission in V21.

¹ Not available on the GEN INDUS 144.

It is possible to set a chosen modulation, regardless of the communication speed. (see the MODEMn, AT+MS=n or ATBn commands).

V.5 - V23 turnaround

Regardless of the starting mode, MINITEL or SERVER, the modem has the possibility of carrying out multiple turnarounds in two different ways. One of these complies with the STUM specifications, the other one is dynamic.

According to the STUM

1 - The modem is in MINITEL: (transmission 75 baud, reception 1200 baud)

The associated computer makes the turnaround request to the remote server by sending the sequence 13,4C (hex).

If the remote server accepts the turnaround request, it sends the sequence 1B,39,6C (hex) that the modem lets pass to the computer before changing into SERVER.

2 - The modem in SERVER: (transmission 1200, reception 75)

The modem changes on lapse of carrier triggered by the remote modem. It changes into MINITEL.

Dynamic

For this mode, either two GEN INDUS modems must be used, or a system that automatically controls turnarounds.

The master modem will turnaround when the RTS signal changes state and the slave modem on loss of carrier.

After connection,

1 - If the master modem has the active RTS signal, it transmits in SERVER mode (transmission 1200, reception 75).

2 - If the master modem has the inactive RTS signal, it goes into MINITEL mode (transmission 75, reception 1200).

The slave modem detects the signal disappearing for the duration of S13 and turns around in order to detect the carrier for a duration of S10 before a 3-second timeout; if it does not succeed, it hangs up.

Specific configuration for the master modem:

ATS46 = 2&W

Specific configuration for the slave modem:

ATS46 = 1&W

Comment: In both of these cases, in V23 operation, the modem balances the speed, thus the computer transmits and receives at the same speed.

V.6 - Half Duplex

The GEN INDUS modem can operate in asynchronous, half duplex mode on the PSTN (Public Switched Telephone Network) or leased line.

It uses the following notices: V23 (1200 b/s), V27ter (2400 or 4800 b/s), V29 (4800 or 9600 b/s) and V17 (9600 or 14400 b/s).

In V27ter or V17, the transmission can be done with a short or long synchronisation phase (register S46). However the choice must be identical at both ends and the first exchange will always be carried out with a long synchronisation phase.

In V29, the transfers are carried out with a long synchronisation phase only.

For these 3 notices, it is possible to add the transmission of a protection signal against on-line echo, before the transmission phase, with a long (185 ms) or short (30 ms) duration. This is selected using register S46.

Operation:

On the rising edge of the RTS signal (105), the modem activates transmission of the on-line modulation and after a time defined by the value contained in the S43 register (base 2 ms) has passed, it gives the CTS signal (106) to the terminal so that it starts transmission. When the RTS signal drops, the modem immediately drops its CTS but maintains the on-line modulation until all the data has been transmitted, followed by a programmable time defined in register S44 (base 2 ms).

When remote modulation is detected, the modem checks the carrier stability for a duration programmed in register S10 (base 1 ms) and when it is present for the supposed duration, it activates its DCD signal (109) . **The signal drop takes place after an integration duration inherent to the circuit modem and a time-out programmable by 1ms steps defined by register S17 (30 by default)**

Disconnection:

Each time the RTS signal disappears, a 40-second timeout is started. When it expires, a second 400-ms delay is initialised each time the DCD signal becomes inactive. When this last delay has passed without the RTS or DCD signal becoming active again, the modem disconnects.

Disconnection also occurs if the remote modem has not signalled itself within a delay of 4 minutes, i.e. by the DCD signal becoming active.

It is possible to disable the automatic disconnection by setting a bit in register S46. In this case, the modem will only hang up when the DTR signal drops (108).

Commands to use.

Cancel self-adaptation in calling and answering by N0

Select modulation with the !Mx or Bx commands

!M4 or B1 for V23

!M16 or B5 for V27ter

!M17 or B11 for V17

!M18 or B12 for V29

Choose the on-line speed either via the communication speed or using the +MS command; for example:

For V17 modulation and communication at 9600 b/s, transfer will be carried out at 9600.

The command AT+MS=29,0,0,4800,4800 enables V29 at 4800.

By default, for V17 and V27ter modulations, a short synchronisation phase without protection against line echo is programmed.

By setting bit B4 in register S46, a long synchronisation phase is selected (V17, V27ter).

By setting bit B5 in register S46, a protection phase against line echo is added (V17, V29, V27ter).

By setting bit B6 in register S46, the duration of the protection phase against line echo is determined (0: 185 ms; 1: 30 ms).

By setting bit B2 in register S46, the modem will only hang up when the DTR signal drops.

By setting bit B3 in register S46, the modem will no longer manage the RTS signal and will pass automatically into transmission when data is received from the junction.

It is possible to have a different junction speed and line speed by using the command AT&I1 or AT&I2.

The S10 register is used here to determine the minimum duration (in milliseconds) that the on-line modulation is present before the DCD signal rises.

The S17 register is used here to determine the minimum duration in milliseconds of the DCD signal after the on-line modulation has been lost.

The S43 register determines the time between the RTS signal rising and the CTS signal rising. Its base unit is 2 ms.

The S44 register determines the time between the RTS signal falling and the on-line transmission modulation stopping. Its base unit is 2 ms.

RTS/CTS delay

Concerning the time between the RTS signal rising and the CTS signal rising, the inherent times of the modem circuit must be considered for each modulation:

Modulation	RTS/CTS Delay	Holding time
V17 Long Sync.	1393 ms	15 ms
V17 Short Sync.	140 ms	15 ms
V29	253 ms	12 ms
V27 4800 Long Sync.	770 ms	7 ms
V27 4800 Short Sync.	105 ms	7 ms
V27 2400 Long Sync.	1010 ms	10 ms
V27 2400 Short Sync.	130 ms	10 ms

j The transmission duration of the protection tone against line echo plus 20 ms must be added when it is enabled.

k 20 ms of silence must be added at the end of transmission in V17 and V27ter.

Recommended values:

V23

- the S10 register remains at its default value 15 i.e. 15 ms.
- the S43 register remains at its default value 30.
- the S44 register remains at its default value 8.
- The S17 register remains at its default value 8

V29 and V17

- the carrier integration register S10 must equal 1 i.e. 1 ms.
- the S43 register remains at its default value 30. (therefore, it is useless as it is less than the inherent time)
- the holding register S44 must equal at least 30 i.e. 60 ms.

V27 ter 2400

- the carrier integration register S10 must equal 50 i.e. 50 ms.
- the S43 register remains at its default value 30. (therefore, it is useless as it is less than the inherent time)
- the holding register S44 must equal at least 20 i.e. 40 ms.

V27 ter 4800

- the carrier integration register S10 must equal 40 i.e. 40 ms.
- the S43 register remains at its default value 30. (therefore, it is useless as it is less than the inherent time)

- register S44 remains at its default value 8.

These values must be adjusted to suit the applications.

V.7 - RS485A

To use the RS485A interface correctly with 2 wires, the following operations must be carried out via a terminal and the V24 socket on the modem :

- Send the AT&A1 command: to tell the modem to timeout the answers, to give it time to set itself to listening to the associated equipment.
- Send the ATE0 command to disable command echo as it may interfere with the communication.
- Send the AT&D0 command or set all the micro-switches to ON to disable DTR signal management.
- Adjust the turnaround timeout via register S47, in base 1 millisecond. (2 ms by default)
- Send the AT&W command to save these parameters.
- Connect the RS485A interface. Start by respecting the A+ and B- indications and if it doesn't work, invert the connections.

Comment: When the modem is programmed to transfer via the RS485A interface, the V24 junction can still be used for programming. In operation, the V24 link must be disconnected. If you do not have a terminal to program the modem, proceed as follows:

- Set the first 3 micro-switches to ON
- Connect the RS485A interface
- Turn the modem on
- Send the command AT&A1E0&W to the modem at least once.

NOTE : A qualification document regarding the setting up of a RS 485A link is available on request at our technical department.

V.8 - Transmission on TIMEOUT

It is possible to use the **GEN INDUS** modem in a configuration that guarantees the shortest possible inter-character time. This allows the associated hardware that communicates with half duplex protocols to work correctly (question -> answer), such as Unitelway® or ModBus. To do this, simply program a value other than 0 in the Hayes S26 register and save it with the &W command. The step is 10 ms.

Principle:

No error correction protocol

- In this case, the **GEN INDUS** modem starts a timeout each time it receives characters from the telephone line. When the delay has passed, it transmits all the received data to the terminal.
- However, this slows down the time response programmed in the S26 register, increased by the length of the frame. The timeout in the application software must therefore be taken into account when programming.

With **MNP4** error correction protocol

- In this case, the **GEN INDUS** starts a timeout each time it receives characters from the junction; it only builds a frame when the delay has passed. This guarantees that the receiving modem will not serve the data to the remote modem in several sections, if MNP frames are repeated between the modems.
- In the same way, the **GEN INDUS** starts a timeout each time it receives a correct frame coming from the line. When the delay has passed, it transmits all the received data to the terminal.
- Data integrity is guaranteed, but data transmission is slowed down **by twice** the time programmed in register S26 increased by the length of the frame. The timeout of the application software must therefore be considered when programming.

VI - LEASED LINE OPERATION

VI.1 - Point to point Leased Line

The GEN INDUS modem can be used on a 2-wire Leased Line. To do this, the following configuration must be set up:

- By a combination of micro switches (under the modem).

1	2	3	CONFIGURATION	MODE
Off	Off	On	Leased line CALL	All Modulations
On	Off	On	Leased line ANSWER	All Modulations

Before setting the micro-switches and turning the power supply off and back on to switch into LL (Leased Line), use dialogue mode to configure the type of connection (full duplex V34+¹ modulation, V34¹, V32bis, V32, V22 bis, V22, V21 or half duplex V23, V27ter, V17, V29) with or without error correction for full duplex modulations. The same commands as for PSTN (Public Switched Telephone Network) communication are used.

Auto-adaptation), must be disabled on the modulations with the N0 command to guarantee fast connections. In this case, the modems continuously look for the carrier of the remote modem and reconnect automatically if the signal disappears on the line.

COMMENT : It sometimes happens that over a long period of time modems desynchronize and, while re-negotiating, are likely to cause a link interruption for a duration of less than 15 seconds. This can be avoided by configuring the modems with command AT%E3; in that case, modems exchange re-synchronizing information for a period of half a second.

In Leased Line operation, the modems must have the DTR signal (108) active or forced by a software command. One of the modems must be in call mode and the other in answer mode, except in half duplex where the two can be in the same mode, as the connection is independent of on-line modulation.

VI.2 - Multi-point Leased Line

To be used with several modems on the same network, the AT&L command must be used. This places the modem in "high impedance", thus reducing its interaction with the network. The recommended modulation is V23 half duplex. However, only field tests depending on the line length allow the optimum configuration to be determined.

¹ Not available on the GEN INDUS 144.

VII - OPERATION OF THE INPUTS/OUTPUTS

Programming is done via a menu accessible with the AT*P command.

VII.1 - Inputs

The GEN INDUS has 4 All or Nothing alarm inputs that can be used to trigger calls when they are closed.

VII.2 - Outputs

The GEN INDUS has 2 'Normally Open' outputs isolated by an opto-coupler that present a maximum transition resistance of 40 ohms and withstand a current of 100 mA.

Output switching is programmable.

For more information, please refer “ INPUT AND OUTPUT MANAGEMENT “ section.

VIII - HAYES COMMANDS

VIII.1 - General principles

Commands always begin with the AT sequence, except for the command to repeat the last command (A/). The modem understands the commands in upper case and lower case characters indifferently. Each command must finish with a line return character, usually the carriage return (cf. register S3).

The repetition command (A/) does not require a return character.

When sending a command, the backspace character (08H) can be used to cancel the last character sent to the modem.

The maximum length of a command string is 128 characters including the AT and carriage return. If there are more than 128 characters, the modem sends back an error message and does not execute any command. If the modem detects an error in the string, it interprets the string until the error is detected and sends the error message without processing the commands that may come after the command that caused the error. In addition to the HAYES commands, a set of control registers exists, a certain number of which are saved in non-volatile memory. There are about 68 of these registers, which are called S registers (S0 to S47, S91 to S95 and S100 to S114).

If a command is sent without a parameter, 0 is placed automatically.

VIII.2 - AT Command

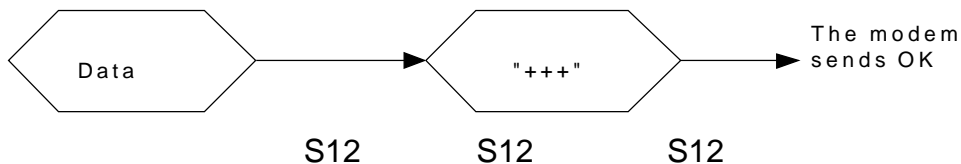
Every command line except the repetition command A/ must begin with the AT command.

VIII.3 - Escape command +++

The escape sequence can be used to return into command mode when the modem is connected (on-line). To correctly interpret this sequence, the modem must see a holding time before, during and after the escape characters are sent. This delay is 1 second by default. The modem then sends back a message to show that it has gone into command mode (OK in verbal and 0 in figures).

The character used for the escape sequence ("+" by default) can be modified via the S2 register. In the same way, the holding time can be modified via the S12 register (see description of the S registers).

Entering command mode only interrupts data transmission between the two modems, not the link.



A command can be used to cancel escape. See AT !En.

VIII.4 - AT commands in alphabetical order

When a command that normally contains an additional parameter is sent without it, the figure 0 is automatically placed instead of it.

8.4.1 - AT command

A : Immediate answer.

This command tells the modem to pick up the telephone line and to set its carrier on answer (transmit 2100 Hz or the V8 sequence).

Bn : **choose the type of modulation**

This command can be used to define the modulation that will be used for the next call without delimiting the range of connection speeds, which does not modify the automatic answering parameters. Communication speed also influences the choice. It must be at least equal to the minimum speed for the chosen modulation.

B0: V22 or V22 bis modulation

B1: V23 half duplex modulation

B2: Minitel modulation

B3: V23 server modulation

B4: V21modulation

B5: V27 ter modulation

B6: V32 modulation

B7: V32bis modulation (default for the GEN INDUS 144).

B8: V34¹ Modulation

B9: V34+¹ Modulation (**default**)

B11: V17 modulation

B12: V29 modulation

Allocate register S94.

D : Immediate call

This command without parameter tells the modem to pick up the telephone line and to listen the line to detect a carrier in answer mode (2100 Hz or the V8 sequence).

Dn : Dial

Tells the modem that it must execute a dialling sequence according to a certain number of format parameters: ATDxx ... xx

The parameters that can be used are the following:

Parameter	Description
0 to 9	Digits to dial the number
#, *, A, B, C, D	Characters to dial the number
P	Pass into decimal dialling
T	Pass into multi-frequency dialling
W	Wait for medium-pitched tone, S6 register
,	pause behind private installation only (2 seconds) register S8
;	Can be used to return into command mode after dialling
!	Inserts a line opening in the dialling that can be programmed by register S29

¹ Not available on the GEN INDUS 144.

R	At the end of a string, allows connection on the calling modulation of the remote modem.
L	Reminder of the last telephone number dialled
S	Dialling from memory n (0 to 9)
&	This parameter placed in a dialling string indicates a request for a detection of 2100Hz prior to carrying on with the dialling after the end of S8 time-out.
@	This parameter placed in a dialling string indicates a request for a detection of an on-line silence of 5 seconds prior to carrying on with the dialling.

Example:

ATDS0: dialling from memory 0 (see AT&Z command)

ATDP0WT3611: Call the electronic directory from a private automatic branch exchange that only accepts decimal dialling.

En : Echo

Can be used to select or deselect echo mode (sends back an echo of all the ASCII characters sent to the modem in communication mode).

ATE0: no echo

ATE1: echo **(default)**

Allocates bit 1 of S14.

Hn : Hang up command:

H0: No communication or during communication, after entering command mode by the escape sequence, releases the line.

H1: No communication, picks up the line and returns into command mode.

In : Modem identification:

n varies from 0 to 9

I0: returns "33600" (Max. on-line speed) ("14400" for the GEN INDUS 144)

I4: returns "OK"

I2: calculates and returns the program memory checksum

Example:" 2EBE"

I3: returns the product name and the software version

Example:" GEN INDUS V0.1 dated the 30.06.98 Ed.I "

I4: returns "OK"

I5: returns "033" (country: FRANCE)

I6 : returns "RP336D" (modem circuit) (RP144D for the GEN INDUS 144)

I7: resets the modem circuit and returns the internal codes from the data pump.

I8 : returns "STANDARD " for standard software versions; otherwise, returns the name of the user of the specific version.

I9 : returns "OK"

Ln : Volume level of the loudspeaker.

L0: disable loudspeaker.

L1: low volume level for the loudspeaker.

L2: medium volume for the loudspeaker. (default)

L3: high volume for the loudspeaker.

Allocates bits 0 and 1 of S22.

Mn : Enable/disable the loudspeaker .

Selects the loudspeaker operation.

M0: disable the loudspeaker.

M1: during the call, the loudspeaker is enabled while the modem is dialling until connection with the remote **(default)**.

M2: during the call, the loudspeaker is still enabled even during transmission.

M3: identical to M1 command, except the loudspeaker is also enabled in automatic answering mode until connection with the remote.

Allocates bits 2 and 3 of S22.

Nn : Negotiate modulation

This command can be used to define a modulation in call mode or answering mode. See additional explanations for the command +MS.

N0: When calling or answering, the contact is made at the specified speed or modulation only.

N1 and 2: When calling, contact is made at the highest line speed (V34+¹), then drops to lower speeds (V32bis, V32, V22 bis, V22, V23, V21). When answering, contact is made starting from the highest modulation towards the lowest. **(default)**

N3 and 4: When calling, contact is made at the specified speed or modulation only. When answering, contact is made starting from the highest modulation towards the lowest.

N5: When calling, contact is made at the highest line speed (V34+¹), then drops to lower speeds (V32bis, V32, V22 bis, V22, V23, V21). When answering, contact is made at the specified speed or modulation only.

Allocates bits 0 and 1 of S31.

O : Line return command.

Can be used to enter transmission mode from command mode when connection with another modem is set up. This command is the inverse of the escape sequence "+++" that can be used to pass from transmission to command mode without interrupting communication.

Qn : Transmit/do not transmit messages

Can be used to control the transmission of status messages in response to commands or in certain situations.

Q0: status messages are transmitted **(default)**.

Q1: no message is transmitted by the modem.

Allocates bit 2 of S14.

Sx : Write/Read registers

Sx=n: change register Sx (x varies from 0 to 47, 91 to 95 and 100 to 114) with the decimal value n (0 to 255).

Sx? <RC>: read register Sx (x varies from 0 to 47, 91 to 95 and 100 to 114).

Vn : message format transmitted by the modem

Can be used to choose the message format transmitted by the modem.

V0: messages in numeric format.

V1: message in verbal format **(default)**.

Allocates bit 3 of S14.

In verbal mode, the reports: are surrounded by CR + LF.

¹ V32 bis for the GEN INDUS 144.

In numeric mode, the reports: are followed by CR only.

Example: acceptance report:

In Verbal: <CR LF> OK <CR LF>

In encoded: 0 <CR>

Wn : Control the connection messages with error correction

This command can be used to choose the format of the CONNECT messages . (see also the description for S95).

W0: after connection, the modem gives the speed of the junction only.

Example: CONNECT 38400

W1: after connection, the modem gives the speed of the line, the error correction protocol and the speed of the junction.

W2: after connection, the modem gives the speed of the line only.

Example: CONNECT 33600

Allocates bits 2 and 3 of S31 and bits 0 to 3 and 5 of S95.

Xn : Select messages

This command can be used to choose the contents of the messages returned by the modem during communication. This command is managed if the Q0 command has been selected. See message table.

X0: selects messages 0 to 4.

X1: selects all the messages except: 6, 7, 8, 11, 12.

X4: selects all the messages **(default)**.

X5: selects all the messages with additional identification of the caller in auto-answering.

In this case, the modem returns the telephone number received from the network after the first RING message, with the France Telecom's "Class" service that shows the caller's number.

X8: selects all the messages with in addition, like X5, the caller identification in auto-answering mode but in the form +CLIP:"nnnn".

In that case, the modem returns after the first RING message, the telephone number received from the network, with the France Telecom "Class" service caller identification.

Allocates bits 4, 5 and 6 of S22.

Zn: Initialise from non-volatile memory.

This command re-initialises the modem parameters with those contained in the non-volatile memory, depending on the parameter entered.

It does not allow forbidden numbers or call-back delays to be revalidated and does not read the micro-switches.

Z0: call up the configuration saved in profile 0 in non-volatile memory.

Z1: call up the configuration saved in profile 1 in non-volatile memory.

8.4.2 - AT& command

&An : RS485A interface management

&A0: the dialogue and data transfer is carried out via the V24 link **(default)**.

&A1: the dialogue and data transfer is carried out via the V24 link or the RS485A link, in this case, half duplex operation. The inter-character silence time, contained in register S47 in base 1 millisecond, must be programmed, (2 by default). In dialogue mode, command echo must be disabled by ATE0 and DTR management disabled by the micro-switches or the AT&D0 command.

Allocates bit 6 of S27.

Comment: When the modem is programmed to transfer via the RS485A link, the V24 junction can still be used for programming. In operation, the V24 link must be disconnected.

&Cn : DCD signal control

&C0: the DCD signal is always active.

&C1: the DCD signal corresponds to detecting the remote modem carrier (default).

Allocates bit 5 of S21.

&Dn : DTR signal control

&D0: The DTR signal is forced into the active state.

&D1: DTR disappearing when the modem is on line is interpreted as if the escape sequence was received. The modem goes into command mode without disconnecting.

&D2: Mode by default, the DTR disappearing when the modem is on line provokes a hang up. If the DTR is inactive the modem does not carry out automatic answering **(default)**.

&D4: When the DTR signal changes from the inactive state to the active state, the modem dials the string stored in position 0 with the command AT&Z0 = xx ... xx.

&D5: Automatic dialling of the string stored in position 0 with the command AT&Z0 = xxx...xxx

- either on inactive -active transition of the DTR signal (identical to AT&D4)

- or on modem power-up (if DTR active).

&D6: When the RTS signal changes from inactive to active, the modem dials the string stored in position 0 by the AT&Z0=xx..xx command. The message "CALLING NUMBER xxxxxx" is sent to the remote on connection, then the modem hangs up. If it fails to connect, the modem repeats the call every 3 minutes, 15 times then 16 times with a 1-hour delay between each sequence.

The string "xxxxxx" is the one contained as the PRGL password entered by the command AT&P3L=xxxxxx (paragraph XIV.5). If this string is empty, the modem connects normally and no message is sent to the remote modem and there is no call-back if there is a connection failure.

If the terminal transmits continuously, a fixed junction speed (!V) must be used to guarantee correct operation, without echo (E0) or reports (Q1).

Allocates bits 0, 1, 3 and 4 of S21.

&En : Activate the security level, refer to paragraph XIV "SECURE CONNECTION FUNCTION".

&F : Call up the factory configuration.

&F0: calls up factory configuration 0. In this configuration, error correction protocols and flow control are not active.

&F1: calls up factory configuration 1. In this configuration, error correction protocols and flow control (CTS) are active.

The S registers are re-initialised with the factory configuration, as well as a certain number of modem parameters, i.e.:

- Auto-adaptation), of speed on the commands (cf. AT!Vx)
- Transmission level set at - 10 dBm
- All secure connection functions are disabled.

Refer to paragraph X of the HAYES S registers for detailed information on the factory configuration.

&G : Select holding tone.

&G0: no holding tone in V22 or V22bis answer.

&G1: no holding tone in V22 or V22bis answer.

&G2: 1800 Hz holding tone in V22 or V22bis answer **(default)**.

Allocates bits 6 and 7 of S23.

&In : Select the baud rate of the V24 junction

Can be used to tell the modem if the speed of the V24 junction must depend on the on-line transmission speed.

&I0: the V24 speed is identical to the on-line transmission speed. For example, for communication with the modem at 19200 bps and an on-line connection at 9600 baud, the connection message is given to the computer at 19200 bps, but then the data arriving or transmitted on the line is at 9600 baud. The computer must change the speed according to the connection message **(default)**.

The connection message indicates the on-line speed.

&I1 and &I2: the V24 speed becomes totally independent from the on-line transmission speed. The modem controls the difference in transmission speed by using the internal buffers.

However, as these buffers are limited, it is advisable to activate local flow control on V24 in this operating mode.

For &I1, the message indicates the on-line speed.

For &I2, the message indicates the V24 junction speed.

Allocates bit 4 of S32.

&Kn : Local flow control on V24

&K0: see \Q0 command **(default)**.

&K3: see \Q2 or \Q3 command

&K4: see \Q1 or \Q4 command

&K5: see \Q1\X1 command

Allocates bits 5 and 6 of S32.

&L : Select the type of impedance in Half Duplex LL (Leased line) mode.

&L0: The impedance presented by the modem is Zr **(default)**.

&L1: When receiving, the modem is in high impedance. When transmitting, the modem presents the impedance Zr.

Allocates bit 3 of S27.

&M : Select synchronous/asynchronous mode.

This command is accepted for compatibility, but has no effect.

Allocates bits 0 and 1 of S27.

&Pn :

With n = 0: Access to the junction and connection parameters programming menu.

With n from 0 to 3 : Programming the password for secure connections , please refer to paragraph XIV 'SECURE CONNECTION FUNCTION'.

With n=4 : Programming the local site name, information available in the alarm programming menu ; used for the control of outputs or DTMF return acknowledgement. (1 to 8 characters).

The lower case (small) letters are automatically turned into uppercase (capital) letters.

Note : For remote control operations with a telephone (DTMF codes), only numeral digits are permitted.

With n=0 saving is done by command AT&W.

With n=4 saving is done by command AT*W.

&Rn : CTS signal control

&R0: the CTS signal is always active.

&R1: the CTS signal is controlled according to the CCITT status diagram **(default)**.

Allocates bit 2 of S21.

&Sn : DSR signal control

&S0: the DSR signal is always active.

&S1: the DSR signal is controlled according to the CCITT status diagram **(default)**.

Allocates bit 6 of S21.

&Tn : Tests and diagnostics (contact us)

Can be used to establish different loop tests, off-line on the local modem, or on-line on the remote modem.

&T0: End of test and return to command mode. This command is used to quit loops 2 and 3 . It must be preceded by the escape command +++.

&T1: Set up the local analogue loop (loop 3). This loop is set up in command mode, off-line.

&T3: Set up the local digital loop (loop 2). This loop is set up in command mode, off-line.

&T4: Reply allowed to a remote loop 2 request.

&T5: No reply allowed to a remote loop 2 request.

&T6: Set up the remote digital loop (loop 2). This command is used during a connection and in escape mode (escape command +++).

Allocates bit 0 of S23.

&Vn : Displaying the current configuration.

The display gives the main parameters, the contents of all the registers and the saved telephone numbers in the following form:

With n=0,

ACTIVE PROFILE:

B09 E1 L2 Q0 T V1 W0 X4 &C1 &D2 &IO &K0 &M0 &R1 &S1 &X0 %C0 %E1 \N0 &Y0
S000:001 S001:000 S002:043 S003:013 S004:010 S005:008 S006:011 S007:135
S008:002 S009:006 S010:015 S011:085 S012:050 S013:002 S014:010 S015:000
S016:000 S017:003 S018:030 S019:209 S020:000 S021:116 S022:118 S023:190
S024:000 S025:005 S026:001 S027:000 S028:000 S029:000 S030:128 S031:048
S032:000 S033:240 S034:000 S035:000 S036:008 S037:000 S038:000 S039:017
S040:019 S041:004 S042:000 S043:024 S044:000 S045:100 S046:000 S047:000
S091:012 S092:000 S093:016 S094:011 S095:000 S100:001 S101:002 S102:008
S103:000 S104:002 S105:001 S106:002 S107:016 S108:000 S109:000 S110:100
S111:003 S112:255 S113:255 S114:000

Z0 :320

Z1:

Z2 :

Z3 :

Z4 :

Z5 :

Z6 :

Z7 :

Z8 :

With n=1, the contents are identical, but the value of the registers is given in hexadecimal.

With n=2, the contents are identical, but the value of the registers is given in binary with the most significant bit to the left.

With n=3, gives a report on the parameters for the last connection.

&Wn : Saving the active configuration (excluding alarm configuration) .

The current configuration contained in a certain number of S registers is saved in non-volatile memory. It will then be present from the next power-up.

The registers saved are: S0, S2, S6, S7, S8, S9, S10, S12, S13, S14, S15, S16, S19, S20, S22, S23, S24, S25, S26, S27, S31, S32, S33, S36, S37, S41, S42, S43, S44, S45, S46, S47, S91, S92, S93, S94, S95, S100 to S114.

The activity status of the secure connection functions is also saved.

In association with the AT&F command, we obtain the possibility of re-initialising the contents of the S registers as well as their image in non-volatile memory by returning to the modem factory configuration (ex.: AT&F&W)

&W0: saving the current configuration in non-volatile memory in profile 0.

&W1: saving the current configuration in non-volatile memory in profile 1.

&Xn : Selecting the type of clock in synchronous mode.

This command is accepted for compatibility, but has no effect.

&Yn : Selecting the user profile loaded on power-up.

&Y0: select profile 0 (**default**).

&Y1: select profile 1.

&Zn : Saving a telephone number

9 different telephone numbers can be saved in non-volatile memory.

The command syntax is: AT&Znn = xx ... xx.

"nn" represents the address of the number to be saved and xx ... xx is the dialling sequence.

These saved numbers can then be used in automatic dialling using the command ATDSnn.

The value of nn varies from 0 to 9. If this parameter is omitted, 0 is taken by default. The "=" sign is used as a delimiter.

The dialling string has a maximum length of 34 characters.

The following is accepted:

- characters from 0 to 9 and A, B, C, D, * and #
- the "P" character to indicate decimal dialling
- the "T" character to indicate multi-frequency dialling
- the "W" character to request a waiting period for the medium-pitched tone
- the "," character to insert a programmable pause with register S8
- the ";" character to return into command mode after dialling
- the "!" character to insert a line opening in dialling that can be programmed with register S29
- the "R" character to call and connect in inverse mode.

Example: AT&Z1 = P0W3611

Save the call sequence for the electronic directory from a private automatic branch exchange that only accepts decimal dialling (P) and requires the 0 to access the PSTN (Public Switched Telephone Network), in memory number 1.

The AT&Z command has two variations, one to erase a saved telephone number and one to view it.

AT&Znn = <RC> can be used to clear memory nn and the password which could be associated to it.

AT&Znn? <RC> can be used to view the string saved in memory nn.

8.4.3 - AT% command

%Cn : Activation command for data compression

This command is accepted for compatibility, but has no effect.

Allocates bits 0 and 1 of S41.

%En : Supervision control of line quality and automatic Retrain.

This function is enabled by default to resolve disturbance problems in the link causing a hang up. During a loss of signal quality, the modem tries to renegotiate a connection. If it fails, it hangs up after a timeout of about ten seconds. When this function is enabled, it is advisable to use flow control to avoid transmitting data that will be lost. This function is only applicable in V32, V32 bis and V34;

%E0: No automatic retrain if poor line quality. **The modem hangs up.**

%E1: Retrain only. If the line is of poor quality while connection is in progress, the modem will systematically initiate a retrain sequence.

%E2: Re-negotiation and Retrain, the modem initiates speed re-negotiations and at the fifth Starts a retrain. **(Default)**

%E3 :Re-negotiation only. If the line is of poor quality while connection is in progress, the Modem will systematically initiate a re-negotiation sequence. To be used with Leased Lines.

Allocates bits 3 and 6 of S41.

%L : On-line signal level.

This command can be used to know the signal level at the input of the modem circuit. This command is used during a connection and in escape mode (escape command +++). The level is given in dBm.

%M : On-line signal quality.

This command can be used to know the quality level of the signal seen by the modem circuit. This command is used during a connection and in escape mode (escape command +++). A value around 0 is ideal. If higher than 64, the modem is either in re-negotiation (%En) or hang up phase.

%Qn : Flow control restart threshold.

Can be used to configure the triggering threshold for XON and activation of circuit 106 (CTS) . The parameter n can be used to calculate the threshold in the following way:

Threshold = (n+1) x 128.

The value of n varies from 0 to 8, which gives a maximum of:

1152 characters with the command AT%Q8.

The **default** value is 128 (AT%Q0).

Allocates bits 0, 1, 2 and 3 of S33.

%Sn : Flow control triggering threshold.

Can be used to configure the triggering threshold for XOFF and to de-activate circuit 106 (CTS). It is only used without error correction.

Parameter n can be used to calculate the threshold in the following way:

Threshold = n x 256.

The value of n varies from 1 to 15 which gives a maximum of:

3840 characters with the command AT%S15.

the **default** value is 3840 (AT%S15).

Allocates bits 4, 5, 6 and 7 of S33.

8.4.4 - AT\ command

An : Maximum size of the MNP frames.

Can be used to determine the maximum size of the MNP frames when error correction is in data stream mode.

\A0: 64 characters maximum.

\A1: 128 characters maximum.

\A2: 192 characters maximum.

\A3: 256 characters maximum (**default**).

Allocates bits 4 and 5 of S31.

\Ln : Error correction operating mode.

Command accepted but without affecting the operation.

\L0: Data stream mode (**default**).

\L1: Block mode.

\Nn : Select the type of error correction:

The error correction protocol MNP4 is integrated directly in the GEN INDUS and it allows data to be transferred securely without the need for external intelligence (computer + telecommunication software).

This function is particularly interesting for links with remote consoles.

The modem creates frames from the data supplied with a minimum of information, thus enabling the received data to be decoded and the integrity checked. The modem informs the remote that these frames need to be repeated if they are altered on the line. If the line quality is particularly poor, the modem may decide to interrupt the link.

Comments:

- Error correction can be used on a Leased Line. However, it must be activated and this configuration must then be saved in non-volatile memory (AT\Nn&Wn).

\N0 or \N1: The modem has no error correction **(default)**.

\N2: With MNP error correction. The modem can only be connected to another modem with MNP error correction.

\N3: Modem with MNP error correction. The modem can also be connected to another modem that does not have any error correction. It turns into a normal modem on timeout.

\N4: Command accepted but without action on the operation.

\N5: Command accepted but without action on the operation.

\N6: Command accepted but without action on the operation.

Allocates bits 3, 4 and 5 of S15.

\Qn : Local flow control on V24

\Q0: No local flow control on V24.

\Q1 or \Q4: Unidirectional software local flow control by sending the XON and XOFF characters from the modem to the local computer. The XON character authorises the computer to send data while XOFF stops it..

\Q2 or \Q3: Unidirectional hardware local flow control from the modem to the local computer by the CTS signal (106). The computer is instructed to stop sending data if the CTS signal becomes inactive.

Allocates bits 5 and 6 of S32 and bit 3 of S36.

Summary of the command combinations:

Software flow control	XON/OFF from the modem to the local PC	XON/OFF from the local PC to the local modem	XON/OFF from the local PC transmitted to the remote PC
AT\Q0	No	No	Yes
AT\Q1 or \Q4	Yes	No	Yes

ATS : Display configuration.

At any moment, the user can ask the modem to display a certain number of configuration parameters in command mode.

The result can be directly viewed on a console in TTY mode (only ASCII characters are used).

The result of the command has the format shown in the example below:

CONFIGURATION

Junction	38.4 K baud no parity 8 Bits 1 Stop
Junction signals	109 CCITT 107 CCITT 106 CCITT
Retrain control	Yes
Auto-adaptation), communication (MODEVx)	Yes
Auto-adaptation), modulation	Call: No Ans: Yes
Type of modulation (MODEMx, +MS)	V34+ 300,33600
Current connection status	Off
Echo (E)	Yes
Report (Q)	Yes
Type of Report (V)	Verbal
Asynchronous (&M)	Yes
Line baud rate = Junction baud rate (&I)	Yes
Flow control (\Q &K)	No
Error correction (\N)	No
Security level (&E)	No
Type of DTR control (&D)	2
Transmission level (MODEL)	- 12 dBm
Switch state (1,2,3)	111
AON input state (1,2,3,4)	1111
Output state (1,2)	00

V4E .0 dated 22.07.04 Ed.A

\Vn : Activate reports: extended or not extended

\V0: The connection message is standard. it does not give any additional indication if error correction is used (**default**).

\V1: If error correction is active, the connection message also gives the type of correction recognised during connection (the indication 'REL' followed by the protocol type is returned, see "TABLE OF MESSAGES TRANSMITTED BY THE MODEM").

Allocates bits 0 to 3 and 5 of S95.

\Xn : Bi-directional flow control in error correction mode.

This command is accepted for compatibility, but has no effect.

8.4.5 - AT* command

Other commands exist with the prefix * that can be used to manage the alarm transmitter functionalities, refer to the chapter TRANSMITTER FUNCTIONALITIES, paragraph "Programming -> Via the Hayes commands.

***B** : Display the forbidden numbers

The **GEN INDUS** modem has a memory where the forbidden and ineffective numbers are stored (maximum 20).

This command can be used to view simply the numbers where two calls have resulted in a pick up but without recognising an automatic answering modem. (erroneous call: principle does not exist in the TBR21 specification).

With:

NO.	The memory position number
TELEPHONE	The telephone number concerned
STATE	The number of erroneous calls authorised (2 to begin with, 0 if forbidden)
NBRE	The total number of remaining erroneous and ineffective calls (when this number is 0, a 60-minute delay will be assigned to the number). It is set to 15 on power-up and after the delay has passed.
MM:SS	Waiting time in minutes and seconds before accepting the next dialling command on this number.

The answer format is the following:

TELEPHONE	NO.	STATE	NBRE	MM:SS
00	0241831300	0	00	00:00

***Cn** : Read the status of the alarm inputs

This command with parameters can be used to receive back the status of one or all four of the alarm inputs.

The character 0 indicates that the input is NO.

The character 1 indicates that the input is NC.

AT*C0 returns the status of the four inputs in order 1,2,3,4.

n = 1 to 4: returns the status of the requested input only.

***D** : Display the forbidden or ineffective numbers with delay

This command can be used to view the numbers where the call did not result in recognising an automatic answering modem (call ineffective: busy, no pick up).

The answer format is the following:

TELEPHONE	NO.	STATUS	NBRE	MM:SS
00	0241831300	2	0	00:47

Memory position 00 indicates that the telephone number 0241831300 is the subject of an ineffective call and that a 47-second waiting time is assigned before dialling again.

***Sn** : Output status management

This command with parameters can be used to drive the two outputs independently. To be able to write this command, the outputs must be inactive in the management menu.

The 0 character indicates that the output is NO.

The 1 character indicates that the output is NC.

AT*S ? returns the status of the two outputs in order 0,1.

AT*Sn=0 requests changing output n to the NO state.

AT*Sn=1 requests changing output n to the NC state.

n = 0 or 1.

****R** : Used to completely reset the modem in the same way as a power up; does not deliver a report. This command is used to accept a new configuration without having to manually switch off the supply. Wait for at least 3 seconds until re-initialization is completed prior to giving a new command.

**** T** : Used to change the modem software version. See chapter “ Loading procedure “

- AT+ command

- Bn : Supervision of the audio tone on power up.

This command with parameter is used to select or not the generation of an audio tone when the modem is powered up.

This command is immediately saved into a non volatile memory.

- BO : Audio tone not generated

- B1 : Audio tone generated **(Default)**

- B? : Used to check if the function is validated or not.

- Rn : Supervision of the saving function of output states.

This command with parameter is used to save or not the output states. Thus, when the supply is cut off, the modem restores the last known output states.

- RO : Save function disabled

- R1 : Save function activated

- R? : Used to check if the function is validated or not.

8.4.7 - Commande AT+

+ES : Used to select the operating mode of the V24 Baud rate and error correction.
This command with parameter is used to inform the modem if the V24 junction speed is depending or not on the line transmission speed and to select or not error correction in call and auto-answering modes..

Syntaxe :

+ES=[<select_call>[,<mode_return_call>[,<mode_return_answer>]]]

The total format is accepted for compatibility, but the first two characters only are checked.

Value definition :

- <Select_call I> Decimal value specifying the call operation mode.
- 0 : the V24 speed is similar to the on-line transmission speed.
Similar for &I0.
 - 1 : the V24 transmission speed becomes totally independent from the on-line transmission speed. The modem will supervise the baud rate difference using internal buffers. Similar for &I1 et &I2.
 - 2 : the V24 transmission speed becomes totally independent from the on-line transmission speed. The modem will supervise the baud rate difference using internal buffers. Similar for &I1 et &I2.
A connection with error correction , MNP type, can be used .
The modem can also be connected to another modem without error correction.
 - 3 : Similar Idem 2.
 - 4 : the V24 transmission speed becomes totally independent from the on-line transmission speed. The modem will supervise the baud rate difference using internal buffers. Similar for &I1 et &I2.
A connection with a MNP- type error correction must be used. The modem cannot be connected to another modem without error correction.Except if the parameter . <mode_return_call> allows it.
 - 5-7 : Similar 1.

<mode_return_call> Decimal value specifying the call return mode when the connection does not correspond to the requested original type.
2,4 : MNP connection obligatory. On display, the 0 value is always shown
Other values without effect

<mode_return_answer>Decimal value specifying the answer return mode .NOT SUPERVISED .

Current mode request report :

Request :

AT+ES ?

Answer :

+ES : 0,0,0 Direct mode, line baud rate = junction baud rate ; no error correction protocol.
+ES : 1,0,1 Bufferized Mode , line baud rate different from junction baud rate; no error correction protocol.

+ES : 4,0,2 Bufferized Mode , line baud rate different from junction baud rate ; MNP error correction protocol obligatory..

<parity>	Decimal value specifying the parity.
	0 : Odd.
	1 : Even.
	2 : Mark (not supported).
	3 : Space (not supported).
	4 : None

Current mode request report :

Request :

AT+ICF ?

Answer :

+ICF: 0,4 Auto-adaptation to format.

+ICF: 3,4 8 bits 1 stop no parity.

+ICF: 2,1 8 bits 1 stop even parity.

Supported mode request report :

Request :

AT+ICF =?

Answer :

+ICF : (0-3,5),(0-1,4)

+IFC : Data flow control type selection.

This command with parameter advises the modem of the flow control to use between the modem and the junction. See also &Kn,\Qn commands

Syntax :

+IFC=[<ETTD to modem>,<modem to ETTD>]]

Value definition :

< ETTD to modem >	Decimal value specifying the type . All the values are accepted but have no effect.
-------------------	---

< modem to ETTD >	Decimal value specifying the type .
	0 : None
	1 : XON/XOFF
	2 : CTS

Current mode request report :

Report :

AT+IFC ?

Answer :

+IFC: 0,0 None.

+IFC: 1,1 XON/XOFF

+IFC: 2,2 CTS

Supported mode request report :

Request :

AT+IFC =?

Answer :

+IFC: (0-3),(0-2)

+IPR : Serial junction baud rate selection

This command with parameter advises the modem of the baud rate to be used on the serial junction. See also !V, !RS commands

Syntax :

+IPR=<speed>

Value definition :

< speed >

Decimal value specifying the speed.

0 : Auto-adaptation, the modem detects the speed of the data received on the serial port. See paragraph « General operation ».

300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 : Fixed speed.

Current mode request report :

Request :

AT+IPR ?

Answer :

+IPR: 0 Auto-adaptation.

+IPR: 9600 9600 b/s

Supported mode request report :

Request :

AT+IPR=?

Answer :

+IPR: (0,300,1200,2400,4800,9600,19200,38400,57600,115200)

+MS : Select modulation

This command with parameters can be used to select a modulation, to optionally enable or disable auto-adaptation), in call and/or in answer mode and to choose the minimum and maximum connection speed; by using 5 parameters. The format of the command is:

+MS = <modulation>[,<auto-adaptation>],<call>[,<auto-adaptation>],<answer>[,<min speed>],<max speed>]]

Comment: The parameters not supplied (enter a comma or carriage return to leave out the last parameters) remain at their current values.

Help: The modem can send a string of information that gives the selected parameters by sending the following command:

AT+MS?

The answer is: <modulation>,<auto-adaptation> <call>, <auto-adaptation> <answer>, <min speed>, <max speed>

For example: 11,0,1,300,33600¹ **(default)**

The modem can send a string of information that gives the supported parameters by sending the following command:

AT+MS =?

The answer is: (list of the <modulation> supported), (values of the <auto-adaptation call> supported), (values of the <auto-adaptation answer> supported), (list of the <min speed> supported), (list of the <max speed> supported)

Thus: (0,1,2,3,4,8²,9,10,11²,17,23,27,29),(0,1),(0,1),(300-33600¹),(300-33600¹)

¹ 33600 replaced by 14400 for the GEN INDUS 144.

² Not available on the GEN INDUS 144.

Definition of the parameters

1 – <modulation> This is a decimal value that specifies the preferred modulation (auto-adaptation) enabled) or the modulation to be used (auto-adaptation) disabled) during a call or an automatic answer. The options are:

<modulation>	Modulation	Possible speeds	Notes
0	V21	300	
1	V22	1200 full duplex	
2	V22bis	2400 or 1200	
3	V23	1200/75 (Server)	
4	V23	75/1200 (Minitel)	
8	V34	28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400	Not available for the GEN INDUS 144.
9	V32	9600 or 4800	
10	V32bis	14400, 12000, 9600, 7200 or 4800	Default for the GEN INDUS 144.
11	V34+	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400	Default Not available for the GEN INDUS 144.
17	V17	4800, 9600 half duplex	
23	V23	1200 half duplex	
27	V27ter	4800, 9600 half duplex	
29	V29	4800, 9600 half duplex	

The modem can also automatically switch to another modulation (auto-adaptation), by respecting the following limitations:

- The DTE can disable the auto-adaptation operations (see <auto-adaptation>).
- The DTE can force the valid modulation range by specifying the lowest and/or highest speed (see <min speed> and <max speed>).

2 – <auto-adaptation call> is an optional figure that enables or disables automatic auto-adaptation according to the V8 or V32bis notice, appendix 1, during automatic calling.

<auto-adaptation call>	Option selected	Notes
0	Auto-adaptation disabled	
1	Auto-adaptation according to the V8 or V32bis notice, Appendix 1	Default

Modulations exist for with no automatic negotiation; for example V23, V17, V27ter and V29.

Two other parameters are used to define the speed on the line. These are junction speed and the indication line baud rate = junction baud rate (&In).

For <auto-adaptation call> = 0

With line baud rate = junction baud rate.

The connection is defined by the junction speed and the requested modulation. The on-line baud rate will not be higher than the junction baud rate.

Example: with 1200 b/s communication and V34 modulation, the connection is made in V22 at 1200 b/s.

With line baud rate # junction baud rate.

The connection is defined by the junction speed, the requested modulation and the parameter <min speed>. The on-line baud rate could be higher than the junction baud rate if the chosen modulation or <min speed> is imposed; otherwise, the on-line baud rate will be equal to the junction baud rate.

Example: with communication at 1200, and V32bis modulation, the connection is made at the lowest possible speed for the modulation defined by <min speed> , i.e. 4800 b/s by default.

Example: with communication at 9600, <min speed = 4800> and V32bis modulation, the connection is made at the junction speed, i.e. 9600 b/s.

For <auto-adaptation call> = 1

With line baud rate = junction baud rate.

If the junction speed is less than the minimum baud rate for the common modulation, which has a higher baud rate, the connection will be made at this minimum speed.

Example: Communication at 1200 b/s and opposite a V32bis modem, the connection will be made at 4800 b/s.

Example: Communication at 1200 b/s and opposite a V34modem, the connection will be made at 2400 b/s.

Otherwise, the connection will either be made at the junction speed, or the speed shown up to <max speed>:

- At the junction speed, if it is less than the <max speed> but within the possible speeds for common modulation.

Example: Communication at 9600 b/s, <max speed = 14400> and opposite a V32bis modem the connection will be made at 9600 b/s.

- Up to the speed indicated by <max speed> if it is less than the junction speed but within the possible speeds for common modulation.

Example: Communication at 19200 b/s, <max speed = 9600> and opposite a V32bis modem, the connection will be made at 9600 b/s.

With line baud rate # junction baud rate.

The on-line baud rate is limited by the parameters <min speed> and <max speed> for V32, V32bis, V34 and VFC modulations. For the other modulations, the modem is connected at the highest speed.

Example: <min speed = 9600> and remote V21 modem, there is a V21 connection at 300 b/s.

3 – <auto-adaptation answer> is an optional digit that enables or disables automatic auto-adaptation.

<auto-adaptation answer>	Option selected	Notes
0	Auto-adaptation disabled	
1	Auto-adaptation enabled	Default

For <auto-adaptation answer> = 0

The modem will only try to connect at the specified modulation by transmitting or not transmitting its V8 sequence, according to the modulation parameter.

For <auto-adaptation answer> = 1

The modem will transmit its V8 auto-adaptation sequence and will try to connect at the specified modulation. If it fails, it will transmit the other modulations from the highest speed to the lowest.

Modulations with no automatic negotiation exist, example V23, V17, V27ter and V29.

4 – <min speed> is an optional number that specifies the minimum speed at which the modem can set up a connection. The value is encoded in decimal, its unit is bps, ex: 2400 specifies that the lowest speed is 2400 bps. The **default** value is 300.

5 – <max speed> is an optional number that specifies the maximum speed at which the modem can set up a connection. The value is encoded in decimal, its unit is bps, ex: 33600 specifies that the highest speed is 33600 bps. The default value is 33600.

EXAMPLES:

- If the <max speed> parameter is within the speeds supported by the modulation specified by <modulation> then the selected speed is the speed specified by <max speed>. For example: AT+MS=9,0,1,1200,4800 selects V32 at 4800 bps.
- If the <max speed> parameter is higher than the highest speed supported by the modulation specified by <modulation> then the selected speed is the highest speed supported by the modulation. For example: AT+MS=9,0,1,1200,14400 selects V32 at 9600 or 4800 bps.

Comment: the speed of the V24 link, the auto-adaptation and the authorisation to have an on-line baud rate different from the junction baud rate also influence the connection speed.

When calling, if auto-adaptation is disabled and the line baud rate = junction baud rate, a limitation prohibits connection at a higher speed than the flow of the data.

Example: V24 link at 19200 and command AT+MS=11,0,1,300,33600 will give us a maximum connection speed of 19200b/s.

Comment: Specific case in V34+¹, V34¹ and V32 bis modulation.

In V34+¹, V34¹ and V32 bis modulation, the on-line speeds can be 14400; 16800¹, 21600¹, 24000¹, 26400¹, 28800¹, 31200¹ or 33600¹ bits/s. As these speeds are not recognised by most telecommunication programs, the GEN INDUS 934 automatically adapts to the baud rates of the junction and line in the following configuration:

On-line speed = 14400 bits/s at 21600 bits/s ¹	⇒ Junction speed = 19200 bits/s
On-line speed = 24000 bits/s ¹ at 33600 bits/s ¹	⇒ Junction speed = 38400 bits/s

If the chosen junction speed is different to 19200 bits/s, it is necessary to use the commands AT&I1 or AT&I2 (see paragraph 8.4.2).

+VCID : Supervision of the « Calling number display » (Caller ID).

This command is used to validate or not the dispatch to the serial port the information about the calling modem when this function is active on the telephone line.

+VCID=0 : De-activates the display

+VCID=1 : Activates the display as follows :

DATE = 0402 (Month, day)

TIME = 1138 (Hours, minutes)

NMBR = 0241831300 (Calling number)

the pre+MSG = 16010A (Additional service information).

VCID=2 : Activates the presentation in the original form as received from the network.

¹ Not available on the GEN INDUS 144.

+VRID : Supervision of the « Calling number display » (Caller ID).

This command is used to re-read the information about the calling modem if this function is active on the telephone line.

+VRID=0 : Re- reading in the form :

DATE = 0402 (Month, day)

TIME = 1138 (Hours, minutes)

NMBR = 0241831300 (Calling number)

MESG = 16010A (Additional service information).

+VCID=1 : Re-reading in the original form as received from the network.

8.4.7 - AT! command

Some of these commands are also used with the standard Hayes commands, but are implemented to keep compatibility with other units in our range. All these commands can also be used in the CCITT format by replacing the "AT!" prefix with "MODE".

!An : Choose auto-adaptation in call mode

This command is immediately saved in non-volatile memory.

!A0: Fixed modulation in answer mode.

!A1: Auto-adaptation in call mode on the modulation of the answering unit **(default)**.

!CCITT : Change the command type

It is possible to change the type of commands that the modem will interpret at any moment.

!CCITT: Change from HAYES commands to the CCITT's V25bis commands.

!CFn : Send connection videotext string

This command is immediately saved in non-volatile memory.

When it is used in V23 Server answering mode, the GEN INDUS can send the hexadecimal string 13-53 (hex) required on certain Videotext servers to its associated computer to send the welcome page. This string is sent after connection and within a delay contained in the HAYES register: S45, in 100 ms steps. (See paragraph X).

!CF0: Disable sending the string 13-53(h) **(default)**.

!CF1: Enable sending the string 13-53(h)

!CF? : Can be used to check if the function is enabled or disabled.

!Dn : Limit the auto adaptation

This command is immediately saved in non-volatile memory.

!D0: In communication mode, the GEN INDUS adapts to the format and speed on each new command received **(default)**.

!D1: This mode can be used to reduce the processing time of the commands received with a restriction in format and speed auto-adaptation on only the first command received after a power-up or completely clearing the transmission buffer (128 characters).

!D?: Can be used to check if the function is enabled or disabled.

!En : Escape command control

This command is immediately saved in non-volatile memory.

!E0: Escape inactive

!E1: Escape active **(default)**

!E?: Can be used to check if the function is enabled or disabled.

!Fn : Non re-initializing of specific functions.

This command can be used to avoid erasing the programmed specific functions when an AT&Fn command is received

!F0: Re-initializing **(default)**

!F1: Non re-initializing.

!F?: Can be used to check if the function is enabled or disabled.

Functions:

Secure connection by password &E1,

Secure connection by call-back &E2,

Remote control &E3,

Manual secure connection &E5 and &E6,

Fixed junction speed !Vn,

Auto-adaptation on intermediate speed authorised !G1,

Limit auto-adaptation !D1,

No escape command control !E0,

Automatic switching of the LL on the PSTN !S1,

Overspeed active !O1,

Transmit connection videotext string !CF1,

EEPROM context use &Yn.

!Gn : Auto-adaptation control on intermediate speed.

The 14400 and 28800 communication speeds are not standard on computers. They can nevertheless be used by activating the function.

This command is only accepted off-line.

!G0: Communication not authorised at 14400 or 28800. **(default)**

!G1: Communication authorised at 14400 or 28800.

!G?: Can be used to check if the function is enabled or disabled.

!Hn : Enable/disable the loudspeaker. (identical to Mn)

Can be used to select the loudspeaker operation.

!H0: disable the loudspeaker.

!H1: the loudspeaker is enabled during dialling until connection with the remote **(default)**.

!H2: the loudspeaker is always enabled even during transmission.

!H3: identical to the M1 command except the loudspeaker is also enabled in automatic answering until it connects with the remote.

!Kn : Auto-adaptation command to 11- bit format.

This command is immediately saved into a non volatile memory.

This command is used to auto-adapt the modem to 10 and 11 bit formats.

!K0 : auto-adaptation to 7- bit, even parity and 8-bit no parity formats.

!K1 : auto-adaptation to 7-bit, even parity, 8-bit no parity, 8-bit even parity, 8-bit odd parity formats. In that case, only commands starting by AT, at, A/ OU A/ are recognized. When this function is valid the "Yes + format" appears on the communication auto-adaptation line (MODEVx) when the configuration is being displayed.

!Ln : Transmission level command

This command can be used to modify the transmission level of the modem in 1-dBm steps. The level is saved in non-volatile memory and is conserved as long as there has not been any new software modification. The factory setting sets it at -10 dBm.

n is a digit from 0 to 9 or a letter from "A" to "F".

Thus we obtain a transmission level setting from 0 dBm to - 15 dBm.

Examples: !L0: sets it to 0 dBm.

!LA: sets it to -10 dBm.

!LF: sets it to -15 dBm.

This command is immediately saved in non-volatile memory and in register S91.

!Mn : Select the type of modulation when calling

This command can be used to define the modulation that will be used for the next call by also delimiting the connection speed range, which influences the parameters for the automatic answer mode. The choice is also affected by the communication speed, which must be at least equal to the minimum speed for the chosen modulation.

!M0: V23 server Modulation (1200 b/s)

!M1: V23 Minitel modulation (1200 b/s)

!M2: V22 or V22 bis modulation (1200 to 2400 b/s)

!M3: V32 modulation (4800 to 9600 b/s)

!M4: V23 half duplex modulation (1200 baud)

!M5: V32bis modulation (4800 to 14400 b/s)

!M6: V27 ter half duplex modulation (2400 or 4800 b/s)

!M7: V21 modulation (300 b/s)

!M8: V32 modulation (4800 b/s)

!M9: V23 Minitel modulation (1200 b/s)

!M12: V34¹ modulation (2400 to 33600 b/s)

!M13: V34¹ modulation (2400 to 28800 b/s)

!M14: V34¹ modulation (2400 to 19200 b/s)

!M15: V34¹ modulation (2400 to 14400 b/s)

!M16: Voice mode and DTMF encoder/decoder (Paragraph XVIII)

!M17: V17 half duplex modulation (9600 or 14400 b/s)

!M18: V29 half duplex modulation (4800 or 9600 b/s)

!M20: V34¹ modulation (300 to 33600 b/s) (default)

Allocates registers S92, S93 and S94.

!Mode: Compatibility command

In order to be compatible with Gener products from a previous generation, this command comes as an addition to command!.

!On : Activate overspeed

This command is immediately saved in non-volatile memory.

This command can be used to accept a fluctuation of the data stream arriving on the line.

Caution, it must only be used opposite certain older generation modems, otherwise a large number of erroneous characters will be generated when receiving data.

!O0: Overspeed "no" (by default); a + 1% to - 2.5 % speed variation is accepted

!O1: Overspeed "yes"; a + 2.3 % to - 2.5 % speed variation is accepted.

!O?: Can be used to check if overspeed is enabled or disabled.

!Rn : Select auto-adaptation in answer mode

This command is immediately saved in non-volatile memory.

!R0: Fixed modulation in answer mode.

!R1: Auto-adaptation in answer mode on the modulation of the calling unit **(default)**.

¹ Not available on the GEN INDUS 144.

!RF : Select the communication format: speed, parity, size, stop

!RS : Select the communication format: speed, parity, size, stop

This command can be used to fix a communication format between the modem and the computer. It only operates for asynchronous transmissions. The parameters are:

speed

- 0: 300 bits/s
- 1: 1200 bits/s
- 2: 1200 bits/s
- 3: 2400 bits/s
- 4: 4800 bits/s
- 5: 9600 bits/s
- 6: 19200 bits/s
- 7: 38400 bits/s
- 8: 57600 bits/s
- 9: 115200 bits/s
- X: auto adaptation (300 to 115.2 k bits/s)

parity

- N: no parity
- E: even parity
- O: odd parity

size

- 7: 7 data bits
- 8: 8 data bits

stop

- 1: 1 stop bit
- 2: 2 stop bits

Allocates bits 0 to 7 of S19 and 1 to 5 of S23.

Examples:

!RS: X, E, 7, 1 gives auto-adaptation on the speed with 7 data bits, even parity and 1 stop bit.

!RS: 6, N, 8, 1 gives fixed speed at 19200 bits/s with 8 data bits, no parity and 1 stop bit.

Comment: It is not possible to have a 12-bit format (1 start bit, 8 data bits, one parity bit, 2 stop bits)

!RS: re-initializes all the parameters with their default value, auto-adaptation to the speed, the format and default speed 38400 b/s. A report is returned.

Comments:

Before saving with the **!RS** command in non-volatile memory, the modem requests confirmation to program the format. On positive confirmation, the new parameters on the speed and communication format are immediately active and saved in non-volatile memory. Therefore, they are active each time it is turned on.

Regardless of the chosen format, data is transmitted on the line on 8 data bits. The MODERS command only modifies the V24 junction side format.

With the **!RF** command, before saving in non-volatile memory, the modem does not request confirmation to program the format. Simply use the same parameters.

!Vn : Command to set the communication speed

This command is immediately saved in non-volatile memory.

It is possible to cancel auto-adaptation on the communication speed by programming a fixed speed. No report is returned.

!V0: Communication speed at 300 bits/s

!V2: Communication speed at 1200 bits/s

!V3: Communication speed at 2400 bits/s

!V4: Communication speed at 4800 bits/s

!V5: Communication speed at 9600 bits/s

!V6: Communication speed at 19.2 k bits/s

!V7: Communication speed at 38.4 k bits/s

!V8: Communication speed at 57.6 k bits/s

!V9: Communication speed at 115.2 k bits/s

!VX: Return to communication speed auto-adaptation **(default)**

Allocates bits 0 to 4 of S19 and 1 to 3 of S23.

!Xn : Command used to allow the control of outputs by DTMF codes.

This command is used to enable the control function of outputs by DTMF codes ; please refer to the paragraph « Control of outputs by DTMF codes » for additional information.

!X0 : de-activation

!X1 : activation

IX - TABLE OF MESSAGES TRANSMITTED BY THE MODEM

Comment: For all 'CONNECT' messages followed by a speed, refer to the commands ATWn, AT&In, ATVn and/or registers S31 and S95 to determine if the on-line modulation or V24 junction speed is given.

Numeric	Verbal	Description
0	OK	Command accepted
1	CONNECT	Junction or line speed 300 b/s
2	RING	Ringing tone detected
3	NO CARRIER	No carrier
4	ERROR	Invalid command or command line exceeding 128 characters
5	CONNECT 1200	Junction or on-line modulation speed
6	NO DIALTONE	No dialling tone
7	BUSY	Busy tone detected
8	NO ANSWER	The remote does not answer
9	CONNECT 600	Junction or on-line modulation speed
10	CONNECT 2400	Junction or on-line modulation speed

11	CALLER BUSY	Modem busy (6 s delay between two calls)
12	FORBIDDEN	Requested number is forbidden
13	CONNECT V23	The carrier has been detected in V23 1200 b/s
14	CONNECT 4800	Junction or on-line modulation speed
15	CONNECT 9600	Junction or on-line modulation speed
16	CONNECT 19200 ¹	Junction or on-line modulation speed
17	CONNECT 38400	Junction speed
18	CONNECT 14400	Junction or on-line modulation speed
19	CONNECT 115200	Junction speed
21	CONNECT 1200/REL x	Junction or line speed with protocol (see comment)
22	CONNECT 2400/REL x	Junction or line speed with protocol (see comment)
23	CONNECT 4800/REL x	Junction or line speed with protocol (see comment)
24	CONNECT 9600/REL x	Junction or line speed with protocol (see comment)
25	CONNECT 19200/REL x ¹	Junction or line speed with protocol (see comment)
26	CONNECT 38400/REL x	Junction speed with protocol (see comment)
27	CONNECT 14400/REL x	Junction or line speed with protocol (see comment)
28	REMOTE LOOP	Remote test loop in progress
29	END REMOTE LOOP	End of remote test loop
30	END LOCAL LOOP	End of local test loop
36	CONNECT 57600	Junction speed
37	CONNECT 28800/REL x ¹	Junction or line speed with protocol (see comment)
38	CONNECT 57600/REL x	Junction speed with protocol (see comment)
39	CONNECT 115200/REL x	Junction speed with protocol (see comment)
40	CARRIER 300	On-line modulation speed
44	CARRIER 75/1200	On-line modulation speed
45	CARRIER 75/1200	On-line modulation speed
46	CARRIER 1200	On-line modulation speed
47	CARRIER 2400	On-line modulation speed
48	CARRIER 4800	On-line modulation speed
49	CARRIER 7200	On-line modulation speed
50	CARRIER 9600	On-line modulation speed
51	CARRIER 12000	On-line modulation speed
52	CARRIER 14400	On-line modulation speed
53	CARRIER 16800 ²	On-line modulation speed
54	CARRIER 19200 ¹	On-line modulation speed
55	CARRIER 21600 ¹	On-line modulation speed
56	CARRIER 24000 ¹	On-line modulation speed
57	CARRIER 26400 ¹	On-line modulation speed
58	CARRIER 28800 ¹	On-line modulation speed
59	CARRIER 16800 ¹	On-line modulation speed
61	CONNECT 21600 ¹	On-line modulation speed
62	CONNECT 24000 ¹	On-line modulation speed

¹ Line speed not available for the GEN INDUS 144.

² Line speed not available for the GEN INDUS 144.

63	CONNECT 26400 ¹	On-line modulation speed
64	CONNECT 28800 ¹	Junction or on-line modulation speed
70	PROTOCOL: NONE	No error correction protocol for this connection
71	CONNECT 7200	On-line modulation speed
72	CONNECT 12000	On-line modulation speed
73	NO DIAL NUMBER STORED	No number stored in this memory position
78	CARRIER 31200 ¹	On-line modulation speed
79	CARRIER 33600 ¹	On-line modulation speed
80	PROTOCOL: MNP4	Error correction protocol used for this connection MNP4
84	CONNECT 33600 ¹	On-line modulation speed
91	CONNECT 31200 ¹	On-line modulation speed
92	CONNECT 7200/REL x	Junction or line speed with protocol (see comment)
93	CONNECT 12000/REL x	Junction or line speed with protocol (see comment)
94	CONNECT 16800/REL x ¹	Junction or line speed with protocol (see comment)
95	CONNECT 21600/REL x ¹	Junction or line speed with protocol (see comment)
96	CONNECT 24000/REL x ¹	Junction or line speed with protocol (see comment)
97	CONNECT 26400/REL x ¹	Junction or line speed with protocol (see comment)
98	CONNECT 31200/REL x ¹	Junction or line speed with protocol (see comment)
99	CONNECT 33600/REL x ¹	Junction or line speed with protocol (see comment)

MNP reports:

The connection messages sent back by the modem are more explicit if the AT\V1 command is activated. The 'REL' indication followed by the protocol type is returned, see TABLE OF MESSAGES TRANSMITTED BY THE MODEM.

Comments:

- In numeric mode, the connection messages for the same speed are identical, regardless of the connection mode (MNP)

Example: for a connection with a junction speed of 38400 b/s, with protocol, the message will be 26.

- For the messages that contain the additional 'REL' indication, if the negotiated protocol is:

MNP, the value of the x parameter is '4'

Example: CONNECT 38400/REL 4

X - HAYES REGISTERS

The GEN INDUS has a set of registers called S registers that are associated to the HAYES command set.

Their value must be between 0 and 255.

The registers underlined are those saved in non-volatile memory.

The default parameters in the registers where the bits are differentiated are shown in bold.

Registers	Function
<u>S0:</u>	Default contents 1. Number of rings in automatic answering before the modem answers. The value 0 disables the automatic answering.
S1:	Default contents 0. Counter for the number of rings. Read only.
<u>S2</u>	Default contents 43. Escape character used to change from transmission mode to command mode (see escape command "+++")
S3:	Default contents 13. Command line end character (CR).
S4:	Default contents 10. Line return character (used when sending messages in verbal mode).
S5:	Default contents 8. Backspace character used to cancel the last character when sending a command.
<u>S6:</u>	Default contents 11. Maximum delay for dial tone detection.
<u>S7:</u>	Default contents 135. Maximum waiting time for the remote carrier.
<u>S8:</u>	Default contents 3. Pause time for the dialling parameter ",", at least 3 seconds.
<u>S9:</u>	Default contents 4. Time between the unit detecting the carrier and DCD rising (circuit 109), 0.4 seconds.
<u>S10:</u>	Default contents 15. Min signal presence time for carrier detection in full and half duplex. Can be modified in 10 ms steps in full duplex i.e. by default: 150 ms; or in 1 ms steps in half duplex i.e. by default: 15 ms.
<u>S11:</u>	Register reserved. Default contents 85.
<u>S12:</u>	Default contents 50. Holding time used for the escape sequence ("+++"), the unit is 20 ms hence a default value of 1 second.
<u>S13:</u>	Default contents 2. Min signal absence time to hang up or start a retrain request. Base 100 ms.

S14: Default contents 10.
 Bit 0: not used
 Bit 1: 0 no echo (ATE command)
 1 echo active
 Bit 2: **0 reports: enabled** (ATQ command)
 1 no report
 Bit 3: 0 reports: numeric (ATV command)
 1 reports: verbal
 Bit 4: not used
 Bit 5: **0 multi-frequency**
 1 decimal dialling
 Bit 6: not used (at 0)
 Bit 7: **0 answer mode**
 1 call mode

S15: Default contents 0.
 Bits 0, 1 and 2 not used.

Bit 5	Bit 4	Bit 3	Error correction
0	0	0	inactive (ATN0)
0	0	1	Inactive (ATN1)
0	1	0	MNP exclusive (ATN2)
0	1	1	auto detection (ATN3)

Bit 6: **0 data stream mode**
 1 data block mode

Bit 7: not used

S16: Default contents 0. Used for test commands (&T).

S17: Contents 30. In half duplex local DCD signal holding time when the carrier has disappeared on line.

S18: Default contents 30. Test times for type 2 and 3 loops. If 0, the test lasts until the command AT &T0 is received.

S19 Speed and format of the V24 junction - Default contents 209.

Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Speed
0	0	0	0	0	300
0	0	0	0	1	600
0	0	0	1	0	1200
0	0	0	1	1	2400
0	0	1	0	0	4800
0	0	1	1	0	9600
0	1	0	0	0	14400
0	1	0	1	0	19200
0	1	1	1	0	28800
1	0	0	0	1	38400
1	0	0	1	0	57600
1	0	0	1	1	115200

Bit 5: **0 one stop bit**
 1 two stop bits

Bit 7	Bit 6	Format
0	0	5 bits
0	1	6 bits
1	0	7 bits

1	1	8 bits
---	---	--------

S20: Register reserved.

S21: Default contents 116.

Bit 2: CTS status (AT&R command)

0 - CTS always ON (&R1)

1 - CTS follows RTS (&R0)

Bit 4-3 and 10: DTR control (AT&D command)

00 00 - &D0

01 00 - &D1

10 00 - &D2

11 00 - &D3

00 01 - &D4

00 10 - &D5

00 11 - &D6

Bit 5: DCD status (AT&C command)

0 - DCD always active (&C0)

1 - DCD follows carrier (&C1)

Bit 6: DSR status (AT&S command)

0 - DSR always ON (&S0)

**1 - DSR active on answering tone detection
and inactive on carrier loss (&S1)**

Bit 7: Not used

S22: Default contents 118

Bit 1	Bit 0	Loudspeaker Volume (Ln)	
0	0	Loudspeaker inactive (L0)	
0	1	Low volume (L1)	
1	0	Medium volume (L2)	
1	1	High volume (L3)	
Bit 3	Bit 2	Loudspeaker command (Mn)	
0	0	Loudspeaker inactive (M0)	
0	1	Loudspeaker up to carrier (M1)	
1	0	Loudspeaker permanently active (M2)	
1	1	Identical to M1 but also in auto-answering.	
Bit 6	Bit 5	Bit 4	Report management:
0	0	0	X0
0	0	1	Reserved
0	1	0	X8 ident calling in the form +Clip: " 123456789"
1	1	1	X5 ident calling in the form 0123456789
1	0	1	X1
1	1	1	X4

Bit 7 to 0 Unused

S23: Default contents 190.

Bit 0 = 0 disable answering a remote loop 2 request

Bit 0 = 1 enable answering a remote loop 2

Request

Bit 3	Bit 2	Bit 1	Communication speed with the modem
0	0	0	300 baud
0	0	1	Not used
0	1	0	1200 baud
0	1	1	2400 baud
1	0	0	4800 baud
1	0	1	9600 baud
1	1	0	19200 baud or 14400 baud
1	1	1	38400 baud or +
Bit 5	Bit 4	Parity control	
0	0	Even	
0	1	Not used	
1	0	Odd	
1	1	None	
Bit 7	Bit 6	Holding tone	
0	0	None	
0	1	None	
1	0	1800 Hz	
1	1	None	

S24: Default contents 0. (in seconds)

Power consumption timeout, with a value other than 0, the modem cuts its power depending on the operating mode chosen; see paragraph on Low power consumption mode.

S25: Default contents 5. Delay before taking into account the disappearance of the DTR signal (50ms)

S26: Default contents 0. Inter-character timeout in 10 ms steps.
See paragraph "Transmit on timeout".

S27: Default contents 0.

Bit 1	Bit 0	Transmission Mode
0	0	Asynchronous (AT&M0)
0	1	Not used
1	0	Not used
1	1	Not used

Bits 2, 4 and 5 at 0.

Bit 3: Impedance type in LL (Leased Line) half duplex.

0 – Normal Zr.

1 – High when listening, Zr when transmitting.

Bit 6: Communication link

0 – V24

1 – RS485A

Bit 7: Low power consumption operating mode.

0 – Cut power supply as soon as DTR drops.

1 – Cut power supply when DTR is dropping, after S24.

S28: Register reserved. Default contents 1.

S29: Default contents 0. Line release duration when the modem finds the '!' parameter flashing in the dialling string. In 10 ms steps.

S30 Register reserved. Default contents 128.

S31 Default contents 50.

Bit 0: Auto-adaptation in call mode on the modulation

0 – disabled

1 – enabled

Bit 1: Auto-adaptation in answering mode on the modulation

0 – disabled

1 – enabled

Bit 3	Bit 2	Connection message management
0	0	V24 speed only (W0)
0	1	All (W1)
1	0	Line speed only (W2)
1	1	Not used
Bit 4	Bit 5	Maximum size of the MNP Blocks
0	0	64 Characters
0	1	128 characters
1	0	192 characters
1	1	256 characters

Bits 6 and 7: not used

S32: Default contents 0.

Bits 0, 1, 2 and 3: not used

Bit 4: **0 line speed equals V24 speed. (&l0)**

1 line speed different to V24 speed. (&ln)

Bit 6	Bit 5	Flow control between the mode and the terminal equipment (\Qn , &Kn n)
0	0	No flow control
0	1	XON/XOFF flow control
1	0	CTS flow control
1	1	XON/XOFF and CTS flow control

Bit 7: Not used

S33: Default contents 128.

Contains the triggering thresholds for flow control.

Bit 3	Bit 2	Bit 1	Bit 0	XON threshold
0	0	0	0	128 characters
0	0	0	1	256 characters
0	0	1	0	384 characters
0	0	1	1	512 characters
0	1	0	0	640 characters

0	1	0	1	768 characters
0	1	1	0	896 characters
0	1	1	1	1024 characters
1	0	0	0	1152 characters

Bit 7	Bit 6	Bit 5	Bit 4	XOFF threshold
0	0	0	0	Not used
0	0	0	1	256 characters
0	0	1	0	512 characters
0	0	1	1	768 characters
0	1	0	0	1024 characters
0	1	0	1	1280 characters
0	1	1	0	1536 characters
0	1	1	1	1792 characters
1	0	0	0	2048 characters
1	0	0	1	2304 characters
1	0	1	0	2560 characters
1	0	1	1	2816 characters
1	1	0	0	3072 characters
1	1	0	1	3328 characters
1	1	1	0	3584 characters
1	1	1	1	3840 characters

S34: Default contents 0, changes to 15, i.e 150 ms with *T command.
For re-transmission of input states over a leased line with protocol, used to indicate the minimum silence duration between each transmitted frame. For re-transmission of input states over the PSTN, determines the waiting time between two calls in case of failure, base 1s.

S35: Default contents 0. changes to 15s, i.e 150 ms with * T command.
For re-transmission of input states over a leased line with protocol, used to indicate the duration between each received frame.

S36: Default contents 8.
Bit 0 contains S1 output status when the status saving function is requested.
Bit 1 contains S2 output status when the status saving function is requested.
Bit 2 indicates if the output status saving function is active through command –Rn.
Bit 3 indicates if the modem is transparent or not for the XON and XOFF characters in error correction mode with XON/XOFF flow control activated.
1: the modem is transparent
0: not transparent.

S37: Default contents 0.
Register used for the inactivity clock in transmission. If S37 equals 0, the inactivity clock is disabled, otherwise the unit is the minute with an accuracy of about a minute (avoid giving the value 1 to this register).

S38: Default contents 0.

S39: Default contents 17.
Contains the XON flow control character.

S40: Default contents 19.
Contains the XOFF flow control character.

S41: Default contents 4.
Bits 4, 5, and 7: not used

Bit 1	Bit 0	Type of compression (%Cn)
0	0	No compression (%C0)
0	1	Not used
1	0	Not used
1	1	Not used
Bit 6	Bit 2	Retrain management (%En)
0	0	Disabled (%E0)
0	1	Enabled (%E1)
1	0	Enabled (%E2)
1	1	Enabled (%E3)

S42: Default contents 0.
Register used to time out sending reports in command mode and sending connection messages after carrier detection. Modifiable in 2 ms steps.

S43: Default contents 30.
Register used in half duplex to time out the CTS signal arrival when RTS rises. Modifiable in 2 ms steps.

S44: Default contents 8.
Register used in half duplex to time out the CTS signal falling when RTS falls. Modifiable in 2 ms steps.

S45: Default contents 100. 10 ms base.
Register used for the delay between connection and sending the string 13-53 (hex) in V23 Server mode, associated with the MODECFn command (paragraph 8.4.7). Modifiable in 10 ms steps: 1s by default.
Is also used for re-transmission of contact states as maximum duration (Second base in that case) between two transmissions when transmitting without protocol.

S46: Contents by default 000.
Bit 0: at 1 enables multiple turnarounds on carrier loss in V23 full.
Bit 1: at 1 enables turnarounds on change of state of the RTS signal (RTS ON -> E1200/R75; RTS OFF -> E75/R1200).
Bit 2: at 1 no longer enables hanging up in half duplex on timeout.
Bit 3: at 1 enables transfer in half-duplex without RTS. The modem goes into transmission as soon as a character is received.
Bit 4: at 1 enables transfer with a long synchronisation sequence in V27ter and V17.
Bit 5: at 1 enables transfer with a protection sequence against line echo before synchronisation sequence in V27ter, V29 and V17.
Bit 6: determines the type of protection sequence against line echo.
0: long 185 ms sequence
1: short 30 ms sequence
Bit 7: At 1. Instructs the modem to reproduce on line the junction data format. Supports 11 bits on line.

- S47: Default contents 002. (in milliseconds)
In the RS485A link, the duration without receiving characters over the link before entering transmission.
- S48 Default contents 0
Bit 0 reserved.
- S92: Default contents 0.
Minimum modulation speed (see bits 0 to 4 of S19). Read only, pass by a +MS command.
- S93: Default contents 16.
Maximum modulation speed (see bits 0 to 4 of S19). Read only, pass by a +MS command.
- S94: Default contents 11.
Modulation selected in call mode. Read only, pass by a +MS command.
- S95: Default contents 0.
Report management
Bit 0 The CONNECT message is given with the line speed instead of the junction speed. (&I2)
Bit 1 The connection message is given in the form CONNECT XXXX/REL.. if error correction is present. (\V1)
Bit 2 Enable sending the message CARRIER XXXX; :. (XXXX=line speed)
Bit 3 Enables sending the message PROTOCOL XXXX; (XXXX= protocol of the current session)
Bit 4 Reserved
Bit 5 Authorises sending the message COMPRESSION XXXX; (XXXX= compression protocol). This message is sent if a connection with protocol is in progress.
Bit 6 Reserved
Bit 7 Reserved
- S100: Default contents 1.
Address allocated to this modem in ModBus.
- S101: Default contents 2.
Number allocated to this network in ModBus.
- S102: Default contents 8.
Maximum inter-character timeout in ModBus (1 ms steps). **Automatically, Gen Indus adjusts the time-out value according to the junction speed and the on-line baud rate. See paragraph " Slave Mode".**
- S103: Default contents 0.
Operation control in ModBus
Bit 0 The operation in ModBus slave is valid.

- Bit 1 In ModBus slave, when calling, the modem transmits its address and network number on connection.
- Bit 2 In ModBus slave, when receiving a call, the modem waits to receive the address and network number from the remote on connection.
- Bit 3 In ModBus off-line master functionality
- Bit 4 In ModBus master, state of the bits read in release condition.
0: release condition at 0
1: release condition at 1
- Bit 5 Reserved
- Bit 6 Reserved
- Bit 7 Reserved

S104: In ModBus master, address of the 1st slave on the network.
Default contents 2.

S105: In ModBus master, slave number on the network.
Default contents 1.

S106: In ModBus master, read interrogation code.
Default contents 2. (read bits)

S107: In ModBus master, address of the 1st slave on the network.
Number of bits read. Default contents 16.

S108: In ModBus master, most significant bit of the start address for reading.
Default contents 0.

S109: In ModBus master, least significant bit of the start address for reading.
Default contents 0.

S110: In ModBus master, timeout for an answer. (100 ms steps)
Default contents 100.

S111: In ModBus master, same frame repetition number before alarm.
Default contents 3.

S112: In ModBus master, most significant bit of the alarm mask on the received data.
Default contents 255.

S113: In ModBus master, least significant bit of the alarm masque on the received data.
Default contents 255.

S114: In ModBus master, index of the memory position to use to call in case of alarm.
Default contents 0. (&Z0)

S115 In MODBUS master, indicates the waiting time between two calls to the master site when an associated PLC does not answer .Contents by default 24 (in hours)

XI - SUMMARY OF THE COMMANDS BY ACTIONS

XI.1 - DCD, DTR, DSR, RTS signal handling

AT&Cn	DCD
AT&Dn	DTR
AT&Sn	DSR
AT&Rn	RTS

XI.2 - Operations on the non-volatile memory

ATZn	Initialise from the non-volatile memory.
AT&Fn	Call up factory configuration.
AT&Wn	Save the active configuration.
AT&Zn	Save a telephone number.
AT&Zn?	Interrogate a memory position.
AT&Yn	Choose profile on power up.

XI.3 - Speed / Format / Mode commands

AT&An	Choose V24 or RS485 link.
AT&In	Line /junction speed dependence/independence.
AT&Mn	Select synchronous/asynchronous mode.
AT&Xn	Select clock type in synchronous mode.
AT!Dn	Fast auto-adaptation.
AT!En	Enable escape sequence control.
AT!Gn	14400 and 28800 auto-adaptation.
AT!Kn	Auto-adaptation to 10-bit and 11-bit formats.
AT!Vn	Set the communication speed.
AT!RF:n	Set the format and communication speed.
AT!RS:n	Set the format and communication speed.
AT+IPR	Set the communication speed
AT+ICF	Select the communication format

XI.4 - Commands influencing the connection

ATBn	Choose the modulation type.
AT!Mn	Choose the modulation type.
AT&Gn	Select the holding tone.
ATNn	Choose auto-adaptation when calling and/or answering.
AT!An	Choose auto-adaptation when calling.
AT!Ln	Modify transmission level.
AT!On	Overspeed control.
AT!Rn	Choose auto-adaptation when answering.
AT+MS=	Choose modulation, auto-adaptation and baud rate.
AT+GHD=	Choose Half Duplex V23 mode

XI.5 - Operations on the Registers

ATSn =	Load a register
ATSn?	Read a register

XI.6 - Commands on modem messages

ATEn	Local echo control.
ATQn	Activate/deactivate messages.
ATVn	Verbal/encoded message.
ATXn	Message in or not in extended mode.
ATWn	Select messages.

ATVn Extended message with protocol.

XI.7 - General operating commands

A/ Repeat the last command.
ATA Immediate answer.
ATD Immediate call
ATDn Dial.
ATDL Call the last number.
ATDSn Call the number in memory n.
ATLn Loudspeaker volume level.
ATHn Hang up the line.
ATIn Modem identification message.
ATMn Enable/disable the loudspeaker.
ATO Line return command.
AT&Tn Tests
AT&Vn Display the registers for the current configuration
AT\S Display the current configuration
AT%En Control the retrain currently in communication.
AT%L Read reception level.
AT%M Read the quality of the signal received.
AT!Hn Enable/disable the loudspeaker.
AT!CFn Specific control in V23 server mode
AT!Sn Leased Line control mode.
AT*P Access the alarm inputs /outputs control menu
AT\$P Access the ModBus operation control menu
ATT Access to the application software loading menu**
AT-Bn Control of audio signal on power up
AT+VCID Control of caller ID
AT+VRID Control of caller ID

XI.8 - Flow control.,

AT&Kn Local flow control on V24.
AT\Qn Local flow control on V24.
AT%Qn Transfer stopping threshold.
AT%Sn Transfer restarting threshold.
AT+IFC Control of V23 local data flow

XI.9 - Error correction.

AT\An Choose block size.
AT\Nn Error correction control.
AT\Ln Choose transfer type.
AT+ES Control of connection type

XI.10 - Data compression

AT%Cn Data compression control.

XI.11 - Secure connection

AT&En Activate/deactivate security level.
AT&P1n Program Answer back password.

AT&P2n Program Call back.
AT&P3n Program remote control password.

XII - LINE INACTIVITY CLOCK

It is possible to set up an inactivity clock using register S37.

The default value of this register is 0 and the clock is then inactive. However, by loading a value between 2 and 255 in S37, a data transmission mode is started, a timeout that runs whilst there is no data transfer on the line. This timeout is rearmed when new data is transmitted or received.

The base unit of S37 is the minute. As soon as the timeout goes to 0, the modem decides to free the line and hangs up.

XIII - LINE BAUD RATE – V24 BAUD RATE

On some server systems, the application fixes the speed of the modem serial port, regardless of the modulations used (V21 to V34+). The **GEN INDUS** allows this operation by authorizing a different line speed to the series interface speed. This functionality requires hardware or software flow control between the **GEN INDUS** and the associated server system. See AT&In command.

XIV - SECURE CONNECTION FUNCTION

XIV.1 - Introduction

To give the user a certain access security to the modem relative to a complex application, without it having to control everything, the following functions are available:

- Access by password in transmission: Answerback
- Call-back after password: Call back
- Remote control of the modem by password via the line (maintenance function)
- Start the inactivity clock

Comment:

For all password functions, the commands and procedure are specific to GENER.

XIV.2 - Principle used

Everything is based on the use of a non-volatile memory in which the user will store passwords that will then be transparently controlled by the modem during connection.

The called modem reacts in two ways:

- No protection level is activated, it then behaves as a normal modem that sends and receives data as soon as there is a connection.
- At least one protection level is activated. On connection, it waits 300ms before asking the calling modem to identify itself by sending ENQ(05H). Then a timeout starts during which it waits for the first character of a password. This password must then arrive within 300 ms. If the remote cannot identify itself, the answering modem waits 600 ms after the connection before deciding what it must do.

However, if the remote sends its password, a maximum time of 900 ms may pass before entering data transmission mode.

XIV.3 - Secure connection by password

This level is considered as being the first level.

Two operating modes can be considered depending on whether the modem is calling or being called.

It is necessary to program two passwords:

- a local password called ABL that is used when the modem is called.
- a remote password called ABD that is used when the modem calls.

After programming the passwords and activating security level 1, the process is the following:

- 1 - The calling modem physically connects to the called modem with a calling side connection message.
- 2 - The called modem tells the calling modem to identify itself (send ENQ)
- 3 - The calling modem then sends its ABD password.
- 4 - The called modem then compares this password with its ABL password. If these two passwords are identical, the two modems go into data transmission, otherwise the answering modem hangs up to prohibit the transmission of any data whatsoever.

The required software commands are the following:

AT&E1 : Activate security level 1, relative to level 2 only. The command must be performed on both units.

AT&P1D = xxxxx: Program the caller's ABD password, with automatic saving in non-volatile memory.

AT&P1L = xxxxx: Program the called unit's ABL password with automatic saving in non-volatile memory.

Passwords are strings of 5 characters that have a decimal value between 0 and 127, excluding the values 8, 13, 32, 43, 45 and 46.

Lower case characters are transformed into upper case characters.

XIV.4 - Secure connection by call-back

This security level of is considered as the second.

It is necessary to program a password on the caller side to be identified. This password is called CB and consists of 4 characters with the same restrictions as above in XIV.3.

A password table must be created for the answering modem, to which a telephone number is associated. We then have a maximum of 9 passwords, each with its associated call-back telephone number.

The numbers are saved in the form of dialling strings in HAYES parameters with the AT command removed. The dialling string can accept a maximum of 34 characters.

After programming the passwords and activating security level 2, the process is the following:

- 1 - The calling modem physically connects to the called modem with a calling side connection message
- 2 - The called modem asks the calling modem to identify itself (send ENQ). At the same time, it saves the caller's modulation type to be able to call it back in the same mode.
Comment: The speed parameters vitesse_min and vitesse_max must be coherent with the modulation (see AT+MS command).
- 3 - The calling modem then sends its CB password.

4 - Once the complete password has been received, the called modem hangs up.

5 - The called modem then compares this password with the password or passwords contained in its table. If the received password is in it, the modem takes the associated dialling string and dials the number 30 seconds after hanging up. During call-back, dialling is controlled like any call according to the V25 bis notice and if it fails, the attempt to connect is definitively abandoned.

6 - After hanging up, the modem that made the first call waits to be called by the remote modem within a maximum delay of 4 minutes. If this time passes without any connection, the call-back is activated in answer mode. If there is an incoming call after this delay, the modem will ask the remote to identify itself and will wait for a password to carry out a call-back sequence.

The required software commands are the following:

AT&E2 : Activate security level 2, relative to level 1 only. The command must be performed on both units.

AT&P20 = xxxx: Program the caller's CB password, with automatic saving in non-volatile memory.

AT&P2n = xy ... xy: Program the Pn password with automatic saving in non-volatile memory. n is from 1 to 8.

AT&Zn = xy ... xy: Save telephone number n associated to password Pn. n is from 1 to 8. The number is directly saved in non-volatile memory.

XIV.5 - To take control of a remote modem

This function is called security level 3.

For maintenance reasons or to find out the configuration of a remote modem, an access function exists via the telephone line that is secured by exchanging a password.

Once again, the calling side and the called side must be considered. The operation is similar to security level 1 except that instead of both modems going into data transmission mode, the remote modem goes into command mode via the telephone line.

The V24 junction of the remote is de-activated until the caller decides to hang up or when the carrier is lost.

The caller then has access to all the commands on the remote modem.

For the caller, it is necessary to program a remote password called PRGD and for the called unit, a password called PRGL. These passwords are strings of 6 characters (same comments as before).

After programming the passwords and activating security level 3, the process is the following:

- 1 - The calling modem physically connects to the called modem with a calling side connection message.
- 2 - The called modem asks the calling modem to identify itself (send ENQ).
- 3 - The calling modem then sends its PRGD password.
- 4 - The called modem then compares this password with its PRGL password. If these two passwords are identical, the caller passes into command mode on the remote, otherwise the two modems pass into data transmission mode.

The required software commands are the following:

AT&E3 : activate security level 3 and not exclusively related to levels 1 and 2. The command must be performed on both units

AT&P3D = xxxxxx: program the PRGD password with automatic saving in non-volatile memory.

AT&P3L = xxxxxx: program the PRGL password with automatic saving in non-volatile memory.

XIV.6 - Manual secure connection

PRINCIPLE

Calling modem: Of unknown make

Answering modem: GEN INDUS

a) level 5 (manual Answer Back)

- Configure the calling modem: None
- Configure the GEN INDUS modem:
 - AT&E5
 - AT&P1L = YYYYYY (5-character password)
 - AT&W (save configuration)

During connection on modem X side, the password corresponding to YYYYYY must be sent at the prompt. The modems will then remain connected.

b) Level 6 (manual Call Back)

- Configure modem X: None
- Configure the **GEN INDUS** modem:
 - AT&E6
 - AT&P2n = yyyy (4 characters)
 - n varies from 1 to 8, which gives 8 possible passwords.
 - AT&Zn = "telephone number to call back"
 - AT&W (save configuration)

Examples:

Command string AT&P21 =GENR and AT&Z1=0W0202020202

When we supply GENR as password on modem X side, the **GEN INDUS** will then call back: 0 02 02 02 02 02

Command string AT&P22 =5432 and AT&Z2=0W0505050505

The **GEN INDUS** will call back:0 0505050505.

Comment:

Passwords must be in upper case characters. The maximum entry time for the password is 15 seconds. After this delay, communication is interrupted and the password entry is considered invalid.

XIV.7 - Additional commands

AT&E0 De-activates all security levels.

AT&E4 Activates security level 4 that has the effect of level 2 then level 1 during the call.

AT&Zn? Display telephone number n. n is from 0 to 14.

AT&Z n = Followed by a carriage return, erases number n and the password

AT&P1n= Followed by a carriage return, erases password P1n.

AT&P3n= Followed by a carriage return, erases password P3n.

Comments: To save the various security levels in non-volatile memory, the AT&Wn command must be used after activating them.
For the calling side, if several security levels are active, the highest level is taken.

XV - SUPERVISION OF INPUTS AND OUTPUTS

Supervision of digital inputs

In addition to its modem functions, the **Gen Indus** modem has 4 inputs, or more if equipped with an extension board ;the input status change will result in the **Gen Indus** generating calls to one or more numbers. After connection, the **Gen Indus** enters the predicted transmission mode.

Supervision of analogue inputs

When the **Gen Indus** is equipped with an extension board, it has the possibility of controlling analogue inputs , current loop 4-20 mA type, thanks to an 8-bit analog/digital converter. The operating principle is as follows : in order not to substantially increase current consumption, analogue inputs are only powered during their reading. The minimum reading interval is 100 milliseconds. The input switching principle requires certain detectors to be powered before data acquisition; this is possible by programming. The result is that the reading intervals of an analogue input depends on the time during which all active inputs are powered. Thus, if two inputs are used and each one needs to be powered for 1,5 second, the minimum time between two readings will be 3 seconds.

The programming will permit the following facilities :

- The selection of the number of times a threshold is exceeded to generate an alarm, with the supply duration, this will give the integration time.
- The selection of threshold values indicating an alarm condition
- To choose if the return to a normal value generates an alarm or not.
- To select the action when returning to stand-by(Note : Stops the call not yet supervised)
- To select the telephone numbers
- To select the information to be sent
- To select the conversion factor in order to know immediately the value read; thus with a PT 100 (0-100°C) detector we obtain 255 steps for 100 degrees, i.e 0,39° by step.
by entering this value, it is possible to read the temperature.
- To select the power supply duration before acquisition

Note : When one single analogue input is activated, this input is permanently powered.

These functions are added to the modem basic call and automatic answer functions. Thus, the associated system (PLC, regulator....) can use the modem in a standard mode in case of failure, by activating a contact and the Gen Indus can call the maintenance department.

COMMENTS

In some cases, it is not possible to inhibit the modem alarm input and the modem will permanently attempt to call. The only way of going back into the modem command mode is to switch off the power supply, set micro switch 1 to ON, 2 and 3 to OFF and then switch the supply back on. In this configuration, the modem no longer tries to call in alarm and it is thus possible to correct possible configuration errors. Do not forget to set the micro switches back to their initial configuration while switching off the power supply, when work on the equipment is over. The above will be implemented in software versions V4.20 and subsequent ones.

Call Supervision

The call is started after a change of state in either direction has been taken into account, (transition from release condition to operating condition only or transition from release condition to operating condition and operating condition to release condition), for a time that can be programmed from 10 ms to 60 seconds, The release position is programmable.

The GEN INDUS can call up to 9 different telephone numbers on a change of state, with the possibility for each number to have a specific transmission mode.

If the modem calls on each change of state, different messages can be allocated for the release to operating transition or the operating to release transition. The GEN INDUS has 8 messages, each 32 characters long. It is possible to make up phrases by placing different messages side by side (A maximum string of 256 characters can be sent).

For each recipient, we can independently program:

the junction speed from 300 to 115200 b/s,

the format 8 bits no parity, 7 bits even parity, 7 bits odd parity, 8 bits even parity and 8 bits odd parity,

the line baud rate relative to the junction baud rate,

the use of error correction protocol. MNP4,

the use of flow control,

auto-adaptation on the remote modulation,

active modulation from V21 to V34+¹

the on-line baud rate from 300 to 33600 b/s¹

¹ V21 to V32 Bis for the GEN INDUS 144.

the transfer protocol (see below).

The connection message is given in the default format that can be modified with the general commands and can be displayed with the AT\S command. It switches to the speed and format of the number once the connection message has been sent.

If "DTMF" modulation is selected, when in alarm, Gen Indus calls the remote .

In addition, the GEN INDUS has 2 independent isolated outputs, or more if the extension board is installed , which can currently be used to monitor the state of the inputs or the DCD signal. For connections and switchable power, see chapter "TECHNICAL DATA".

XV.1 - Calling principle

When an alarm is detected, it is saved in memory and the **GEN INDUS** starts its transmission cycle, as follows:

- It checks that there are no incoming calls,
- It takes the line and dials the first number allocated to this alarm,
- If the call connects,
- The modem enters the predicted mode and controls hanging up.
- Otherwise, the modem keeps a trace of the call failure,
- It tries to call the next number allocated to this alarm if there is one, or the one of another alarm before repeating the one that failed.

In this way, the **GEN INDUS** reviews all the numbers and alarms in progress before repeating a call if there is a failure.

Example: input 1 (E1) has telephone numbers 0 (N0) and 1 (N1) allocated to it. Input 2 (E2) only has telephone number 2 (N2) allocated to it.

Call procedure.

Input 1 becomes active,

Input 2 becomes active,

Try to call N0,

N0 call fails,

Try to call N1,

Transfer correct,

Try to call N2,

Transfer correct,

Try to call N0,

N0 call fails,

Try to call N0,

Transfer correct.

XV.2 - Transfer protocols

The protocols currently available are "TRANSPARENT", or "MESSAGE" with sending pre-recorded messages, or "TEC". Other transmission protocols will be added later: pagers, mini message, etc...

TRANSPARENT: In this case, the **GEN INDUS** automatically calls the pre-recorded number and once the connection is set up, connects the line to the junction (like a normal modem), by taking programmed information into account (line baud rate = junction baud rate, etc..).

MESSAGE: As above, the GEN INDUS automatically calls the pre-recorded number and once the connection is set up, transmits the message(s). To be sure of the integrity of the transmitted message in this mode, it is advisable to validate the MNP4 error correction.

¹ 300 to 14400 for the GEN INDUS 144.

After transmitting the message, the GEN INDUS waits 3 seconds then hangs up.

TEC: This protocol is mainly used to transmit technical alarms. It includes a return acknowledgement. The GEN INDUS automatically calls the pre-recorded number and once the connection is set up, transmits the first alarm frame, waits for the acknowledgement before transmitting the next frame or hangs up. If the modem does not receive the acknowledgement, it hangs up and repeats its call cycle until an acknowledgement is obtained.

MODBUS: To use it in this mode, "TRANSPARENT" protocol must be used and the modem configured in ModBus using the specific menu (AT\$P).

XV.3 - Alarm return acknowledgement

The acknowledgement is different depending on the transfer protocol and the modulation used. For V23 to V34 modulations :

TRANSPARENT: The call resulting in a connection acknowledges the alarm.

MESSAGE : The fact that **Gen Indus** is able to transmit its message following a connection acknowledges the alarm; there is no control of the reception by the remote.

TEC : With this protocol, the receipt of the remote return acknowledgement frame acknowledges the alarm.

MODBUS : In that case, the acknowledgement is programmable , either the connection in itself acknowledges the alarm or a writing into the register (address 0050h)is necessary to acknowledge the alarm.

SCRIPT : In that case, if the script follows its normal course to the last line, the alarm is acknowledged.

“DTMF “ modulation

In that case, the **Gen Indus** does not take into account the speed and protocol information.

During a call, it waits, in return, for the receipt of a series of DTMF figures, followed by character “ * “ , corresponding to the programmed value at “ SITE Name “ in the alarm programming menu. If the code is correct, a short “bip” is generated to the remote, if the maximum waiting time is reached or the code is wrong, a long “bip” is sent back.

In the event of a call failure (no answer from the remote), **Gen Indus** supervises the return calls in accordance with TBR21 specifications. If the remote enters a wrong acknowledgement code, the call will be repeated according to the TBR21 specifications and up to a specified maximum number of times.

If the acknowledgement is validated, the other DTMF- configured call numbers will not be called.

XV.4 Programming

To be able to use the GEN INDUS with the alarm input management functionality, it must be programmed. This can be done in two different ways, either via a user-friendly menu, or via a set of Hayes © commands.

When the modem receives, it is in default configuration, i.e.:

For the alarm inputs

- Not operational,
- Normally Open,
- Alarm on Release/Operate condition switching only,
- Allocated telephone number corresponding to the input number – 1 (Ex: memory &Z0 allocated to input 1),
- Allocated message number corresponding to the input number – 1 (Ex: memory &M0 allocated to input 1),
- No wait for acknowledgement,

- No acknowledgement wait delay.
- Acknowledgement management is provided at the programming level, but is not currently operational, it will be in the near future.
- For the outputs
- Inactive,

15.4.1 - Via the menu

The entries made will only be definitively taken into account when saved. This step will be carried out last.

When entering the programming menu, a 3-minute timeout is started; it is reloaded each time a key is pressed; at the end of this time, the **GEN INDUS** automatically reloads the last configuration that has been saved and quits the programming mode; if the parameters being entered have not been saved, they are lost.

Comment: When the word "validate" is used below, it will refer to the use of the CARRIAGE RETURN key.

The "backspace" key is accepted in every case.

The text in the menus is in English and can be used with all types of terminal.

The text in italics gives additional entry explanations.

PRINCIPLE TO ENTER PARAMETERS

Upper case or lower case characters can be used.

When programming, the **GEN INDUS** displays the previous value entered after the message "Current value: ". If no character appears then this parameter does not exist.

To be correct, parameters must be entered in compliance with the indications contained in the rest of the message between brackets. When the dash symbol appears, it signifies a value from x to y. (Ex: 1-4, enables the values 1, 2, 3, 4).

To pass a parameter that does not need to be changed, simply send the carriage return p.

To enter the menu, the AT*P command must be sent. The modem sends back the following information:

```
1 : ALARM INPUT PROGRAMMING MENU
2 : TELECOMMUNICATION PROGRAMMING MENU
3 : PROGRAM MESSAGES
4 : PROGRAM OUTPUTS
5 : DISPLAY
M : RELOAD SAVED CONFIGURATION
U : RELOAD FACTORY CONFIGURATION
S : SAVE
Q : QUIT
```

If verbal report transmission is valid, then the "Q: QUIT" option or the expiration of the timeout gives:

```
OK
```

At this moment, the GEN INDUS is ready to operate taking into account the input management parameters.

The "1: ALARM INPUT PROGRAMMING MENU " option returns:

SITE name (1 to 8 char.)

Current value:

GENERp (Keyboard entry)

Input number to configure (1-4):

1p

Time before validation (0:HS , 1-6000 x 10 ms)

Current value: NOT OPERATIONAL

5p (i.e. 50 ms; 0 to set as not operational)

Release condition (O:Open C:Closed)

Current value: Open

p

Activation (S:Single R->T transition, D:Double each R<->T change)

Current value: R -> T (Single release->operate condition transition)

Dp (Double each R<->T change)

If Double: Returning action on the release condition (A:Stop the current call E:Save)

Current value: Placed on stack (Returning to the release condition is saved and will be processed in sequence)

Ap (Stop the current call, the alarm is not saved, equivalent to a DTR interruption)

Allocated telephone number index (0-8)

Current value: 0

0123p (Enter all the allocated numbers)

Allocated message number index Alarm(0-n)/Release(0-n) (n equals 7 by default and 35 if extension board)

Current value: 0

01?02p (message '0' and '1' on alarm, '/' separator, message '0' and '2' on returning to the release condition). See additional information below

01/028 Software version entry before V4.00 (message '0' and '1' on alarm, '/' separator between alarm and release , message '0' and '2' on returning to release condition) See additional information below.

0.1/0.208 Software version entry before V4.00 (message '0' and '1' on alarm ':' Message number separator '/' separator between alarm and release, message '0' and '20' on returning to release condition) See additional information below.

Maximum number of calls for each alarm (0:no limit/1-255)

Valeur actuelle : Infini

8 (Used to limit the number of repeated calls if no answer received. The value is global for all the numbers to be called).

Wait for acknowledgement after a call (Y-N)

Current value: No

ρ *(Do not enter anything, not operational at present)*

Maximum time in mn if waiting for acknowledgement before call back (0-255)

Current value: 000

ρ *(Do not enter anything, not operational at present)*

E	PRESENCE	RELEASE	ALARM	MEMORY	MESSAGE (ALM/REL)	ACKN.	TIME
	10 ms	(O/C)	(S/D/A)	(Zn)	(Mm)	(Y/N)	(mn)
1	005	OPEN	Dbl+Stop	0.1.2.3	0.1 / 0.2	NO	000
2	NOT OPERAT.	OPEN	R -> T	1	1	NO	000
3	NOT OPERAT.	OPEN	R -> T	2	2	NO	000
4	NOT OPERAT.	OPEN	R -> t	3	3	NO	000

(Table summarizing input programming)

Other programming (1-4/N):

(Only entering the input number to be programmed or modified will return to programming. Any other character will return to the main menu)

Input 1 is used to wake the modem (switch 4 ON)

Current value: No

(advises the modem if it can be woken up when alarm input 1 closes and in this case, it is taken into account by the power supply management)

Additional information:

For the allocated message numbers, if the same ones are required when the contact is opened and closed, simply enter the desired message numbers and do not enter the separator '/'.

Starting from new software versions V4.xx, which will control an extension board (the message number in excess of 10), it is imperative that the separator should be placed between each number for proper validation.

It is possible to automatically add up the input number having provoked the call after or between messages. This reduces by 1 the number of possible messages but provides the same configuration for all inputs. Instead of a digit, enter the "N" character, in that case the input number will be sent out preceded by a space character.

The "2: TELECOMMUNICATION PROGRAMMING MENU" option returns:

Memory position index for the number to be configured (0-8):

0p

Telephone number:

Current value:

0241831300p (34 characters maximum)

Junction speed:

(0:300 1:600 2:1200 3:2400 4:4800 5:9600 6:19200 7:38400 8:57600 9:115200)

Current value: 38400

5p (5 for 9600)

Number of bits (7, 8):

Current value: 8

p

Parity (S:None, P:Even, I:Odd):

Current value: none

p

Line baud rate = junction baud rate (Y/N):

Current value: Yes

p

MNP4 error correction (O:yes not exclusive, No, Exclusive) :

Current value: No

Ep (The upper case character gives the choice O,N,E)

Flow control (N:No, C:Cts, X:Xon/xoff) :

Current value: No

Xp (C for CTS)

Modulation (0:V21 1:V22 2:V22b 3:V23S 4:V23M 8:V34¹ 9:V32 10:V32b 11:V34+¹ 20:DTMF) :

Current value: V34+

9p (9 for V32, *selection 20: DTMF permits calls to telephones without waiting for the return connection, the acknowledgement being the receipt of a DTMF code.*)

Auto-adaptation when calling (Y/N):

Current value: No

p

Minimum on-line speed (300 to 33600):

Current value: 2400

9600p

Maximum on-line speed (300 to 33600²):

Current value: 33600

9600p

¹ Not available on the GEN INDUS 144.

² 300 to 14400 for the GEN INDUS 144.

Transfer protocol:
 0:Transparent 1:Message 2:TEC
 Current value: Transp.
 1p (1 to send Message)

Z0: 0241831300

Z1:

Z2:

Z3:

Z4:

Z5:

Z6:

Z7:

Z8:

Memory config	&Z0:	&Z1:	&Z2	&Z3	&Z4	&Z5	&Z6	&Z7	&Z8
Junction baud rate (Kb/s)	9.6	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Number of bits	8	8	8	8	8	8	8	8	8
Parity	NO	NO	NO	NO	NO	NO	NO	NO	NO
Line baud rate=junction	YES	YES	YES	YES	YES	YES	YES	YES	YES
Error correction	EXCLF	NO	NO	NO	NO	NO	NO	NO	NO
Flow Control	CTS	NO	NO	NO	NO	NO	NO	NO	NO
Modulation autoadapt.	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation type	V32	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+
Min on-line speed	9600	300	300	300	300	300	300	300	300
Max on-line speed	9600	33600	33600	33600	33600	33600	33600	33600	33600
Transfer protocol	MESS G	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P

(Summary : programming the telephone numbers and the connection configurations)

Other programming (0-8/N):

(Only entering the number of the memory position to be programmed or modified will return to programming. Any other character will return to the main menu)

The "3: PROGRAM MESSAGES" option returns:

Message number to be programmed (0-7):

0p

Current value:

GENER SITEp

MESSAGE

M0: GENER SITE M1:

M2: M3:

M4: M5:

M6: M7:

Other programming (0-7/N): 1p

Current value:

TLOWp

MESSAGE

M0: GENER SITE M1: LOW T

M2: M3:

M4: M5:

M6: M7:

Other programming (0-7/N): 2p

Current value:

TNORMALp

MESSAGE

M0: SITE GENER M1: LOW T

M2: NORMAL T M3:

M4: M5:

M6: M7:

Other programming (0-7/N):

(Only entering the number of the memory position to be programmed or modified will return to programming. Any other character will return to the main menu)

The GEN INDUS has the possibility of sending several messages to the same recipient, thus building sentences. To make them easier to read when they are received, it is worthwhile adding a "space" character after each string. The length of each message must not exceed 32 characters.

Upper case or lower case characters can be entered or they can be mixed.

It is possible to send unprintable characters to the modem (value between 00h and 1Fh) by adding the '\ ' parameter in front of an ASCII character; the **GEN INDUS** recognises this character that instructs it to mask the 3 most significant bits of the next character. Thus "\A" can be used to transmit the character 01h ('A' = 41h). To make a line feed to the next line between two messages, simply place the characters "\M\J" that equal 0Dh 0Ah. If you want to use the '\ ' character in a message, simply double it "\\".

ASCII	Hex.	ASCII	Hex	ASCII	Hex	ASCII	Hex
\@	00h	\H	08h	\P	10h	\X	18h
\A	01h	\I	09h	\Q	11h	\Y	19h
\B	02h	\J	0Ah	\R	12h	\Z	1Ah
\C	03h	\K	0Bh	\S	13h	\[1Bh
\D	04h	\L	0Ch	\T	14h	\	1Ch
\E	05h	\M	0Dh	\U	15h	\]	1Dh
\F	06h	\N	0Eh	\V	16h	\^	1Eh
\G	07h	\O	0Fh	\W	17h	_	1Fh

At present, once the connection has been set up, the GEN INDUS adds the CR and LF characters at the start and end of transmitting the message(s).

The messages constructed in this way in our example are:
 GENER SITE LOW T
 GENER SITE NORMAL T

The "4: PROGRAM OUTPUTS" option returns:

Output number to be programmed (1-2):

1p

Current value: Inactive

0:Inactive 1:Follows the DCD; N1-N4:Follows input(1-4), I1-I4:Invert input(1-4)

1p *(1 to follow the DCD)*

Other programming (1-2/N):

1p *(To check the previous entry)*

Current value: Follows the DCD signal

0:Inactive 1:Follows the DCD; N1-N4:Follws input(1-4), I1-I4:Inverts input(1-4)

p

Other programming (1-2/N):

(Only entering the number of the memory position to be programmed or modified will return to programming. Any other character will return to the main menu)

The "5: DISPLAY" option returns:

ALARM INPUT MANAGEMENT									
E:	PRESENCE	RELEASE	ALARM	MEMORY	MESSAGE (ALM/REL)	ACK.	TIME		
	10 ms	(O/C)	(S/D/A)	(Zn)	(Mn)	(Y/N)	(mn)		
1	005	OPEN	Dbl+Stop	0.1.2.3	0.1/0.2	NO	000		
2	NOT OPERAT.	OPEN	OPEN	1	1	NO	000		
3	NOT OPERAT.	OPEN	R -> T	2	2	NO	000		
4	NOT OPERAT.	OPEN	R -> T	3	3	NO	000		
TELEPHONE NUMBER					NOTICE	SPEED	PROTOCOL		
Z0: 0241831300					V32	9600 8 N	Message		
Z1:					V34+	38400 8 N	Transp.		
Z2 :					V34+	38400 8 N	Transp.		
Z3 :					V34+	38400 8 N	Transp.		
Z4 :					V34+	38400 8 N	Transp.		
Z5 :					V34+	38400 8 N	Transp.		
Z6 :					V34+	38400 8 N	Transp.		
Z7 :					V34+	38400 8 N	Transp.		
Z8 :					V34+	38400 8 N	Transp.		
MESSAGE									
M0: GENER SITE					M1: LOW T				
M2: NORMAL T					M3:				
M4:					M5:				
M6:					M7:				
p (Continued on following page)									
Z0: 0241831300									
Z1:									
Z2:									
Z3:									
Z4:									
Z5:									
Z6:									
Z7:									
Z8:									
Memory config	&Z0	&Z1	&Z2	&Z3	&Z4	&Z5	&Z6	&Z7	&Z8
Junction board rate	9.6	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
(Kb/s)									
Number of bits	8	8	8	8	8	8	8	8	8
Parity	NO	NO	NO	NO	NO	NO	NO	NO	NO
Line baud rate=junction	YES	YES	YES	YES	YES	YES	YES	YES	YES
Error correction	EXCLF	NO	NO	NO	NO	NO	NO	NO	NO
Flow Control	CTS	NO	NO	NO	NO	NO	NO	NO	NO
Modulation autoadapt.	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation type	V32	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+
Min on-line speed	9600	300	300	300	300	300	300	300	300
Max on-line speed	9600	33600	33600	33600	33600	33600	33600	33600	33600
Transfer Protocol	MESSG	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP

Option « 6 : ANALOGUE INPUT PROGRAMMING MENU returns :

SITE Name(1 to8 chr.)

Current value:

GENER8 (Enter keyboard)

Hysteresis on returning to release

Current value: 0

58 (Enter keyboadr)

Input number to be configured (101-104) :

1018

Presence Nb before validation (0:HS , 1-255)

Current value : Disabled

58 (0 to disable, **see explanation below**)

Alarm thresholds (LOW-HIGH) (0=Low threshold disabled, 255=High threshold disabled)

Current value : 000/255

64/1928

Activation (S:Single transition R->T, D:Doubles each change R<->T)

Current value : R -> T (Single transition release->alarm)

D8 (Doubles each change R<->T)

If double : Return action on the release conditio(A:Stops current call E:Saves)

Current value : Enregistre (The return to release will be saved and processed in sequence)

A8 (Stops current call , the alarm is not saved , corresponds to a DTR interruption)

Allocated telephone number index (0-8)

Current value : 0

01238 (Enter all the allocated numbers)

Allocated message number index Alarm(0-7)/Release(0-7)

Current value : 0

01A/02C8 (message '0'and '1' in alarm, '/' separator, message '0' and '2' when returning to release) See additional information below.

Wait for acknowledgement before a call (O-N)

Valeur actuelle : Non

8 (No entry, currently disabledt)

Conversion factor for direct reading

Multiplicator (1-99) followed by the power of10

(Ex : 39-2 = 0,39 ; 52+1 = 520 ; 1+0=1)

Current value : 01+0 = 1

39-28

Power supply duration before reading (1-255 x 100ms)

Current value :

Active Detector (with its own power supply , immediate reading)

20 (Requires to be powered 2 seconds before reading)

(see additional explanation below)

E	PRESENCE (nUMBER)	THRESH ; (B/H)	ALARM (S/D/A)	SAVE (Zn)	MESSAGE(ALM/REI) (Mm)	ACK (Y/N)	TPS (mn)
1	5	064-192	R -> T	0.1.2.3	1.A / 2.C	NO	000
	Conversion factor : 0.39				Supply (x100ms) : 20		

(Chart detailing the input programming)

Other programming (101-104/N) :

(Seule la saisie du numéro de l'entrée à programmer ou modifier fait retourner dans la programmation tout autre caractère fait revenir au menu principal)

Additional information:

- Presence nbr before validation(0:HS , 1-255)
- Power supply duration before reading.

Both parameters are linked together as it is not possible here to programme an integration duration like for the digital inputs, the acquisition interval depending also on the value entered for the « duration of supply presence before reading » . Thus, if 4 inputs are used , each one being powered for 2 seconds, the polling of each input will take place every 8 seconds ;if it is required to see 5 times the default value before generating the alarm, the time between the appearance of the excess value and the alarm condition will be $4 \times 2 \times 5 \text{ s} = \mathbf{40 \text{ seconds}}$. Bear in mind this parameter to determine the number of necessary default presence conditions.

- Allocated message number index

For the allocated message numbers, if the same messages are used for the opening and closing of the contacts, it is sufficient to enter the message numbers required and leave out the separator '/'.

It is possible to automatically add up the input number having provoked the call after or between messages. This reduces by 1 the number of possible messages but provides the same configuration for all inputs. Instead of a digit, enter the "N" character , in that case, the input number will be sent out preceded by a space character.

With the extension board and for analogue inputs, it is possible in the same way to send the following information, converted into an information directly usable with the values entered when programming under the heading "Conversion factor for direct reading".

A	Transmission of the alarm value having generated the call
B	Lowest value found
H	Highest value found
C	Current value

The "M: RELOAD SAVED CONFIGURATION" option returns:

reloading saved configuration complete

1: ALARM INPUT PROGRAMMING MENU
2: TELECOMMUNICATIONS PROGRAMMING MENU
3: PROGRAM MESSAGES
4: PROGRAM OUTPUTS
5: DISPLAY
M: RELOAD SAVED CONFIGURATION
U: RELOAD FACTORY CONFIGURATION
S: SAVE
Q: QUIT

In this case, the GEN INDUS will look for the information previously saved in the non-volatile memory and overwrite the current configuration.

The "U: RELOAD FACTORY CONFIGURATION" option returns:

reloading factory configuration complete

1: ALARM INPUT PROGRAMMING MENU
2: TELECOMMUNICATIONS PROGRAMMING MENU
3: PROGRAM MESSAGES
4: PROGRAM OUTPUTS
5: DISPLAY
M: RELOAD SAVED CONFIGURATION
U: RELOAD FACTORY CONFIGURATION
S: SAVE
Q: QUIT

In this case, the GEN INDUS reloads its default configuration in the volatile memory and overwrites the current configuration. To save the factory configuration, you must pass via menu "S".

The "S: SAVE" option returns:

Saving

(Time taken to write in memory)

Save complete

1: ALARM INPUT PROGRAMMING MENU
2: TELECOMMUNICATIONS PROGRAMMING MENU
3: PROGRAM MESSAGES
4: PROGRAM OUTPUTS
5: DISPLAY
M: RELOAD SAVED CONFIGURATION
U: RELOAD FACTORY CONFIGURATION
S: SAVE
Q: QUIT

15.4.2 - Via the Hayes® commands

The commands sent are taken into account as soon as they are received, but will only be saved with the appropriate command. This step will be carried out last.

The AT commands followed by the character * are mainly intended to act on parameters related to the supervision of alarm inputs and outputs and the configuration when transferring this information.

AT*An: Program modulation parameters

For a given memory position (corresponding to a telephone number), this command with parameters selects a modulation, validates or disables auto-adaptation during a call, selects the minimum and maximum connection speed and the transfer protocol once connection is successful.

AT*A=[memory],[modulation],[auto adaptation call],[min speed],[max speed],[protocol]

Help:

The modem can send a string of information that gives the supported parameters by sending the following command:

AT*A=?: can be used to display the supported parameters.

(0-8),(0,1,2,3,4,8,9,10,11,20),(0,1),(300-33600¹),(300-33600¹),(0,1,2,4, A,B,C,D)

The modem also returns the current configuration in the form of a table via the following command:

AT*A ?

ALARM INPUT MANAGEMENT							
E	PRESENCE (* 10 ms)	RELEASE (O/F)	ALARM (S/D/A)	MEMORY (Zn)	MESSAGE (ALM/REL) (Mn)	ACK. (Y/N)	TIME (mn)
1	NOT OPERAT.	OPEN	R -> O	0	0	NO	000
2	NOT OPERAT.	OPEN	R -> O	1	1	NO	000
3	NOT OPERAT.	OPEN	R -> O	2	2	NO	000
4	NOT OPERAT.	OPEN	R -> O	3	3	NO	000
TELEPHONE NUMBER				NOTICE	SPEED	PROTOCOL	
Z0:				V34+	38400 8 N	Transp	
Z1:				V34+	38400 8 N	Transp.	
Z2:				V34+	38400 8 N	Transp.	
Z3:				V34+	38400 8 N	Transp.	
Z4:				V34+	38400 8 N	Transp.	
Z5:				V34+	38400 8 N	Transp.	
Z6:				V34+	38400 8 N	Transp.	
Z7:				V34+	38400 8 N	Transp.	
Z8:				V34+	38400 8 N	Transp.	
MESSAGE							
M0:				M1:			
M2:				M3:			
M4:				M5:			
M6:				M7:			

¹ 300-14400 for the GEN INDUS 144.

Parameter definition

1 – [memory] value from 0 to 8, corresponds to the memory index in which the recipient's number is saved, accessible via the &Zn commands.

2 – [modulation] (same as AT+MS commands)

Refer to the general documentation on the Hayes© commands for additional information.

[modulation]	Modulation	Possible speeds	Notes
0	V21	300	
1	V22	1200 full duplex	
2	V22bis	2400 or 1200	
3	V23	1200/75 (Server)	
4	V23	75/1200 (Minitel)	
8	V34	28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400	Not available for the GEN INDUS 144.
9	V32	9600 or 4800	
10	V32bis	14400, 12000, 9600, 7200 or 4800	Default for the GEN INDUS 144.
11	V34+	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800 or 2400	Default Not available for the GEN INDUS 144.

20	DTMF		For ACK by DTMF
----	------	--	-----------------

3 – [auto-adaptation call] (same as AT+MS commands)

Refer to the general documentation on the Hayes© commands for additional information.

[auto-adaptation call]	Possible speeds	Notes
0	Auto-adaptation disabled	Default
1	Auto-adaptation according to the V8 or V32bis notice	

No automatic negotiation exists for V23.

Two other parameters are used to define the on-line speed, these are junction speed and line baud rate speed = junction baud rate.speed These parameters can be modified with the AT*J command.

4 – [min speed] (same as AT+MS commands) is a number that specifies the minimum speed at which the modem can set up a connection. The value is encoded in decimal, its unit is bps, ex: 2400 specifies that the lowest speed is 2400 bps. The default value is 2400 (4800 for the GEN INDUS 144).

5 – [max speed] (same as commands AT+MS) is a number that specifies the maximum speed at which the modem can set up a connection. The value is encoded in decimal, its unit is bps, ex: 33600 specifies that the highest speed is 33600 bps. The default value is 33600 (14400 for the GEN INDUS 144).

6 – [protocol] is a character that specifies the transfer protocol that will be used once the connection has been set up.

At present, only the following characters are operational:

0 : TRANSPARENT

4 : RE-COPY

1 : MESSAGE

2 : TEC

AT*Cn : Read the state of the **digital** alarm inputs **with n digit**

This command with parameters allows the state of one or **all** the alarm inputs to be received back.

The 0 character indicates that the input is NO.

The 1 character indicates that the input is NC.

AT*C0 returns the state of the four inputs in order 1, 2, 3, 4.(5, 6 if extension board)

N = 1 to **x**: returns the state of the requested input only.(**x: maximum number of inputs**)

AT*Cx : Reading the state of analogue inputs with x letter

This command with parameter is used to receive back the value of analogue inputs. If in the programming menu a correction factor is programmed, this is taken into account in the returned values.

X = **C** : returns the current values of all the analogue inputs separated by a space.

X = **A** : returns the last alarm values of all the analogue inputs separated by a space.

X = **B** : returns the lowest values reached of all the analogue inputs separated by a space.

Reading these values re-initializes them with the current values.

X = **H** : : returns the highest values reached of all the analogue inputs separated by a space.

Reading these values re-initializes them with the current values

X = **N** : returns the minimum threshold values to be reached to trigger an alarm.

X = **X** : returns the maximum threshold values to be reached to trigger an alarm.

AT*Cxy:z : Programming of alarm thresholds for analogue inputs

Minimum threshold:

x = **N** : Programming of the minimum threshold value to be reached to trigger an alarm.

y = 0 to n. **Note**, analogue input number from 0 to n-1 (number of the last analogue input of extension boards)

z = Decimal threshold value (255 disables the function).

Maximum threshold :

x = **X** : Programming of the minimum threshold value to be reached to trigger an alarm.

y = 0 à n. **Note**, analogue input number from 0 to n-1 (number of the last analogue input of extension boards)

z = Decimal threshold value (0 disables the function).

AT*En : Program the alarm inputs

For a given alarm input , this command with parameters can be used to configure the integration time, the position in the release condition, the type of alarm triggering, the index(es) of the allocated telephone number(s), the index(es) of the allocated message number(s), the acknowledgement control and the waiting time for this acknowledgement.

AT*E=[input:],[integration time],[position in the release condition],[trigger type], [telephone number index(es)],[message number index(es)], [acknowledgement],[acknowledgement waiting time] [Maximum number of calls for each alarm (**0 to 255**)], This last parameter is only programmable for software versions starting from V4.60

Help:

The modem can send back a string of information that gives the supported parameters by sending the following command:

AT*E= ? : displays the supported parameters.

(1-4),(0,6000),(**O,F**),(**S,D,A**),(0-8),(0-7),(Y,N),(0-255)

The modem also returns the current configuration in the form of a table with the following command:

AT+E ?

ALARM INPUT MANAGEMENT							
E:	PRESENCE (* 10 ms)	RELEASE (O/F)	ALARM (S/D/A)	MEMORY (Zn)	MESSAGE (ALM/REP) (Mn)	ACK. (O/N)	TIME (mn)
1	NOT OPERAT.	OPEN	R -> O	0	0	NON	000
2	NOT OPERAT.	OPEN	R -> O	1	1	NON	000
3	NOT OPERAT.	OPEN	R -> O	2	2	NON	000
4	NOT OPERAT.	OPEN	R -> O	3	3	NON	000
TELEPHONE NUMBER				NOTICE	SPEED	PROTOCOL	
Z0:				V34+	38400 8 N	Transp	
Z1:				V34+	38400 8 N	Transp.	
Z2:				V34+	38400 8 N	Transp.	
Z3:				V34+	38400 8 N	Transp.	
Z4:				V34+	38400 8 N	Transp.	
Z5:				V34+	38400 8 N	Transp.	
Z6:				V34+	38400 8 N	Transp.	
Z7:				V34+	38400 8 N	Transp.	
Z8:				V34+	38400 8 N	Transp.	
MESSAGE							
M0:				M1:			
M2:				M3:			
M4:				M5:			
M6:				M7:			

Definition of the parameters

1 – [input] value from 1 to 4, corresponds to the index for the input that we want to configure.

2 – [integration time] is a number from 0 to 6000 that specifies the time during which the input: must have a stable state before signalling this change of state. The value is encoded in decimal, its unit is the tenth of a millisecond. With this value at 0, the input is considered as being not operational. Ex: 50 specifies a stable change of state for 500 ms before signalling the change of state.

3 – [position in the release condition] is a 'O' or 'C' character that specifies the input position: when it is not in alarm. The 'O' parameter indicates that the system associated to its output in the NO position in the release condition. The 'F' parameter indicates that the system associated to its output is in the NC position in the release condition.

4 – [Validation] is a 'S', 'D' or 'A' character which specifies the actions after a change of state. Parameter 'S' indicates that only the change from the release state to the alarm state is taken into account.

Parameter 'D' indicates that the changes from the release state to the alarm state and from the alarm state to the release state are taken into account.

Parameter 'A' indicates that the change from the release state to the alarm state initiates the action and the change from the alarm state to the release state stops the current action.

5 – [telephone number index(es)] is a string of 1 to 9 digits (0 to 8) corresponding to the memory positions &Zn (n = 0 to 8). It specifies the indexes of the telephone numbers that the **GEN INDUS** must call if this input goes into alarm.

6 – [message number index(es)] is a string of 1 to 8 digits (0 to 7) corresponding to the memory positions *Mn (n = 0 to 7). It specifies the indexes of the messages that the GEN INDUS must transmit if this input goes into alarm.

The character to be used to separate the alarm messages from the release ones is '/'.

For software versions from V4.40 (Message number index(es)) is a string of numbers (0 to n) which specifies the message indexes that **Gen Indus** has to transmit in case this input goes into alarm. N = 35 when an extension board is installed. This 2-digit value makes it necessary to create a digit separator.

The character to be used to separate each digit is ':'

7 – [acknowledgement] is a 'Y' or 'N' character that specifies if the GEN INDUS must expect to receive an incoming call to acknowledge the transmitted alarm. This functionality will be developed later.

8 – [acknowledgement waiting time] is a number from 0 to 255 that specifies the duration in minutes during which an acknowledgement must be received before repeating the call. This functionality will be developed later.

9 – [maximum number of calls for each alarm] Is a number from 0 to 255. With value 0 **Gen Indus** keeps calling so long as the calls have not been successful. With a value of 1 to 255, Gen Indus will try to achieve the assigned goal for the counter value while continuing to supervise calls in accordance with the regulations. Each failure decrements the counter. If the Gen Indus is to call several numbers the counter value is global. **For software versions from V.4.60 on.**

AT*EA : Programming of analogue alarm inputs (For supporting versions)

This command with parameters is used to configure for an alarm input the number of default presence before validation, the alarm low threshold value, the alarm high threshold value, the supply duration before reading, the single or double triggering type of the alarm, the allocated telephone number index (es), the allocated message number index(es), the acknowledgement and acknowledgement waiting time supervision.

AT*EA=[input (1 to 4)] , [Presence number (0 à 255)] , [low threshold (0 à 255)] , [high threshold (0 à 255)] , [Supply duration before reading (0 à 255)] , [triggering type (S ou D)] , [telephone number index(es) (0 à 8)] , [message number index(es) (0 à n)] , [acknowledgement (O ou N)] , [acknowledgement waiting time (0 à 255)] , [maximum number of calls for each alarm (0 à 255)]

Additional information:

See chapter « 15.3.1 - By the I menu » and at the paragraph end « « 6 : ANALOGUE INPUT PROGRAMMING MENU returns : » .

AT*EA= ? : used to visualize the supported parameters

(1-4),(0,255),(0,255),(0,255),(0,255),(S,D),(0-8),(0-35,ABCHN,/),(O,N),(0-255)

The modem also returns the current configuration in the form of a chart by the following command:

AT*E ?

The first part concerns digital inputs, the second one ANALOGUE inputs.

ALARM INPUT SUPERVISION							
E	PRESENCE (* 10 ms)	RELEASE (O/C)	ALARM (S/D/A)	SAVE (Zn)	MESSAGE (ALM/REP) (Mn)	ACK (Y/N)	TPS (mn)
1	NOT OPERAT	Open	R -> T	0	0	NO	000
2	NOT OPERAT	Open	R -> T	1	1	NO	000
3	NOT OPERAT	Open	R -> T	2	2	NO	000
4	NOT OPERAT	Open	R -> T	3	3	NO	000
E	PRESENCE (number)	THRESH (B/H)	ALARM (S/D/A)	SAVE (Zn)	MESSAGE(ALM/REP) (Mn)	ACK (y/N)	TPS (mn)
101	2	020-200	R->T	0	N.10.A./N.12.13.A	No	000
Conversion factor : 1					Supply (x100ms) : 5		
102	NOT OPER	000-255	R->T	0	0	No	000
Facteur de conversion : 1					Supply (x100ms) : 0		
103	HORS SERVIC	000-255	R->T	0	0	No	000
Facteur de conversion : 1					Supply (x100ms) : 0		
104	HORS SERVIC	000-255	R->T	0	0	No	000
Facteur de conversion : 1					Supply (x100ms) : 0		

Parameter definition:

1 – [input] value from 1 to n (nr of the last present analogue input as per configuration with or without extension board) , corresponds to the input index to be configured. Note : Digits here start from 1 to n whereas, when programmed by the menu, they start by 101 ;

2 – [Presence number] is a number from 0 to 255 which specifies the number of times an input should have a stable state before a state change is signalled. The value is encoded in decimal. With value 0, the input is considered to be non operational. Ex : 5 specifies a 5 times stable change before the change is signalled. The delay between each acquisition depends on the time during which each analogue input is powered. **See additional information above.**

5 – [release position] is a character 'O' or 'C' which specifies the input state : when it is not in alarm condition. The 'O' parameter indicates that the system associated to its output is in the NO position in a release state. The 'F' parameter indicates that the system associated to its output is in the NC position in a release state.

6 – [telephone number index(es)] is a string of 1 to 9 digits (0 to 8) corresponding to memory positions &Zn (n = 0 to 8) which specifies the number of telephone numbers **Gen Indus** is to call in case this input goes into alarm.

The character to be used in order not to allocate any digit is '\

7 – [message number index(es)] is a string of (0 to n) digits corresponding to memory positions *Mn (n = 0 to n) which specifies the message indexes **Gen Indus** is to transmit in case this input goes into alarm. N is worth 35 when an extension board is installed.

The character to be used to separate each digit is ':

The character to be used in order not to allocate messages is '\

The character to be used to separate alarm messages from release ones is '/

It is possible to automatically add up the input number having provoked the call after or between messages. This reduces by 1 the number of possible messages but provides the same configuration for all inputs. Instead of a digit, enter the "N" character , in that case, the input number will be sent out preceded by a space character.

With the extension board and for analogue inputs, it is possible in the same way to send the following information, converted into an information directly usable with the values entered when programming under the heading "Conversion factor for direct reading".

A	Transmission of the alarm value having generated the call
B	Lowest value found
H	Highest value found
C	Current value

8 – [acknowledgement] is a 'Y' or 'N' character that specifies if the GEN INDUS must expect to receive an incoming call to acknowledge the transmitted alarm. This functionality will be developed later.

9 – [acknowledgement waiting time] is a number from 0 to 255 that specifies the duration in minutes during which an acknowledgement must be received before repeating the call. This functionality will be developed later.

10 – [maximum number of calls for each alarm] is a number from 0 to 255. With value 0, Gen Indus keeps calling so long as the calls have not been successful. With a value of 1 to 255, Gen Indus will try to achieve the assigned goal for the counter value while continuing to supervise calls in accordance with the regulations. Each failure decrements the counter. If the Gen Indus is to call several numbers the counter value is global.

Example :

AT*EA=1,2,20,200,5,D,0,N10A/N12:13A,N,0,10-> Analogue input 1 is validated after low threshold « 20 » and high threshold « 200 » levels have twice been successively exceeded at the end of a supply time of 500 ms. It is a double input ; when in alarm, the input number, the contents of message 10 and the alarm value are sent out to the recipient in directory 0. When the input is back to the release condition, the contents of message 12 and 13 and the alarm value are sent out. There is no acknowledgement. (Not currently supervised) and the unit keeps calling until the 10 attempts have been completed if it has not succeeded in correctly sending its message ; if not, it stops.

AT*F : Call up the factory configuration.

All the parameters concerning the supervision of the alarm inputs not saved in memory are re-initialized with the factory configuration (See default value in the Programming chapter). The messages are erased. Only the telephone numbers are not affected, use the command AT&Zn= to erase them (see general documentation).

AT*G : Program the use of input 1 to wake up the modem

This command allows the modem to find out if it is possible for it to be woken up by the input closing: alarm 1. In this case, the power management takes it into account and thus stops the unit from being permanently locked in the powered-up position.

AT*G0: no wake-up by alarm input 1.

AT*G1: can be woken by alarm input 1.

AT*Jn : Program the junction parameters on connection

For a given telephone number, this command with parameters can be used to define the configuration of the serial interface following a call with junction speed, format, if line baud rate = junction baud rate, use of error correction, use of flow control.

AT*J=[memory],[junction speed],[number of bits],[parity],[line speed = junction speed],[error correction],[flow control]

Help:

The modem can send back a string of information that gives the parameters supported by sending the following command:

AT*J=? : displays the parameters supported.

(0-8),(0-9),(7,8),(S,P,I),(O,N),(O,N,E),(N,C,X)

The modem also returns the current configuration in the form of a table via the following command:

AT*J ?

ALARM INPUT SUPERVISION							
E:	PRESENCE (* 10 ms)	RELEASE (O/C)	ALARM (S/D/A)	MEMORY (Zn)	MESSAGE (ALM/REL) (Mn)	ACK. (O/N)	TIME (mn)
1	NOT OPERAT.	OPEN	R -> O	0	0	NON	000
2	NOT OPERAT.	OPEN	R -> O	1	1	NON	000
3	NOT OPERAT.	OPEN	R -> O	2	2	NON	000
4	NOT OPERAT.	OPEN	R -> O	3	3	NON	000
TELEPHONE NUMBER				NOTICE	SPEED	PROTOCOL	
Z0:				V34+	38400 8 N	Transp	
Z1:				V34+	38400 8 N	Transp.	
Z2 :				V34+	38400 8 N	Transp.	
Z3 :				V34+	38400 8 N	Transp.	
Z4 :				V34+	38400 8 N	Transp.	
Z5 :				V34+	38400 8 N	Transp.	
Z6 :				V34+	38400 8 N	Transp.	
Z7 :				V34+	38400 8 N	Transp.	
Z8 :				V34+	38400 8 N	Transp.	
MESSAGE							
M0:				M1:			
M2:				M3:			
M4:				M5:			
M6:				M7:			

To have a complete display of the junction parameters per number, use the AT*V command.

Definition of the parameters

1 – [memory] value from 0 to 8, corresponds to the memory index in which the recipient's number is saved, accessible via the AT&Zn commands.

2 – [junction speed] is a digit from 0 to 9 that specifies the junction speed during the transfer phase, with the following coherence:

0: 300 b/s.	5: 9600 b/s.
1: 600 b/s.	6: 19200 b/s.
2: 1200 b/s.	7: 38400 b/s.
3: 2400 b/s.	8: 57600 b/s.
4: 4800 b/s.	9: 115200 b/s.

3 – [number of bits] is a digit '7' or '8' that specifies the number of bits for the characters during the transfer phase, with the following coherence:

7: 7 data bits
8: 8 data bits

4 – [parity] is a character 'S', 'P' or 'I' that specifies the parity format of the characters during the transfer phase, with the following coherence:

S: no parity
P: even parity
I: odd parity

5 – [line speed = junction speed] is character 'O' or 'N' that tells the GEN INDUS if the V24 junction speed must or must not depend on the on-line transmission speed during the transfer phase.

O: Yes, junction speed depends on the on-line speed.

N: No, junction speed is independent of on-line speed.

Refer to the command AT&In in the general documentation for more information.

6 – [error correction] is a character 'O', 'N' or 'E' that specifies if the GEN INDUS must or must not negotiate the MNP4 error correction protocol at the start of the connection.

O: Yes, the GEN INDUS negotiates but it can also connect to another modem that does not have error correction. It goes back to being a normal modem on timeout.

N: No, the GEN INDUS does not negotiate error correction.

E: Exclusive, the GEN INDUS negotiates and it can only connect to another modem that has error correction.

7 – [flow control] is a character 'N', 'C' or 'X' that specifies if the GEN INDUS must use flow control with the associated terminal.

N: No, the GEN INDUS does not use flow control.

C: CTS, the GEN INDUS uses unidirectional hardware flow control from the modem to the local terminal with the CTS signal.

X: XON, the GEN INDUS uses unidirectional software flow control from the modem to the local terminal with the XON and XOFF characters.

AT*Ln : Alarm counter reading

This command is used to know the number of times when a digital or analogue input has gone into alarm.

AT*L0 : returns the contents of the 120 inputs (maximum normally possible after future developments)

AT*L101 : returns the number of times when analogue input 1 has gone into alarm.

AT*Mn: =xx : Program alarm messages

This command can be used to save the messages that must be transmitted when the alarms are triggered with the MESSAGE protocol.

The value of n varies from 0 to 7.

The length of the message varies from 1 to 32 characters maximum.

To be able to send characters that have a value between 00h and 1fh, refer to the additional information in the "3: PROGRAM MESSAGES" option in programming via the menu above.

Comment: In Hayes© command programming mode, the modem transforms the strings received with lower case characters into upper case characters. In addition, it deletes all the "space" type characters. To be able to enter a string that has these specific characters, the AT*Rn command must be sent first.

Example:

at*m0= pump alarm 1 site 24

This saves the message PUMPALARM1SITE24

To have a correct message, proceed as follows:

AT*R1 (in upper case characters)

AT*M0= pump alarm 1 site 24

AT*R0 (in upper case characters)

By surrounding message programming with the **AT*R0** and **AT*R1** commands, we can save the characters that we want.

AT*P : Program alarms via the menu, see previous chapter.

AT*Rn : Accept special characters.

This command authorises the **GEN INDUS** to accept characters that are normally eliminated from the command strings. (ex: space, NULL,...)

This must only be used to save messages.

See **AT*Mn** command above.

AT*Sn : Output status management

This command with parameters can be used to independently drive the two outputs. To be able to write to this command, the outputs must be inactive in the output management menu.

The 0 character indicates that the output is NO.

The 1 character indicates that output is NC.

AT*S ? returns the state of the two outputs in order 0,1.

AT*Sn=0 requests output n to go into the NO state.

AT*Sn=1 requests output n to go into the NF state.

n = 0 or 1.

AT*V : Display the number configuration

This command can be used to display the communication parameters programmed for the various telephone numbers.

The modem returns the configurations in the form of a table:

Z0:

Z1:

Z2:

Z3:

Z4:

Z5:

Z6:

Z7:

Z8:

Memory config	&Z0	&Z1	&Z2	&Z3	&Z4	&Z5	&Z6	&Z7	&Z8
Junction baud rate (Kb/s)	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Number of bits	8	8	8	8	8	8	8	8	8
Parity	NO	NO	NO	NO	NO	NO	NO	NO	NO
Line baud rate=junction	YES	YES	YES	YES	YES	YES	YES	YES	YES
Error correction	NO	NO	NO	NO	NO	NO	NO	NO	NO
Flow Control	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation autoadapt.	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation type	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+
Min on-line speed	300	300	300	300	300	300	300	300	300
Max on-line speed	33600	33600	33600	33600	33600	33600	33600	33600	33600
Transfer protocol	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP

AT*Tn : Alarm transmitter type

This command with parameter can be used to define the type of operation of the **GEN INDUS** in alarm transmitter mode.

With n = ?, the **GEN INDUS** returns the current value of the type of operation, 00 by default.

AT*W : Save the active configuration.

The current parameters concerning the commands '*' above are saved in a non-volatile memory. They will then be present from the next time the modem is powered up.

AT*Z : Initialize from non-volatile memory.

This command re-initializes the modem parameters with those contained in the non-volatile memory.

XV.4 - Input to output remote copy functionality

It is possible to use the **GEN Indus** to copy the alarm inputs on a site to the outputs of another site. When this functionality is used between two **GEN INDUS** modems, it is only possible to copy the first two inputs (The GEN INDUS only has two outputs). However, when it is used with another unit in our range, the **GEN 44 i** (see datasheet on our site www.gener.fr) it is possible to transmit the status of the 4 inputs to the **GEN 44 i** and receive the status of its first 2 inputs.

Comment: In this operating mode, the modem can still be used for other types of calls, except on a Leased Line (LL). In this case, the configuration parameters that are automatically loaded when this function is enabled must be modified.

- Command AT-R1 re-instates the previous status of the modem outputs in case of power failure .
- With PSTN, to avoid call « collisions » and also to activate the transmission of the input states immediately on power up, it is sufficient to load a value different from 0 in register S34 . This value will be used as a timeout (in second) before a return call is initiated in case of failure (busy, no answer).
 - Therefore, in the event of inter site re-transmission of input states , where site A calls B and vice versa, S34 values should have a sufficient time interval to allow for the modem to call the other one. Example site A with S34 = 3 and site B with S34 = 10.
 - Note : it is the latest input status which is re-transmitted, thus an impulse will not be ' re-copied if it is shorter than the time necessary for a call and a transmission.

Operation mode selection chart

	Support	Called number	Number of managed inputs	Transm . input states	Receiver output states	Contact state exchange		Supervision of input re-transmission of extension board
						Communication in progress	Dedicated call	
Case 1	PSTN	GEN Indus	2	X	X		X•	NO
Case 2	PSTN	GEN Indus	2	X	X		X•	YES
	PSTN	GEN 44 I	4	X	X		X•	YES
Case 3	LL	GEN Indus	2	X	X	X,		YES
Case 4	LL	GEN Indus	2	X	X	X \mathcal{f}		NO
Case 5	LL	GEN Indus	2	X		X \mathcal{f}		NO
Case 6	LL	GEN Indus	2		X	X \mathcal{f}		NO

- In answer-back, it is possible to switch to data mode after a 5 second timeout, see specific paragraph.
- , With on-line speed from 9600 to 33600.
- \mathcal{f} With Half duplex transmission protocol(UNITELWAY, MODBUS, etc.).

15.5.1 - Case 1 - Copy between GEN INDUS (PSTN: Public Switched Telephone Network)

This is done simply with the following command set:

AT&Z0 = nnn (Remote telephone number)

AT*T2*W&W (Activate the function and save the parameters in non-volatile memory)

The modem then has the following configuration (the command between brackets displays the configuration) :

- For Alarm inputs 1 and 2 (**AT*A?**):
 - a 50 ms integration time,
 - Open in the release condition,
 - Double State (Each change of state triggers an alarm),
 - Telephone number allocated to memory Z0.
- For telephone number Z0 memory (**AT*V**):
 - An 8-bit format, no parity line baud rate that is different to the junction,
 - MNP4 error correction
 - No flow control
 - No auto adaptation on the modulation,
 - Modulation in V22 call,
 - A baud rate limited to 1200,
 - A COPY transfer protocol.
- For the general format used in automatic answering (**AT\S**):
 - No auto-adaptation on the modulation,
 - V22 modulation with a baud rate limited to 1200,
 - A line baud rate different to the junction,
 - No flow control
 - MNP4 error correction
 - No DTR signal control.

These default parameters guarantee a fast copy of the contacts; about 7 seconds from the moment when ringing arrives at the remote modem. The connection phase has been optimized for this modulation.

It is possible to modify the parameters underlined but with the risk of altering performance.

The call is triggered on a change of state of one of the inputs.

With this configuration, if a change of state occurs during the call, it is transmitted to the remote after the one that initiated the call.

Note : The answering modem cannot update the calling modem outputs; this will be done by a return call after hang-up.

Comment: The answering modem; once the connection is made, opens a 5-second "listening window" during which it expects to receive a copy frame from the remote. If nothing is received at the end of this time frame, it goes into transparent mode (data on the line goes to the junction). In the same way, when receiving a copy frame, a 5-second timeout is started. If the modem has not received a new frame at the end of this time, it goes into transparent mode. This allows a system to control the outputs remotely then to communicate with the associated equipment. Please contact us to supply the control protocol.

15.5.2 - GEN 44 i compatible copy (PSTN and GSM network)

This is done simply with the following command set:

AT&Z0 = nnn (Remote telephone number)

AT*T3*W&W (Activate the function and save the parameters in a non-volatile memory)

The modem then has the following configuration:

- For Alarm inputs 1, 2, 3 and 4 (**AT*A?**):
 - a 50 ms integration time, (300 ms for extension board)
 - Open in the release condition,
 - Double State (Each change of state triggers an alarm),
 - telephone number allocated to memory Z0.
- For telephone number Z0 memory (**AT*V**):
 - An 8-bit format, no parity,
 - A line baud rate different to the junction,
 - MNP4 error correction
 - No flow control
 - No auto-adaptation on the modulation,
 - Modulation in V32 calling,
 - A baud rate limited to 9600,
 - A COPY transfer protocol.
- For the general format used in automatic answering (**AT\S**):
 - No auto-adaptation on the modulation,
 - V32 modulation with a baud rate limited to 9600,
 - A line baud rate different to the junction,
 - No flow control
 - MNP4 error correction
 - No DTR signal control.

These default parameters guarantee that the contacts are copied rapidly. V32 modulation is the only one that the GSM modem associated to the **GEN 44 i** accepts in answer mode.

It is possible to modify the parameters underlined, but with the risk of altering performance.

The call is triggered when one of the inputs changes state.

With this configuration, the state of all the inputs is transmitted. Therefore, if several inputs change state before connection, it is the state when the frame is being built which is transmitted.

Comment: The answering modem ; once the connection is made, opens a 5-second "listening window " during which it expects to receive a copy frame from the remote. If nothing is received at the end of this time, it goes into transparent mode (data on the line goes to the junction). In the same way, when receiving a copy frame, a 5-second timeout is started. If the modem has not received a new frame at the end of this time, it goes into transparent mode. This allows a system to control the outputs remotely then to communicate with the associated equipment. Please contact us to supply the control protocol.

15.5.3 - Copy between GEN INDUS modems (Leased Line and V32 to V34 modulations)

In this operation mode, it is possible to use the modems for data exchange , independently of the transmission of the state of the first two inputs and the receipt of the two output states.

NOTE :

- For this to operate, it is essential that the on-line speed should be at least 9600 b/s in V32 Or V34 ;

The time between updatings is about 1 s.

This is done simply with the same command as previously indicated :

AT*T3*W&W (Function activation and saving of parameters into a non volatile memory.

The configuration is the same as for the status re-transmission to the GSM network (see above) but it is possible to modify the different parameters without altering the transmission of the input states.

In this operation mode, the modems permanently exchange between themselves the input states, which guarantees a rapid and safe receipt.

Once programming is made, it is sufficient to set the micro-switches of a modem in « CALL dedicated line » and the other one in « ANSWER Dedicated Line (see paragraph CONFIGURATION) and switch the modems off and back on.

15.5.4 – Case 4: Data transfer and re-transmission of input states between GEN Indus (LL network)

In this operation mode, it is possible to use the modems for data exchange, independently of the transmission of the state of the first two inputs and the receipt of the two output states. The only restrictions are :

- No use of flow control
- Use of a Half Duplex protocol (MODBUS, UNITELWAY, etc.)

This is done simply using the set of the following commands :

AT*T4*W&W (Activation of the function and saving of the parameters into the non volatile memory.)

The modem has thus the following configuration :

- For alarm inputs 1 and 2 (**AT*A?**) :
 - An integration time of 50 ms
 - Open on release condition
 - Double State (Each state change triggers an alarm) ,

The choice concerning the modulation and the on-line speed is left free for the user.

Register S34 (15 By default, 10 ms base) is used to determine the minimum silence (inactivity) between each transmission frame.

Register S35 (15 By default, 10 ms base) is used to determine the minimum silence (inactivity) between each reception frame.

Register S45 (4 by default, 1 sec base) is used to determine the maximum inactivity (silence) time between two transmission of input states, also used when there is no protocol.

Once programming is made, it is sufficient to set the micro-switches of a modem in « CALL dedicated line » and the other one in « ANSWER Dedicated Line (see paragraph CONFIGURATION) and switch the modems off and back on.

15.5.5 – Cas 5: Data transfer and input transmission to a GEN Indus (LL network)

In this operation mode, it is possible to use the modems for data exchange, independently of the transmission of the state of the first two inputs. The receipt of the output states is not supervised. The only restrictions are :

- No use of flow control
- Use of a Half Duplex protocol (MODBUS, UNITELWAY, etc.)

This is done simply using the set of the following commands :

AT*T5*W&W (Activation of the function and saving of the parameters into the non volatile memory.)

The modem has thus the following configuration :

- For alarm inputs 1 and 2 (**AT*A?**) :

- An integration time of 50 ms
- Open on release condition
- Double State (Each state change triggers an alarm)),

The choice concerning the modulation and the on-line speed is left free for the user.

Register S34 (15 By default,10 ms base) is used to determine the minimum silence (inactivity) between each transmission frame.

Register S35 = 0 (15 By default,10 ms base) is used to determine the minimum silence (inactivity) between each reception frame.

Register S45 (4 by default, 1 sec base) is used to determine the maximum inactivity (silence) time between two transmission of input states, also used when there is no protocol.

Once programming is made, it is sufficient to set the micro-switches of a modem in « CALL dedicated line » and the other one in « ANSWER Dedicated Line (see paragraph CONFIGURATION) and switch the modems off and back on.

15.5.6 – Cas 6: Data transfer and input reception from a GEN Indus (LL network)

In this operation mode, it is possible to use the modems for data exchange , independently of the reception of the two output states, the input state is not transmitted.

- No use of flow control
- Use of a Half Duplex protocol (MODBUS, UNITELWAY, etc.)

This is done simply using the set of the following commands : :

AT*T6*W&W (Activation of the function and saving of the parameters into the non volatile memory.)

The modem has thus the following configuration :

- For alarm inputs 1 and 2 (**AT*A?**) :
- An integration time of 50 ms
- Open on release condition
- Double State (Each state change triggers an alarm)),

The choice concerning the modulation and the on-line speed is left free for the user.

Register S34 = 0 (15 By default,10 ms base) is used to determine the minimum silence (inactivity) between each transmission frame.

Register S35 = 0 (15 By default,10 ms base) is used to determine the minimum silence (inactivity) between each reception frame.

Register S45 (4 by default, 1 sec base) is used to determine the maximum inactivity (silence) time between two transmission of input states, also used when there is no protocol.

Once programming is made, it is sufficient to set the micro-switches of a modem in « CALL dedicated line » and the other one in « ANSWER Dedicated Line (see paragraph CONFIGURATION) and switch the modems off and back on.

15.5.7 – Data transfer and re-transmission of inputs between GEN Indus (multipoint II network)

It is possible to re-transmit the input states of a modem to several other ones in a network consisting of several modems with the following configuration :

- Modulation V23 Half duplex.
- The « master » modem configured with command AT*T5.
- The « slave » modems configured with command AT*T6.
- If in the network some modems have unused outputs, they should also be configured with command AT*T6.
- NOTE, in this configuration, if no protocol is used, the modem must be instructed to transmit itself the frame by setting bit 3 of register S46 ;

XV.6 - Control of outputs by DTMF codes

It is possible to control the opening or closing of **GEN Indus** outputs by DTMF codes. In that case, the modem has to be configured to switch its DTMF receiver in automatic answer, either directly or after the automatic answer normal sequence.

15.6.1 – Application dedicated to the direct control of outputs.

To do this, proceed as follows :Place the modem in vocal mode by AT!M16N0&D0, send command AT!X1 to activate the function, save by AT&W. In the programming menu of alarms accessed by AT*P, select menu 1, heading "Site name (1 to 8 char.), enter a sequence of 1 to 8 characters among the following : 0 to 9, and # this will be the password permitting access to the control function. Exit this menu, then "S : SAVE" AND "Q : QUIT". The modem is ready to operate. It should now be called from a telephone, when picking up the line, it generates a DTMF character signalling that it is waiting for a password . Enter the password and validate by star (*). If the password is accepted, a short DTMF signal is transmitted back within two seconds, if invalid, a long DTMF signal is sent back and the modem hangs up. If the code is valid, the control of outputs can start.

15.6.2 – Modem application and output control

In that case, the modem keeps working normally, and will only switch to control mode upon detection of the password. To do this, should be added at the end of the automatic answer normal sequence a time frame for password detection. This is done, by commands AT#M5=20#M11=50#W, the modem should also be in answer auto-adaptation ATN1 or ATN3, send, then, command AT!X1 to activate the function and save by AT&W. In the alarm programming menu accessed by AT*P, select menu1, heading "Site name (1 to 8 char.), enter a sequence of 1 to 8 characters from the following : 0 to 9, and # this will be the password permitting access to the control function. Exit this menu, then "S : SAVE" AND "Q : QUIT". The modem is ready to operate. It should now be called from a telephone, when picking up the line, it generates its normal automatic answer sequence then after the transmission of the last modulation, waits for 5 seconds the password reception ;. Enter the password and validate by star (*). If the password is accepted, a short DTMF signal is transmitted back within two seconds, if invalid, a long DTMF signal is sent back and the modem hangs up. If the code is valid, the control of outputs can start.

15.6.3 – Output control method

- To close, the output number surrounded by character # should be sent.
- To open, the output number surrounded by character * should be sent.
-

Example : #01# closes input 1 ; *02* opens input 2. If the command is valid, a short signal is generated back, if not, it is a long signal. The waiting time between each character of the same sequence is three seconds ; if this time expires the modem hangs up.

XVI - CCITT V25 BIS COMMANDS

XVI.1 - General Principles

The commands always start with the CR sequence. The modem understands the commands in upper case and lower case indifferently. Each command must end with a line return character, i.e. the carriage return (0Dh).

The backspace character (08H) can be used to cancel the last character sent to the modem when sending a command.

The maximum length of a command string is 128 characters including the CR and carriage return. If there are more than 128 characters, the modem sends back an error message and does not execute any command. If the modem detects an error in the string, it interprets the string until the error is detected and sends the error message without processing the commands that may be after the command that caused the error.

The commands must be sent with a parameter.

Commands are ASCII strings that end with the carriage return character (RC: 0DH). The command is only executed when the CR is received.

However, it should be noted that, not all the unit's functionalities can be accessed in this format (ex: Call-back, error correction and data compression.)

XVI.2 - Dialling command

Format: **CRN**wyzxxxxxx ... xxx

This command automatically dials the sequence xxx...xxx with the optional parameters wyz. The dialling string cannot exceed 34 characters.

Parameters (wyz)	Effect
M0	Modulation in V23 server
M1	Modulation in V23 Minitel
M2	Modulation in V22 bis or V22 (2400/1200 baud)
M3	Modulation in V32 (9600 baud)
M4	Modulation in V23 half (1200 baud)
M5	Modulation in V32 bis (19200 baud)
M6	Modulation in V27 ter half (4800 baud)
M7	Modulation in V21 (300 baud)
M8	Modulation in V32 (4800 baud)
M9	Modulation in V23 Minitel
MC ¹	Modulation in V34+ (33600 baud)
MD ¹	Modulation in V34 (28800 baud)
ME ¹	Modulation in V34 (19200 baud)
MF ¹	Modulation in V34 (14400 baud)
H0	Loudspeakers enabled
H1	Loudspeakers enabled low level
H2	Loudspeakers enabled medium level
H3	Loudspeakers enabled high level
A	Asynchronous connection

¹ Not available on the GEN INDUS 144.

Dialling sequence	Description
0 to 9	Digit to dial a number
P or I	Pulse type dialling (decimal)
T or F	Multi-frequency type dialling (DTMF)
:	Medium-pitched tone detection
<	2-second pause authorised behind a private installation only.

The default parameters are:

- multi-frequency dialling
- modulation and format determined by micro-switches 1, 2 and 3
- loudspeaker enabled until the connection is set up.

Dialling example: CRN0:T3699

To call the speaking clock from a private installation in decimal dialling then in multi-frequency dialling on the PSTN (Public Switched Telephone Network).

XVI.3 - Dial command with memory

Format: **CRSnn**

This command dials from the string saved in a non-volatile memory in position nn.

Parameter nn is from 1 to 9.

Format: **CRSnn;wxyzxxxxx ... xx**

Save the dialling string wxyzxxxxx ... xx in memory position nn (cf. CRN command)

Format: **CRSnn;**

Clear memory position nn.

Format: **CRSnn?**

Display the contents of memory position nn in the following form: LSNnn;wxyzxxxxx ... xx

Format: **CRS?**

Display all the numbers in memory.

XVI.4 - Reports

The modem transmits a certain number of messages following a command or according to certain situations.

Each report is an ASCII string that contains upper case characters and/or digits.

The reports are terminated by the sequence CR+LF (0D_H, 0A_H).

Message	Meaning
VAL	Command accepted
INV	Command not accepted or invalid
CFI ET	Ineffective call: remote busy
CFI RT	Ineffective call: remote absent
CFI NT	Erroneous call: no answer tone
CFI FC	Forbidden number
CFI CB	Caller busy (minimum delay between two calls - 6 seconds)
CFI AB	No dialling tone or permanent routing tone.
CFI NS	Call address of the requested memory empty
INC	Incoming call detected (ringing)
DLC xx	Call deferred for a xx minutes
CNX 300	Connection made in V21
C	Connection made in V23
CNX 1200	Connection made in V22
CNX 2400	Connection made in V22 bis or V34 ¹
CNX 4800	Connection made in V32 or V34 ¹ (4800 baud)
CNX 9600	Connection made in V32 or V34 ¹ (9600 baud)
CNX 14400	Connection made in V32 bis or V34 ¹
CNX 19200	Connection made in V34 ¹
CNX 38400	Connection made in V34 ¹ or V34+ ¹
CNX 38400	Connection made in V34 ¹ or V34+ ¹
CNX 57600	Connection made in V34 ¹ or V34+ ¹
CNX 115200	Connection made in V34 ¹ or V34+ ¹

¹ Not available on the GEN INDUS 144 replaced by V32bis.

XVII - MODBUS® OPERATION

From software version V2.20, the GEN INDUS incorporates the MODBUS protocol in RTU mode (Remote Terminal Unit). Thus, it is possible to create a network that consists of a master PLC that controls several slaves, some local ones and other remote ones. The MODBUS communicates independently via the V24 or RS485A link.

- **MODBUS slave®** mode can be used to start and receive calls and also to read the state of the 4 digital inputs and control the 2 outputs, program the modem, etc. In the same way, the remote modem is capable of recognising the frames that concern it. It is also possible to read the modem address locally and/or the calling slave PLC.
- **MODBUS master®** mode can be used to get rid of the wiring constraint for the slave PLC outputs to the modem input contacts in order to start calls. In this mode, when the **GEN INDUS** modem is not connected, it behaves like a master to the serial link. It transmits interrogation frames to the slave(s), analyses the answer and automatically manages the call to the master site if an alarm occurs or a timeout expires. From this moment, the **GEN INDUS** modem behaves as a slave. If an incoming call is detected, the **GEN INDUS** automatically switches into slave mode until the end of the communication.

In MODBUS operating mode, the **GEN INDUS** no longer manages the DTR signal.

However, the ModBus protocol can easily be used in parallel with the alarm inputs to send messages or start a call to a remote site.

When the **GEN INDUS** behaves as a slave; its address can be configured from 1 to 255.

It does not manage transmission requests (address 0).

To simplify the associated terminal program, it can be configured before being installed via the HAYES command set.

When the modem is configured in MODBUS operation, it automatically disables some functionalities to guarantee correct operation. Therefore, command echo becomes inactive, auto-speed adaptation and format and escape sequence control during communication.

It must be programmed with the micro-switches in the following position:

1	2	3	CONFIGURATION®	MODE
On	On	On	10-bit asynchronous (1 start + 8 bits + 1 stop)	V21, V22, V22bis, V23, V32, V32bis, V34 ¹ , V34+ ¹

A user-friendly menu that can be accessed with the **AT\$P** command can be used to program MODBUS operation.

The two modems do not normally disconnect at the same time. The one that initiates the break works correctly in that it does not receive erroneous characters, whereas the receiver takes a certain time (value in S10) to find the carrier loss. This causes noise characters to arrive on the junction, which may interfere with the transfers taking place on the network. To overcome this phenomenon, simply enable MNP4 error correction protocol to guarantee the integrity of the data transmitted to the junction.

¹ Not available on the GEN INDUS 144.

Inter-character timeout: The **Gen Indus** automatically modifies the value of the inter-character timeout if it is incompatible with the junction speed. Thus, the following minimum values are used:

Serial link or on-line baud rate	If no MNP & value	Value of S102 Without MNP4	If MNP4 & value	Value of S102 with MNP4	These values have been determined with functional tests
300	< 64	64	< 64	idem	
1200	< 48	48	< 100	100	
2400	< 24	24	< 48	48	
4800	< 12	12	< 30	30	
9600	< 8	8	< 16	16	
>19200	< 8	8	< 12	12	

This time must be adjusted according to the on-line speed. Thus, for a junction speed of 9600 and an on-line baud rate of 1200 b/s, this time must be programmed according to the lowest value, in this case 1200.

XVII.1 - SLAVE MODE

The specific MODBUS slave[®] parameters are programmed directly in HAYES registers or via the user-friendly menu that can be accessed with the **AT\$P** command (see paragraph below)

The slave address allocated to the modem must be programmed in register S100.

An optional number allocated to this network must be programmed in register S101.

The inter-character timeout in 1 ms steps must be programmed in register S102 (default 8). NOTE , this value must take into account the on-line transmission time that may cause additional inter-characters. **Automatically, Gen Indus adjust the timeout value according to the junction speed, see above**

The operation is validated in configuration register S103:

Bit 0: Validate the operation with ModBus Slave[®] protocol.

Bit 1: Validate the functionality to send the slave address (S100) and network number (S101) on connection in call mode.

Bit 2: Validate the functionality to receive the slave address (S100) and network number (S101) on connection in answer mode.

Bit 3: Validate the operation with the ModBus Master[®] protocol.

Bit 4: Release condition of the data received from the slaves in ModBus Master operation. If at 1, call when a 0 value is read, otherwise call when a 1 value is read.

Bit 5, : Call acknowledgement by writing into the register at the address 50h (80) 1

6, 7 reserved.

If the called slaves use the same format and transmission speed, the modem can be configured beforehand then saved in a non-volatile memory; otherwise, it is possible to program the modem according to the remote site via the HAYES registers using a ModBus command.

The numbers of the correspondents must be saved with the AT&Zn=xxxx command (see the paragraph "AT& command"), via the AT\$P menu or be loaded by a ModBus command. Note, the other communication parameters attributed to the numbers must also be programmed.

Once the configuration is over, switch off the modem, set the micro-switches in the required operating position then turn the power back on. See below.

1	2	3	CONFIGURATION	MODE
Off	Off	Off	10-bit asynchronous (1 start + 8 bits + 1 stop)	V21, V22, V22bis, V23, V32, V32bis, V34 ¹ , V34+ ¹
Off	On	Off	11-bit asynchronous (1 start + 8 bits + even parity + 1 stop)	As above
On	On	Off	11-bit asynchronous (1 start + 8 bits + odd parity + 1 stop)	As above
Off	Off	On	Leased CALL line	As above
On	Off	On	Leased ANSWER line	As above

Comment: When operating in ModBus Slave, some operations unique to the modem take all the machine time and cause the GEN INDUS not to answer (ex: MNP negotiation phase, etc.) Consequently, it is recommended not to pass directly in error on a modem answer timeout.

17.1.1 - Call sequence

See the precise description of the registers, addresses and function codes in the following pages.

17.1.1.1 - Outgoing call

The master terminal must firstly check line availability (no incoming call) in the input register at address 0020h, then it writes the number of the directory that it wants to call in address 0010h.

The master terminal can control the call either to one of the 9 numbers in the directory, or to the dynamic number, which cannot be saved but was previously sent to the modem via address 0700h.

The call is triggered when a value corresponding to the index in a memory position is written. (1 to 9 for the pre-saved numbers, i.e. 0001h to 0009h or 128 for the dynamic number, i.e. 0080h).

At this moment, the modem checks if the number is valid and indicates the result in register 0021h. In the same way, the call progress and success can be followed via this register.

When the connection is successful, the modulation and on-line speed are available in register 0022h. When the call is made to one of the 9 numbers in the directory, the modem uses the parameters (junction speed, junction format, protocol, modulation, minimum and maximum on-line speed, etc.) programmed for this number to connect, otherwise it takes those in the current configuration.

If the call fails or the connection is broken, the cause is available in register 0021h. The modem clears register 0010h and loads 0000h in registers 0020h and 0022h, thus indicating the end of the call.

At any moment, the master terminal can interrupt the call procedure, automatic answer procedure or the connection by writing 0000h to address 0010h.

¹ Not available on the GEN INDUS 144.

When the modem is connected to a slave network, it is also possible to generate calls by activating alarm inputs 1 to 4. For connection in this case, the modem uses the configurations programmed for these call numbers via the menu that is available with the AT*P command.

17.1.1.2 - Incoming call

By regularly scanning the input register at address 0020h, the master terminal detects the presence of an incoming call, then the connection.

When the connection is successful, the modulation and on-line speed are available in register 0022h. The modem uses the current configuration parameters to connect.

If the call fails or the connection is broken, the cause is available in register 0021h. The modem clears register 0010h and loads 0000h in registers 0020h and 0022h, thus indicating the end of the call.

At any moment, the master terminal can interrupt the call procedure, the automatic answering procedure or the connection by writing 0000h to address 0010h.

If the remote site identification functionality is active, the value is available in register 0023h.

17.1.2 - Registers

The GEN INDUS has operating registers to make full use of its functionalities.

- Ads 0010h: A register that can be used to control calling numbers pre-saved or loaded in address 0700h..
- Ads 0030h: A register that can be used to re-initialize, reload and/or save the default configuration, etc.
- **Ads 0050h to 0058h : A register that can be used to know current alarms and acknowledge them. 1**
- Ads 0100h to 015Fh: Access to all the Hayes registers
- Ads 0300h, 0311h, 0322h, 0333h, 0344h, 0355h, 0366h, 0377h, 0388h: 9 pre-saved telephone numbers in non-volatile memory.
- Ads 0700h to 070Fh: Telephone number to be called, loaded in ModBus.
- **Ads 0800h: Write a command in Hayes format.**
- **Ads 1000 to 1004 h :A group of registers used to know the current value of each analogue input (extension board)**
- **Ads 1100h to 1104h ; A group of registers used to know the minimum value reached by each analogue input (extension board)**
- **Ads 1200h to 1204h : A group of registers used to know the maximum value reached by ech analogue input 'extension board)**
- **Ads 1300h to 1304h : A group of registers used to know the current value of the triggering low threshold of an alarm.**
- **Ads 1400h to 1404h : A group of registers used to know the current value of the triggering high treshold of an alarm.**
- **Ads 1500h to 1528h : A group of registers used to know the alarm value (extension board)**
- **Ads FF00h to FF04h : A group of registers used to know the value of communication error counters. 1**
-

The GEN INDUS has input registers that can be used to follow the call sequence

- Ads 0020h: A register that can be used to find out the modem status.
- Ads 0021h: A register that can be used to follow the call progress.
- Ads 0022h: A register that can be used to find out the modulation and baud rate of the communication.
- Ads 0023h: A register that can be used to identify the modem and calling network.
- Ads 0040h: A register that can be used to read the caller's telephone if this functionality is available on the network and activated in the modem (Command ATX5).

The GEN INDUS also has the following possibilities to use the inputs/outputs.

- Ads 0000h to 0003h: Read the status of the inputs (one at a time or in blocks).
- Ads 0000h to 0001h: Read or set the outputs (one at a time or in blocks).

17.1.3 - Function codes

The GEN INDUS handles the following MODBUS function codes:

- 01 Read the state of N outputs (1 word = 1 to 16 outputs maximum).
- 02 Read the state of N inputs (1 word = 1 to 16 inputs maximum).
- 03 Read N operating word(s).
- 04 Read N input word(s).
- 05 Set an output.
- 06 Set an operating word.
- 11 Read the slave functionality description
- 15 Set several outputs.
- 16 Set several operating words.

The following addresses can be used:

Code 01 - Read the state of N outputs

Addresses 0000h and 0001h.

The sum of the address and the number of points must not exceed the number of modem outputs. At present, the modem has 2 outputs as standard, i.e.:

Address 0000h with reading 1 point. (S1)

Address 0000h with reading 2 points. (S2, S1)

Address 0001h with reading 1 point. (S2)

If the value returned for the point is 0, this indicates that the output is not controlled.

Code 02 - Read the state of N inputs

Addresses 0000h to 0003h. (With extension board 0000h to xxxh (as per configuration))

The sum of the address and the number of points N must not exceed the number of modem inputs. At present, the modem has 4 inputs as standard, ex:

Address 0000h with reading 4 points. (E4, E3, E2, E1)

Address 0000h with reading 1 point. (E1)

Address 0002h with reading 2 points. (E4, E3)

If the value returned for the point is 0, this indicates that the input is normally open.

Code 03 - Read N word(s) in the operating registers

Addresses available, between brackets maximum number of addressable words 0010h(1), 0020h(5)¹, 0030h(1), 0040h(16)¹, 0050h(9), 0100h(96), 0300h(17), 0311h(17), 0322h(17), 0333h(17), 0344h(17), 0355h(17), 0366h(17), 0377(17), 0388h(17), 0400h(116), 1000h(16), 1100h(16), 1200h(16), 1300h(16), 1400h(16), 1500h(40).

N cannot be greater than 48.

Code 04 - Read N word(s) in the input registers

Addresses 0020h to 0023h and 0040h.

The number of words requested must not exceed the last address, i.e.:

Possible to read 4 words maximum at address 0020h and only 1 at address 0024h.

Possible to read 1 to 10 words from address 0040h.

¹ Fonctionnalité accessible avec une version logicielle au minimum V4.40.

Code 05 - Set an output

Addresses 0000h and 0001h by default. Other values possible with extension board, depending on the configuration.

Code 06 - Set an operating word

Addresses available for this function 0010h, 0030h, 0100h to 015Fh , FF00h à FF04h¹.

Code 15 - Set several outputs

Addresses 0000h and number of outputs limited to 2.

Code 16 - Set several operating words

Addresses available, between brackets maximum number of addressable words 0010h(1), 0050h(9)¹, 0100h(116), 0300h(17), 0311h(17), 0322h(17), 0333h(17), 0344h(17), 0355h(17), 0366h(17), 0377(17), 0388h(17), 0400h(116), 0700h(16), 800(48), 1000h(16), 1100h(16), 1200h(16), 1300h(16), 1400h(16), 1500h(16), FF00h à FF04h¹.

The number of words in the write command cannot be greater than 48.

Code 17 – Read the modem identification

The answer consists of a value that indicates the modem type, an operating indicator, the number of digital inputs and the number of outputs.

modem type:	33 (21h) for GEN INDUS 33600 14 (0Eh) for GEN INDUS 14400
Operating indicator:	255 (FFh)
Number of inputs:	4 (04h) for 4 inputs currently by default
Number of outputs:	2 (02h) for 2 outputs currently by default

17.1.4 - Description of the useable addresses.

17.1.4.1 - Output control

Useable function code 01(01h) or 05(05h) or 15(0Fh).

Address 0000h to 0001h.

Read or write by point or block of points.

If the value returned for the point is 0, this indicates that the output is not controlled.

17.1.4.2 - Input control

Useable function code 02(02h).

Address 0000h to 0003h.

Read by point or block of points.

If the value returned for the point is 1, this indicates that the input is normally open.

¹ Fonctionnalité accessible avec une version logicielle au minimum V4.40.

17.1.4.3 - Operating register management

Useable function code 03(03h) or 06(06h) or 16(10h).

Address 0010h

Value (hex.)	Description
0000	Modem at rest (hung up) or requesting to abandon the current action. Note: If the connection was set up with a V32, V32 bis or V34, The modem when the abandon request is initiated will only be ready to accept a new request 2 seconds later.
0001 to 0009	Call the number in the directory.
0080	Call the dynamic number.

In this case, the modem uses the general parameters for the connection. These parameters can be displayed with the AT\S command.

Note: Following a hang-up request, the delay to accept a new command is 2 seconds.

Address 0030h (48)

Value (hex.)	Description
0000	Completely re-initializes the modem (equivalent to power up). Note: Following this command , the delay to accept a new command is 2 seconds.
0001	Revalidate the numbers that have a delay allocated.
0002	Completely clear the 9 numbers in the directory saved in memory.
0010	Call up factory configuration 0. (equivalent to AT&F0)
0020	Call up the configuration saved in a non-volatile memory in profile 0. (equivalent to ATZ0)
0030	Save the current configuration in a non-volatile memory in profile 0. (equivalent to AT&F1).
0040	Call up factory configuration 1. (equivalent to AT&F1)
0050	Call up the configuration saved in a non-volatile memory in profile 1. (equivalent to ATZ1)
0060	Save the current configuration in a non-volatile memory in profile 1 (equivalent to AT&W1).

Adresse 0050h to 58h (80 à 88)¹

Indicator register if input in alarm condition, the bits are available according to the configuration of the extension board (8 ETOR, 24 ETOR). (8DI, 24 DI)

Positions without value are reserved, those with a dash are unused.

¹ Fonctionnalité accessible avec une version logicielle au minimum V4.40.

Ads \ Bits	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0050h	E12	E11	E10	E9	E8	E7	E6	E5	----	----	----	----	E4	E3	E2	E1
0051h																
0052h																
0053h																
0054h																
0055h																
0056h	----	----	----	----	----	----	----	----								
0057h													EA4	EA3	EA2	EA1
0058h	----	----	----	----	----	----	----	----	Ads Slave without answer See above							

Depending on the configuration of MODBUS operating mode in the menu « MODBUS SLAVE », writing into these registers will acknowledge current alarms. In order to be sure not to lose an alarm, the previously read value must be written. The modem makes an OR EXCLUSIVE between its current value and the one received. If the call is cut off while registers have not been cleared , the modem will call back.

Address 0058h (88) ¹

This register value changes when the modem in master mode interrogates a slave which does not answer. The 8 least significant bits give the slave address which has not answered. When connecting with the master site, if this register is erased by the application, then the modem will call immediately in the next answer absence, if not, it will wait for the duration of 115 before reporting the problem. To acknowledge, the previously read value must be written, the modem making OR EXCLUSIVE between its current value and the one received.

Adresse 0100h à 0173h (256 à 371)

This address range corresponds to the HAYES registers. Please refer to the « HAYES REGISTER » for a more precise description and the possible values.

Restrictions : Some registers can be addressed , but writing is not validated.this concerns S1, S48 to S90, S92 à S94, S100 à S115 Hayes registers.

When writing, the least significant bits only are taken into account.

Address 0100h corresponds to the S0 Hayes registers

Address 0173h corresponds to S115 Hayes registers

It is possible to modify the Hayes registers dedicated to MODBUS while in operation (S100 to S115). Function to be used with precaution.

Address 0300h to 0398h (256 to 371)

This range of addresses corresponds to the number directory.

The parameters that can be used are the following:

Parameter	Value (hex.)	Description
0 to 9	30 to 39	Digits to dial the number
#, *,A,B,C,D	23, 2A, 41, 42, 43, 44	Characters to dial the number
P	50	Enter decimal dialling
T	54	Enter multi-frequency dialling
W	57	Wait for medium-pitched tone, S6 register
,	2C	Pause only behind private installation (2 seconds) S8 register

The number must be written starting at the beginning of each zone. The first character must be located in the most significant bits. The maximum size must not exceed 17 words.

The value 255 (FFh) must always be sent after the last digit.

When writing, the number is immediately saved in a non-volatile memory.

Address (hex.)	Indication
0300	Start of the zone for number 1.
0311	Start of the zone for number 2.
0322	Start of the zone for number 3.
0333	Start of the zone for number 4.
0344	Start of the zone for number 5.
0355	Start of the zone for number 6.
0366	Start of the zone for number 7.
0377	Start of the zone for number 8.
0388	Start of the zone for number 9.

Address 0400h à 0477h (1024 to 1143)¹

Reading and writing register , indicating the number of times when a **digital or analogue** input has gone into alarm since the resetting to 0. Reading of two bytes minimum. Address 464h (1124) start of the register zone of analogue inputs..The value is set back to 0 when it reaches 255 Note : writing of bytes (most significant bits = input 1 ; least significant bits = input 2, etc.)

Address 0700h to 070Fh (1792 to 1807)

This range of addresses corresponds to the dynamic telephone number (not saved in non-volatile memory).

The values accepted are the same as for address 0300h above.

Writing the number must start at address 0700h, the first character must be located in the most significant bits.

The maximum size must not exceed 16 words.

If the least significant bits of the last word are not used, they must be loaded with the value 255 (FFh).

Address 0800h to 0830h (2048 to 2096)

This range of addresses can be used to send commands to the modem directly in HAYES format and to avoid managing the registers that are accessible via addresses 0100h to 015Fh. The string must be written starting at address 0800h, the first character must be located in the most significant bits. The hexadecimal value must be between 21h and 5Ch. (upper case character).

The maximum size must not exceed 24 words.

The first two characters "A" and "T" that always start the HAYES commands must not be loaded.

The end of the command string must always be indicated by the CARRIAGE RETURN character 13 (0Dh).

If the least significant bits of the last word are not used, they can contain any value.

RESTRICTION: It is not possible to re-read this memory zone. Only HAYES commands are accepted, some are forbidden, including the main ones (In, &Vn, \S, A, O). This list is not restrictive.

Address 1000h to 100Fh (1000h to 1003h only operational) (4096 à 4111)

This address range corresponds to the 16 analogue inputs . These read - only registers indicate for each analogue input their current value.

¹ Fonctionnalité accessible avec une version logicielle au minimum V4.40.

Address 1100h to 110Fh (1100h to 1103h only operational) (4352 to 4367)

This address range corresponds to the 16 analogue inputs . These read/write registers indicate for each analogue input the minimum value reached. Re-initializing is in writing.

Address 1200h to 120Fh (1200h to 1203h only operational) (4608 to 4623)

This address range corresponds to the 16 analogue inputs . These read - only registers indicate for each analogue input the maximum value reached. Re-initializing is in writing

Address 1300h to 130Fh (1300h to 1303h only operational) (4864 to 4879)

This address range corresponds to the 16 analogue inputs . These read/write registers indicate for each analogue input the minimum value to be reached to go into alarm.

Address 1400h to 140Fh (1400h to 1403h only operational) (5120 to 5135)

This address range corresponds to the 16 analogue inputs . These read/write registers indicate for each analogue input the maximum value to be reached to go into alarm.

Address 1500h to 159Fh (1500h à 1510h only operational) (5376 to 5392)

This address range corresponds to the 16 possible analogue inputs with a memory of the last alarm value for each input, ex : 1500h for analogue input 1.

Address FF00h TO FF04h (65280 TO 65284)¹

These addresses correspond to the modem internal counters permitting the identification of possible communication problems.

- Ads FF00h : frame counter with erroneous CRC
- Ads FF01h : frame counter with erroneous address
- Ads FF02h : frame counter with erroneous size
- Ads FF03h : frame counter with erroneous function code
- Ads FF04h : frame counter with erroneous data

17.1.4.4 - Input register management

Useable function code 04 (04h).

Input register at address 0020h (32)

Value (hex.)	Indication
0000	Modem at rest (hung up).
0001	Outgoing call in progress
0002	Incoming call in progress
0004	Modem makes outgoing call (Alarm)
0010	Connected after outgoing call
0020	Connected after incoming call

0011	Connected after a call initiated by the modem
------	---

¹ Fonctionnalité accessible avec une version logicielle au minimum V4.40.

Input register at address 0021h (33)

Value (hex.)	Indication
0000	Modem at rest (hung up).
0001	Non-existent number or memory position empty
0002	Forbidden number.
0003	Number with a delay allocated
0004	No dialling tone
0005	Remote busy
0006	Remote does not answer
0007	Remote answers, but is not a modem
0008	2100 Hz detected but connection has failed
0009	Carrier loss
000A	Negotiation (MNP4) or transfer failed (TEC Protocol).
0010	Pick up line
0020	Dialling finished
0030	Connection successful.
0040	Automatic transfer successful

0050	Incoming call 1
-------------	------------------------

Input register at address 0022h (34)

Value (hex.)	Most significant bit indication (Modulation)	Value (hex.)	Least significant bit indication (Speed b/s)
00xx	Not connected	xx00	Not connected
01xx	V21	xx01	300
02xx	V23 Minitel (E75R1200)	xx02	600
03xx	V23 Server (E1200/R75)	xx03	1200
04xx	V23 Half Duplex	xx04	2400
05xx	V27 Ter Half Duplex	xx05	4800
06xx	V29 Half Duplex	xx06	7200
07xx	V17 Half Duplex	xx07	9600
08xx	V22	xx08	12000
09xx	V22bis	xx09	14400
0Axx	V32	xx0A	16800
0Bxx	V32bis	xx0B	19200
0Cxx	Not used	xx0C	21600
0Dxx	V34	xx0D	24000
0Exx	V34+	xx0E	26400
1xxx	MNP4 protocol active	xx0F	28800
		xx10	31200
		xx11	33600

Input register at address 0023h (35)

Value (hex.)	Most significant bit indication (Modulation)	Value (hex.)	Least significant bit indication «<0»
xx--	Indicator of the slave network that generated the automatic call.(register S101)	--xx	Address of the slave modem that generated the automatic call.(register S100)

Input register at address 0024h (36)

Value (hexa.)	Most significant bit indication (Modulation)	Value (hexa.)	Least significant bits
xx--	Local network number. (register S101)	--xx	Local MODBUS address (register S100)

Input register at address 0040h (64)

The number of words accessible via this register is 10 maximum.

By default, the words in this register have the value 65355 (0xFFFF).

With France Telecom's "Class" service that presents the caller's number, if this functionality is available on the network and is activated in the modem with the command ATX5, then the received number will be available at this address during automatic answering.

17.1.5 - Command examples

Read the state of the outputs (read the state of the two 2 outputs available)

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	01	Function	01
Start address (MSB)	00	Byte counter	01
Start address (LSB)	00	Data (Outputs 08..01)	00
Number of points (MSB)	00	CRC error control	--
Number of points (LSB)	02		
CRC error control	--		

Read the state of the inputs (read the 4 inputs available)

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	02	Function	01
Start address (MSB)	00	Byte counter	01
Start address (LSB)	00	Data (Inputs 10008..10001)	00
Number of points (MSB)	00	CRC error control	--
Number of points (LSB)	04		
CRC error control	--		

Read n operating registers (read address 0010h).

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	03	Function	03
Start address (MSB)	00	Byte counter	02
Start address (LSB)	10	Data (MSB)(register 40017)	00
Number of points (MSB)	00	Data (LSB)(register 40017)	00
Number of points (LSB)	01	CRC error control	--
CRC error control	--		

Read n input registers (Read 3 call monitoring registers)

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	04	Function	04
Start address (MSB)	00	Byte counter	06
Start address (LSB)	20	Data (MSB)(register 30129)	00
Number of points (MSB)	00	Data (LSB)(register 30129)	00
Number of points (LSB)	03	Data (MSB)(register 30130)	00
CRC error control	--	Data (LSB)(register 30130)	00
		Data (MSB)(register 30131)	00

Data (LSB)(register 30131)	00
CRC error control	--

Set an output (output 2 in the closed state)

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	05	Function	05
Start address (MSB)	00	Start address (MSB)	00
Start address (LSB)	01	Start address (LSB)	01
Number of points (MSB)	FF	Number of points (MSB)	FF
Number of points (LSB)	00	Number of points (LSB)	00
CRC error control	--	CRC error control	--

Write to an operating register. (Call request from the correspondent in number 3 in the directory).

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	06	Function	06
Start address (MSB)	00	Start address (MSB)	00
Start address (LSB)	10	Start address (LSB)	10
Value (MSB)	00	Value (MSB)	00
Value (LSB)	03	Value (LSB)	03
CRC error control	--	CRC error control	--

Set several outputs (output 1 closed, 2 open)

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	0F	Function	0F
Start address (MSB)	00	Start address (MSB)	00
Start address (LSB)	00	Start address (LSB)	00
Number of outputs (MSB)	00	Number of outputs (MSB)	00
Number of outputs (LSB)	02	Number of outputs (LSB)	02
Byte counter	01	CRC error control	--
Value (Outputs 8..1)	01		
CRC error control	--		

Write to several operating registers.
(Send the HAYES command &K3&I2\N3W1M2N).

REQUEST		ANSWER	
Field name	Example (Hex)	Field name	Example (Hex)
Slave address	01	Slave address	01
Function	10	Function	10
Start address (MSB)	08	Start address (MSB)	03
Start address (LSB)	00	Start address (LSB)	00
Number of registers (MSB)	00	Number of registers (MSB)	00
Number of registers (LSB)	08	Number of registers (LSB)	08
Byte counter	10	CRC error control	--
Data (MSB)	26		
Data (LSB)	4B		
Data (MSB)	33		
Data (LSB)	26		
Data (MSB)	49		
Data (LSB)	32		
Data (MSB)	5C		

Data (LSB)	4E
Data (MSB)	33
Data (LSB)	57
Data (MSB)	31
Data (LSB)	4D
Data (MSB)	32
Data (LSB)	4E
Data (MSB)	0D
Data (LSB)	00
CRC error control	--

Read slave identification.

REQUEST	
Field name	Example (Hex)
Slave address	01
Function	11
CRC error control	--

ANSWER	
Field name	Example (Hex)
Slave address	01
Function	11
Byte counter	04
Slave identification	21
Operating indicator	00 = OFF FF = ON
Number of inputs:	04
Number of outputs	02
CRC error control	--

XVII.2 - MASTER MODE

In this mode, the GEN INDUS modem can interrogate from 1 to 255 slaves that have their consecutive addresses. It reads the same type of data at the same address in each slave. A programmable alarm mask can be used to determine the bits that must generate a call. even if the slave does not answer within the predicted time, the GEN INDUS still generates a call.

Comment: For the master mode to be active, the slave mode must be valid.

The specific MODBUS master parameters are programmed directly in HAYES registers or via the user-friendly menu that can be accessed with the **AT\$P** command (see below).

- The address of the first slave must be programmed in register 104.
- The number of slaves to be interrogated must be programmed in register 105.
- The slave interrogation function code must be programmed in register 106 by respecting the following values:
 - 1: output bit read function
 - 2: input bit read function
 - 3: operating word read function
 - 4: input word read function
- When reading bits, the number of bits to be read must be programmed in register 107; the value must be between 1 and 16.
- The most significant bits of the read address in the slaves must be programmed in register 108 and the least significant bits in register 109.
- The maximum waiting time for an answer from the interrogated slave must be programmed in register 110 in 100 millisecond steps, i.e. from 0.1 to 25.5 seconds.
- The number of repetitions of the same frame without obtaining an answer and before generating a call to the remote master site must be programmed in register 111.
- The most significant bits of the alarm mask superimposed on the data received from the slave must be programmed in register 112 and the least significant bits in register 113. Setting the bits to one corresponds to the information that triggers a call.
- The index of the pre-saved telephone number memory position must be programmed in register 114; the value must be between 0 and 8. (corresponds to the memory of the number saved with the at&zn = command, with n from 0 to 8)

The operation is validated in configuration register 103:

Bit 0: Validate operation with ModBus Slave protocol.

Bit 1: Validate the slave address send functionality (S100) and network number (S101) on connection in call mode.

Bit 2: Validate the slave address receive functionality (S100) and network number (S101) on connection in answer mode.

Bit 3: Validate operation with ModBus Master protocol.

Bit 4: Rest state of the data received from the slaves in ModBus Master operation. If at 1, call when value 0 is read, otherwise call when value 1 is read.

Bit 5, 6, 7 reserved. Do not set.

17.2.1 - Operation

When the **Gen Indus** modem detects that it is not connected, it takes the information in the various Hayes registers and builds an interrogation frame that it sends. It waits for the answer by triggering the maximum wait timeout. When it receives the answer, it checks that it complies then extracts the data, places it on the alarm mask and checks that there were no alarm(s). If the answer does not contain an alarm state, the **GEN INDUS** builds the next slave interrogation frame or the same one, if there is only one of them and repeats the cycle.

If the **GEN INDUS** detects an alarm state, either by reading or repeating the interrogation frame without receiving answers, it loads the defective slave address in register 101. Thus, on connection, if the address send functionality is valid, the modem will transmit this address and the supervision computer will immediately be able to find out the address of the slave to be interrogated.

As soon as the **GEN INDUS** has detected an alarm and entered into a call phase, it stops interrogating the slaves. This also applies when an incoming call is detected. This is valid until it finally hangs up.

In master mode, the GEN INDUS manages the following exception code:

05 : Acknowledgement (the slave is busy)

but not the following exception codes:

01: illegal function code

02: illegal address

03: illegal data

04: slave fault.

Which cause the same process as when an answer is not received.

XVII.3 - PROGRAMMING via the Menu

The example below corresponds to a ModBus network communicating at 19200 b/s in the 8-bit format, even parity with error correction protocol, with master operation, not connected to a slave.

The entries made will only definitively be taken into account when saved. This step must be carried out last.

When entering the programming menu, a 3-minute timeout is started; it is reloaded each time a key is pressed; at the end of this time, the **GEN INDUS** automatically reloads the last configuration that was saved and quits the programming mode; if the parameters being entered were not saved, they are lost.

Comment: When the term "validate" is used below, it will refer to the use of the CARRIAGE RETURN key.

In every case, the "backspace" key is accepted.

The text in the menus is in English and can be used with all types of terminal.

The text in italics gives additional explanations on entering.

PRINCIPLE OF ENTERING PARAMETERS

Parameters are entered in upper or lower case characters.

When programming, the **GEN INDUS** displays the previously entered value after the message "Current value:", if no character appears, the parameter does not exist.

To be correct, the entry must comply with the indications contained in the rest of the message between brackets. When the dash symbol appears, it signifies a value from x to y. (Ex: 1-4, authorises the values 1, 2, 3, 4).

To enter a parameter that does not need to be changed, simply send the carriage return ρ.

To enter the menu, the AT*P command must be sent, the modem returns the following information:

```
1: MODBUS SLAVE PROGRAMMING MENU
2: MODBUS MASTER PROGRAMMING MENU (OFF-LINE)
3: TELECOMMUNICATIONS PROGRAMMING MENU
4: DISPLAY
5: SERIAL PORT PROGRAMMING MENU
M: RELOAD SAVED CONFIGURATION
U: RELOAD FACTORY CONFIGURATION
S: SAVE
Q: QUIT
```

If report transmission in verbal mode is valid , the "Q: QUIT" option or timeout expiration gives:

```
OK
```

The GEN INDUS will be ready to operate, taking parameters into account when the configuration of the micro-switches is changed and then by turning it off and back on again.

The "1: MODBUS SLAVE PROGRAMMING MENU" option returns:

Slave number allocated to this Gen Indus
(Enter 'x' before the value if entering in heXadecimal)
Current value: 001 (x01)
3p (Keyboard entry)

Number allocated to this network
(Type 'x' before the value if entering in heXadecimal)
Current value: 002 (x02)
3p

Inter-character timeout (1 ms steps)
Current value: 008
!)p (i.e. 10 ms maximum between each character. This value must take into account the transmission times on the line that may be caused by additional inter-characters. See at the chapter beginning the comment" on Inter-character timeout "

Activate transmission on call (slave and network numbers)
Current value: No

Op
Activate of reception on answer (slave and network numbers)
Current value: No

Activate call by RAZ alarm (writing ads 80-87)

p
Activate MODBUS slave operation
Current value: No
Op

The "2: MODBUS MASTER PROGRAMMING MENU (OFF-LINE)" option returns :

Address of the first slave
(Type 'x' before the value if entering in heXadecimal)
Current value: 002 (x02)
4p (Keyboard entry)

Number of slaves on the network
Current value: 001
p

Read function code (Output(1), Bit(2), Status word(3), Input word(4))
Current value: 2
p

If reading Outputs or Bits, number (1 to 16)
Current value: 016
p

Bit status at rest 0/1

Current value: 0

p

Read address

(Type 'x' before the value if entering in hexadecimal)

Current value: 00000 (x0000)

Ξ0100p *(address 256 in decimal, enter 4 characters after X)*

Maximum wait time for an answer (100 ms steps)

Current value: 100

p *(i.e. 10 seconds)*

Number of repetitions before alarm

Current value: 3

p

Mask that generates the alarm (16 bits (1: alarm, 0: inactive))

(Type 'x' before the value if entering in hexadecimal)

Current value: 65535 (xFFFF)

Ξ00ΦΦp *(only the least significant bits are active, enter 4 characters after X)*

Index of the memory position allocated to the call (0-8)

Current value: 0

p

Activate MODBUS master operation off-line

Current value: No

Op

The "3: TELECOMMUNICATIONS PROGRAMMING MENU" option returns:

Memory position index for the number to be configured (0-8):

0p

Telephone number:

Current value:

0241831300p (34 characters maximum)

Junction speed:

(0:300 1:600 2:1200 3:2400 4:4800 5:9600 6:19200 7:38400 8:57600 9:115200)

Current value: 38400

6p (6 for 19200)

Number of bits (7, 8):

Current value: 8

p

Parity (S: No, P: Even, I: Odd) :

Current value: no

Πp

Line baud rate = junction baud rate (Y/N):

Current value: Yes

p

MNP4 error correction (O:yes not exclusive, No, Exclusive):

Current value: No

Ep (The upper case character gives the option O,N,E)

Flow control (N: No, C: Cts, X: Xon/xoff) :

Current value: No

p

Modulation (0:V21 1:V22 2:V22b 3:V23S 4:V23M 8:V34¹ 9:V32 10:V32b 11:V34+¹):

Current value: V34+

8p (8 for V34)

Auto-adaptation when calling (Y/N):

Current value: No

p

Minimum on-line speed (300 to 33600²):

Current value: 2400

19200p

Maximum on-line speed (300 to 33600²):

Current value: 33600

19200p

¹ Not available on the GEN INDUS 144.

² 300 to 14400 for the GEN INDUS 144.

Transfer protocol:

0:Transparent 1:Message 2:TEC

Current value: Transp.

ρ (0 Transparent in ModBus)

Z0: 0241831300

Z1:

Z2:

Z3:

Z4:

Z5:

Z6:

Z7:

Z8:

Memory config	&Z0	&Z1	&Z2	&Z3	&Z4	&Z5	&Z6	&Z7	&Z8
Junction baud rate (Kb/s)	19.2	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Number of bits	8	8	8	8	8	8	8	8	8
Parity	EVEN	NO	NO	NO	NO	NO	NO	NO	NO
Line baud rate = junction	YES	YES	YES	YES	YES	YES	YES	YES	YES
Error correction	EXCLF	NO	NO	NO	NO	NO	NO	NO	NO
Flow Control	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation autoadapt.	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation type	V34	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+
Min on-line speed	19200	300	300	300	300	300	300	300	300
Max on-line speed	19200	33600	33600	33600	33600	33600	33600	33600	33600
Transfer protocol	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP	TRNSP

(Chart giving a programming summary of the telephone numbers and the connection configurations)

Other programming (0-8/N):

(Only entering the number in the memory position to be programmed or modified returns to programming, any other character returns to the main menu)

The "4: DISPLAY" option returns:

MODBUS SLAVE CONFIGURATION

Activate MODBUS slave operation..... Yes
 Slave number allocated to this Gen Indus..... 003
 Number allocated to this network..... 004
 Inter-character timeout (1 ms steps)..... 005
 Activate transmission when calling..... Yes
 Activate receiving when answering No
 Acknowledgement by RAZ alarm (writing ads 80-87)..... YES

MODBUS MASTER CONFIGURATION

Activate MODBUS master operation off-line..... Yes
 First slave address 004
 Number of slaves on the network..... 001
 Read function code 2
 If reading Outputs or Bits, number..... 016
 Bit status at rest 0/1 0
 Read address..... x0100
 Maximum wait time for an answer (100 ms steps)..... 100
 Number of repetitions before alarm..... 003
 Mask that generates the alarm..... x00FF
 Index of the memory position allocated to the call (0-8)..... 0

ρ (displays the rest of the menu)

Z0: 0241831300

Z1:

Z2:

Z3:

Z4:

Z5:

Z6:

Z7:

Z8:

Memory config	&Z0	&Z1	&Z2	&Z3	&Z4	&Z5	&Z6	&Z7	&Z8
Junction baud rate (Kb/s)	19.2	38.4	38.4	38.4	38.4	38.4	38.4	38.4	38.4
Number of bits	8	8	8	8	8	8	8	8	8
Parity	EVEN	NO	NO	NO	NO	NO	NO	NO	NO
Line baud rate=junction	YES	YES	YES	YES	YES	YES	YES	YES	YES
Error correction	EXCLF	NO	NO	NO	NO	NO	NO	NO	NO
Flow Control	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation autoadapt.	NO	NO	NO	NO	NO	NO	NO	NO	NO
Modulation type	V34	V34+	V34+	V34+	V34+	V34+	V34+	V34+	V34+
Min on-line speed	19200	300	300	300	300	300	300	300	300
Max on-line speed	19200	33600	33600	33600	33600	33600	33600	33600	33600
Transfer protocol	TRNSP	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNS P	TRNSP

(Table giving a programming summary of the telephone numbers and the connection configurations)

ρ (can be used to return to the main menu)

The "5: SERIAL PORT PROGRAMMING" option returns:

This programming will be the one used during incoming calls, when calling via the dynamic number or in master mode to interrogate the slaves.

Warning: The new parameters are active once the save requested in this menu has been carried out. This can oblige the parameters of the current programming port to change. This menu is best left until the end.

Junction speed

(0:300 1:600 2:1200 3:2400 4:4800 5:9600 6:19200 7:38400 8:57600 9:115200)

Current value: 38400 (by default)

6p (6 :19200)

Speed and format auto-adaptation (Y/N)

Current value: Yes

Np (serial link fixed in ModBus)

Number of bits (7,8):

Current value: 8

p

Parity (S: None, P: Even, I:Odd):

Current value: none

IIp

Line baud rate = junction baud rate (Y/N):

Current value: Yes

p

Auto-adaptation when calling (Y/N):

Current value: Yes

Np (because only one modulation authorises a baud rate of 19200 on the line)

Auto-adaptation when answering (Y/N)

Current value: Yes

Np (as above)

MNP4 error correction (O:yes not exclusive, No, Exclusive) :

Current value: No

Ep (The upper case character gives the choice O,N,E)

Modulation (0:V21 1:V22 2:V22b 3:V23S 4:V23M 8:V34¹ 9:V32 10:V32b 11:V34+¹) :

Current value: V34+

8p (8 for V34)

Minimum on-line speed (300 to 33600²) :

Current value: 300

19200p

¹ Not available on the GEN INDUS 144.

² 300 to 14400 for the GEN INDUS 144.

Maximum on-line speed (300 a 33600¹) :

Current value: 33600

19200p

CONFIGURATION

Junction Baud rate 19200 b/s no parity 8 Bits 1 Stop(s)

Communication Autoadaptation (!V) Yes

Modulation Autoadaptation (N) Call: Not Rep :No

Modulation Type (!M,+MS,B) V34+ 19200.19200

Line baud rate = Junction baud rate (&I) Yes

Error correction (\N) MNP Exclusive

SAVE Y/N?

Op (Caution, the format is taken into account once you have saved)

Saving

Save complete

In this case, saving only concerns the parameters programmed above.

The "M: RELOAD SAVED CONFIGURATION" option returns:

reloading configuration complete

1: MODBUS SLAVE PROGRAMMING MENU

2: MODBUS MASTER PROGRAMMING MENU (OFF-LINE)

3: TELECOMMUNICATIONS PROGRAMMING MENU

4: DISPLAY

5: SERIAL PORT PROGRAMMING MENU

M: RELOAD SAVED CONFIGURATION

U: RELOAD FACTORY CONFIGURATION

S: SAVE

Q: QUIT

In this case, the GEN INDUS will look for the information saved beforehand in its non-volatile memory and overwrite the current configuration.

The "U: RELOAD FACTORY CONFIGURATION" option returns:

reload factory configuration complete

1: MODBUS SLAVE PROGRAMMING MENU

2: MODBUS MASTER PROGRAMMING MENU (OFF-LINE)

3: TELECOMMUNICATIONS PROGRAMMING MENU

4: DISPLAY

5: SERIAL PORT PROGRAMMING MENU

M: RELOAD SAVED CONFIGURATION

U: RELOAD FACTORY CONFIGURATION

S: SAVE

Q: QUIT

¹ 300 to 14400 for the GEN INDUS 144.

In this case, the GEN INDUS reloads its default configuration in volatile memory and overwrites the current configuration. To save the factory configuration, you must pass via the "S" menu.

The "S: SAVE" option returns:

Saving

(the time to write in memory is shown running here)

Save complete

1: MODBUS SLAVE PROGRAMMING MENU
2: MODBUS MASTER PROGRAMMING MENU (OFF-LINE)
3: TELECOMMUNICATIONS PROGRAMMING MENU
4: DISPLAY
5: SERIAL PORT PROGRAMMING MENU
M: RELOAD SAVED CONFIGURATION
U: RELOAD FACTORY CONFIGURATION
S:SAVE
Q: QUIT

XVIII - OPERATION IN VOCAL MODE

In this operation mode, **GEN Indus** is not capable of transmitting a vocal message but is used as an interface between a vocal system (PC, synthesized voice board) and the telephone network.

This function requires a factory intervention by the addition of a connector (stereo jack) for the connection of the vocal signal. Please consult us .

XVIII .1 - Principle

- For a call request with this operation mode, **GEN Indus** dials the telephone, upon detecting the first ringing tone, it switches its audio input over to the telephone line and generates back the OK message. This indicates to the associated system that the call has been successful as it is not possible now to detect in a reliable way in less than 8 seconds when the remote has picked up the line. At this very moment, the associated system can continuously broadcast its vocal message, the validation taking place on receipt of a DTMF code.
- In the automatic answering mode, if the modem is fixed in vocal operation, it picks up the line and to signal its presence to the remote sends over a DTMF code (character*), switches its audio input over to the telephone line and then controls the communication, see below ; if not, when it takes the line, it generates its normal automatic answer sequence, then after the transmission of the last modulation, waits 5 seconds for the arrival of a DTMF digit ; it will change to vocal mode, in this case only.

XVIII .2 - Communication

When connected, the **GEN Indus** monitors the telephone line and on receipt of DTMF digits, decodes them and transmits their value over the serial link followed by the ODh (Carriage return). Likewise, if it detects a busy tone for at least 3 seconds indicating that the remote has hung up, it generates back the NO CARRIER message.

It is also possible to transmit DTMF digits. To do this, send out the digits to the modem. If it is necessary to send A to D letters, the serial port speed needs, in that case, to be fixed by an AT!Vn.command. In that mode, the modem always accepts Hayes commands, which implies that character A cannot be sent alone ; to be transmitted on line, it needs to be followed by at least two other characters.

XVIII .3 –Implementation

Command AT!M16 selects the DTMF 'modulation'. If the modulation selected by default is DTMF, even though the call auto-adaptation is validated, the modem will connect in vocal mode. To set the modem in call and automatic answer vocal mode, command ATNO must be sent out. In automatic answer mode, to obtain the auto-adaptation and the DTMF detection, at the end of the modulations the code for DTMF "AT#M5=20#M11=50#W" must be added , which will change to DTMF detection at the end all modulations for a duration of 5 seconds.

XIX - GESTION DE SCRIPTS

[NOUS CONSULTER](#)

XX - GENERAL COMMANDS

By general commands, we mean specific commands used to configure the modem. These commands are mostly accessible in HAYES with the prefix "AT!", but it is also possible to use them with the CCITT protocol with the string MODEnnn. In this case, no report is returned if the command is accepted.

Refer to paragraph 8.4.7 of the HAYES commands.

The commands below that have an equivalent in Hayes format are only accessible with their own syntax.

ANS = ATA

CAL = ATD

CONF = AT\S

ETAT = AT*D

XX.1 - Change Protocol

At any moment, it is possible to change the type of commands that the modem will interpret.

MODEAT: Change from CCITT V25bis commands to HAYES commands.

MODECCITT: Change from HAYES commands to CCITT V25bis commands.

We can also access for example, MNP4 error correction AT commands then return to dial with the V25bis CRN command.

XX.2 - Display the configuration

At any moment in command mode, we can ask the modem for its current configuration using the CONF command. The unit sends back a table with the current active parameters (cf. AT\S paragraph 8.4.4).

XX.3 - Display erroneous or ineffective numbers

The STATUS command can be used to display the memory positions that contain these numbers.

For the answer format, refer to paragraph 8.4.5

XX.4 - Modem identification commands

(Also see ATIn commands paragraph 8.4.1)

A command can be used to "join" an application with the modem by exchanging a password.

Using the MP command, the modem sends back a string of up to 10 characters that were loaded in the factory.

We pre-program this password on request. If nothing has been defined, the password is "GENER".

XXI - DOWNLOADING PROCEDURE

It is possible to update the software in the modem simply by downloading it via the serial link. This enables you to have a unit with the latest functionalities. The latest version of the software is available on our Internet site at the address GENER.FR

To carry out this operation, you will need a PC in TTY terminal emulation (GETRANS, Windows© HYPERTERMINAL).

Set a speed of 115200 b/s, 8 bits, no parity, 1 stop bit, no flow control.

Before clearing the flash memory, it is possible to return to the application by simply switching off the modem.

Type the command AT**T↵

The GEN INDUS emits 2 short sounds and the following menu appears.

Download program

- 1 - Clear flash memory*
- 2 - Test flash memory*
- 3 - Download*

To switch over to the application
Turn the power off and back on

First of all, the flash memory must be cleared.

Choose 1

Confirm clearing Y/N

Type Y in upper case

Clearing

Clearing sector: 18

Clearing complete

Then the modem must be set to wait for the file by entering 3

Waiting for file

At this moment, send the new version file over the V24 junction: Vx_xx.hex

- With GETRANS, press ALT-S then the filename, this must be in the GETRANS directory.
- With Windows HyperTerminal, select the file to be sent via "Transfer" then "Send the text file" and "Open".

Normally, the display should be as shown below. However, it doesn't normally capture the first line in Windows.

GEN INDUS V2.0 dated 01.09.99

-01-04 \ -02-04 -08-04 | -17-04 -

Download complete

To switch over to the application
Turn the power off and back on

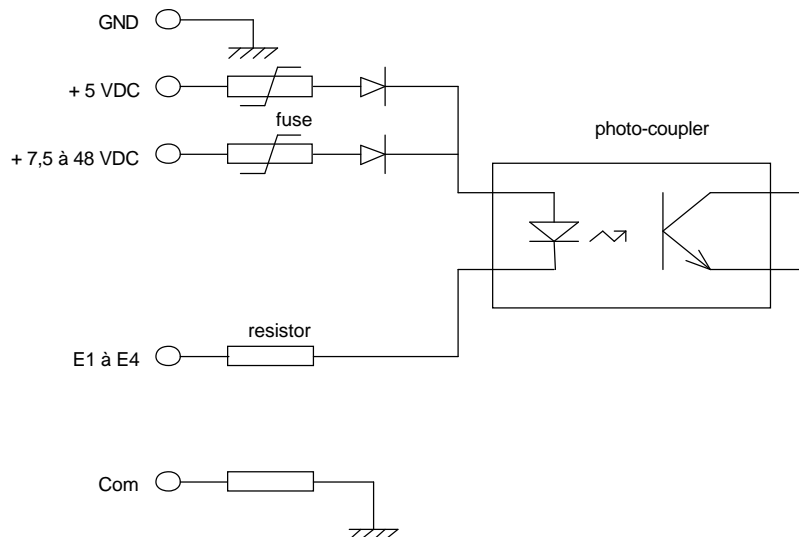
At this moment, to check if the download was successful without leaving terminal emulation, the modem must be turned off and back on again,

- if it emits its auto-test sequence, everything is correct and you can load the parameters for a specific configuration

- if it emits a continuous signal and the *Clearing* message appears on the screen, then downloading was not successful and must be repeated.

XXII - TECHNICAL DATA

XX.1 - Schematic diagram of an input



Line length:

The distance between the associated hardware contact and the **GEN INDUS** modem depends on two main factors, the supply voltage and the resistance of the wire.

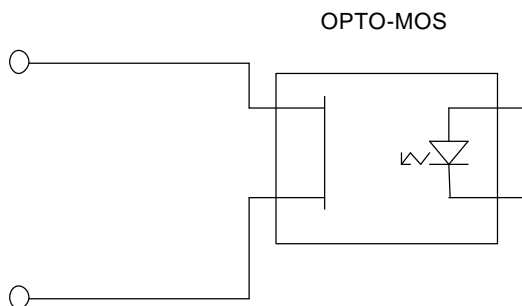
Thus with the **GEN INDUS** supplied with +5V, the line resistance can be up to 3.8 K ohms.

Whereas with 12 volts, it can be as much as 15 K ohms.

It is advisable to use at least 6/10 twisted-pair cable.

XXII.2 - Schematic diagram of an output

The outputs are made with electronic components called OPTO-MOS relays.



The various parameters of this component are:

Typical ON resistance of 25 ohms.

Maximum load voltage of 350 volts

Maximum direct load current of 120 milli-amperes

Maximum leakage current 1 µampere at 350 volts.

XXII.3 - Analogue input characteristics

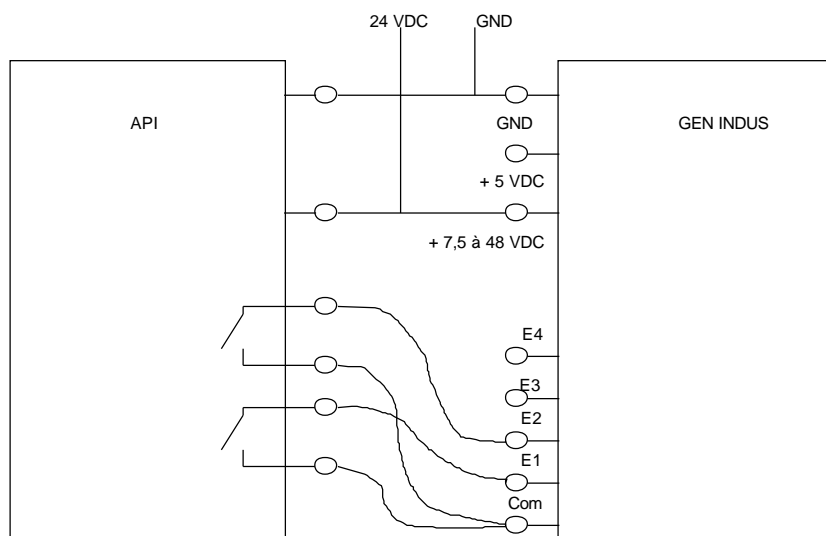
- Analogue inputs are of the 4-20 mA. Type.
- The associate analogue converter has an 8-bit resolution.

Précision :

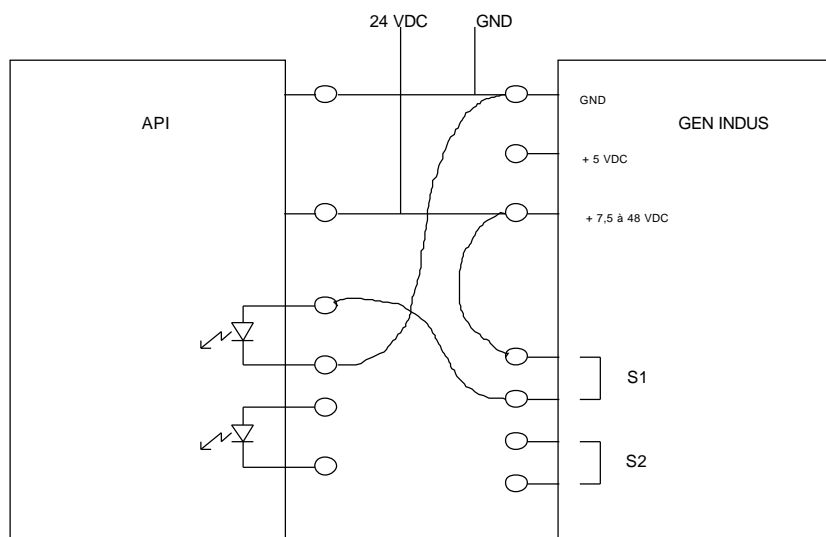
Linearity error	$\pm 1,5$ LSB
Gain error	1 %
Gain error on small signals up to 16 LSBE	5%
Common mode rejection ratio	60 dB
Supply noise rejection ratio $f = 100$ Hz	40 dB

XXII.3 - Connection example

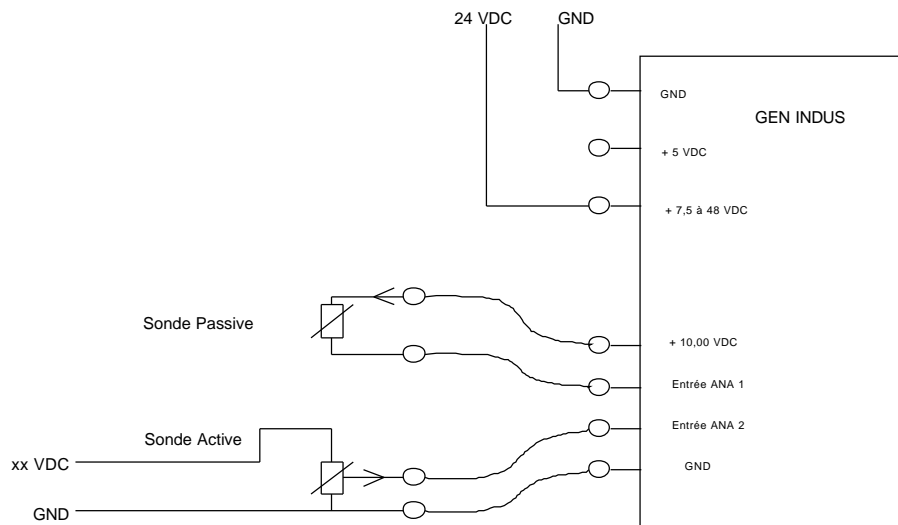
22.3.1 - Inputs



22.3.2 - Outputs



22.3.3 4-20 mA Analogue inputs



XXII.4 - Transmission Format

- Asynchronous series with 10 or 11-bit characters (start and stop included)

XX.5 - Modulation Type

- V34+¹ notice of the UIT
- V34¹ notice of the UIT
- V32 bis notice of the UIT
- V32 notice of the UIT
- V22 bis notice of the UIT
- V22 notice of the UIT
- V21 notice of the UIT
- V23 notice of the UIT
- V27ter notice of the UIT
- V29 notice of the UIT
- V17 notice of the UIT

¹ Not available on the GEN INDUS 144.

XX.5 - Information Baud Rate

V34+ ¹	From 2400 to 3429 baud on both channels allowing data to be transmitted at 2400 to 33600 bits/s
V32 bis	2400 baud on both channels allowing data to be transmitted from 4800 to 14400 bits/s
V32	600 baud on both channels allowing data to be transmitted at 4800 to 9600 bits/s
V22 Bis:	600 baud on both channels allowing data to be transmitted at 1200 to 2400 bits/s
V22	600 baud on both channels allowing data to be transmitted at 1200 bits/s
V21	300 baud on both channels allowing data to be transmitted at 300 bits/s
V23	1200 baud on the main channel, 75 baud on the secondary channel (as the modem performs balancing, the terminal equipment works in both directions at the same speed).
V27 ter	1200 baud allowing data to be transmitted at 2400 bits/s or 1600 baud allowing data to be transmitted at 4800 bits/s in asynchronous.
V29	2400 baud allowing data to be transmitted at 4800 or 9600 bits/s in asynchronous.
V17	2400 baud allowing data to be transmitted at 9600 or 14400 bits/s in asynchronous.

XX.7 - Carrier Frequencies

V34 ¹	Calling modem	Adaptive
	Called modem	Adaptive
V32 bis	Calling modem	f = 1800 Hz
	Called modem	f = 1800 Hz
V32	Calling modem	f = 1800 Hz
	Called modem	f = 1800 Hz
V22 bis and V22	Calling modem	f = 1200 Hz
	Called modem	f = 2400 Hz + 1800 Hz
V21	Calling modem Level 0	f = 1180 Hz
	Calling modem Level 1	f = 980 Hz
	Called modem Level 0	f = 1850 Hz
	Called modem Level 1	f = 1650 Hz
V23	Channel at 1200 Level 0	f = 2100 Hz
	Channel at 1200 Level 1	f = 1300 Hz
	Channel at 75 Level 0	f = 450 Hz
	Channel at 75 Level 1	f = 390 Hz
V27 ter		f = 1800 Hz
V29		f = 1700 Hz
V17		f = 1800 Hz

XXII.8 - Operating mode

- Simultaneous bi-directional on two wires.

¹ Not available on the GEN INDUS 144.

XXII.9 - Line impedance

Complies with the CTR 21 specification.

XXII.10 - Transmission level

- Setting from 0 dBm to - 15 dBm by software.
- Factory set at:
 - 10 dBm for the PSTN (Public Switched Telephone Network)
 - 10 dBm for the two-wire Leased Line.

XXII.11 - Reception level

- On PSTN (Public Switched Telephone Network) and Leased Line:
 - DS active if signal at - 43 dBm.
 - DS inactive if signal at - 48 dBm

XX.12 - Line current regulation

- Automatic regulation.

XX.13 - Dialling

- 66/33 ms decimal pulses with 900 ms inter train.
- Voice frequency: code Q23 of the CCITT

XX.14 - Low power mode

For this functionality, registers S24 and S27 and micro-switch 5 must be used to drive the modem power supply.

If it is ON, the modem is always powered up.

If it is OFF, the power supply is driven by the V24 DTR signal, the arrival of a ringing train or the transition of alarm input 1 into the closed state (For the latter, indicate it with the command AT*G or via the alarm input programming menu that can be accessed with the command AT*P, and if micro-switch 4 is ON).

With DTR signal control

Bit 7 of register S27 can be used to choose the operating mode, register S24 with a value other than 0 (unit in seconds) activates the function and determines the time before entering low power mode.

As soon as the **Gen indus** is woken, it activates a self-holding signal.

If bit 7 of S27 is not set:

When the modem wakes up, it starts a timeout of S24 duration and manages automatic answering without taking the DTR signal into account;

- if the DTR arrives before the timeout has expired, the modem clears this timeout and will return to standby mode as soon as the DTR drops.
- if the DTR does not arrive, the modem returns to standby mode at the end of this timeout.

- If bit 7 of S27 is set:

When the modem wakes up, it starts a timeout of S24 duration and waits for the DTR signal;

- if the DTR arrives before the timeout has expired, the modem clears this timeout and when the DTR drops, it starts a timeout of S24 duration before returning to standby mode;
- if the DTR does not arrive, the modem returns to standby mode at the end of this timeout.

Note, if S24 is programmed with a value that is too small and the automatic answering functionality is used, the modem will wake up each time there is a ringing train, then it will return to standby mode and so on. A value must be set that allows the associated terminal to activate its DTR when the RI signal is detected.

Without DTR signal management

It is possible to use this functionality without controlling the DTR signal. In this case, the modem must be programmed in &D0 mode with bit B7 of S27 at 0. It will wake up when there is an incoming call, or when alarm input 1 closes and will return to standby mode if there is an incoming call at the end of the transfer when the DCD drops, or on timeout (S24) when alarm input 1 switches to the release condition (See AT*G command).

Comments:

- If the DTR signal is present in this mode, the modem will only return to standby mode when it disappears after the timeout.
- To take control of the modem, micro-switch 5 must be set to ON and the command **ATS24=0** must be sent after power up and before the time programmed in register S24 expires. At this moment, it is possible to consult or modify the modem configuration without any risk of the supply being cut off..

Power consumption

In standby mode, the power consumption of the board is less than 10 µA.

XXII.15 - Operating conditions and miscellaneous information

Temperatures

- Operating: -15°C to +60°C
- Storage: - 25°C to + 70°C

Humidity without Condensation:

- Operating: 5 % < HR < 80%
- Storage: 5 % < HR < 90 %

Atmospheric Pressure:

- normal.

Weight:

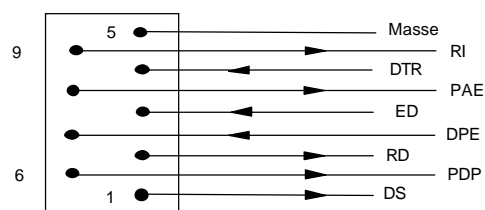
- 250 grams

APPENDIX I

RS 232 connector signals

Circuit	Pin N°	Designation	V24 symb.	RS232C symb.
109	1	Signal detection	DS	DCD
104	2	Data reception	RD	RD
103	3	Data transmission	ED	TD
108/2	4	Data terminal ready	TDP	DTR
102	5	Signal earth	TS	SG
107	6	Data system ready	PDP	DSR
105	7	Transmit request	DPE	RTS
106	8	Ready to transmit	PAE	CTS
125	9	Call indicator	IA	RI

Front view of the RS232 "female" connector on the GEN INDUS.



APPENDIX II

List of CCITT commands by function

LIST OF CCITT COMMANDS / GENERAL COMMANDS

ANS Enter answer mode
CAL Enter call mode
CONF Display configuration (identical to AT\S)
CRN Dialling command
ETAT Display forbidden or erroneous or ineffective numbers
MP Request internal password

MODEAn Modulation auto-adaptation in call mode
MODECFn Send string 13-53 (hex)
MODEDn Choose auto-adaptation in communication
MODEEn Enable or disable escape
MODEHn Enable and disable loudspeaker
MODELn Transmission level command
MODEMn Type of modulation
MODENn Choose memory use.
MODEOn Overspeed control
MODERS Fixed junction auto-adaptation and format
MODEVn Fixed communication auto-adaptation or speed

ALPHABETICAL INDEX

A/, 24, 63

approval, 1, 6, 8

power supply, 5, 9, 10, 11, 13, 56, 90, 135

supply

connections, 9, 11, 12

ANS

command, 129, 138

automatic call, 16

erroneous call, 14, 37, 102, 129, 138

immediate call, 25, 63

inefficient call, 14, 16, 37, 102, 129, 138

ART, 6

asynchronous, 7, 13, 17, 31, 36, 49, 56,

62, 101, 103, 105, 133

AT, 24

AT

A, 25, 63

B, 16, 18, 25, 62

D, 25, 63

Dn, 25

E, 20, 26, 54, 63

H, 26, 63

I, 5, 26, 63, 129

L, 26, 55, 63

M, 26, 55, 63

N, 15, 16, 18, 27, 62

O, 27, 63

Q, 27, 54

S, 27, 62

V, 27, 54, 63

W, 28, 60, 63

X, 28, 45, 46, 55, 63

Z, 28, 62

ATl

A, 34, 63

L, 34, 63

N, 35, 54, 63

O, 63

Q, 35

S, 35, 63

V, 36, 63

V1, 60

X, 36

AT!

A, 46, 62

CCITT, 46

CF, 46, 59, 63

D, 46, 62

E, 46, 62

F, 47

G, 47, 62

H, 47, 63

L, 47, 62

M, 18, 48, 62

O, 48, 62

R, 48, 62

RF, 62

RS, 49, 62

S, 63

V, 30, 50, 62

AT%

C, 33, 64

E, 33, 59, 63

L, 34, 63

M, 34, 63

Q, 34, 63

S, 34, 63

AT&

A, 20, 29, 62

C, 29, 55, 62

D, 20, 29, 55, 62

E, 29, 64, 65, 66, 67, 68

F, 30, 62

G, 30, 62

I, 19, 30, 43, 57, 62, 64

I2, 59, 60

K, 30, 63

L, 22, 30

M, 31, 62

P, 31, 64, 65, 66, 67, 68

R, 31, 55, 62

S, 31, 55, 62

T, 31, 54, 63

V, 32, 63

W, 32, 62

X, 32, 62

Y, 32, 62

Z, 33, 62

AT*

A, 84

B, 37

C, 37, 86

D, 37

E, 86, 88

F, 90

G, 90, 92

J, 90

M, 92

P, 23, 93

R, 93

S, 38, 93
 T, 94
 V, 93
 W, 94
 Z, 94
AT+
 MS, 16, 18, 38, 39, 40, 41, 42, 60, 62
auto adaptation, 43
auto adaptation
 caractère, 15, 30, 36, 46, 47, 49, 50
 modulation, 15, 18, 36, 46, 48
avertissement, 5
BUSY, 50
BUSY
 message, 50
C
 message, 102
CAL
 commande, 129, 138
CARRIER
 message, 51, 52, 60
CCITT, 7, 14, 16, 31, 46, 100, 129, 138
CFI
 message, 102
CNX
 message, 102
comptes-rendus
 authorization, 54
 CCITT, 102
 numeric, 28, 54
 extended, 36
 control, 55, 59, 60
 Hayes, 50
 MNP, 52
 without, 29
 verbal, 27, 54
CONF
 command, 129, 138
configuration, 13, 83, 126
configuration
 display, 32, 35, 63, 87, 88, 93, 124, 129, 138
 LS, 22
 Modbus, 103
 by default, 13, 72
 call up, 28, 109
 save, 32, 62, 94, 109
 transmitter, 71, 72
 factory, 30, 32, 62, 90, 109
 V23 slave, 17
 V23 master, 17
CONNECT
 message, 28, 50, 51, 52, 60
connectors, 8, 9, 11, 12, 132
secure connections, 29, 30, 31, 32, 64
consumption 10, 136
consumption
 flow, 9, 10, 56, 135, 136
error correction, 7, 28, 30, 34, 35, 36, 52, 63, 70, 71, 129
CRN
 command, 138
CTS
 flow, 30, 34, 35, 57
dimensions, 8
DLC
 message, 102
technical data, 131
escape
 command, 24, 26, 27, 29, 46, 47, 53, 62
echo
 commande, 26, 29, 54, 63, 103
input
 alarm, 7, 9, 10, 11, 12, 13, 23, 69, 70, 72, 74, 81, 84, 86, 88, 90, 103, 107, 109, 131, 135
 'alarm, 103
 state, 35, 37
 connection, 132
ERROR
 message, 16, 50
STATE
 command, 129, 138
flow
 CTS, 30, 34, 35, 57
 control, 7, 30, 33, 34, 35, 57, 58, 63, 64, 70, 130
 XOFF, 34, 35, 57, 58
 XON, 34, 35, 57, 58
FORBIDDEN
 message, 50
format, 15, 49, 54, 62, 70
fréquency, 134
half duplex, 7, 17, 22, 25, 30, 43, 48, 53, 56, 59
loudspeaker, 26, 47, 55, 63, 101, 138
Hayes, 5, 7, 14, 46, 53, 84, 129
Hayes
 commands, 25
humidity, 136
identification
 caller, 28
 remote, 106
 modem, 63, 108, 129
inactivity
 clock, 7, 14, 58, 64
INC
 message, 102

INV

message, 102

leased line, 7, 8, 13, 22, 35, 105, 134

leased line

multi-point, 22, 30, 56

message

CCITT, 102

Hayes, 50

micro switch, 11, 13, 14, 22, 103, 105, 120, 135

Minitel, 15, 17, 25, 43, 47, 48, 85, 100, 113

INSTALLATION, 8

MNP, 5, 7, 34, 35, 39, 54, 57, 113

MNP

message, 52

Modbus, 5

Modbus

address, 108

display, 124

function code, 107

configuration, 60, 61, 103, 104, 117, 119

inputss, 109

slave, 104, 117

example, 114

master, 104, 117

programming, 119

input register, 107, 112

operating register, 106, 109

outputs, 108

MODE, 46, 129

MODE

A, 16, 138

AT, 129

CCITT, 129

CF, 59, 138

D, 138

E, 138

H, 138

L, 138

M, 16, 138

N, 138

O, 138

R, 15

RS, 49, 138

V, 36, 47, 138

modulation, 27, 38, 39, 40, 41, 42, 43, 46, 48, 57, 60, 62, 84, 100, 133, 134, 138

mot de passe, 7, 29, 31, 33, 47, 64, 65, 66, 67, 68, 129, 138

MP

command, 129, 138

transmission level, 30, 47, 60, 62, 134, 138

NO ANSWER

message, 50

NO CARRIER

message, 50

NO DIALTONE

message, 50

numéro

erase, 33

inefficient, 14, 16, 28, 37

save, 33

OK

message, 50

overspeed, 48

weight, 136

control, 7, 13, 47, 64, 67

protocol

message, 71

Modbus, 71

TEC, 71

transparent, 71

connection, 8

connection

supply, 9, 11, 12

inputs, 11, 12, 132

serial link, 9

ltelephone line, 8

RS485A, 11, 12

mains, 5

output, 11, 12, 132

protective earth, 11, 12

hanging-up, 15, 16, 26, 29, 33, 34, 59, 63, 66

registers

Hayes, 24, 27, 30, 32, 53, 62, 63, 104, 110, 117

Modbus, 105, 106, 107, 108, 109, 112, 113, 114

automatic answer, 7, 14, 15, 25, 27, 29, 37, 43, 48, 53, 105, 106, 114, 135

TurnaroundV23

dynamic, 17, 59

STUM, 17, 59

retrain, 33, 53, 59

call-back, 7, 64, 66, 68

RING

message, 50

RS485A

command, 29, 56, 59, 62

Modbus, 103

connection, 11

service "Class", 28, 45, 46

signaux

CTS, 18, 19, 30, 31, 34, 35, 55, 57, 59, 137

DCD, 18, 19, 29, 53, 55, 62, 70, 135, 137

DSR, 31, 55, 62, 137
DTR, 7, 9, 13, 14, 15, 18, 22, 29, 36, 55,
56, 62, 103, 135, 137
junction, 22, 36, 62, 137
RTS, 7, 17, 18, 19, 29, 55, 59, 62, 137
output
alarm, 7, 23, 72, 84, 93, 103, 131
state, 35, 38
connection, 11, 132
loading, 130
temperature, 136
protective earth, 11
Time out, 21
Transmitter, 37, 71, 72, 94

Unitelway, 21
V25 bis, 7, 14, 16, 46, 66, 100, 129
VAL
message, 102
version, 5, 26, 103, 130
speed, 5, 15, 16, 17, 18, 19, 25, 28, 30,
42, 46, 47, 49, 50, 57, 60, 62, 64, 70, 103,
104, 105
XOFF
flow, 34, 35, 57, 58
XON
flow, 34, 35, 57, 58