

Protocollo modem GSM per pCO² / GSM modem protocol for pCO²



Manuale d'uso

User manual

→ **LEGGI E CONSERVA
QUESTE ISTRUZIONI** ←
**READ AND SAVE
THESE INSTRUCTIONS**

CAREL
Technology & Evolution



Vogliamo farvi risparmiare tempo e denaro!

Vi assicuriamo che la completa lettura di questo manuale vi garantirà una corretta installazione ed un sicuro utilizzo del prodotto descritto.

We wish to save you time and money!

We can assure you that the thorough reading of this manual will guarantee correct installation and safe use of the product described

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IMPORTANT WARNINGS



BEFORE INSTALLING OR OPERATING ON THE DEVICE, CAREFULLY READ THE INSTRUCTIONS IN THIS MANUAL.

This instrument has been designed to operate without risks only if:

- *Installation, operation and maintenance are performed according to the instructions of this manual;*
- *Environmental conditions and supply voltage fall within the values indicated here below;*

Any different use or changes which have not been previously authorised by the manufacturer, are considered improper.

Responsibility for injuries or damage caused by improper use lies exclusively with the user.


Warning: voltage is present in some electrical components of this instrument, thus all the service or maintenance operations must be performed by expert and skilled personnel only, who are aware of the necessary precautions to be taken.

Before accessing the internal parts, disconnect the power supply.

Disposal of the instrument:

The controller is made up of metal and plastic parts. All these components must be disposed of according to the local standards in force.

Certification: *the quality and safety of Carel products are guaranteed by Carel's ISO 9001 certified design and production*

system, as well as the  *mark.*

INTRODUCTION

Carel's pCO² programmable controllers can now manage the new pCO²/GSM protocol which allows them to send and receive SMS messages, using the GSM modem, for signalling active alarms and resetting them where possible using a GSM mobile phone.

Furthermore, a pCO² can be connected to a remote supervisor even when a traditional telephone line isn't available. In fact, all the properties of the pCO²/Modem protocol remain valid, allowing interface via modem of the pCO² peripherals to a remote supervisor communicating with Carel standard protocol, without the assistance of a gateway (see **MODEM Protocol for pCO² manual**).

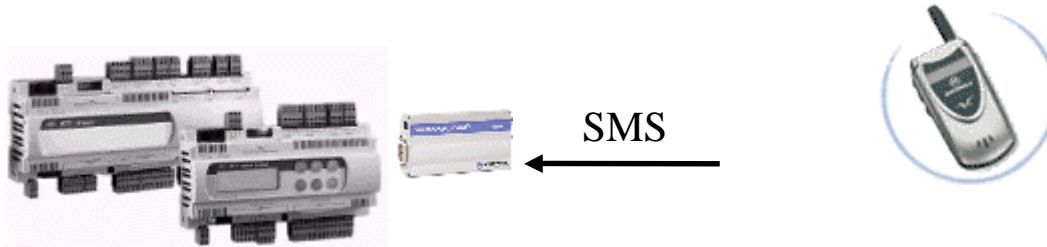
1. GENERAL INFORMATION ON THE pCO²/GSM PROTOCOL

The pCO²/GSM protocol:

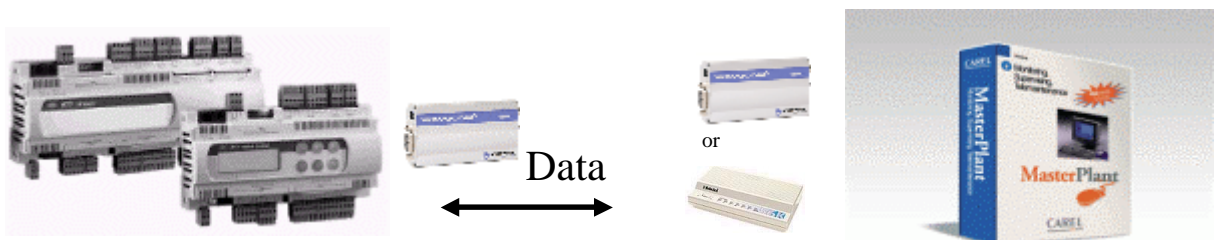
1. allows the sending of SMS alarm messages via GSM modem from the pCO²,



2. allows the reception of SMS messages by the pCO² sent only from a cellular phone (sending SMS via Internet is not allowed) for alarm reset and more generally for the direct setting of the variables,



3. as in the case of the pCO²/Modem protocol, allows the pCO² to communicate with a remote supervisor with the connection of either a GSM modem or a traditional modem.



The meaning of the pCO² data exchanged with the supervisor and the possibility to read or modify it from the supervisor then depends on the application program used by the pCO² itself.

The protocol implemented in the pCO² is a subset of the standard Carel point-to-point protocol used for the local connections. The commands for the transfer of data logging, files and graphs are not available.

2. PROTOCOL USE REQUIREMENTS

To connect the pCO² to a GSM modem, both of them must meet the following requirements respectively.

2.1 pCO² requirements

1. The application program must be suited to manage a GSM modem.
2. The firmware (BIOS) must be version 2.29 or higher for the compatible modems listed in the table below, except for the SIEMENS TC35 modem. For the latter modem the BIOS must be version 3.08 or higher. The last version is available in the area Carel Top User, included in the EasyTools package.
3. It must feature the RS232 expansion card, Carel code PCO200MDM0 (see **Connections**).

2.2 GSM modem requirements

Not all GSM modems are compatible with the **GSM modem protocol for pCO²**. A study of various brands of modem has led to the following results:

MODEM			
TYPES	MANUFACTURER	COMPATIBILITY	
GSM360	TELITAL	NO	
POCKET GSM	DIGICOM	YES	
GSM 2702-D	MICROTEL	YES	
WMOD2B*	WAVECOM	YES	TESTED
FALCOM A2D*	FALCOM	YES	TESTED
FALCOM A3D ³	FALCOM	YES	
M20	SIEMENS	YES	
TC35*	SIEMENS	YES	TESTED

The wording TESTED means that the modem has been tested on the pCO².

Recommended GSM modems: those marked "TESTED" in the compatibility column in the above table.

In reference to the above table, the non-tested modems are theoretically compatible, in the sense that the Hayes command set implemented includes all the commands that the pCO² uses to manage the modem.

In general, the modem being used must comply with the following requirements described in detail in the subsequent paragraphs:

1. the PIN code of the modem SIM card must be disabled;
2. the number of the Service Centre has to be already entered in the SIM card;
3. furthermore, the space dedicated to the storage of SMS messages on the SIM card should be free.

2.2.1 Disabling the modem flow control

Since the protocol ensures that the data are transmitted in binary and not ASCII format, they can take any value between 0 and 255. In order not to mistake the data with the XON and XOFF software flow control codes, software control flow on the modem must be disabled.

WARNINGS:

- In the GSM modems indicated in the table as being compatible, except for the SIEMENS TC35 (Wavecom WMOD2B, Falcom A2, Siemens M20T) flow control is automatically disabled by the pCO² during the modem initialization phase when the AT+IFC=2,2 extended Hayes command is sent.

³ GSM-GPS MODEM

- If the modem used is the SIEMENS TC35, a specific command from its Hayes command set is used.
- If the used modem is not among those declared as being compatible in the previous table and cannot manage the AT+IFC command for the disabling software flow control, the modem initialization procedure cannot be correctly executed and therefore the modem cannot be used in connection with the pCO². To verify the correct management by the modem of the AT+IFC command for disabling flow control, it may be useful to execute the procedure described below, which explains how to use the HyperTerminal application contained in Windows™ 95/98/2000/NT, for disabling XON/XOFF software flow control (in the example for the Wavecom WMOD2B modem). This procedure is however not necessary if you use one of the tested modems.

HyperTerminal is a terminal emulator generally present among the Windows™ “accessories”, which allows you to configure the modem using Hayes commands. Before using HyperTerminal, it is necessary to connect the modem to a free serial port (COMx) on the PC using a serial cable.

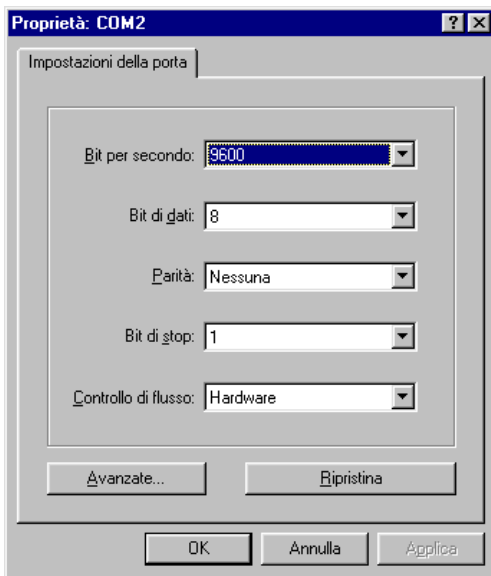
1. Go to **Start > Programs > Accessories > HyperTerminal**
2. Run **Hypertrm.exe**
3. Enter the name of the new connection (as desired), select the desired icon and click **<OK>**. The HyperTerminal window will appear as follows:



From the “Connect:” drop-down menu select “directly to COMx” and press **<OK>**. (The COM to be selected must be the one that the modem is connected to).

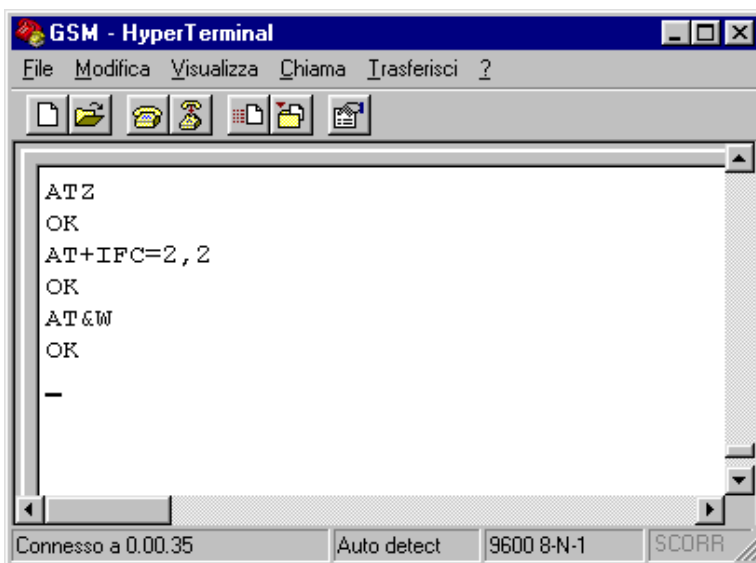


4. Setup the port according to the modem and press <OK>. The window displayed will appear as follows:



You can now send the Hayes commands.

The sequence of commands to be communicated to the Wavecom modem is the following (the response of the modem to each command is "OK"):



The ATZ command resets the modem, loading the default configuration.

The AT+IFC=2,2 command sets RTS/CTS - DTE/DCE flow control, disabling XON/XOFF software flow control.

The AT&W command saves the configuration to the modem's permanent memory.

WARNING. Depending on the model modem used, the procedure may differ from the one indicated above: in this case, refer to the instructions contained in the manual for the specific modem.

2.2.2 Disabling the PIN code

GSM modems, like GSM phones, need a SIM card to work. This can be set with a code (PIN) to protect the usage of the card, yet that also prevents connection between the modem and the pCO².

During the modem initialization procedure, the pCO² checks if the PIN code has been disabled. If not, it signals via a system variable that the PIN is enabled and that consequently it has to be disabled.

Generally, the enabling of the PIN can be checked visually, if the modem features a status LED. If, after turning on the modem, this LED stays on red, this means that the modem requires the PIN to be entered and that therefore you have to disable it. This can be done simply by turning on the modem before connecting it to the pCO².

As for disabling the PIN code, see the modem manual. However, the operation can be carried out by inserting the modem SIM in any cellular phone and using the main menu on the phone.

2.2.3 Entering the Service Centre number

If you want to send SMS messages using the GSM modem, you have to enter the Service Centre number for the telephone operator set in the SIM card. To enter the Service Centre number, refer to the modem manual. However, the operation can be carried out by inserting the modem SIM in any cellular phone and using the main menu.

2.2.4 Deleting all messages before utilization

Before connecting the modem to the pCO², particularly if the SIM card is also used in cellular telephones, it is preferable to delete all the messages received so as to clear the SMS memory.

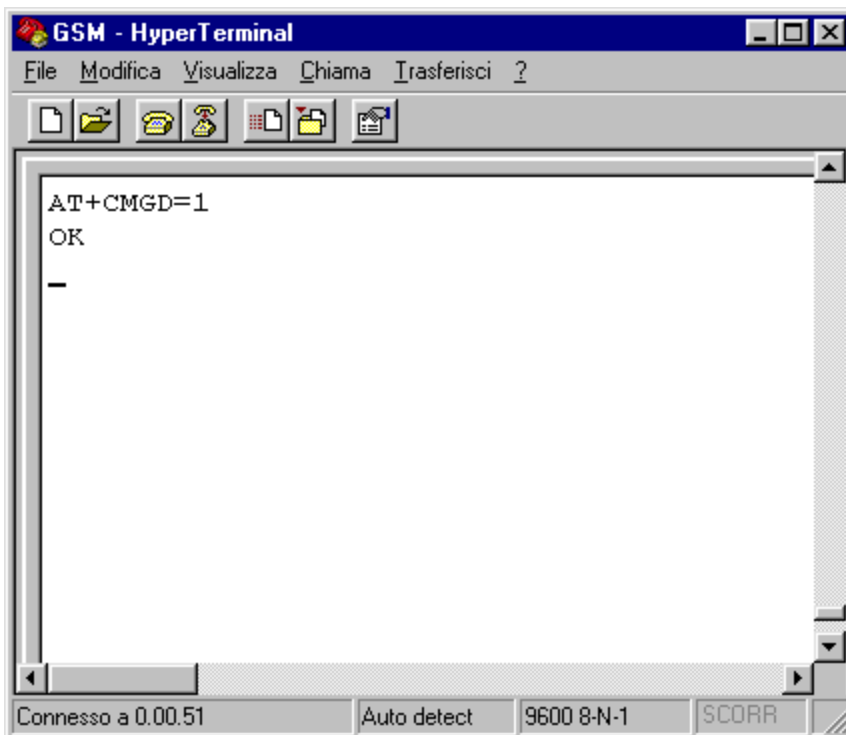
If you cannot do this by inserting the SIM in a cellular phone and using, for example, the “Delete All” command in the message menu, you can use HyperTerminal for WindowsTM (see **Disabling the modem flow control**) by sending the modem the following type of messages:

```
AT+CMGD=N ↵
```

N has a variable value from 1 to 10, indicating the memory position occupied by the message to be erased.

For each erased message the modem will answer “OK”.

After the first message has been erased, the HyperTerminal window will appear as follows :



WARNING. The modem deletes the messages using the AT+CMGD command, independently of whether or not there is a message to be deleted in the specified position.

3. pCO²/GSM PROTOCOL SELECTION

The protocol is selected through the system variable SERIAL1_PROTOCOL. The values for this variable and their related protocols selected on pCO² are:

SERIAL1_PROTOCOL	SELECTED PROTOCOL	MODEM TYPE
2	“Remote supervisor” with traditional modem not GSM	Analog standard
10	“Remote supervisor + SMS” with modem GSM	GSM

4. CONNECTIONS

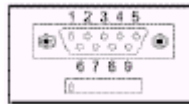
4.1 RS232 serial card

The pCO² communicates with the GSM modem using the RS232 standard, and so it is necessary to install the RS232 serial card, Carel code **PCO200MDM0** in the pCO².

The connection to the modem is made using the 9-pin male connector on the card. The meanings of the pins on the connector are as follows:

pin	meaning	pin	meaning
1	CD	5	GND (frame)
2	RX	6	n. c.
3	TX	7	RTS
4	DTR	8 & 9	n. c.

Tab. 3.1.1



As for the technical specifications and the installation of the serial card, follow the instructions described on the instruction sheet enclosed with the card itself.

4.1.1 Setting the baudrate between the pCO² and the modem

The communication rate between the pCO² and the GSM modem is set to 9600 baud by default. In any case, this can be modified using the application program, if the modem allows. One of the main causes of the failure of the modem initialization procedure from the pCO² is the incorrect setting of the baudrate.

4.1.2 Auto-baudrate problem in the SIEMENS T35

In some firmware revisions of the SIEMENS TC35 modem, in data transmission mode, after the modem sends the “CONNECT...” string, it can no longer transmit unless the first sequence sent is “AT...”. This problem can be overcome by disabling the autobaud mode using the AT+IPR=19200 command and saving the settings to the EEPROM using AT&W.

It is clear that in this case, having set the modem baudrate to 19200, the serial communication baudrate on the pCO² must be set to the same value.

4.2 pCO² - modem cable

For the connection between the pCO² and the modem, it is necessary to use a standard PC-modem cable, 25 or 9 pin male on the modem side and 9 pin female on the pCO² side, like the one usually supplied together with the modem itself.

5. NOTES ON THE MODEM MANAGEMENT PROCEDURES

5.1 Modem initialization

The pCO², which features an application program for GSM modem management, performs the modem initialization sequence at each start-up. This sequence is then repeated cyclically every 10 minutes.

WARNING. The pCO²/GSM protocol can work only if the modem is correctly initialized.

Incorrect modem initialization is signaled by the pCO², and can therefore be handled by the application program.

The initialization sequence, for modems other than the SIEMENS TC35, is the following:

DTR & RTS = Low

pause = 1s

DTR & RTS = High

pause = 400ms

ATZ<CR> for the modem reset

Wait for "OK"

ATS0 = [x]E0S7=90<CR> where:

x: is the value of the system variable that sets the number of rings the modem waits before answering;

E0: disable echo

S7=90: wait time setting of the remote modem carrier

Wait for "OK"

AT+IFC = 2,2<CR> to disable software flow control

wait for "OK"

AT+CMGF = 1<CR> to set the text format of the SMS messages

wait for "OK"

The time the modem takes to send the "OK" string depends on the modem type and model. The pCO² waits a maximum of 5 seconds. After this time, if the modem has not sent the string, the initialization string is repeated.

5.2 Disconnection sequence

The disconnection sequence is as follows:

pause = 1.5s

+++

pause = 1.5s

ATH<CR>

pause = 1s

This sequence is sent to the modem whenever one of the following situations occurs:

1. DCD (Data Carrier Detect) signal failure, after the pCO² has received a RING from the supervisor (which is therefore calling). If the signal failure takes place before the "CONNECT" string is received, disconnection occurs by timeout (60s). Otherwise it is immediate.
2. No data sent by the supervisor during a connection initiated by the supervisor itself; disconnection occurs by timeout (30s).
3. Sending of the wrong password by the supervisor after the connection phase; disconnection occurs by timeout (30s).
4. No answer from the supervisor after a pCO² call (60s).
5. If the supervisor answers a call from the pCO², see item 1. Furthermore, disconnection occurs by timeout (180s), if no more data is exchanged between the supervisor and the pCO² (silence in the CONNECT phase).

5.3 SIM card voice number and data number

Each GSM network operator provides three numbers for each SIM card:

voice number, data number, fax number⁴

It is clear that the SMS messages are sent to the pCO² by selecting the voice number of the SIM used by the modem connected. As regards the calls made by the supervisor, these must occur by setting the number called by the supervisor to the data number of the SIM.

⁴ In some cases the data number and fax number may be the same.

6. SENDING SMS ALARM MESSAGES

The pCO² application programs that manage the new protocol, now allow selected alarm variables to be associated to the sending of SMS messages, for example, signalling the alarm type.

The selection of the alarm variables, of the associated message and of the recipient's telephone number is defined by the application program.

The recipient's number can be expressed using internal variables managed by the application program or entered in the message to be sent. In this case, each SMS alarm can also be sent to several recipients.

EXAMPLE.

The following is an example of how an application program that manages the GSM modem can define an alarm message with the recipient's number entered in the message to be sent (enclosed by two # symbols).

```
+5553475734657# Severe Alarm: High Temperature on the first uchiller unit! To reset
send the following message: .pCO2.0001.D.010.000000& (without spaces)
```

6.1 Message sent outcome

The message sent may have the following outcomes:

1. **If the modem does not answer correctly** to the initial SMS send request in text format, the pCO² holds the message, re-initializes the modem and attempts to send the message again after 18 seconds from the end of the initialization.
2. **If the modem accepts the send request**, the message is sent and deleted from the pCO² memory.
If the Service Centre has not received the message or any other error occurs, the pCO² in any case deletes the message and signals an error, which will be managed by the application program
If, during the sending process, an incoming remote call is accepted, before having received the outcome from the Service Centre, the pCO² resumes the sending of the SMS message at the end of the connection to the supervisor.

6.2 Character set

The complete set of alphanumeric characters that can be used to create the SMS alarm messages to be sent is listed below:

SP ¹	!	"	#	%	&	'	()	*	+	,	-	.	/	0	1	2	3	4	5	6
7	8	9	:	;	<	=	>	?	A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e	f	g	h	i
j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z					

(¹): SP = space.

7. RECEIVING SMS MESSAGES

Thanks to the new protocol, it is also possible to set the single pCO² variables from a GSM telephone via SMS. Therefore, by keying in the appropriate command, it is also possible to reset a remote alarm.

WARNINGS.

- The messages must be sent from a cellular phone, not via Internet.
- For the meaning and description of the pCO² variables, please refer to the documentation of the application program used by the pCO² itself.

The messages sent must also strictly comply with the following format:

`.pCO2.PWD.Type1.Index1.Value1.... .. .TypeN.IndexN.ValueN&` with $N \leq 11$

where:

pCO2 = Message header.

PWD = Access password: this must be composed of 4 ASCII characters and coincide with the remote access password. If the password is 0001, PWD will be '0001'.

Typei = Type of i-th variable to be set: it is represented by one of the following characters 'A', 'I' and 'D', respectively for Analog, Integer or Digital variable.

Indexi = Index of the i-th variable to be set: it must be composed of 3 consecutive digits '0'... '9'.
If, for example, the variable index is 132, the Index will be '132'.

Valuei = Desired value to set the i-th variable to: this must be always be composed of 6 characters, where the first is the sign, and the others are composed the digits '0'... '9'.
For example, if the variable value is 12, Value will be '000012' or '+00012'.
If, on the contrary, the variable value is -243, Value will be '-00243'.
As for the analog variables, the value sent is the actual variable value multiplied by 10. For example, the '-00243' value will correspond to -24,3.
For the digital variables, the possible values are '000000' or '000001'.

N represents the number of variables to be set with only one SMS message. The maximum number is 11, so as to avoid exceeding the threshold of 160 characters.

WARNINGS.

- No spaces must be present in the SMS message.
- The message begins with a dot.
- The fields of the message are mutually separated by a dot.
- The message ends with the character '&', not preceded by a dot.

EXAMPLES.

For resetting the digital variable with index 5 in a pCO² with password = 1234, the SMS message must be as follows:

```
.pCO2.1234.D.005.000000&
|_____|_____|_|_____|_____|
header password index value
                type
```

To set the analog variable with index 1 to the value -22.4, the integer variable with index 123 to 15 and the digital variable with index 21 to the value 1 in just one SMS message, this must be as follows:

```
.pCO2.1234.A.001.-00224.I.123.000015.D.021.000001&
```

7.1 Message reception outcome

Every 2 minutes, the pCO² downloads all the new SMS messages received.

If the message received is correct, the pCO² processes it every 15 seconds, in the absence of incoming or outgoing calls.

If the message is not correct, either due to the syntax or the password, it is deleted.

During the time needed for the correct processing of the message (about 7 seconds), the incoming calls are inhibited and then enabled again at the end of the processing of each message.

If when downloading the new SMS messages, the memory dedicated to SMS messages is full, all the messages received will be lost. In this case, any possible alarms may remain active.

The possible causes of the memory filling up are the following:

- reception of three or more messages of maximum length (for the setting of 11 variables) within 2 minutes;
- reception of 7 or more shorter messages (for the setting of one variable) within 2 minutes.

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