

SNM15
OPERATION MANUAL

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INTRODUCTION

OVERALL FEATURES

The SNM 15 modem is externally designed with a metal frame. The cards are pulled out by pressing the lever located beneath the front panel.

On the front panel there are indicating lights for the main interface circuits, the operational condition of the modem and the operation and test enabling switches.

On the rear panel there are the power supply cord, the protection fuses and the mains switch. There are also the line connector and the two ISO 2110 type female connectors to terminate the DTE(s).

The modem is supplied together with the present manual with a cable for the connection to the telephone plug.

Mechanical Dimensions

Width	:	190 mm.
Height	:	44 mm.
Depth	:	266 mm.
Weight	:	2 Kg.

Environmental Conditions

Operational temperature	:	from 0°C to +50°C
Storage temperature	:	from -20°C to +80°C
Relative moisture	:	from 5% to 92% non condensing

Mains Power Supply

Power supply voltage	:	220 Vac. (-15%:+10%) frequency 47 : 63 Hz.
Consumption	:	3 VA

Digital Interface

The modem is equipped with two data interfaces: MAIN PORT and COMMAND PORT. The former can be used indifferently for programming the modem and transmitting data to a remote modem, the latter can only be used to program the modem.

Communication procedure	:	asynchronous Start/Stop serial
Character format	:	see table:

1 start bit	7 data bits	even/odd	1 stop bit
1 start bit	7 data bits	mark/space	1 stop bit
1 start bit	7 data bits	no parity	2 stop bits
1 start bit	8 data bits	no parity	1 stop bit

MAIN PORT	:	The connector marked by this abbreviation is the main port of the modem. By using this connector, the initial functions of programming and enabling
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connection and the real primary function of transmitting data are performed. The latter function can be performed in either synchronous or asynchronous mode.

- COMMAND PORT : This port can only be used to send the commands to the modem. The criteria: CTS, DSR, DCD, when the port is active, are forced into a working condition so as to allow data to be transferred from the DTE to the DCE and vice-versa.
- Operational mode : In order to program and enable the connection, the format is start-stop asynchronous, whereas data can be transmitted in either asynchronous or synchronous format.
- Characters Code : the ASCII code is used for programming, while there are no limitations once it has been connected, the BREAK signal is also transferred according to the CCITT V.22 standard.
- Type of interface : In compliance with the CCITT V.24/V.28 or EIA RS.232C specifications, the 25 contact female connectors conform to the ISO 2110 standards.

Cont. Conn.	Circuit V.24 RS 232	Direction DTE-SNM15	Mnem. Abbrev.	Description
2	103	BA	—————>	TD Transmit data
3	104	BB	<—————	RD Receive data
4	105	CA	—————>	RTS Request to transmit
5	106	CB	<—————>	CTS Clear to transmit
6	107	CC	<—————	DSR Modem ready
7	102	AB	<—————>	SG Signal ground
8	109	CF	<—————	DCD Data carrier detect
9	-	-	<—————	+12 V test voltage
10	-	-	<—————	-12 V test voltage
11	-	-		
12	-	-		
13	-	-		
14	-	-		
15	114	DB	<—————	TC Internal transmission clock
16	-	-		
17	115	DD	<—————	RC Reception clock
18	141	CN	—————>	L3 Request for loop 3
19				CCONF pin (see *M command)
20	108.2	CD	—————>	DTR Data terminal ready
21	140	CF	—————>	RDL Request for remote Loop
22	125	CE	<—————	RI Ring Indication
23	112	CI	<—————	Speed section for DCE (Note 1)
24	113	DA	—————>	ETC External transmission clock
25	142	-	<—————	TI Active loop

Interface circuits

Note: contacts 11, 12, 13, 14 and 16 have been left free.

Transmitted data clock : in synchronous operation, the modem needs a clock for data transmission. This may be generated by the modem (internal clock) and supplied to the DTE via the interface circuit C114. The modem also accepts an external timer (external clock) supplied on circuit C113 of the interface, provided that it has the tolerance levels envisaged by the CCITT.

Received Data Clock : in synchronous mode, the modem deals with timing the received data on circuit C115.

Analog Interface

Transmitting support : 2 balanced wires per switched line (private PABX exchange or public PSTN network).

Transmission level : from -1 to -16 dBm that can be adjusted by 1 dbm step.

Data carrier : V.21 300 bps FSK
 V.22 1200 bps DPSK
 V.22bis 2400 bps QAM

- Threshold of the receiver : definitely OFF with a carrier level (DCD) lower than -48 dBm; definitely ON with a level at -43 dBm.
- Call detector : frequency from 25 Hz to 50 Hz; sensitivity 20 Veff or higher; insensitivity 15 Veff or lower.
- C125 (RI) delay : 500 ms \pm 100 ms compared to the initial call voltage.
- Answer tone : 2100 Hz \pm 1 Hz of the duration of 3.3 sec \pm 1 ms.
- Automatic disconnection : within 30 seconds per failure to synchronize with the corresponding modem (selectable); once connected, due to loss of carrier, 700 ms (selectable).
- Type of call : can be selected to emit pulses (decadic) or multi-frequency (DTMF).
- Recurrence frequency : 10 \pm 1 pulse/sec.
- Open/close ratio : 40/60 ms.
- Pause between bits : 800 ms \pm 50 ms.

Frequency tolerance	:	$\pm 1\%$ compared to nominal frequencies laid down in the CCITT Q23 recommendation.
Tone duration	:	100 ms \pm 5 ms.

Control and Warning Devices

The control and warning devices with which SNM 15 is equipped can be considered as auxiliary devices since the functions played by these devices are already present in the form of commands and communication protocol messages.

They are particularly useful in the case of manual calls or loop tests for the switches.

Controls on the Front Panel

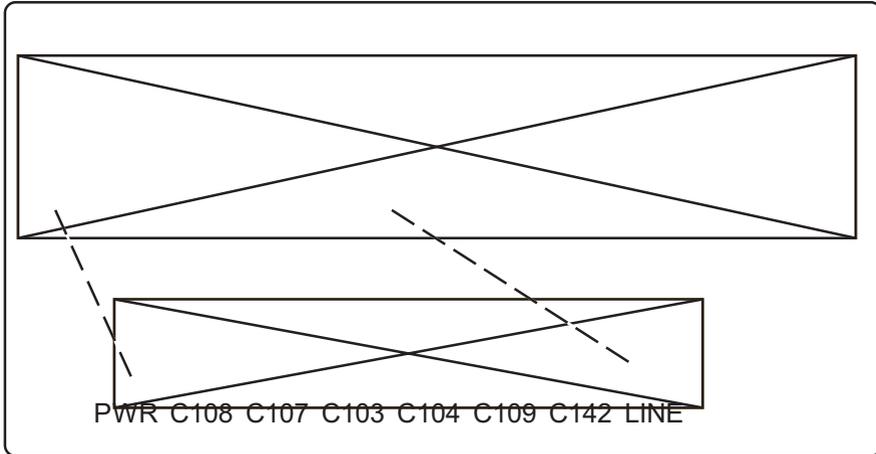
DATA	answer/calling
TEST	loop 2/3

Warning Lights on the Front Panel

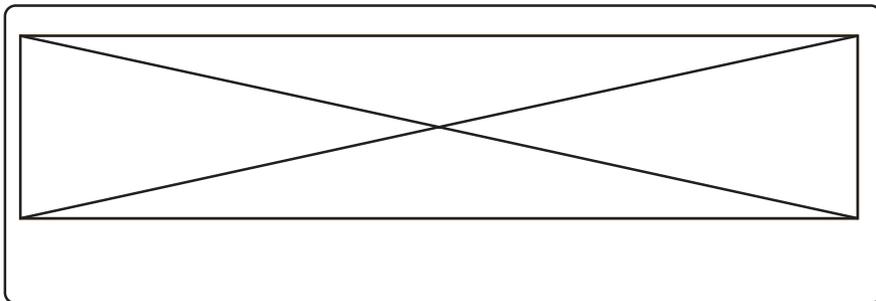
PWR	modem being fed
C108	DTR Data terminal ready
C107	DSR Modem ready
C103	TD Transmit data
C104	RD Receive data
C109	DCD data carrier detector
C142	TEST modem in loop
LINE	modem connected to the line

Controls on the Rear Panel

ON/OFF power supply switch on/off



Front view of SNM 15



Rear view of SNM 15

FUNCTIONAL FEATURES

Operational Modes

The environments V.25bis and AT that live together in the same SNM 15 modem allow you to operate, at different times, in one or another mode.

When it is switched on, the system directly goes into the last environment in which you operated, by initializing the modem with the values previously saved in the non-volatile memory.

When it is first switched on or for any losses of the programmed values, the modem will be initialized with the default values and then go into the “AT” environment.

The V.25bis is enabled by the command “AT*Vn” (see command “*V”). With parameter “n”, you select the control of V.25bis C108/2 (AT*V=0) asynchronous or V25bis HDLC (AT*V2).

It is compulsory to use the AT&W command, if you wish to save any possible alteration of the parameters, enabled in the “AT” mode before changing mode (fig. 3).

The complementary command: HAY, allows you to pass from the “V.25bis” mode to the “AT” mode.

Note: it is possible to perform a hardware reset of the modem which loads the factory configuration: switch on the modem keeping the DATA button pressed for some seconds.

Error correction and data compression

Transmission optimizing techniques have been introduced to ensure faultless data transmission.

These techniques are made up of a line protocol acting as a logical means of transport with functions of supervising the transmitting device and optimizing the data transmission speed.

SNM15 implements 2 error correction techniques: MNP4 and CCITT V.42.

When using the error check it is indispensable to use the flow control (see command &U); in fact, if the features of the line when being connected become worse, the modem will be forced to retransmit many blocks several times.

This might lead to the saturation of modem buffer (especially if there is continuous traffic coming from the DTE) and without appropriately handling the flow control (CTS or XON and XOFF) many of the data being transmitted that are parked in the DCE, would be overwritten by data continuously emitted by the associated DTE.

In the DIGICOM SNM 15 modem V.42/V.42bis and MNP functions are available in both the AT and the V.25bis (asynchronous) environments; the configuration and enabling/disabling stages can be controlled in the AT mode.

MNP

3 classes of operation as well as a series of options have been defined.

Classes 1 & 2 make use, on line basis, of an asynchronous protocol, whereas class 3 is supported by a HDLC type synchronous protocol.

This allows you to check the presence of errors in the transmission blocks (due to interference present on line) and to request the wrong blocks received to be transmitted again.

Before listing the features of the MNP supported by the SNM 15 modem, we will give a brief informative summary of the 5 levels defined by this protocol.

MNP CLASS 1

Asynchronous error correction protocol, half-duplex or byte oriented; it is now practically out of use with a line efficiency equal to 70% of the nominal value of the set speed on a RS232 interface level.

MNP CLASS 2

Asynchronous error correction protocol, full-duplex and byte oriented with a line efficiency equal to 84% of the nominal value.

MNP CLASS 3

Synchronous error correction protocol, full-duplex and bit oriented with a structure similar to the HDLC.

Its line efficiency is equal to about 108 of the nominal value, thus with a total increase of 8%.

MNP OPTION 4

This option introduces two new features in the world of error correction:

Adaptive Packet

The transferred packets are optimized, on the basis of the features of the transmitting device. During the transfer, the modem monitors the line, by detecting the amount of errors (and thus the quality of connection) and consequently has the effect of optimizing the length of the packets (from 1 to 256 characters, in dynamic mode). If the data channel has relatively few errors, the MNP will automatically increase the length of the packets, thus obtaining greater efficiency, and vice-versa should there be errors.

Data Optimizing

This only eliminates the rounded off characters present in the data field.

Here its line efficiency reaches 120% of the nominal value.

MNP OPTION 5

Option 5 allows you to optimize the transmission packet, by taking advantage of a data compression achieved by an adaptive algorithm in real time.

Its line efficiency reaches 200% of the nominal value.

SNM 15 can operate with the following configurations:

CLASS (with &E=4 or 5)

2
3
2 + 4
3 + 4

CLASS (with &E=4 or 5 and *E=1)

2 + 5
3 + 5
2 + 4 + 5
3 + 4 + 5

This makes it completely compatible with all modems having a MNP 5 or lower type correcting function.

Obviously the choice of the level exclusively depends on the features of the modem and occurs AUTOMATICALLY (see column &E 4 or 5) when it is connected, by establishing the maximum common level for both units.

Remember that option 5 can be enabled or disabled independently at one of the classes mentioned above, therefore classes 2 and 3 together with option 4 cannot be set manually by the operator, but they are automatically selected when it is negotiating with the remote DCE.

CCITT V.42 and V.42bis

V.42 and V.42bis are standard error correction and data compression techniques stated by CCITT; V.42bis allows to have a more efficient data compression respect MNP5; infact the line efficiency can reach 400% of the nominal value.

INSTALLATION

INTRODUCTION

This part contains some indications for the preinstallation of the modem as well as the operational procedure for its correct mechanical and electrical installation.

Connection to the DTE Data Terminal

It is better to make sure that the data interface of the DTE to be connected to the modem complies with the CCITT V.24 or V.28 recommendations.

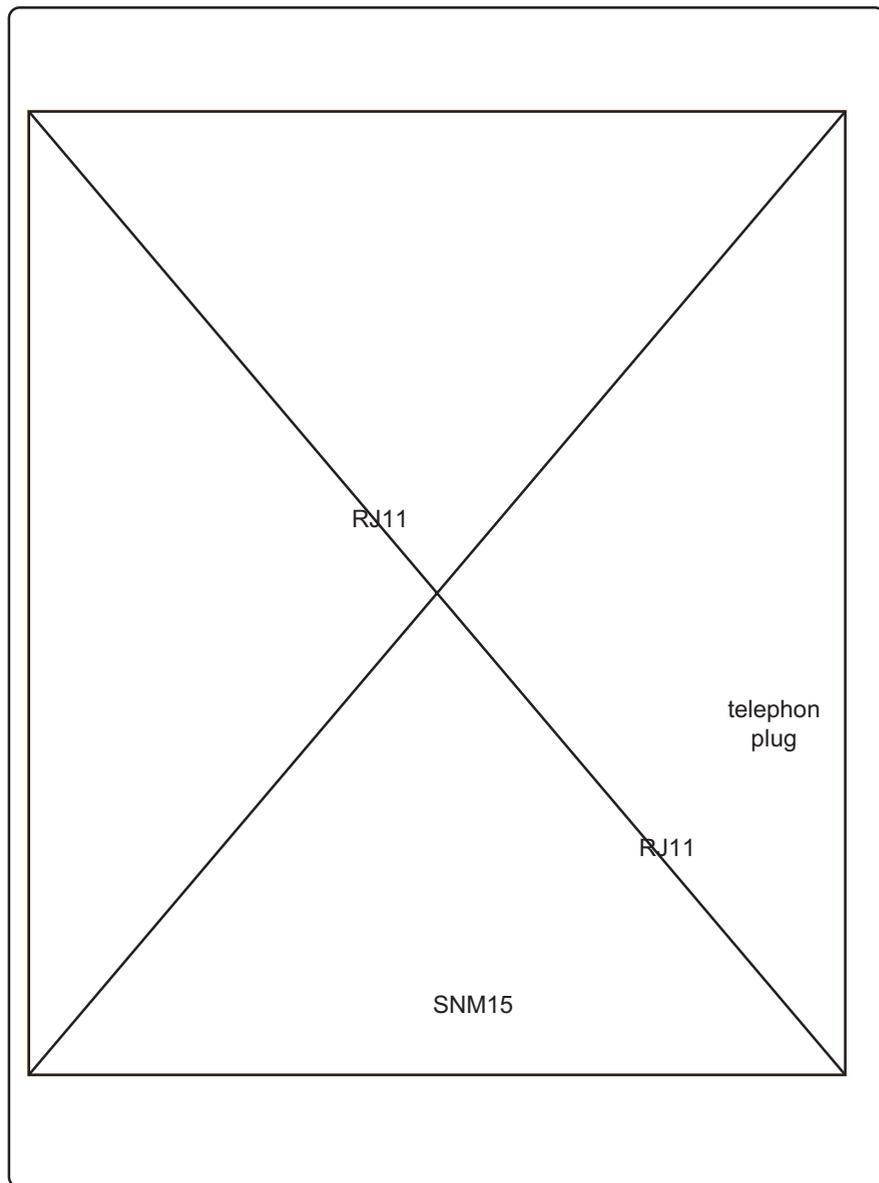
The circuits used with the modem are given in the introduction. Please remember that the V.28 standard recommends that the interface cables must be no longer than 15 m.

The interface connector is a standardized 25 contact female ISO 2110 connector.

Connecting to the Telephone Line and Telephone

The line connectors to match the telephone line and the telephone are located on the rear part of the modem.

A terminated cable with a RJ11 connector is supplied together with the modem allowing you to quickly connect the modem to the telephone socket. On the RJ11 connector, the central wires are the line, the external ones are to be connected to the telephone.



INSTALLATION OF THE SNM 15

Operational Test

After installing your modem, it is preferable to carry out an operational test on a local level to check out whether the modem is working all right and the telephone line is exactly matched.

We suggest you carry out the test as follows:

- Connect the DTE to the modem on the marked connector with the MAIN PORT.
- Switch the modem on and check out whether there is live voltage from the power supply with the PWR (that should be on).
- Following this LED lamps C107 (DSR) and C109 (DCD) should light up, the modem will in fact be programmed according to its default value that envisages the criteria DCD and DSR forced to operate.
- Check out whether the telephone line is correctly hooked up; you only need to lift up the telephone receiver and check that there is a dialing tone, then press the push-button DATA; the modem should “pick up” the telephone line and you should no longer hear the dialing tone in the telephone receiver. By pressing DATA once again, the modem will restore the telephone line.
- Digit the code number “AT” from the terminal, the modem should answer with “OK”.
- Press the push-button TEST: by enabling this (line loop), the warning “CONNECT...” followed by the connection speed

(300, 1200 or 2400) will be sent to the display, and LED lamp C142 will light up on the modem. The same thing can be done, by keying in the command AT&T1 from the terminal.

- Press the push-button TEST again to disable the loop, or key in the ESCAPE sequence (+++) from the terminal and once it is confirmed by “OK”, key in AT&T0.

USE OF THE MODEM

INTRODUCTION

Control and warning devices

All the manual controls and indicating lights are located on the front panel of the modem (Fig. 1).

In order to identify them, consult the mnemonic reading on the panel. The control devices, located on the right side of the front panel, are push-button switches. With the exception of the double position middle switch (ANS/ORG), the other two are unstable position push-buttons normally in standby (the key is out).

Control Devices on the Front Panel

DATA Voice/data switching. When this unstable push-button is pressed, will cause the modem to be connected to the telephone line (in ANS or ORG mode - see ANS-), by automatically unhooking the telephone. If you press the button again, the connection of the modem from the line will be disabled and the telephone will be restored.

ANS Selection of the answer/calling condition (Originate Answer). With this bistable push-button in the OUT position, the modem is set in the calling mode (ORG) and transmits on a low channel. In the IN position, it will be selected in answer (ANS) mode with emission on a high channel. If the auto-answer device is used,

the ANS push-button may remain in the OUT position, since when the call comes in from the telephone line, it will be automatically set to ANSWER (see register S0). This option is available when the terminations are indifferently set to call and to answer, typically in unattended automatic systems. In leased or manual connections one of the two modems should be preset to call and the other to answer.

TEST Enabling the analogical and digital loops (Loop 3 & 2). This push-button, if pressed, will cause loop 3 to be enabled when the modem is disconnected from the line, whereas when it is hooked up with the DATA push-button (modem preset in data) it will cause digital loop 2 to be enabled.

Warning Devices

- PWR** (Power) green LED lamp, on indicates that that the modem has been switched on.
- C108** (Data Terminal ready) red LED lamp: ON indicates that the DTE is connected.
- C107** (Transmitted Data) red LED lamp: ON indicates that there is data on the interface circuit C103, transmitted data, therefore the flashes of the C103 LED warns of the transmission of significant data.
- C103** (Received Data) red LED lamp: ON indicates that there is data on the interface circuit C104, received data, therefore the flashing of C104 LED indicates that siifant data are being received.
- C109** (Data Carrier Detect) red LED lamp: ON indicates that the receiver has correctly detected the data carrier on line, this condition is then signaled to the DTE, thus switching the C109 circuit ON and keeping it in this position until the detection is over (Note 1).
- C142** (Test) red LED lamp: ON indicates that an analogical or digital loop is enabled (loop 2 or loop 3).

Note 1: This criteria can be forced ON (ATRC0) if the DTE needs this criteria to enable the communication.

AT COMMANDS

The AT command set has become a de facto industry standard for commanding low, medium and high speed asynchronous modems. The SNM 15 modem's extended AT command set is fully compatible with the original AT command set, but in addition, it contains command for error control, speed conversion and stored numbers for auto-dialling.

There are two basic modes of operation for SNM 15: **COMMAND mode** and **DATA mode**. **COMMAND mode** is when the modem is not connected to another modem, that is "off-line" or idle condition. In this mode the modem will accept commands beginning with the AT prefix. **DATA mode** is when the modem is connected to another modem, that is "on - line" condition or operative. While in this condition all the characters sent from DTE are interpreted as data and they are sent to the remote mode. You may switch from data to command mode by entering an escape sequence. The default escape sequence is +++ (see Register S12) which must have a period of one second before and after its being keyed, where no other characters are sent to the modem. To go back into data mode simply type **ATO<CR>**.

The AT commands fall into three categories:

1. "AT" or "at" + <command body> + <CR>

Most AT commands belong to this category. This command can be divided into three additional sub-categories:

a. **“AT”** or **“at”** + <command body> + <CR>
EXAMPLE: ATDTP0331263122<CR>

b. **“AT&”** or **“at&”** + <command body> + <CR>
EXAMPLE: AT&F <CR>

c. **“AT*”** or **“at*”** + <command body> + <CR>
EXAMPLE: AT*E1 <CR>

2. **“A/”** or **“a/”**

This command means: repeat the previous command. Note that a carriage return is not required.

3. **“+++”**

This command is known as the escape sequence and is used when the modem is in data mode and you want to put it into command mode. The ATO command will return the modem to data mode.

Command Buffer

The AT command buffer length is 40 characters maximum per command entry. The AT, carriage return, line feed, -, (,), space and backspace count as buffer positions. If an AT command overflows the command buffer an “ERROR” message will be displayed and the command will not be executed. Use backspace to correct typing errors.

Auto-Baud and Auto-Parity Detection

When in command mode, each time an AT command is entered, the SNM 15 modem will automatically analyze the prefix “AT” or “at” to detect the speed and parity of your computer or terminal.

SNM 15 will accept DTE speeds of 300, 1200, 2400 bits per second. The modem has the ability to perform interface speed up to 9600 bps (See *I command for details).

The modem will accept even, odd, mark, space and no parity.

Data length

Each character of the AT command must be an ASCII code with any of the following format combinations.

1 start bit	7 data bits	even/odd	1 stop bit
1 start bit	7 data bits	mark/space	1 stop bit
1 start bit	7 data bits	no parity	2 stop bits
1 start bit	8 data bits	no parity	1 stop bit

AT COMMAND SET DESCRIPTION

COMMAND	DESCRIPTION
AT	Attention
A/	Repeats last command
A	Connection in Answer mode
D	Dial command
E	Echo
F	Communication standard on line
H	Connection/disconnection from the line
I	Modem ID
L	Loudspeaker volume
M	Loudspeaker control
Nn&Zxx	Stores telephone number
O	On line
Q	Quiet mode
Sx	Sets register “x”
Sx?	Reads register “x”
V	Verbous result codes
X	Extended result codes
Y	Long Space disconnect
Z	Recalls User configuration
&C	C107/C109 control
&D	C108 options
&E	Error correction
&F	Recalls factory configuration
&I	Constant speed interface

&M	Async/Sync mode
&N	Displays telephone numbers directory
&R	CTS options in synchronous mode
&S	Enables/disables front panel buttons
&T	Test mode
&U	Flow control
&W	Stores user configuration
&X	Synchronous clock source
&Y	Command port
*B	Displays Black List numbers
*C	Displays configuration
*D	Asynchronous C108.1 mode
*E	Data compression
*H	CTS handling in asynchronous mode
*I	Adaptive rate control
*M	CCONF interface signal
*S	S-registers status display
*T	Answer tone options
*V	Enters V.25bis mode
*X	Synchronous clock control
+++	Escape sequence

Dial Commands (ATD)

0:9	Digit to select
N	Selects stored telephone number
P	Pulse dial
T	Touch dial tone
W	Wait for dial tone
,	Pause
/	Wait for 1/8 sec

AT

ATTENTION: in the AT command state the modem can automatically detect the terminal bit rate and character format, adjusting itself accordingly, as soon as a command is issued. The following DTE rates are permitted: 300, 1200 and 2400 bps (for 4800 and 9600 bps see command *I)

A/

This command causes the modem to repeat the last AT command. This command is neither preceded by the Attention Code (AT) nor is followed by a carriage return.

ATA

This command causes the modem to go off-hook immediately, answer an incoming telephone call and begin the answer sequence.

ATD

This command causes the modem to go off-hook and automatically originate a telephone call.

ATDnnnnn executes the dialling sequence of number nnnnn

ATDNn calls the number stored in position n in the telephone book

ATE

Enables or disables the echo; only with the modem in command mode, whose characters come from the DTE interface.

E0 = The echo of the commands is disabled.

E1 = The echo of the commands is enabled.

ATF

Selects the modulation standard that the modem will have to adopt when it is connected to the remote modem. The choice of a modulation standard automatically disables the other options; for example with ATF4 you set the modem to operate only with the V.22 standard (1200 bps full-duplex).

- F0 = Multistandard enabled
- F1 = V.21 standard (300 bps full-duplex)
- F4 = V.22 standard (1200 bps full-duplex)
- F5 = V.22bis standard (2400 bps full-duplex)

ATH

This command controls the telephone switch hook, causing the modem to go immediately on-hook and terminate a call connection.

- H0 = Disconnects the modem from the telephone line, the line is switched over to the telephone, and if a connection is going on, this will be broken.
- H1 = Connects the modem to the telephone line, the line is switched over to data.

ATI

Command for the request for internal parameters and memory tests.

- I0 = Request for modem code
- I1 = Request for firmware release
- I2 = Request for internal memory test
- I4 = Request for the family of the modem.

ATL

This command controls the volume of the modem's internal loudspeaker.

- L1 = Low loudspeaker volume
- L2 = Medium loudspeaker volume
- L3 = High loudspeaker volume

ATM

This command controls the loudspeaker.

- M0 = Loudspeaker always off
- M1 = Loudspeaker on until the carrier is detected
- M2 = Loudspeaker always on

ATNn&Zxx

This command allows the writing in one of the twenty locations of memory available.

n is one of the 20 locations available while xx is the telephone number to store.

ATO

Controls the return of the modem from the on-line state; the modem will leave this command so it can transmit more data.

This command can be given after sending the ESCAPE sequence to go back on line and then continue transmitting.

ATQ

This command enables or disables any messages or answers when faced with commands supplied by the DTE.

If it is disabled, the modem will accept the commands but it will not confirm them.

- Q0 = Messages and Answers enabled
- Q1 = Messages and Answers disabled

ATSr

This command allows the user to change the modem configuration parameters stored in the S-Registers.

Sr=xx Where r is the register number and xx is the value to be written in the register.

ATSr?

This command displays the value of the S-Register r. See also *S command.

ATV

This command selects the answer mode of the modem toward the DTE.

It can be selected in short form to have the modem handled by a computer or furthermore to have the modem handled by an Operator.

- V0 = The messages supplied by the modem are in a short form.
- V1 = The messages supplied by the modem are in an extended form.

LIST OF THE MESSAGES IN SHORT AND EXTENDED FORMS

SHORT	EXTENDED	DESCRIPTION
0	OK	command performed
1	CONNECT 300	connected to 300 bps
2	RING	ring on
3	NO CARRIER	carrier absent
4	ERROR	illegal command
5	CONNECT 1200	connected at 1200 bps
6	NO DIAL TONE	dialing tone absent
7	BUSY	line engaged
8	NO ANSWER	no answer
10	CONNECT 2400	connected at 2400 bps
12	RDL GRANTED	digital loop on
13	RDL DENIED	digital loop off
15	(aborted!)	aborted message
20	/BUF	active BUFFER
22	/REL	active MNP error correction
22	/REL5	data compression MNP5
22	/V42	active V.42 error correction
22	/V42BIS	data compression V.42bis
27	DELAYED	number in question delayed by 2 min.
28	FORBIDDEN	number forbidden for a maximum of 2 hours.
29	NO MEMORY	there is no room in the BlackList

MESSAGES SENT TO THE DTE

In extended form the messages are preceded and followed by control characters [RETURN] [LINEFEED].

In short form only the characters given in the table are sent followed by [RETURN].

ATX

- X0 = Compatible with Hayes 300 modem
- X1 = Enables result code "CONNECT 1200"
- X2 = Enables the detection of the dialing tone
- X3 = Enables the detection of the engaged tone
- X4 = Enables the detection of the engaged tone and the previous dialing tone.

ATY

This command enables or disables the disconnection with the BREAK character; if the modem is receiving a BREAK signal from the remote modem for a period longer than 1.5 sec., it will be disconnected from the telephone line.

If this function is enabled, upon receiving the command ATH0, the local modem will send the corresponding remote modem a BREAK character (SPACE lasting 4 seconds) to enable the disconnection.

This function can also be controlled from the circuit C108 to switch it ON and OFF.

- Y0 = Long space disconnect disabled
- Y1 = Long space disconnect enabled

ATZ

This command resets the modem and load the user defined configuration stored with &W command.

AT&C

Selects the mode for handling criteria C109 (DCD) and C107 (DSR).

&C0 = C107 and C109 forced ON

&C1 = C107 and C109 handling depends on the selected modulation standard.

&C2 = C107 forced ON.

&C3 = C109 forced ON.

&C4 = C109 is always ON; during disconnection it goes OFF for 2 seconds then comes back to ON.

It has been implemented for use of modem when a transition to OFF of DCD (C109) is necessary in order to close the communication port and viceversa C109 is necessary to open the communication port and to send the programming string to the modem.

&C5 = a fall of C108 (DTR) causes a transition to OFF of C107 (DSR) and C109 (DCD) for 500 ms.

This happens either when modem is OFF-LINE or when it is ON-LINE. When ON-LINE, in case the carrier falls, DSR and DCD go to OFF for 500 ms. This function is very useful for modems used in UNIX and XENIX applications.

AT&D

This command selects the mode for handling criterion C108 (DTR).

&D0 = DTR is ignored.

&D2 = DTR is handled like C108.2; the standby condition disables the modem when it calls and answers. If the modem is switched off on-line, it will be immediately disconnected.

&D3 = A transition of DTR from ON to OFF causes the modem disconnection when this is ON-LINE and it reloads the last stored configuration with &W command.

This command works in the same way as ATZ.

AT&E

This command enables or disables the error detection/correction function. This function makes sure that asynchronous data transmission is protected against any errors entered by the transmitting support.

Both modems, provided with an error correction, take care of coding the data to be transmitted to ensure that the corresponding remote modem will be able to detect whether there are any errors in the received data and ask for them to be transmitted again.

SNM 15 implements also the auto-reliable buffer and auto-reliable character functions. The first allows to store user data during the negotiation of the error corrector; the second permits to stop the error corrector negotiation if a particular character is received from the line. The fallback character is indicated in S48 register (carriage return: 13 Hex).

In case the fallback character is not received and the modem does not receive the error corrector negotiation, it starts working in

buffer mode after 8 seconds. In this case the received characters are stored and sent to the DTE (the buffer capacity is 200 characters).

- &E0 = the error correction function is disabled.
- &E1 = error correction (MNP and LAPM) are enabled in autoreliable mode with autoreliable buffer and character.
- &E2 = LAPM corrector enabled in autoreliable mode. If at the end of the negotiation it does not find the corrector on the remote modem, it enters in standard data mode.
- &E3 = LAPM corrector enabled in reliable mode. If at the end of the negotiation it does not find the corrector on the remote modem, the connection is dropped.
- &E4 = MNP enabled in autoreliable mode. If at the end of the negotiation it does not find the corrector on the remote modem, it enters in standard data mode.
- &E5 = MNP enabled in reliable mode. If at the end of the negotiation it does not find the corrector on the remote modem, the connection is dropped.
- &E6 = LAPM and MNP are enabled in autoreliable mode.
- &E7 = LAPM and MNP enabled in reliable mode.

AT&F

This command recalls the default configuration, that the modem has when leaving the factory.

This command will not cancel the user's stored configuration.

AT&I

This command enables or disables the constant speed of the data interface. This command allows you to maintain a constant transmission speed between the DTE and modem and vice-versa, independently from the transmission speed on line. A buffer in the modem will take care of “parking” the data if the speed on line is lower than the interface speed. With very different speeds, such as 2400 bps for the data interface and 300 baud for the line, the buffer might be saturated. It is thus necessary to select the control mode for flow control with the command “&Un” in order to avoid any loss of data.

SNM 15 can reconstruct the parity of the received data. This function (&I3) allows the dialog between two DTEs which use different parities (ex.: 7 EVEN and 7 ODD).

The modem analyses and reconstructs the parity bit of received characters according to the format of AT commands used for the programming.

Example: if you programme the modem with a terminal which is setted to 7 data bit and Even parity, the modem will give back all received data with this parity, even if the remote DTE sent them with parity Odd or with no parity.

Attention: this option MUST BE DISABLED (or always use a terminal set to 8 bit data and no parity) when using any file transfer protocol; otherwise the file will be wrongly received.

- &I0 = constant speed is disabled.
- &I1 = constant speed is enabled. Upon connection, “CONNECT” will appear followed by the line speed.

- &I2 = constant speed is enabled. Upon connection, “CONNECT” will appear followed by the data interface speed.
- &I3 = same as &I1 with parity reconstruction

AT&M

This command selects synchronous or asynchronous mode of operation.

- &M0 = The modem is programmed for asynchronous operation.
- &M1 = The modem is programmed for synchronous operation.
It is disconnected from the DTE with criterion DTR; the standby transition of this criterion causes the modem to be disconnected.
- &M2 = The modem dials the number stored in memory location N0 when DTR is raised; communication is synchronous. The modem hangs up the call and returns to command mode when DTR is lowered.
- &M3 = The modem is programmed for synchronous operation.
The CTS remains OFF until the connection is over.

Note: As soon as the command &M3 is given, the modem will lower the CTS; therefore should it be used to program an asynchronous terminal that uses criterion CTS (ON) to send the commands, it is convenient to give this command only at the end of programming or to ignore criterion C106 (CTS) to the terminal.

AT&N

This command displays the entire telephone directory.

- &N = Displays the telephone directory
- &N99 = Deletes the entire telephone directory

AT&R

This command controls the interaction of criteria C105 and C106 (see register S26).

This command is only valid for synchronous operation.

- &R0 = C106 follows C105
- &R1 = The modem ignores C105; 106 is fixed ON.
- &R2 = C106 is fixed at ON.

AT&S

This command enables or disables the frontal push buttons.

- &S0 = Frontal push buttons disabled
- &S1 = Frontal push buttons enabled

AT&T

This command selects the testing options.

- &T0 = Current test disabled
- &T1 = Local Analog Loopback (loop 3)
- &T6 = Sends a request to enable remote loop 2.

AT&U

This command enables or disables the option for the modem or the DTE to block the data flow. It is important to set this option especially with error correction active. The flow control can be hardware and/or software. XON and XOFF characters for flow control are defined by S49 and S50 registers.

- &U0 = flow control disabled
- &U1 = software flow control enabled with XON/OFF characters.
- &U2 = software flow control enabled with XON/OFF characters. These characters are transferred to the remote modem too.
- &U4 = hardware flow control with RTS/CTS
- &U5 = flow control enabled with RTS/CTS and XON/XOFF
- &U6 = flow control enabled with RTS/CTS and XON/XOFF. Characters are transferred to the remote modem too.

The characters are also transferred to the remote modem.

The ON/OFF characters may be defined as you wish via registers S49 and S50.

AT&W

This command stores the configuration parameters set by the user.

It may be given on its own or be preceded by the commands that you intend to store, such as e.g.:

ATF0X4&I1S0=0S8=3&W

In this way, the given configuration is stored, as well as selecting the operational mode of the modem.

AT&X

This command selects the source of the synchronous transmission clock at the DTE interface when the modem is in data mode (synchronous mode only).

&X0 = Internal clock (supplied by the modem).

&X1 = External clock (supplied by the DTE).

AT&Y

This command enables or disables the command port.

&Y0 = Command port disabled (the commands are received by the main port).

&Y1 = Command port enabled

A table highlighting which port is enabled when the commands are received and which port is enabled to receive the ESCAPE sequence, on the basis of the port selected and the type of operation (synchronous or asynchronous) is given below.

OPERATION	PORT	PORT	PORT	ESCAPE	V.25bis
SYNC	MAIN	MAIN	MAIN	N.A.	N.A.
SYNC	COMMAND	COMMAND	MAIN	COMMAND	N.A.
ASYNC	MAIN	MAIN	MAIN	MAIN	MAIN
ASYNC	COMMAND	COMMAND	MAIN	COMMAND	N.A.

USE OF THE SNM 15 PORTS

N.A. = NOT AVAILABLE (the modem can be disconnected by C108 handling).

AT*B

Displays the numbers in the black list.

- *B0 = displays the delayed and forbidden numbers
- *B1 = displays only the delayed numbers
- *B2 = displays only the forbidden numbers

The command *B plays the same role as the commands RLD and RLF in V.25bis.

AT*C

This command displays the current configuration of the modem.

AT*D

This command enables the C108.1 functionality in asynchronous mode.

This feature allows the modem to dial the number stored in memory location N0 when DTR is raised; communication is asynchronous. The modem hangs up the call and returns to command mode when DTR is lowered.

*D0 = asynchronous C108.1 disabled

*D2 = asynchronous C108.1 enabled

COMMAND: *E

This command controls the integral data compression feature of the modem during error control connections. In fact besides correctors there are also the relative compressors, which are V.42bis (as compression of V.42) and MNP 5 (as compression of MNP).

*E0 = Data compression disabled

*E1 = Data compression enabled

AT*H

This command performs the C106 (CTS) control in asynchronous mode.

*H0 = C106 remains OFF during handshake

*H1 = C106 is normally controlled

AT*I

This command disables the auto-speed function (that allows the interface speeds to be automatically selected up to 2400 bps) and defines the operation with constant DTE side speed for the value selected (e.g. “AT*I6” the modem remains forced on the interface side to operate at 4800 bps; it is thus indispensable to preset the DTE to 4800 bps.).

With forced speed on the DTE side, the format and parity is detected by the AT characters anyhow.

If the desired speed is 4800 or 9600 bps, the command must be given at 2400 bps, so after the OK message, the modem starts working at the speed selected.

Speed at 9600 bps can also be selected through a software switch. If 1/7 dip switch is at ON at the power on, the modem is ready to work at 9600 bps (same as *I7 command).

- *I0 = Autobaud enabled from 300 to 2400 bps.
- *I1 = DTE side speed fixed at 300 bps.
- *I4 = DTE side speed fixed at 1200 bps.
- *I5 = DTE side speed fixed at 2400 bps.
- *I6 = DTE side speed fixed at 4800 bps.
- *I7 = DTE side speed fixed at 9600 bps.

AT*M

This command enables the CCONF interface signal (pin 19). Through V.24 interface of MAINPORT it is possible to pass from asynchronous to synchronous mode and viceversa.

Example: after the modem has been connected to a data bank in asynchronous with error correction, you want to connect through a synchronous emulation card to a remote terminal without reprogramming the modem but simply turning a switch.

This is possible by controlling pin 19 on the MAIN PORT. When

pin 19 has a negative polarity (MARK) or it is not connected, the modem works regularly; the changing to a positive polarity (SPACE) is the same as &M1 command.

- *M0 = CCONF function is disabled
- *M1 = CCONF function is enabled

AT*S

This command displays the current setting of the S-registers.

AT*T

This command disables the answer tone when the originate modem does not control it.

When answer tone is disabled, it is necessary to force the modulation standard (F command). The modem directly sends the carrier relative to the selected standard; it is not possible working in multistandard mode.

- *T0 = Answer tone enabled
- *T1 = Answer tone disabled

AT*V

This command enables V.25bis mode.

- *V0 = V.25bis asynchronous
- *V2 = V.25bis synchronous HDLC

N.B.: In V.25bis the push-buttons on the front panel are disabled.

AT*X

This command allows to control the clocks for synchronous operation of the modem.

*X0 = The clocks are supplied upon connection.

*X0 = The clocks are always present.

+++

This ESCAPE command allows you to bring the modem into command mode, by maintaining the connection with the remote modem.

To ensure the ESCAPE command is correctly interpreted, you need to take into account the following conditions:

- do not transmit any characters for the time determined by register S12. The default value is one second.
- key in the ESCAPE code (+++) in sequence. The interval between one '+' and another should be no shorter than the time determined by S12.
- do not transmit any characters for the time determined by register S12.

If the operation has been correctly performed, the modem will answer with: "OK", and the operator can now send the desired commands.

If you wish, the ESCAPE character can be modified by writing the new character in register S2.

Dial Commands (ATD)

0:9	Digit to select
N	Selects stored telephone number
P	Pulse dial
T	Touch dial tone
W	Wait for dial tone
,	Pause
/	Wait for 1/8 sec

ATD0-9

Represents digits of the telephone number. The P modifier instructs the modem to pulse dial a telephone number. The T modifier instructs the modem to dial subsequent digits of a Tn in tone mode

To dial 0331263122 number send the following string to the modem:

ATD0331263122<CR>

ATDNn

The modem has been instructed to call the number in the stored memory location n.

ATDP

Instructs the modem to pulse dial a telephone number

ATDT

Instructs the modem to dial the telephone number in tone mode.

ATDW

Instructs the modem to wait 5 sec for a dial tone before dialling the rest of the dial string. If the dial tone is not detected the call will be aborted and the message “NO DIAL TONE” will be displayed.

ATD,

This command instructs the modem to pause during dialling for the number of seconds set by the value of S8 register. The character “;” can be inserted in the number to call when the modem is installed on a line of a PABX.

ATD/

This command inserts a delay of 1/8 sec in the dialling.

DEFAULT CONFIGURATION

When the modem is switched on, it is preset as follows:

E	ECHO	1	ECHO ENABLED
F	STANDARD	0	MULTISTANDARD
L	VOLUME	2	AVERAGE LOUDSPEAKER VOLUME
M	LOUDSPEAKER	1	LOUDSPEAKER ON SINCE CARRIER DETECTION
Q	ANSWER	0	COMMAND ANSWER ENABLED
V	MESSAGES	1	MESSAGES IN EXTENDED FORM
X	MESSAGE EXT.	1	RESULT CODE ENABLED <CONNECTnnnn>
Y	BREAK	0	DISCONNECTION FOR BREAK DETECTION DISABLED
&C	DCD DSR CONTROL	0	DCD & DSR ALWAYS ON
&D	DTR CONTROL	0	DTR IGNORED
&E	ERROR CORRECTOR	0	ERROR CORRECTOR DISABLED
&I	SPEED	1	CONSTANT SPEED ENABLED
&M	OPERATION	0	MODEM IN ASYNCHRONOUS MODE
&R	RTS CTS CONTROL	0	CTS FOLLOWS RTS
&S	PUSH BUTTONS	1	ENABLED
&U	FLOW CONTROL	5	FLOW CONTROL RTS/CTS AND XON/XOFF

&X	CLOCK	0	SUPPLIED BY THE MODEM
&Y	PORT POSITION	0	MAIN PORT
*D	ASYNCH. C108/1	0	DISABLED
*E	DATA COMPRESS.	1	ENABLED V.42BIS/MNP CLASS 5
*I	DTE SPEED	0	BY AUTOBAUD
*H	CTS IN ASYNC.	1	CTS NORMAL
*M	CCONF OPTION	0	DISABLED
*T	ANSWER TONE	0	ENABLED
*X	CLOCK HANDLING	0	SUPPLIED IN THE CONNECTION

V.25 BIS

INTRODUCTION

SNM 15 includes the V.25bis command protocol to allow auto-dialling from Synchronous and asynchronous data terminal equipments, using series 100 interface circuits.

This is an international standard which makes the modem compatible with host software already written for dial-up modems. For synchronous applications the protocol format is HDLC with ASCII NRZ code.

Duties of the DTE

During the call stage the DTE has to:

- Make sure that the DCE is available.
- Dial a telephone number or request one that has been already programmed in the DCE.
- Decide to disconnect the connection in case of an unsuccessful call.

After the call stage, the DTE must:

- Check out the data flow.
- Ask for the connection to be disconnected.

Definitions and Operational Modes

Before tacking the explanations for use, it is a good idea to supply some definitions regarding the V.25bis and point out how to operate it.

The following fields can be distinguished in the V.25bis:

Command:

This is an instruction sent from the DTE to the DCE as part of the V.25bis automatic call procedure.

Indication:

This is an instruction or answer sent from the DCE to the DTE as part of the V.25bis auto-call procedure.

Parameter:

This is a variable that can accompany commands and indications.

Address:

This is a two figure programmable variable indicating the position in which a telephone number is stored in the telephone-book present in the non-volatile memory of the DCE.

Stored Telephone Number:

A telephone number, up to 20 figures including separators indicating the number of the corresponding modem to be reached, can be entered into the phone-book present in the non-volatile memory of the modem.

The phone-book may contain a maximum of 20 numbers that can be stored and/or recalled via the logical address (1-20) with which they are entered into the memory.

Telephone calls:

by using the telephone book (in V.25bis mode) or sending the desired number one at a time, you can make a telephone call with the help of the appropriate commands.

If, for any reason, the call were not successful (engaged number, failed connection handshake, line cut off) the number would be stored in the parking area (Black list) and a 120 minute timer, associated to it, would be started.

At this point the number could still be called without any restrictions up to a maximum of 5 times.

If even the fifth phone call, within a 120 minute period, were not successful, you would need to wait two minutes before trying once again (DELAYED state). This can be done another 4 times up to a maximum of 9 times since the first call you made.

From this point on, if even the ninth call were unsuccessful, it will be no longer possible to call the number in question until the 120 minute timer, associated to it, has run out (FORBIDDEN state). Only once the 12 minutes are over will the number be canceled from the Black List and it will no longer be subject to any restrictions. The number would be canceled from the Black list anyway if the phone call were successful during one of the nine attempts.

Black List and File:

The memory areas dedicated to the File and the Black List are of “non-volatile” type, and contain a maximum of 20 numbers.

In the File a number is considered different from another if it has at least one different separator or if this separator is allocated differently (e.g. 123, 1>23, 12>3 are all different), whereas the same numbers are considered the same as far as the restrictions set for the numbers in the Black List are concerned.

In order to cancel a number from the File or replace an existing

number with another one, the number that you wish to operate on must not be present in the Black List.

It is possible to insert a number into the File that is already present in the Black List, for example due to an unsuccessful phone-call made with the direct dialing command. In this case the number in the Black List will maintain all the limitations laid down by the presence of the number in the Black List.

Should the Black List be completely full, it is still possible to make phone-calls for numbers contained in it (Black List allowing !). It is however not possible to call new numbers until a new position has been vacated in the Black List.

This guarantees that any other unsuccessful phone-calls may be inserted into the Black List with all the envisaged limitations.

Should there be a power failure, the data in the File and Black List will be maintained any way with the warning that any timers that might have been allocated to it will be frozen until it is next switched on.

State:

Indicates the current state of the telephone number.

It is made up of six ASCII characters following the telephone number indicating respectively:

- The dialing state of the number to be called (Z) (1 character).
- The delay time (P) (1 character).
- The number of redialing attempts (S) (1 character).
- The prohibition time for further attempts (T) (3 characters).

DIALING State:

Determines the state of the telephone number in the memory. To determine it, the parameters U, D and F are used with the following meaning:

Phone-call with no Restrictions (U): In this case the number may be dialed in any case you wish since it is not subject to restrictions.

Delay Call (D): If the DCE has made a phone-call for at least 5 times unsuccessfully with the same number, any other attempt, up to a overall maximum of 9, will be made with a delay time of 2 minutes since the end of the previous attempt.

Forbidden Call: If the telephone number has been called unsuccessfully for a minimum of attempts equal to 9, it will be inaccessible for a period equal to 120 minutes since the first unsuccessful attempt.

Delay Time (P): This is the P time mentioned above; it is equal to two minutes.

Number of redialing attempts (S): This is the number of attempts made unsuccessfully up to this moment from the DCE with the same telephone number.

Prohibition Time for Further Phone-calls (T): Indicates the time needed for a forbidden telephone number to return to the state with no restrictions (U), in minutes.

Examples:**COMMAND: RLN(XX)**

This is sent from the DTE; XX (01-20) represents the memory area in which the number whose related parameters you wish to find out are contained (without XX, the situation of all the numbers in the memory will be displayed).

INDICATION: LSN(XX);YY...Y;ZPST

This is the answer of the DCE; XX has the same meaning as given above;

YY...Y is the telephone number corresponding to the memory area selected; Z, P, S and T indicate the state parameters given above.

e.g: RDNO2 (From DTE)
LSNO2; 064745871;D25000 (from DCE)

In this case the information of the DCE will confirm that numbers corresponding to area 02 in the memory is 064745871, it has been called five times unsuccessfully and is subject to a delay, in case of any further attempts, equal to 2 minutes.

If there had been F29108 instead of D25000, the information of the DCE directed to DTE would have meant that the number being presently called is prohibited for a period of time equal to 108 minutes, since the number of attempts has reached the maximum possible (9), and that 12 minutes have gone by since the first attempt you made.

Asynchronous V.25bis commands and indications

MESSAGE	CR	LF
---------	----	----

The format of the characters must be the same as in the IA5 alphabet, i.e: 7 data bits and EVEN parity. It should thus be noted that the operations always take place with a 10 start-stop character format.

Every command must be followed by “Carriage Return” and “Line Feed” characters.

The commands to be used in asynchronous V.25bis are given below.

CAUTION: before activating the V.25b, key in AT&W in order to store the parameters that have previously been varied.

ASYNCHRONOUS V.25BIS COMMANDS

COMMAND FORMAT	DESCRIPTION
CRN CRNXX...XX	REQUEST FOR CALL WITH TELEPHONE NUMBER SUPPLIED BY DTE. It is sent from the DTE to start up the procedure. The command is always accompanied by the number to be dialed.
CRS CRSXX	REQUEST FOR CALL WITH A TELEPHONE NUMBER STORED IN THE DCE. It is the equivalent of the previous request with the difference that the number is already present in the DCE memory. The command is always accompanied by two figures to identify the memory area in which the number is located.
PRN PRN;YY..YY	TELEPHONE NUMBER PROGRAMMING. It is the command that sets the DCE into a programming state. It allows the user to put a maximum of 20 number with 20 figures each into the memory. Their position is

determined by the first two figures of the parameter, separated by the number to be stored with the symbol“;”.

RLN	RLNXX	REQUEST FOR THE LIST OF NUMBER IN MEMORY. This command allows the DCE to list the numbers contained in the memory together with their state. The command may be followed by two figures to indicate the position in the memory of one specific number to be examined.
RLF	RLF	REQUEST FOR THE LIST OF FORBIDDEN NUMBERS. Upon request the DCE will supply the address, the telephone number and the state of any forbidden number.
RLD	RLD	REQUEST FOR THE LIST OF DELAYED NUMBERS. Upon request the DCE will supply the address, the telephone number and the state of any delayed number.
DIC	DIC	FAILURE TO DETECT INCOMING CALL. The DCE is authorized to ignore the presence of incoming calls signaled to the DTE. The command always has

priority even if the DCE is set for auto-answer. The DCE must receive the DIC command within a time limit of 5 sec. since the display of INC. Any incoming calls will be ignored for a minute since the reception of DIC.

CIC CIC

CONNECTION WITH
INCOMING CALLS. It is the opposite command to the previous one that allows the DCE to connect the incoming call previously ignored. The DCE must get the CIC command within 10 sec. of receiving DIC.

CLA CLAXX

ADDRESS CANCELLATION
This command allows the DTE to cancel any number in the DCE's memory. The two figure parameter indicates the memory address of the number to be canceled. This command is not valid on telephone numbers also in the Black List. If the parameter is not specified, the whole file will be canceled (i.e. only number not subject to the Black List.

DLN	DLN	REDIALING OF THE LAST NUMBER This command allows the DCE to redial the last number you called The command is linked to the last time the DTE sent a CRN.
EON	EON	ECHO ON Faced with this command, the DTE will echo each command that it receives from the DTE. The new echo state is stored in the non-volatile configuration.
EOF	EOF	ECHO OFF Faced with this command, the DTE will not echo any commands that it receives from the DTE. The new echo state is stored in the non-volatile configuration.
CSP	CSP300	CHANGE OF SPEED TO 300 bps. CSP1200 CHANGE OF SPEED TO 1200 bps. CSP2400 CHANGE OF SPEED TO 2400 bps. The new speed is stored in the non-volatile configuration. N.B. The line speed always coincides with DTE interface speed
HAY	HAY	ENTERS HAYES MODE recalling the stored configuration.

Separators

In comparison to what was given in table 4/V.25bis of the CCITT the following meaning has been allocated to the separators:

- Separator No.2 (<) : 2 second pause indication.
- Separator No.3 (=) : 5 second pause indication.
- Separator No.4 (>) : 10 second pause indication.
- Separator (:):wait tone : wait for dialing tone.

The separators can be used in groups, for example to have a 7 second pause you need to use a combination of several “=<“ (or vice-versa <=).

ASYNCHRONOUS V.25BIS INDICATIONS

INDICAT.	FORMAT	DESCRIPTION
EOL	EOL	END OF LIST This indication allows the DCE to inform the DTE that it has completed the list of the requested indications.
ONL	ONL	ON LINE INDICATION This indication allows the DCE to inform the DTE that the call was successful and that the connection has been established.
OFL	OFL	OFF LINE INDICATION. This indication allows the DCE to inform the DTE that the disconnection has been performed.
DLC	DLC1	DELAYED PHONE-CALL. This indication allows the DCE to inform the DTE that the next attempt to call will be delayed by a period equal to 1 or 2 minutes.
INV	INV	INVALID COMMAND. The DCE warns the DTE that is not able to perform the command it has received.

VAL	VAL	VALID COMMAND. The DCE informs the DTE that is able to acknowledge the programmed command it has received as valid.
INC	INC	INCOMING CALL. The DCE informs the DTE of the presence of an incoming call signal on line. This indication has priority over commands CRS and CTS.
LSN	LSNXX;YY...Y;	LIST OF STORED NUMBERS. In reply to a RLN ZSPT command of the DTE. The first two commands are meant to indicate the position in the memory followed by the telephone number and the state of the number.
LSF	LSFXX;YY...Y;	LIST OF FORBIDDEN NUMBERS. In reply to a RLF ZSPT command. The meaning of the parameters is the same as that of the previous indication (LSN).
LSD	LSDXX;YY...Y;	LIST OF DELAYED NUMBERS. In reply to a RLD ZSPT command of the DTE. The parameters have a meaning analog to that for the LSN.

CFI **CFIXX** **CALL FAILURE** This is an indication sent by the DCE in reply to a CRN, DLN or CRS of the DTE; it must be accompanied by a two letter parameter that determines the cause of it.

In the following is described the meaning to be attributed to the parameters which determine the cause of an indication **CFI**.

CALL STAGE

CB: This parameters is meant to inform the DTE that the DCE is not available for the call (it is being tested, is in loop or it is performing other functions incompatible with the control of the call).

NS: The call cannot take place since the number is not present on the DCE's memory.

FC: The call cannot take place since the number is forbidden.

ET: The call cannot take place since the occupied tone is detected on line (test for 5 sec.).

MF: The call cannot take place because the list is completely full.

PERFORMED DIALING

RT: The call is interrupted due to a 40+5 sec. time-out on the detection of a ring tone (call control tone).

NT: The call is hung up since there is no answer tone from the remote DCE (test on 60 + 5 sec.).

ET: The call is hung up because an occupied tone of the dialed number is detected (test on 40 + 5 sec.).

AB: Given the absence of checks, handshake not established by the remote DCE, the DCE decides, after a time out period of 60 + 5 sec. since the last figure sent, to hang up the call.

In the following table commands, indications and relative consequences are listed.

COMMAND	CHECK	INDICATION	CONSEQUENCE
Any one	INV		Command not performed
CRN(YY..Y)	VAL	ONL (1)	Call accepted
CRS(XX)	VAL	ONL (1)	Call accepted
DLN	VAL	ONL (1)	Call accepted
CRN(YY..Y)		DLCX	The call cannot be accepted for an X period.
CRS(XX)		DLCX	The call cannot be accepted for an X period.
DIC	VAL	INC	Incoming calls not accepted
CIC	VAL	INC	Incoming calls accepted
CIC	INV		Command not accepted because it was given more than 10 sec. after DIC.
PRNXX;Y.Y	VAL		Storing of the telephone number Y.Y in the position XX.
RLNXX		LSNXX;Y.Y;	Appearance of the telephone ZPST number Y.Y corresponding to the XX memory area and related with the parameters ZPST (in absence of XX all the memory areas must be highlighted).
RLF		RLFXX;Y.Y;	As indicated above but limited ZPST only to forbidden numbers.

RLD		LSDXX;Y.Y; As indicated above but limited ZPST only to delayed numbers.
CLAXX	VAL	Cancellation of the number in the XX memory area.
EON	VAL	The DCE will echo each command that it gets from the DTE.
EOF	VAL	The DCE will not echo any command that it from the DTE.
CSP 300	VAL	Speed brought to 300 bps. after the warning VAL.
CSP 1200	VAL	Speed brought to 1200 bps. after the warning VAL.
CSP 2400	VAL	Speed brought to 2400 bps. after the warning VAL.
HAY	VAL	From this moment on the SNM 15 will only accept "AT" commands.

(1). **Note:** only if connection has been established.

Synchronous V.25bis commands and indications

In synchronous V.25bis, in order to send commands to the modem, the frame structure must follow V.25bis recommendation concerning the use of a bit oriented protocol (HDLC)

The frame structure is as following:

F A C MESSAGE FCS F

- F** (Flag start/end frame) It is a fixed and standard field of bit oriented protocols (HDLC/SDLC) and it corresponds to 7E in hexadecimal or to 01111110 in binary.
- A** (Address) This is usually a changing field but in this case it has a fixed value and it must be FF (hex) or 11111111 (binary).
- C** (Control) This is usually a changing field but in this case it has a fixed value and it must be 13 (hex) or 11001000 (binary).
- FCS** This is a changing field which depends on the frame content for error correction.
- MESSAGE** Changing field containing the message according to V.25bis command set.

The format of characters, included in “message” field, must use IA5 alphabet (ASCII) with 7 bit data and ODD parity.

Example

The modem has to call this number: 0331-263122; sequence will be the following:

7E FF 13B CRN0331<263122 FCS 7E

Note: for convenience, the content of message field is displayed in text and not in hexadecimal form as the remaining sequence (except the not specified FCS field).

SYNCHRONOUS V.25BIS COMMANDS

COMMAND FORMAT	DESCRIPTION
CRN CRNXX....XX	REQUEST FOR CALL WITH TELEPHONE NUMBER SUPPLIED BY DTE. It is sent from the DTE to start up the procedure. The command is always accompanied by the number to be dialed.
CRS CRSXX	REQUEST FOR CALL WITH A TELEPHONE NUMBER STORED IN THE DCE. It is the equivalent of the previous request with the difference that the number is already present in the DCE memory. The command is always accompanied by two figures to identify the memory area in which the number is located.

PRN PRN;YY..YY TELEPHONE NUMBER
PROGRAMMING. It is the command that sets the DCE into a programming state. It allows the user to put a maximum of 20 number with 20 figures each into the memory. Their position is determined by the first two figures of the parameter, separated by the number to be stored with the symbol “;”.

SYNCHRONOUS V.25BIS INDICATIONS

INDICAT.	FORMAT	DESCRIPTION
INV	INV	INVALID COMMAND. The DCE warns the DTE that is not able to perform the command it has received.
VAL	VAL	VALID COMMAND. The DCE informs the DTE that is able to acknowledge the programmed command it has received as valid.
INC	INC	INCOMING CALL. The DCE informs the DTE of the presence of an incoming call signal on line. This indication has priority over commands CRS and CTS.

LINE PROCEDURES

For everything concerning the exchange tones and related levels, consult the CCITT E180, E181, E182 recommendations, whereas you need to consult what is outlined in brochure 11.2 supplement N° 2 of the CCITT for the modulation of the tones.

For all the remaining questions concerning the line procedures, go back to what is outlined in the V.25 bis recommendation of CCITT.

Default configuration of the commands from AT to V.25bis

COMMAND	DESCRIPTION	V.25bis (default)
E ECHO	1 ECHOENABLED	P/M
F STANDARD	0 MULTISTANDARD	I
L ALARM	2 MEDIUMLOUDSPEAKER VOLUME	P
M LOUDSPEAKER	1 SPEAKER ON UNTIL CARRIER IS DETECTED	P
Q ANSWER	0 COMMAND ANSWER ENABLED	0F
V MESSAGES	1 MESSAGES IN EXTENDED FORM	1F
X MESS. EXT.	1 RESULT CODE ENABLED (CONNECTnnnn)	4F
Y BREAK	0 DISCONNECTION FOR BREAK DETECTION DISABLED	P
&C DCD DSR CONTROL	0 DCD & DSR ALWAYS ON	P
&D DTR CONTROL	0 DTR IGNORED	2F
&E ERROR CORRECTOR	0 MNP DISABLED	P
&I SPEED	1 CONSTANT SPEED ENABLE	0F
&M OPERATION	0 MODEM IN ASYNCHRONOUS MODE	0F
&R RTS CTS CONTROL	0 CTS FOLLOWS RTS	P
&S BUTTONS	1 BUTTONS ENABLED	0F

&U	FLOW CONTROL	5	FLOW CONTROL RTS/CTS AND XON/XOFF	P
&X	CLOCK	0	SUPPLIED BY THE MODEM	P
&Y	PORT POSITION	0	MAINPORT	0F
*D	C108.1 IN ASYNC.	0	DISABLED	0F
*E	DATA COMPRESS.	1	ENABLES - CLASS 5 MNP	P
*H	CTS IN ASYNC.	1	NORMAL CTS	1F
*I	DTE SPEED	0	BY AUTO-BAUD	P
*M	CCONF	0	DISABLED	0F
*T	ANSWERTONE	0	ANSWERTONE ENABLED	0F
*X	CLOCK CONTROL	0	SUPPLIED BY THE CONNECTION	P

F = Fixed (the value assumed in V.25bis is independent from and fixed by the value set in Hayes).

P = Passing (the setting set in Hayes is also maintained in V.25bis).

M = Can be modified by V.25bis (these parameters can be modified in V.25bis by appropriate commands).

I = Ignored by V.25bis.

Default configuration of S-Registers from AT to V.25bis

A complete list of the default registers of the modem together with their setting when V.25bis is enabled is given below.

REG. NUM.	RANGE	UNIT	DECIM. DEF.	DESCRIPTION	V.25bis (Default)
S0	0-255	RING	00	Rings awaited for connection	I
S1	0-255	RING	00	Detected rings counter	I
S2	0-127	ASCII	43	Escape character	I
S3	0-127	ASCII	13	Return	CR (F)
S4	0-127	ASCII	10	Line feed	LF (F)
S5	0-127	ASCII	08	Backspace	BS (F)
S6	2-255	SECONDS	02	Waiting time for dial tone	I
S7	1-255	SECONDS	30	Waiting time for carrier	I
S8	0-255	SECONDS	02	Pause time for “,”	I
S9	1-255	1/10 s.	06	Answer tone detection time	06 (F)
S10	1-255	1/10 s.	07	Disconnect time for lack of carrier	07 (F)
S12	20-255	1/50 s.	50	Watch time for Escape	I
S13-17				BIT MAPPED REGISTERS	
S25	0-255	SECONDS	05	DTR delay	5 (F)
S26	0-255	0.02 s.	00	RTS/CTS delay	0 (F)
S29-31-32-33				BIT MAPPED REGISTERS	
S48	0-127	ASCII	13	Fallback character	P
S49	0-127	ASCII	17	XON character	P
S50	0-127	ASCII	19	XOFF character	P

DIAGNOSTICS

INTRODUCTION

The modem is supplied with circuits for diagnostics in compliance with CCITT recommendations. They can be used to carry out a complete test of all the elements making up the network.

The command used to enable the loops from DTE is `&Tn`; the list below describes the function of this command and are only valid in HAYES mode.

&T0 = Remove the active loop.

&T1 = The analog loop is enabled (loop3).

&T6 = Sends a request for a remote digital loop (loop 2).

N.B: The loop functions are only active for connections without MNP or buffers.

Enabling Remote Loop 2

This loop can be enabled only with the modem in V.22 and V.22bis with RDL (Remote Digital Loop) enabled.

With the two modems connected to each other, key in the ESCAPE sequence and then “`AT&T6`” or else press the TEST push-button on the front of the modem.

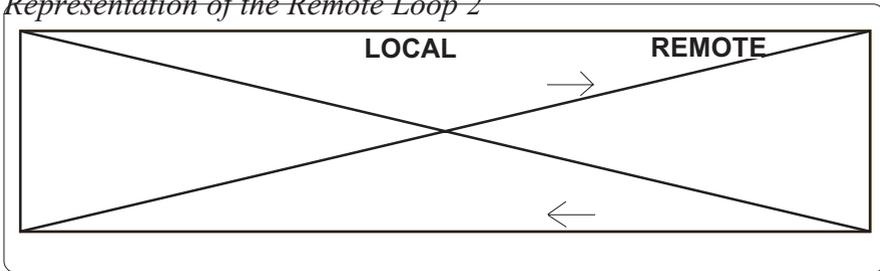
The data transmitted by the local DTE on the C103 are transmitted on line, at the other end of the remote modem it will retransmit the data, thus bringing them back to the local modem as C104.

The local modem, the telephone line and the line circuits of the modem will be checked in this way.

Disabling Remote Loop 2

To bring the test to an end, key in the ESCAPE sequence and then AT&T0; key in ATO to put it back on line with the remote modem or else press the TEST push-button on the front of the modem.

Representation of the Remote Loop 2



Enabling Loop 3

To enable Loop 3, the modem must be OFF LINE, then key in the command “AT&T1” or press the TEST push-button on the front of the modem, after a few seconds the modem will answer with the message:

CONNECT...

The loop complies with the CCITT specifications and as laid down it is only available in V.22 and V.22bis.

The interface circuits, the modulator and the demodulator and some of the line circuits are tested with this loop.

From the same terminal, used to send the commands, you can carry out a summary test on the operation of the modem, by

simply keying in the characters and making sure that the modem restores them correctly.

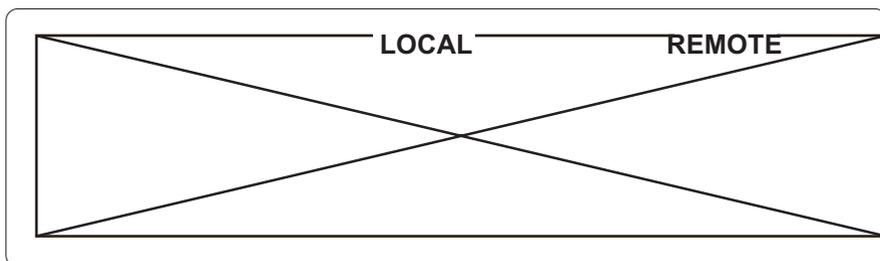
A more effective test can be carried out with an analysis instrument such as a data tester or a data analyzer.

Disabling Loop 3

To remove the loop, you need to key in the ESCAPE sequence and when the modem answers with “OK” key in: AT&T0 or press the TEST push button on the front panel of the modem.

N.B: The modems must be set OFF LINE

Representation of Local Loop 3



Resetting the Hardware

It is possible to reset the hardware of the modem, which allows you to automatically load the default configuration.

To reset the hardware, you need to switch the modem on, by keeping the DATA push-button pressed.

The kind of reset is equivalent to the command AT&F. Remember, however, that the numbers in the Black List will not be canceled.

USE OF THE S-REGISTERS

INTRODUCTION

The SNM 15 modem is equipped with some registers to store the value of the control characters on, timers and counters then used in operation.

The registers can be identified as internal (used by the modem) and

registers that can be modified by the operator.

Remember that the internal registers **MUST NOT** be modified by the user in case of any possible malfunctioning of the unit.

The command “S” allows you to write or read the values contained in these registers.

Sr=xx writes “xx” in register “r”.

Sr? reads the content of register “r”.

Remember that the values to be entered in the registers **MUST** be entered in a decimal form.

Content of the Main Registers

The list of the main registers and their meaning is given below. The registers used by the modem or those not necessary for the operator have been missed out.

S0 Auto answer feature

Enables and disables the auto-answer device.

S0=0 The auto-answer feature is disabled.

S0=n (where n>0) the auto-answer feature is enabled before
 carrying out the connection.

S1 Ring counter

Detecteds RING counter.

This register counts the number of rings that are detected by the
modem in period of 8 seconds.

S2 Escape character

Contains the character used to activate the ESCAPE sequence
(default value is +). By entering a new value, this will be used as
a ESCAPE character.

S3, S4, S5 Control characters

These registers contain the control characters used by the modem.
Respectively:

S3: [RETURN], in decimal 13

S4: [LINE FEED], in decimal 10

S5: [BACK SPACE], in decimal 8

S6 Waiting time for dialling tone

This register determines the time the modem needs to wait to detect the dialling tone supplied by the telephone exchange (if the detection

has been enabled by the command X).

If this time passes by without detecting the tone, the modem will display the message: “NO DIAL TONE”.

The value is entered in seconds.

S7 Waiting time for carrier

This determines the waiting time needed to detect the carrier supplied by the remote modem. If this time passes by without detecting the carrier, the modem will display the message “NO ANSWER”.

The value is entered in seconds.

S8 Pause for character “,”

This determines the pause time needed to detect the character “,” during the automatic calling stage. The value is entered in seconds.

S9 Answer Tone Duration Time for Detection

This register determines the minimum duration time of the answer tone to be recognized as such. if it is preset to zero, it will inhibit a 2100 Hz answer tone from being detected, thus giving you the option of a “blind phone-call” and thus also to perform connections with modems that do not comply with the CCITT V.25 (auto-answer) specification. **Caution:** for the “blind call” function; the

value of parameter **F** must compulsorily be different from 0 (zero). The value is determined in tenths of a second.

S10 Disconnection Time for Carrier Absence

This register determines the time interval between the loss of carrier and the disconnection of the modem. The value is in tenths of a second.

S12 Watch Time for Escape

This sets the watch time that comes before or after the ESCAPE character sequence. The value is expressed in fiftieths of a second.

S13, S14, S15, S16, S17

Internal registers.

25 Delay for the “DTR ON-OFF” Disconnection

This determines the delay between switching off the DTR and disconnecting the modem.

A typical example of the use of this register is given in paragraph 5.4. (connection in synchronous mode), where it is used to enable a call with an asynchronous DTE by the Command and then the synchronous emulator on the Main, without causing the modem to be disconnected. The value is expressed in seconds.

S26 RTS/CTS Delay

This sets the delay time for the operational transition of the CTS in relation to the RTS. The value is in hundredths of a second.

29, S30, S31, S32, S33

Internal registers.

S48 Fallback character

This register contains the decimal value of the fallback character used with error corrector applications. The default value is 13 which corresponds to the Carriage Return character.

S49, S50

These contain the characters used in flow control from the DTE with XON/OFF; if this is enabled (&U1, &U2) together with the options of **constant speed** (&I1), **DTE speed** and/or **error correction** (&F4).

A complete list of the default registers is given below:

Default configuration of the register

REG. N°.	RANGE	UNIT	DECIM. DEF.	DESCRIPTION
S0	0-255	RING	00	Rings awaited for connection
S1	0-255	RING	00	Detected rings counter
S2	0-127	ASCII	43	Escape character
S3	0-127	ASCII	13	Return
S4	0-127	ASCII	10	Line feed
S5	0-127	ASCII	08	Backspace
S6	2-255	SECONDS	02	Waiting time for dialing tone
S7	1-255	SECONDS	30	Waiting time for the carrier
S8	0-255	SECONDS	02	Pause time for characters
S9	1-255	1/10 s.	06	Answer tone detection time
S10	1-255	1/10 s.	07	Disconn. time for carrier absence
S12	20-255	1/50 s.	50	Watch time for Escape
S13-17				BIT MAPPED REGISTERS
S25	0-255	SECONDS	05	DTR delay
S26	0-255	0.02 s.	00	RTS/CTS delay
S29-31-32-33				BIT MAPPED REGISTERS
S48	0-127	ASCII	13	Fallback character
S49	0-127	ASCII	17	XON character for flow control
S50	0-127	ASCII	19	XOFF character for flow control

TYPICAL APPLICATIONS

INTRODUCTION

A few examples of how to use the modem are given in this section of the manual. The programs given are related to general applications and start from the default programming of the modem.

Please remember that the default programming can be loaded in two ways, either via command AT&F or by resetting the hardware of the modem (see paragraph 3.1.5).

ASYNCHRONOUS CONNECTION WITHOUT AUTO ANSWER FEATURE

The default programming allows you to make a phone call in compliance with the V.21, V.22 or V.22bis standards without needing to set any parameters of the modem with the exception of the command for selecting the telephone number. In fact the modem is able to automatically adapt itself to the speed both from the line and the interface side.

You only need to key in the number you wish to call preceded by the command ATDn (n=number to be called) to make an automatic call.

EXAMPLE: ATD363122 <CR> (<CR> = ENTER indicates the command has been sent, it is a key available on any keyboard).

CONNECTION IN V.22 AND MNP

The programming for the connection of the two modems, by enabling the error corrector, is given below.

Remember that the auto-answer function is by default disabled in the modem.

The programming commands are:

MODEM ORIGINATE

ATF4 (V.22 modulation)
AT&E4 (MNP enabled)
 (auto-answer enabled)
AT*E1 (MNP option 5 enabled)
AT&W (Stores the configuration)
ATDn.. (automatic call)

MODEM ANSWER

ATF4[1]
AT&E4
ATS0=2 [2]
AT*E1
AT&W

[1] This command is optional.

[2] The modem will be connected after detecting 3 telephone rings.

SYNCHRONOUS CONNECTION

For synchronous connection, you need to use various commands such as, DTR control, enabling synchronous operation etc...

In synchronous mode, phone calls can be made manually or via an asynchronous terminal connected to the MAIN PORT or COMMAND PORT.

Call from the Command Port

Should you only have one personal computer available and you wish to first enable the terminal emulation program and then the synchronous emulation, you need to use register S25 (delay to disconnect).

In this way, once the call (ATDn...) has been enabled on the COMMAND PORT and the connection has been completed, it is possible to go out of the terminal emulation program and enable the synchronous emulation (on the Main Port), without causing the modem to be disconnected due to absence of C108.

Obviously everything must be done within the time set on register S25 (usually 30 sec.), to stop the call from being hung up.

The parameters to be used are:

ATS25=30 (delay in detecting the DTR) [1] [2]

AT&M1 (modem in synchronous mode)

AT&Y1 (COMMAND PORT enabled) [1] [2]

AT&W (stores the configuration).

[1] From this moment onwards, the modem will answer the commands only on the COMMAND PORT, where the asynchronous terminal will have to be connected.

[2] These parameters are not to be set should the call be manually made, since only the Main Port is used.

Call from the Main Port

Repeat the operations described above, without sending the command to enable the COMMAND PORT.

Remember that the ESCAPE FUNCTION is no longer available with this configuration.

The commands will thus become:

ATS25=30

AT&M1

AT&W

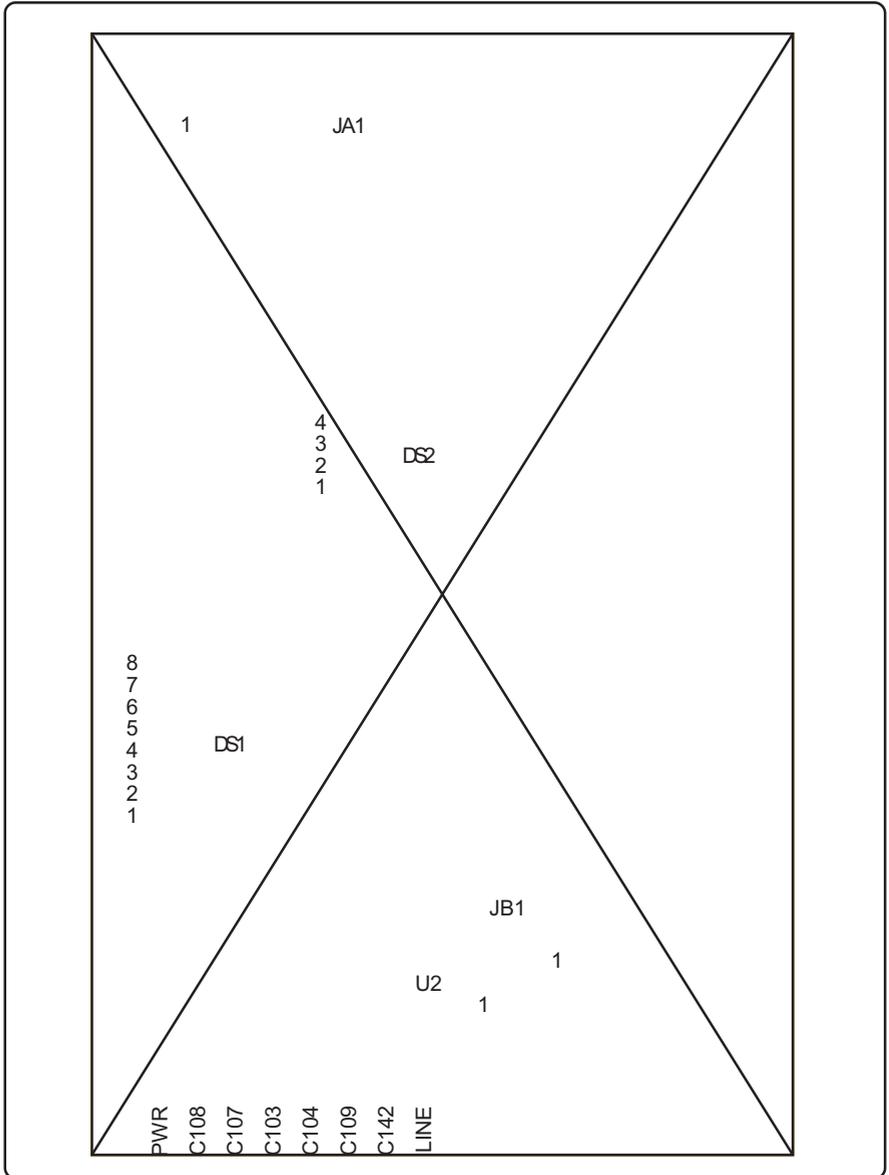
DIP-SWITCHES SETTING

A table summarizing the functions played by each single dip-switch is given below:

DS2	1	2	3	4	Level TX
	OFF	OFF	OFF	OFF	- 1 dBm
	ON	OFF	OFF	OFF	- 2 dBm
	OFF	ON	OFF	OFF	- 3 dBm
	ON	ON	OFF	OFF	- 4 dBm
	OFF	OFF	ON	OFF	- 5 dBm
	ON	OFF	ON	OFF	- 6 dBm
	OFF	ON	ON	OFF	- 7 dBm
	ON	ON	ON	OFF	- 8 dBm
	OFF	OFF	OFF	ON	- 9 dBm
	ON	OFF	OFF	ON	- 10 dBm
	OFF	ON	OFF	ON	- 11 dBm
	ON	ON	OFF	ON	- 12 dBm
	OFF	OFF	ON	ON	- 13 dBm
	ON	OFF	ON	ON	- 14 dBm
	OFF	ON	ON	ON	- 15 dBm
	ON	ON	ON	ON	- 16 dBm

Remember that the nominal transmission level with all the dip-switches switched OFF is equal to 0 dBm.

Dip-switch	Position	Description
DS1	1	Reserved for future use
DS1	2	Reserved for future use
DS1	3	Reserved for future use
DS1	4	Reserved for future use
DS1	5	Reserved for future use
DS1	6	Reserved for future use
DS1	7	OFF interface speed as autobaud ON interface speed 9600 bps
DS1	8	Reserved for future use



Topographical view of SNM 15

TERMINAL EMULATION PROGRAM

A program that allows you to obtain a terminal emulation, by using the Basic interpreter present in the DOS operating system, is given below. To enable it you only need to key in GWBASIC under DOS, for Olivetti systems, while in IBM systems you will need to key in BASIC or BASICA, depending on the system. If you need any further information, we suggest you consult the operating system manual.

To run the program you only need to key in RUN, and to quit <CTRL> <E>.

```

10  REM
20  REM
30  REM
40  REM
50  REM
70  REM
80  REM
90  REM
100 REM
110 ON ERROR GOTO 370
120 KEY OFF: CLS: LOCATE 1,1
130 DEFINT E: FINE=5
150 REM On line 240, set the following parameters:
160 REM (Refer to the numbers on line 230)
170 REM 1) Port to which the modem is connected E.g:
    COM1, COM2
180 REM 2) Transmission speed. E.g: 300, 1200, 2400, 4800,
    9600
190 REM 3) Character parity. E.g:  e (even), o (odd)
200 REM                               s(space),m(mark),n(none)

```

Simple terminal emulation
program for programming
the SNM 15 modem

To quit this program,
press <CTRL> <E>

```
210 REM 4) Character length. E.g: 7, 8 bits
220 REM 5) Number of stop bits. E.g: 1, 1.5, 2
230 REM 1      2 3 4 5
240 OPEN "com2:1200,e,7,1,rs,cs,ds,cd" AS #1
260 IF EOF(1) THEN 270 ELSE GOSUB 340
270 A$=INKEY$: IF A$="" THEN GOTO 260
280 IF ASC(A$)=FINE THEN CLOSE: SYSTEM
290 PRINT#1,$;
300 GOTO 260
340 REM I$=INPUT$(LOC(1),#1)
350 REM PRINT I$
360 REM RETURN
370 REM IF ERR=57 AND ERL=240 THEN RESUME NEXT
380 REM IF ERR=57 AND ERL=340 THEN RESUME NEXT
```