OEM-GSM-10
GSM COMPATIBLE
DUAL BAND
MODEM MODULE

DESIGN MANUAL

FEATURES

Part No	Auto Dial	Auto Answer on Ring	Dual Band	SMS Supported	5V Supply
OEM-GSM-10	✓	✓	✓	✓	✓

- Fully approved
- Data throughput up to 14400 bps
  - 2400 bps V.22bis / V.26 ter /V.110
  - 4800 bps V.32 / V.110
  - 9600 bps V.32 / V.110
  - 14400 bps V.32bis / V110 GPRS1
- HAYES AT-COMMAND compatible
  AT +++, A, B, D, E, &F, &G, &N, H, I, O, Q, Sn, ?, Sn=x, T, V, X, Z
- 3/5V Serial TTL Interface
- Built in SIM socket
- SMS support
- FAX support
- Maximum power consumption in active data mode of 2.5W RMS
- Standby power consumption of 150mW
- Dual band for use with all GSM networks using both 900Mhz and 1800Mhz
- SMS support allowing messages of up to 150 characters to be sent and received.
- Class 1 FAX support.
- Auto Answer on Ring Detect
- Small mechanical outline approx 60x157mm (Approx)
- Single +5v DC Power Supply
- Hayes compatible serial interface
- 0°C to 60°C operating Temperature Range

The OEM-GSM-10 is a fully GSM modem module for internally embedded applications. It provides a 3/5v CMOS compatible Serial Interface to the HOST Data Terminal Equipment (DTE). Call control is provided using the Hayes AT Command Set operating over the GSM cellular Network , the OEM-GSM-10 meets the modem standards for ETS 300 342-1, ETSI GSM 0707/05 At commands, Extended SMS GSM rec. 7.05 including PDU Mode, GSM 04.21 transparent data and GSM 04.22 non-transparent data. The OEM_GSM_MODEM also provides for SMS, FAX.

This product was specifically designed for use in embedded modem applications where space, performance and power consumption, ease of use and fast time to market are key requirements

Comtech House, 28 Manchester Road, Westhoughton, Bolton, Lancs, England BL5 3QJ
Tel: +44 1942 851800 Fax: +44 1942 851808 Email: sales@comtech.uk.com
Web: www.comtech.uk.com

OEM-GSM-10

EMBEDDED MODEM

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Issue 4.04

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1. Introduction

The OEM-GSM-10 is a fully approved GSM modem module for internally embedded modem applications.

Supported features are:

- V.22bis, V26ter, V32, V.110 and V.110 GPRS1 ITU Data Modes.
- GSM SMS.
- Extended AT Command Set.
- TTL/CMOS Compatible Serial Host Interface.
- Internal SIM card socket.
- Class 1 FAX.
- Dual band.
- Developed in partnership with a world leader in radio products.
- Simple RS232 interface 3 and 5 volt compatible.

2. Host Design Guidelines

2.1 Mounting The PCB

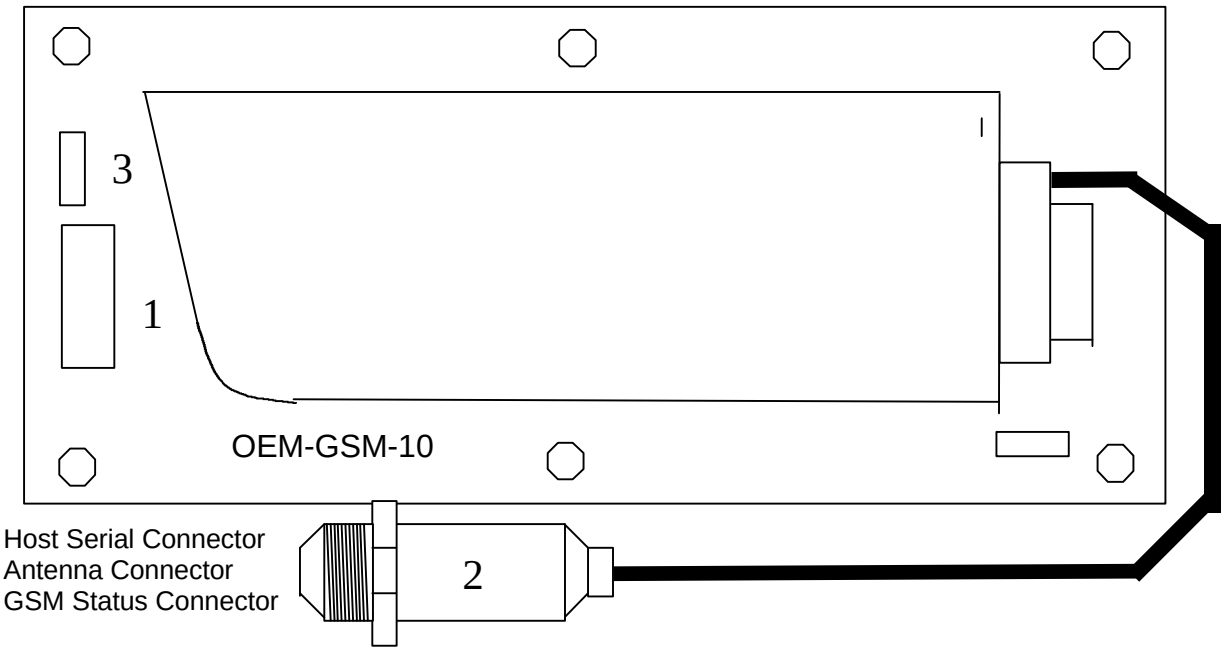
Care must be taken when designing the host equipment and mounting the OEM-GSM-10 to ensure that Regulatory Safety Approvals are NOT INVALIDATED.
Ensure that minimum CREEPAGE and CLEARANCE DISTANCES for HOST or other expansion modules and OEM-GSM-10 are maintained. Refer to the STATUTORY REQUIREMENTS section of this manual.
Ensure that the OEM-GSM-10 antenna socket is accessible with the HOST enclosure fitted and ensure that the antenna ground is NOT connected to the supply ground as this may result in damage to the unit. Antennas which are through panel/chassis mounting and have a electrical connection to the panel/chassis should not be used. Suitable antennas are available from Comtech Ltd.

2.2 Power Supply

All supply voltages are + 5 DC and must have ripple less than 0.1v peak to peak. If switching supply is used, the frequency may be between 20Khz and 150Khz. No component of the switching frequency should be present outside of the supply greater than 500 uV peak. The power supply must be able to supply a peak current of 2A. See section 13 for more details.

3. Installation

3.1 Connector Layout



1. Host Serial Connector
2. Antenna Connector
3. GSM Status Connector

3.2 Connecting To The Host

The 10-way Header Socket provides the serial interface to the host DTE. This is a 3 volt TTL compatible signal level interface. This interface also will accept inputs from 5 volt TTL levels. This connector also provides the power source connection. It should be noted that the CTS control is an open collector output.

3.3 Connection To The Antenna

The OEM-GSM-10 is terminated with a FME socket.

3.4 OEM-GSM-10 Installation Procedure

- Remove power from Host Unit.
- Insert data SIM Card into OEM-GSM-10.
- Open Host enclosure exposing modem mounting site.
- Align the OEM-GSM-10 module with host mounting plugs.
- Press module firmly onto the host mounting plugs, ensuring that the antenna connector is available.
- Connect modem to host DTE using ribbon cable plugged into the 10-pin header.
- Connect the antenna to the modem.
- Close the host enclosure.

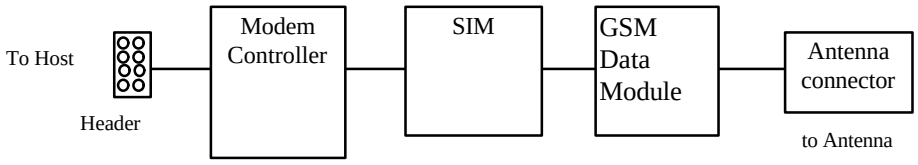
4. Modem Operation

4.1 Introduction

The OEM-GSM-10 is equipped with its own microprocessor and can interpret commands from the Host DTE. The on-board firmware is compatible as far as possible with the AT Commands developed and used by Hayes Microcomputer Products Inc of America as well as the ETSI GSM AT command extensions. A detailed list of supported commands is shown in section 6.

Commands are passed to the modem via the host serial interface in the same manner as data. The OEM-GSM-10 is able to distinguish between data and commands by the use of a special escape sequence, which switches to local mode. After having received a valid escape sequence (and also on power-up), the modem will accept commands of the appropriate form from the HOST DTE. Once a command has been accepted and executed the modem may either go into its on-line state or wait for further commands.

Functional Schematic



This modem contains three basic modules:

4.2 GSM Data Module

This part of the modem converts information between the GSM radio network and the digital format used inside the modem.

The typical operations performed by a data module:

- Modulation and demodulation.
- Filtering.
- Adaptive equalisation.
- Automatic retraining.
- Encryption and decryption.
- Clock and data extraction.

4.3 SIM

The SIM contains all of the information required to allow the unit to connect to the subscribers network. It is also used to store telephone numbers and messages. Only SIM's suitable for data transmission may be used. Contact you airtime provider for further details.

4.4 Modem Controller

This part controls the modem's operation. The operations performed by the Modem Controller include:

- Processing AT commands from the terminal.
- Controlling the operation of the data pump, including dialling and answering the telephone.
- Modem diagnostics and testing.

After completion of the power up diagnostics, the firmware waits for an AT command from the terminal connected to the modem. This operates at a data rate of 19200 bps with 8 bit characters, no parity and 1 stop bit.

4.5 Conventions

Bit Numbering and S-register Values
In this manual, the least significant bit in a byte is number 0, the most significant bit in a byte is number 7. When a description involves multiple bits, the bit on the left is the most significant and the bit on the right is the least significant.

Lists of possible values for each of an S-register's functions are shown in decimal (base 10).

To determine which function values are selected when an S-register performs more than one function, convert the S-register's value to binary (base 2), and then determine what function values are selected according to which bits are set.

4.6 RS-232 Signal Values

Supported control signals RTS, CTS, DTR, DCD and RI are referred to as being SET or CLEAR in this manual. These signals are active low at TTL levels,(SET). This table shows the voltages for the SET and CLEAR values of these TTL signals.

The RS232 levels are the inverse of the above, +12 being SET and –12 being CLEAR.
(Voltage levels for RS232 vary considerably and the values given are only approximate.)

Status	TTL	RS232
SET	0 Volts	+12 Volts
CLEAR	+3 Volts	-12 Volts

4.7 Modem States Of Operation

The Modem Controller firmware has several different states of operation.

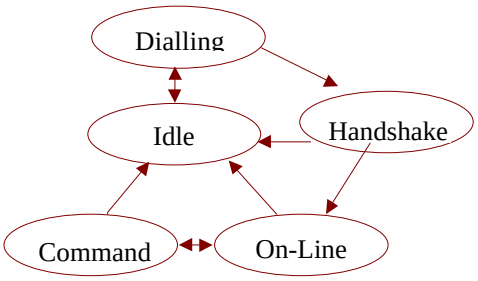


Figure 1: Modem State Diagram

Idle

When the modem is in the Idle state it is not communicating with another modem. The modem accepts AT commands from the terminal while idle.

Dialling

When the modem dials it performs the same actions as a person does when dialling with a telephone. The modem does not accept AT commands or data from the terminal while dialling.

Handshake

When the modem handshakes it communicates with another modem via the GSM network to determine the data rate the two modems should use to communicate. Handshaking takes place at the beginning of each telephone call between two modems. The modem does not accept AT commands or data from the terminal while Handshaking. The initial handshake confirms to V.25 ITU Standard. Subsequent handshake is specific to the modulation scheme.

On-Line

Upon successfully completing Handshaking, the modem enters the On-Line state. When a modem is in the On-Line state, data from its terminal is sent over the telephone line to the other modem. Data received from the other modem is sent to the terminal.

Command

If the terminal sends a special ‘escape sequence’ to a modem in the On-Line state, the modem enters the Command state. During Command state the modem maintains the telephone call with the other modem but does not pass data between the terminal and the other modem. Instead, data received from the terminal is treated as AT commands in the same way as if the modem was in the idle state. The modem can be returned to the On-Line state by the O command. Data received from the other modem while a modem is in Command state is buffered until it can be delivered to the terminal when the modem returns to the On-Line state.

5. How AT Commands Work

5.1 The Command Line

Command lines are sent to the modem from the host when the modem is in the Idle or Command state. The modem does not execute any of the commands in a command line until after the command line is ended by the end of line character, <CR>. The only exception is the A/ command which is implemented immediately.

A command line is a string of characters starting with the A and T characters and ending with a special end of line character, <CR>. Characters typed before AT are ignored. Command lines contain up to 40 characters after the AT, not counting spaces. The modem does not execute any of the command line that is too long.

The exception is the A/ command (repeat last command) which is not preceded with AT or terminated with <CR>.

To echo command line characters use the ATE1 command.

Typing mistakes can be corrected using a special Backspace character, <BS>, after the initial A and T characters have been entered.

Command lines may contain several commands one after another. The Answer (A), Dial (D), Go On-Line (O) and SLEEP (Z) commands usually cause any following commands in the command line to be ignored.

5.2 Command Line Execution

The characters in a command line are executed one at a time. Any unexpected characters except control characters, stop command line execution and return an ERROR result code. Unexpected characters include numbers outside the range of values accepted by the command. All control characters in a command line except the special characters such as <CR> and <BS> are ignored.

The numerical argument of a command is assumed to be 0 if it was not provided. For example, the commands ATH<CR> and ATH0<CR> both hang up the telephone.

When the modem has executed a command line the result code of the last command executed is returned to the terminal. These are often OK or ERROR.

If the value to be written to a modem S-register is outside the maximum range of values accepted by the S-register then it will be set to it's maximum permissible value.

Leading zeros in numeric arguments, including S-register numbers, are ignored. For example, ATS1=2 and ATS01=2 both set S-register S1 to 2.

All numeric arguments, including S-register numbers, are decimal (base 10).

5.3 AT Command Prefix

The modem command line begins with the letters A and T. The modem doesn't support autobauding so will not communicate with the HOST if an incompatible TE data rate is used.

5.4 <CR> End of Line Character

This character is typed to end a command line. The default is ASCII 13, the carriage return character. When the <CR> character is entered, the modem executes the commands in the command line.

5.5 <BS> BackSpace Character

This character is typed to erase the last character in a command line. The default is ASCII 8, the backspace character.

5.6 Result Codes

A result code is a short line of text or a number the modem sends to the terminal to indicate the result of a command's execution, e.g. 'Connect' means that the modem is in the On-line state.

5.7 Escaping From ON-LINE To COMMAND STATE (+++)

Sometimes you need to issue AT commands to a modem when it is exchanging data with another modem (i.e. when the modem is in the On-Line state). To do this you switch the modem from the On-Line state to the Command state so the modem will accept AT commands from the host while maintaining the telephone line connection with the other modem.

When you finish issuing AT commands you can either use the Return On-Line command (ATO <CR>), to return to the On-Line state continue exchanging data with the other modem or you can use the hang up command (ATH <CR>) to hang up the telephone line and return the modem to the Idle state.

This modem design will switch from the On-Line state to the Command state when the modem receives the Time Independent Escape Sequence (+++) from the terminal.

5.8 Escape Sequences

An Escape Sequence is one or more particular characters or line breaks sent from the terminal to the modem during the on-line state. The Escape Sequence characters and line commands are typically sent to the other modem as data.

A good Escape Sequence does not occur naturally during an exchange of data between two modems. Unfortunately, it is impossible to guarantee any escape sequence will never occur naturally since there are *no restrictions* on the data or timing between characters sent between two modems during the On-Line state.

The only method of switching from the On-Line to the Command state that does not ever occur naturally during the exchange of data is the Data Terminal Ready Signal (the AT&D1 command). The terminal has complete control of this signal and is not part of the data exchanged between the modems.

The Hayes Escape Sequence was adopted by many modem manufacturers and communications programs *before* Hayes was granted a patent for the escape sequence guard times. Now the un-patented Time Independent Escape Sequence (TIES) has gained popularity with many modem manufacturers.

5.9 The TIES Escape Sequence

TIES stands for the Time Independent Escape Sequence. This was developed by a number of modem manufacturers in response to Hayes enforcing patent rights for their escape sequence guard time patent.

The Time Independent Escape Sequence is a sequence of 3 escape characters. Once these characters have been recognised the modem enters the Command state without sending a confirming result code to the terminal and the modem starts a prompt delay timer. Then:

- If one of the recognised AT commands is received before the timer expires the timer is stopped, the command is executed and its result code is sent to the host.
- If any other data is received while the timer is running, the timer is stopped, the modem returns to the On-Line state, and the received data is sent to the other modem.
- If the timer expires a confirming result code is sent to the host, indicating the modem is in the Command state.

5.10 Carrier Detection

After Handshaking, the modem determines if a telephone line connection exists by detecting the carrier signal from the other modem. If the carrier is not detected for a long enough period of time the modem assumes the telephone line connection with the other modem has been broken. The modem uses S-register S10 to determine how long a carrier may not be detected before the telephone line is hung up. The time specified in S10 is in 100ms units.

6.0 AT Command Set

Command lines are sent to the modem from the terminal when the modem is in the Idle or Command state. The modem does not execute any of the commands in a command line until after the command line is ended by the end of line character. The following table is a list of the user AT commands supported.

6.1 AT Commands

A summary of the commands implemented by the GSM modem is shown in Table 1. Commands may be executed when the modem is in COMMAND mode. COMMAND mode is entered upon by one of the following conditions:

- After power-up.
- At the termination of a connection.
- After the execution of a command other than dial or answer commands (ATO or AT&T).
- Upon the receipt of the ESCAPE SEQUENCE (three consecutive '+' characters) while on-line mode.

6.1.1 Table 1. AT Command Set Summary

Command	Description	Page
A/	Repeat the last command	17
A	Answer command	18
D	Dial command	18
DL	Redial the last telephone number	18
E	Echo command	19
H	Hang up call	18
I	Request ID information	23
O	Return on-line to data mode	19
Q	Result code control	19
Sx	S Register commands	31
V	Result code format	19
X	Result code and call progress monitoring	19
Z	Reset	23
&C	Data carrier detect options	19
&D	Data terminal ready options	20
&Fx	Restore default configuration	23
&V	Display current configuration	23
&W	Save current configuration	23
+CBST	Select bearer type service	24
+CEER	Display why last call was disconnected	24
+CMGD	Delete SMS messages	28
+CMGF	Message SMS format	25
+CMGR	Reads received SMS message	28
+CMGS	Send SMS messages	28
+CNMI	SMS indication to terminal equipment	27
+CSCA	Service centre address	25
+CSDH	Show test parameters	26
+CSMP	Set text mode parameters	26
+CSQ	Request network signal and error status	25
+DR	Data compression report	22
+DS	Data compression mode	22
+FCLASS	Select, read or test service class	29

6.1.2 Table 1. AT Command Set Summary (continued)

+FMM	Report module ID	29
+FMR	Report revision	29
+FRM	Receive data with carrier	30

+FTM	Transmit data with carrier	29
+GMM	Request model ID	23
+GMR	Request revision ID	23
+GSN	Request serial number	23
+ICF	Character framing	21
+IFC	Local flow control	20
+ILRR	Display local report rate	21
+IPR	Set terminal equipment data rate	20

6.1.3 Table 2. The S-Register Summary

Register	Default	Description
S0	0	Automatic answer ring number
S1	0	Ring counter
S2	43	Escape character
S3	13	Command line termination character
S4	10	Line feed character
S5	8	Backspace character
S6	2	Pause before blind dialling
S7	60	Wait time for carrier
S8	2	Wait time before dialling
S10	15	Wait time before disconnection
S12	10	Escape code guard time

6.2 Modem Result Codes

A result code is short line of text or a number the modem sends to the terminal to indicate the result of a command execution. Some CONNECT result codes indicate the telephone line data rate and whether or not error control is in use. Either of the modems may be communicating with its terminal at a different data rate. The following table provides a list of the available result codes.

6.2.1 Table 3. Result Code Summary

Result Code	Numeric	Description
OK	0	Command executed
CONNECT	1	Modem connected to line
RING	2	A ring signal has been detected
NO CARRIER	3	Modem lost carrier signal, or does not detect carrier signal, or does not detect answer tone
ERROR	4	Invalid command
CONNECT	5	Connection at <value> bits/s
NO DIALTONE	6	No dial tone detected
BUSY	7	Busy signal detected
NO ANSWER	8	No quiet answer

6.2.2 Table 4. CME ERROR<n> code summary

<n>	Description
0	Phone failure
3	Operation not allowed
4	Operation not supported

10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
16	Incorrect password
26	Dial string too long
30	No network service

6.2.3 Table 5. CMS ERROR<n>

<n>	**Description**
0-127	GSM 04.11 values
128-255	GSM 03.04 values
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text modem parameter
310	SIM not inserted
311	SIM PIN necessary
312	PH-SIM PIN necessary
313	SIM failure
314	SIM busy
315	SIM wrong
320	Memory failure
321	Invalid memory test
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
500	Unknown error

6.3 AT Commands Reference

AT commands are issued to the modem to control the modem's operation and software configuration. AT commands can only be entered while the modem is in command mode. The format for entering AT commands from a terminal emulator is:

TYPE: ATX*n*

Where X is the AT command, and *n* is the specific value for that command.

PRESS: Enter <CR>

Any command issued is acknowledged with a response in either text or numeric values known as result codes. Table 3 lists all the valid result codes. If the "n" parameter is omitted the default command will be executed.

Example hayes command:

ATD 0123456789

OK

In the following listing, all commands and command-values accepted by the modem are shown; any entries other than those shown cause the ERROR result code.

+++ Escape Sequence
The escape sequence allows the modem to exit data mode and enter on-line command mode. While in on-line command mode, you may communicate directly to your modem using AT commands. Once you are finished, you may return to data mode using the ATO command.

A pause, the length which is set by the escape guard time (S12), must be used after an escape sequence is issued. This pause prevents the modem from interpreting the escape sequence as data.

6.4 OEM-GSM-10 AT Generic Commands

A/ Re-execute last command

The A/ command lets you re-execute the last command entry. This command is not preceded by AT, and does not have to end with <CR>.
e.g.
Enter: ATD 12345678<CR>
Response: BUSY
Enter: A/
Response: ATD12345678 (Re-executes the ATD command)

ATD Dial a telephone number

This command will dial the number entered after the ATD command.
e.g.
Enter: ATD 12345678<CR>

The modem Dials the telephone number 12345678.

Response: Connect 14400 (Selected speed)

As soon as the modem detects the carrier from the GSM base station, it returns the CONNECT result code. Data transmission can now begin.
The following characters are valid in a dial string. The digits from “0” to “9”, and “+” for making international calls. The “+” must be at the beginning of the phone number.

ATDL Redial last telephone number

This command will dial the last number that the modem has dialled.
e.g.
Enter: ATDL<CR>

ATA Manual answer an incoming call

The modem does not automatically answer an incoming call (Default setting). The ATA command causes the modem to go off-hook when the modem rings.

e.g.
Enter: ATA
Response: The modem will answer the incoming call

ATS0=n Auto-answer mode

The ATS0=n command allows you to select the number of times that the modem shall ring before answering the call.

ATS0=0 No auto-answer, incoming calls are ignored. (Default value).
ATS0=1 The modem will answer the incoming call after the first ringing signal.
… etc.
ATS0=5 The modem will answer the incoming call after the fifth ringing signal.
The ATA command can still be used regardless of the value of the ATS0=n setting.
e.g.
Enter: ATA
Response: The modem will answer the incoming call.
The S0 register can be read out by the ATS0? Command. The modem will then display the current value.

ATH Hang up call

This command is used for asynchronous transmission only. If the user returns from data mode to command mode after sending an escape sequence (+++) or after disabling the DTR signal with AT&D1 option, the modem can be forced to disconnect by sending the ATH command.

ATO Return to transparent mode

If you wish to interrupt the data flow only briefly, you can use the ATO command to return your modem to trans-parent mode, i.e. the data flows once again.

ATE Local echo

This command is used to enable and disable echo.

ATE0 Disable echo.
ATE1 Enable echo.

ATQ Result code suppression

This command is used to enable and disable the result code.

ATQ0 Enable result code.
ATQ1 Disable result code.

ATV Result code format

This command is used to select short or long result codes.

ATV0 Short result codes.
ATV1 Long result codes.

ATX Defines CONNECT result code format

This command is used to define the result code for CONNECT.

ATX0 The modem returns only the CONNECT code as soon as a satisfactory connection has been set up.
ATX1 The modem returns only the CONNECT<SPEED> code as soon as a satisfactory connection has been set up.

AT&C Data Carrier Detect options

This command affects the DCD line connected to the serial port.

AT&C0 The GSM module places the DCD control line SET regardless of the data carrier status of the distant station.
AT&C1 DCD specifies the data carrier status of the distant station. DCD on indicates that a connection
exists.

AT&D Data Terminal Ready options

AT&D1 The modem changes to command mode when the DTR line switches from CLEAR to SET.

AT&D2 The modem sets a connection to the remote station, switches to command mode and deactivates auto answer when the DTR line switches from CLEAR to SET.

Auto answer can be re-activated by resetting DTR to SET.

Note:- All commands to the modem will be ignored while DTR is CLEAR.

6.5 GSM Modem Configuration AT+ Commands

AT+IPR Set terminal equipment data rate

This command is used to set the data rate between the modem and the interfacing equipment.
AT+IPR=<speed>

Speeds supported
300, 600, 1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600

AT+IPR? Displays the current data rate.
AT+IPR=? Displays the supported data rates.

AT+IFC Local flow control

This command is used to control the operation of local flow control between the modem and equipment interfacing the modem.

AT+IFC=<DCE_DTE>, <DTE_DCE>

AT+IFC? Displays the current values
AT+IFC=? Displays the supported values.

DCE_DTE Description
- 0 None
- 1 Xon/Xoff local
- 2 RTS
- 3 Xon/Xoff global

DTE_DCE Description
- 0 None
- 1 Xon/Xoff
- 2 CTS

AT+ICF Character framing

This command is used to determine the start-stop (asynchronous) character framing that the modem shall use.

AT+ICF=<format>, <parity>
AT+ICF=? Displays the supported values.
AT+ICF? Displays the selected values.

Format Description
- 1 8 Data, 2 Stop
- 2 8 Data, 1 Parity, 2 Stop

3 8 Data, 1 Stop
4 7 Data, 2 Stop
5 7 Data, 1 Parity, 1 Stop
6 7 Data, 1 Stop

Parity Description
0 Odd
1 Even
2 Mark
3 Space

AT+ILRR Display local port rate

This parameter setting determines whether or not an intermediate result code of local rate is reported at connection set-up. The rate is applied after the final result code is transmitted to from the modem.

AT+ILRR=0 Disables reporting of local port rate.

AT+ILRR=1 Enables reporting of local port rate.

AT+ILRR? Displays the current selected value.

6.6 AT Data compressions commands

AT+DS V.24bis Data Compression Control

The command is used to determine the possible data compression mode between the modem and the compression negotiation with the remote modem after call set-up.

AT+DS=<p0>, <n>, <p1>, <p2>

<p0>
0 None
1 Transmit only
2 Receive only

3 Both directions, but allow negotiation

<n>

0 Allow negotiation of p0 down

1 Don't allow negotiation of p0, disconnect if difference

<p1>

512-1024 Dictionary size

<p2>

6-64 Maximum string

AT+DS? Displays the current values.
AT+DS=? Displays the supported values

AT+DR V.42bis Data Compression Reporting Control

This command is used to determine whether or not the intermediate result code of the current data compression is reported after a connection set-up.

AT+DR=0 Disable reporting
AT+DR=1 Enable reporting
AT+DR? Displays the current value
AT+DR=? Displays the supported values.

+DR<type>

NONE Data compression is not used
V42B Rec. V42bis for both directions
B42BRD Rec. V42bis for receive direction only
B42BTD Rec. V42bis for transmit direction only

6.7 GSM AT commands (GSM 07.07)

ATZ Load user profile

This command will load a user-defined profile.

AT&Fx Restore default configuration

This will force the modem to load default configuration x, where x is as follows.

0 Restore default configuration 0, but maintains current communications speed.
1 Restore default configuration 1, sets modem to hardware flow control.
2 Restore default configuration 2, sets modem to software flow control.
3 Restore default configuration 3, as 0 but resets communication speed to default (19200).

AT&W Save current configuration

This command will allow you to save the current configuration.
The saved configuration will be loaded on power up and ATZ events.

AT&V Display current configuration

The modem will display the current configuration.

ATI Identification

Provides model information, product identification and software revision.

AT+GMM Request model ID

This command provides you with the module model number.

AT+GMR Request software revision ID

This command provides you with the software version of the module and the software creation date.

AT+GSN Request serial number

This command provides the unique serial number of the OEM-GSM-10.

AT+CBSTs,m,p Select bearer service type

Selects the bearer service to be used when data calls are originated.

Note:- This functions sets the modem data transfer rate and not the serial interface.

S = Speed
M = Mode
P = Protocol

Speed
0 Not supported
1 300 bps / V.21
2 1200 bps / V.22

3	1200/75 bps / V.23
4	2400 bps / V.22 bis
5	2400 bps / V.26 ter
6	4800 bps / V.32
7	9600 bps / V.32
65	300 bps / V.110
66	300 bps / V.110
68	2400 bps / V.110
70	4800 bps / V.110
71	9600 bps / V.100

Mode

0	Asynchronous

Protocol

0	Transparent
1	Non-Transparent

By sending AT+CBST? to the modem, the modem will then display the selected speed, mode and protocol.
By sending AT+CBST= ? to the modem, the modem will then display a list of supported speed, mode and protocol.

Default settings

9600,Asynchronous,Non Transparent

AT+CEER Displays why last call was disconnected

These command lets you query the reason why last call was disconnected.

AT+CSQ Display signal strength

This command is used for reading out the signal strength.
AT+CSQ=? The modem will display a list of supported values.
+CSQ <rssi>, <ber>

AT+CSQ The modem will display the signal strength.
+CSQ <rssi>, <ber>

<rssi> Receive level with 0 = -113 dBm or less and 31 = -53dBm or greater. 99 indicates unknown dBm.

<ber> Received bit error rate. (See GSM 05.08, section 8.2.4). 99 indicates unknown bit error rate.

The CSQ value varies for the 900 and 1,800 Mhz bands Listed are typical values for <rssi>.
These vales are only a guide only and may vary. At present Cellnet and Vodafone are 900Mhz with Orange and One2One being 1,800Mhz.

	900Mhz	1,800Mhz
Insufficient Signal	0 - 5	0 - 8
Marginal Signal	5 - 8	8 - 10
Adequate signal	9 - 30	11 - 30

6.8 SMS AT commands (GSM 07.05)

AT+CMGF Message format

This command allows you to define the input and output format of the SMS.

AT+CMGF=1 Set to text mode, every commands and responses are in ASCII characters.
AT+CMGF=0 Set to PDU mode, the complete SMS message including all header information is passed as a binary string.
AT+CMGF=? Displays all supported values

Note:- For SMS operation AT+CMGF must be set to 1, ASCII mode.

AT+CSCA Service centre address

This command must be used to indicate to which service centre the message has to be sent. The modem has no default value for this address. If a SMS is sent without having indicated the service address, an error will be generated.

AT+CSCA=”<sca>”

<sca> GSM04.11 RP SC address address-values field string format.

AT+CSCA? Displays the current value.

AT+CSMP Set text mode parameters

This command is used to select additional values, when a SMS is send to the network, or placed in a storage, when text format.

AT+CSMP=<fo>,<vp>

AT+CSMP=? The modem will display a list of supported values.

+CSMP <fo>, <vp>

<fo> The first octet of SMS-SUBMIT of GSM 03.40
<vp> Validity period of the message in integer format.

AT+CSDH Show text mode parameters

This command is used to determine if a detailed header information is shown in text mode result codes.

AT+CSDH=0 Disable header information

AT+CSDH=1 Enable header information

AT+CSDH=? Displays the supported values

AT+CSDH? Displays the current values

AT+CNMI New message indication to terminal equipment

This command allows you to determine how the modem shall notify the user when a SMS message is received from the network operator.

AT+CNMI=<mode>, <mt>, <bm>, <ds>, <bfr> Set message indication mode.

AT+CNMI? Display current values

AT+CNMI=? Display list of supported values

AT+CNMI <mode>, <mt>, <bm>, <ds>, <bfr>

<mode>

0 Buffer unsolicited result code modem. If buffer is full, the oldest indications may be discarded and replaced with the new received indication.

1 Discard indication and reject new received messages unsolicited result codes when serial port is in use. Otherwise forward them directly to the user.

2 Buffer unsolicited result codes in the modem when the serial link is in use, and

deliver them when serial link is unused.

3 Forward unsolicited result codes directly to the user. Serial link specific inband used to embed result codes an data when modem is in on-line mode.

<mt>

0 Disable SMS-deliver indication.

1 If SMS-deliver is stored in modem, indication of memory location routed to the user using +CMTI<men>,<index> indication that new message has been received.

2 SMS delivery are routed directly to the user.

3 Class 3 SMS delivery are routed directly to the user.

<bm>

0 No CBM, Cell Broadcast Message, is routed to the user.

1 If CBM, Cell Broadcast Message, is stored in modem, indication of memory location is routed to the user using the +CBMI <mem>, <index>.

<ds>

0 SMS status disabled.

1 SMS status report enabled.

<bfr>

0 The result codes buffered in the modem are send to the user when mode 1…3 is entered.

1 The result code is cleared when mode 1…3 is entered.

AT+CMGR Read message

This command is used to read SMS messages.

AT+CMGR=<index>

<index> Location in memory.

Note:- The index is allocated by the OEM-GSM-10 and is not the location specified by the user. The index number is indicated upon receipt of each SMS.

Example

AT+CMGR=3

Comtech demo text.

AT+CMGS Send messages

This command is used to send SMS messages.

AT+CMGS=”Recipient number”<CR><text to be send to a maximum of 150 characters>ctrl/z

PDU mode:- Not supported, set AT+CMGF to 1, ASCII mode.
Recipient must be a number supporting SMS which at present is mainly mobile numbers.

Esc in place of ctrl/z quits without sending.

Example

AT+CMGS=”077991234567”<CR>

> This is the text which will be sent in the SMS message any characters greater than 150 will be discarded and not sent<ctrl/z>.

AT+CMGD Delete messages

This command is used to delete received or stored SMS messages.

AT+CMGD=<index>

Delete SMS entry corresponding to <index>
<index> Location in memory

Note:- The index is allocated by the OEM-GSM-10 and is not the location specified by the user. The index number is indicated upon receipt of each SMS.

6.9 AT Facsimile Class 1 commands

AT+FCLASS Select, read or test service class

This command is used to toggle between fax and data commands. AT+FCLASS=0 Set to data mode

AT+FCLASS=1 Set to fax mode

AT+FCLASS=? Displays the supported values

AT+FCLASS? Displays the current values

AT+FMM Report module ID

This command provides you with the model type of the module.
Result as per AT+GMM.

AT+FMR Report revision

This command provides you with the version of the module and the software creation date.
Result as per AT+GMR.

AT+FTM Transmit data with carrier

Transmit Data.

+FTM=n causes the modem to transmit data using the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

AT+FTM=<mod>

<mod>
24 v.27 ter 2400 bps
48 v.27 ter 4800 bps
72 v.29 7200 bps
96 v.29 9600 bps

AT+FTM=? Display supported values

AT+FRM Receive data with carrier

Receive Data.

+FRM=<mod> causes the modem to enter the receiver mode using the modulation defined below. An ERROR response code results if this command is issued while the modem is on-hook.

AT+FRM=<mod>

<mod>
24 v.27 ter 2400 bps
48 v.27 ter 4800 bps
72 v.29 7200 bps96 v.29 9600 bps

AT+FRM=? Display supported values

7.0 S-Register Reference

7.1 S-Registers Definitions

S-registers generally affect how the AT commands perform. Contents of the registers can be displayed or modified when the modem is in command mode.

To display the value of an S-register:

From a terminal emulator:

TYPE ATS*n*?<CR> where *n* is the register number.

To modify the value of an S-register:
TYPE ATS*n* = *r* <*CR*> where *n* is the register number, and *r* is the new register value.

This manual process can be replaced by an automated system sending the characters to the serial port.

Register	Function	Default value
S0	Rings to auto-answer	0
S1	Ring Counter	0
S2	Escape character	43
S3	CR character termination character	13
S4	LF character	10
S5	Backspace character	8
S6	Pause before blind dialling	2
S7	Wait time for carrier	60
S8	Number of seconds wait for comma in dialling string.	2
S10	Wait time before disconnection	15
S12	Escape code guard time	10

S0 Rings to auto-answer

Defines the number of rings before auto-answering an incoming call. Setting the S0 register to zero will disable auto answering.

S1 Ring counter

Contains the number of rings the modem has detected. This register is cleared when no rings occur for 8 sec, or when the value becomes equal to S0.

S2 Escape Character

S2 contains the decimal value of the ASCII character used as the escape character. The default value corresponds to an ASCII.

<+>. The value 127 disables the escape process.

S3 CR character

Sets the command line and result code terminator character. Affects asynchronous operation only.

S4 LF character

Sets the character recognised as a line feed. Affects asynchronous operation only.

S5 Backspace Character

Sets the character recognised as backspace. Affects asynchronous operation only.

S6 Pause before blind dialling

The value of this register is ignored on GSM systems.

S7 Wait time for carrier

After dialling, this register sets the time the modem must wait before hanging up if fails to detect the remote carrier. Time is in seconds.

S8 Wait time before dialling

Sets number of seconds to wait when comma dial modifier encountered in dial string.

S10 Wait time before disconnection

Sets number of tenths of seconds to wait before disconnecting after the modem has indicated the absence of received line signal.

S12 Escape code guard time

Defines the maxim silence time, in fiftieths of a second, accepted between two characters in an escape sequence.

8.0 Serial and Control Interface

8.1 Power and Reset and Watchdog

+5 Volts This input provides positive supply to the OEM-GSM-10. The power supply connected to this pin must be meet the criteria as stated in this manual.

0 Volts This input provides the supply return (0 Volts). All measurements with regards to supply voltages should be made reference to this pin.

A 0 volts connection is also available on one mounting hole of the PCB . This is to allow 0 volts to be connected direct to the host chassis WHERE REQUIRED. Depending upon power and ground configuration of the host equipment connection of this point may cause poor performance or damage to the OEM-GSM-10. If in doubt electrically isolate this mounting point.

Reset This input allows remote disconnection of the OEM-GSM-10 power. Under normal conditions this pin is either left floating of held at +5 volts. If this input is taken to 0 volts the power is removed from the OEM-GSM-10. If a RESET is performed this input must be held at 0 volts form at least 1 second.

A secondary function of this pin is to allow the OEM-GSM-10 to be maintained powered down, therefore take less standby current. It should be noted that no incoming call will be received while powered down and once powered up it may take up to about 20 seconds before a network connection is available.

Watchdog This output provides a watchdog pulse. The pulse is 3 volt TTL levels and of the following characteristics.

Idle 0 Volts, Active 3 volts duration 8 milliseconds at intervals of approximately 3 to 20 seconds.

Active This output provides a steady level indicating the “health status” of the OEM-GSM-10.
The level is +3 volts for healthy and 0 volts for unhealthy. The healthy to unhealthy will occur about 30 seconds after the loss of watchdog pulses.

Note:- As the network can significantly vary the interval of watchdog pulses during connections, it is possible that system unhealthy levels may occasionally be seen during online connections. It is recommended that the serial interface activity should be used to determine the “health” of the OEM-GSM-10 during online connections and not the ACTIVE output.

8.2 Serial Control Interface

The serial interface consists of TX data, RX data, and flow control lines.

All control and data lines are labelled with reference to the HOST (DTE) .

RX Is used to transmit the data from the OEM-GSM-10 to the host at the selected baud rate set by AT+IPR.

TX Is used to receive data coming from the host to the OEM0GSm-10 at the selected baud rate set by AT+IPR.

CTS Is used to halt data from the host should the OEM-GSM-10 internal buffers become full and is cleared when the buffers have emptied sufficiently for transmission to resume. This output is open collector and requires an external pull-up resistor. A typical value is 10k for a 5 volt supply.

RTS Is used to halt data from the OEM-GSM-10 should the host internal buffers become full and is cleared when the buffers have emptied sufficiently for transmission to resume.

The function of RTS and CTS can be set by the AT+IFC command. This command also allows software flow control (XON / XOFF).

DTR Is used by the host device to indicate that the host is ready to communicate. If DTR is CLEAR on the OEM-GSM-10 no communication will be possible. The affect of DTR on the OEM-GSM-10 can be changed by the AT&D command.

DCD This control line is often used to indicate a connection with the remote modem. However its function can be changed by use of the AT&C command.

RI This control line indicates the presence of an incoming call. The line will SET when the RING commences and remain SET throughout the RING events. Once the call is disconnected the line will return to CLEAR.

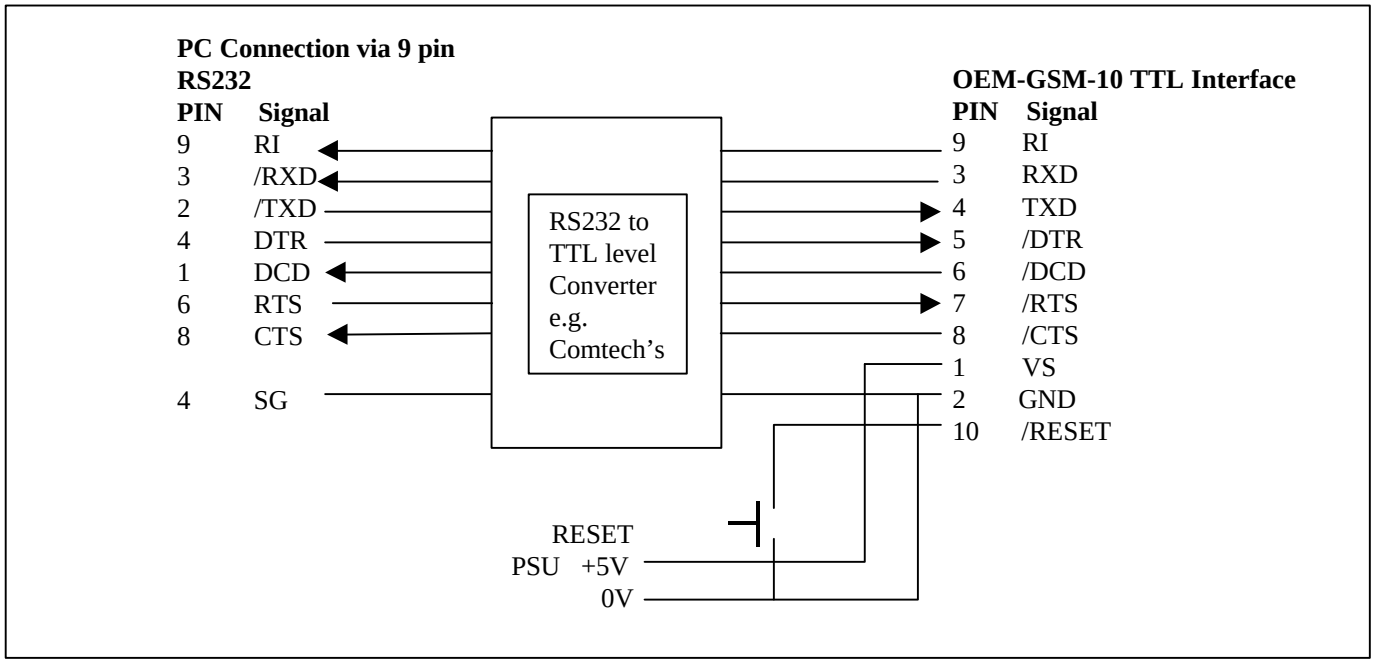
Note:- Signals are 3 TTL volt logic. All inputs are protected and will accept up to 5 TTL logic levels. Control lines are SET at 0 volts and CLEAR at 3 volts.

IF software flow control (XON / XOFF) is used the hardware control lines must be held in the SET state.

If the OEM-GSM-10 is controlled from a Windows application or system it is recommended that hardware flow control is used.

8.3 Connecting to a PC via an RS232 converter

The following diagram should be followed to implement an RS232 connection to a PC with handshaking performed by the hardware.



8.4 Debugging And Indicator Lights

The modem has a built in indicator, which can show Red or Green and flashes at different speeds according to the status of the modem.

RED:	Not connected to the network.
GREEN:	Connected to the network.

The indicator flashes with the following information:

Normal	
In service	One flash, Off, One flash, Off etc.
Information	
Missed calls, SMS messages etc	Two flashes, Off, Two flashes, Off etc.
SMS messages etc.	
Alert	
Incoming call	Four flashes, Off, Four flashes, Off etc.

9.0 Antennas

The majority of GSM antennas do not require an additional ground plane. However, it is important that any antennas are installed in the best possible location and, if necessary, provided with a suitable ground plane.
The recommended antenna is available from Comtech. This antenna may be mounted inside suitable equipment, ie not suitable for mounting inside all metal enclosures or onto metal surfaces.. This avoids any problems of any exposed antenna being at risk from damage or vandalism.
Consideration should be made when positioning the antenna. Most CE test requirements typically call up 3-10 volts per meter for radiated immunity. It is possible to exceed this in very close proximity to the antenna and equipment should be sited / protected as required.
Multiple antennas should be separated by a minimum of a wavelength (at the lowest frequency). Recommended minimum separation distances are as follows.

Cellnet and Vodaphone (900Mhz) 33cm minimum.
Orange and One 2 One (1800Mhz) 17cm minimum.

These are minimum distances, signal strength can often be improved by providing as much separation as possible from any metallic object or small changes in the location of the antenna.

It is important that the antenna ground is not connected to the modem ground. Failure to observe this may result in damage to the unit and will invalidate the warranty.

It should be noted that the FME connector is antenna ground and should be treated as above.

Antennas which are through panel/chassis mounting and have an electrical connection to the panel/chassis should not be used. Suitable antennas are available from Comtech Ltd.

10.0 Statutory Requirements

10.1 CE marking

This OEM-GSM-10 , GSM Module had been assessed and found to comply with the following Common Technical Regulations.

CTR31, Edition 2
CTR32, Edition 2

And has been certified in accordance with European Directive 91/263/EEC for Telecommunications Terminal Equipment, and may be connected to the Public Common European Telephone Systems, GSM, and DCS1800.

It is essential when fitting the OEM-GSM-10 into existing equipment that any impact on the existing approvals are considered. When fitted the OEM-GSM-10 together with the host equipment shall comply with all compulsory European directives which are applicable including the EMC directive (89/336/EC), Low Voltage Directive 73/23/EC and the R&TTE Directive 99/5/EC.
Due to the characteristics of the OEM-GSM-10 the EMC (89/336/EC) and R&TTE (99/5/EC) directives shall be considered when assessing new equipment .Depending on the equipment type other directives and or technical requirements may also apply.
It should be noted when selecting levels for examination that e-field strength close to the OEM-GSM-10 antenna may exceed the 3 volts/meter specified in some standards.

10.2 Safety Requirements

10.2.1 Warnings

Internal components containing beryllium oxide are used in the equipment. Dust from this material is a health hazard if inhaled or allowed to come into contact with the skin. Great care must be taken when handling these components. The OEM-GSM-10 must not be broken, opened or subjected to excessive heat.

Never operate the modem without the correct antenna, or a suitable artificial load connected.

Never modify a modem, or accessory, except as instructed by Comtech in a formal communication as this may invalidate any warranty, guarantee or type approval.

Do not operate this equipment in environments containing explosive materials or vapour. This includes petrol service stations or any location which prohibits the use of mobile telephones.

This equipment should not be operated by the driver of a vehicle while the vehicle is in motion so as to interfere with driving safety.

This equipment should not be operated on an aircraft as it is forbidden by law. It should not be operated in the vicinity of medical equipment.

The power required by the host and the total of all adapter cards installed in the host environment, together with any auxiliary apparatus shall not exceed the power specification on the host apparatus.

The power requirements for this OEM-GSM-10 adapter are:

	Min	Typ	Max/Peak	Units
Supply Voltage	4.75	5.0	5.5	Volts
Supply Current (operating)	300	500	1000 peak	mA
Supply Current (idle)	18	30	120 peak	mA

10.2.2 Special Conditions for Use

- The affixed manufacture/approvals label may mot be removed, changed or obscured.
- The OEM-GSM-10 may not be modified or changed in any way, other than may be advised in writing by the manufacture.
- Connection may only be made as described and within the limits stated in this manual.

10.2.3 Suitability for use

The modem is suitable for:

- Connection to the GSM Network provided by Cellnet, Vodafone ,Orange, etc.
- Household, office and similar indoor use when connected using a suitable antenna.
- An enclosure or other protection should be provided suitable for the intended environment.

10.3 Available Facilities

The modem is manufactured in the UK by Complementary Technologies Ltd and has been approved for the use with the following facilities:

- Transmission rates supported are:

Transparent
Non-error corrected link according to GSM 04.21
User rates:

2400 bps	V.22 bis / V.26 ter / V.110
4800 bps	V.32 / V.110
9600 bps	V.32 / V.110
14400 bps	V.32 / V.110 GPRS1

Non-Transparent
Error connected link according to GSM 04.22 (V.42)
User rates:

9600 bps	V.32 / V.110
14400 bps	V.32 / V.110 GPRS1

Note: When using V.110, the correspondent has to be an ISDN adapter. Data compression according to V.42 bis.

Transparent Fax
Group 3, Class 1 support only.
User rates;
2400 bps
4800 bps
7200 bps
9600 bps

SMS
GSM rec. 7.05

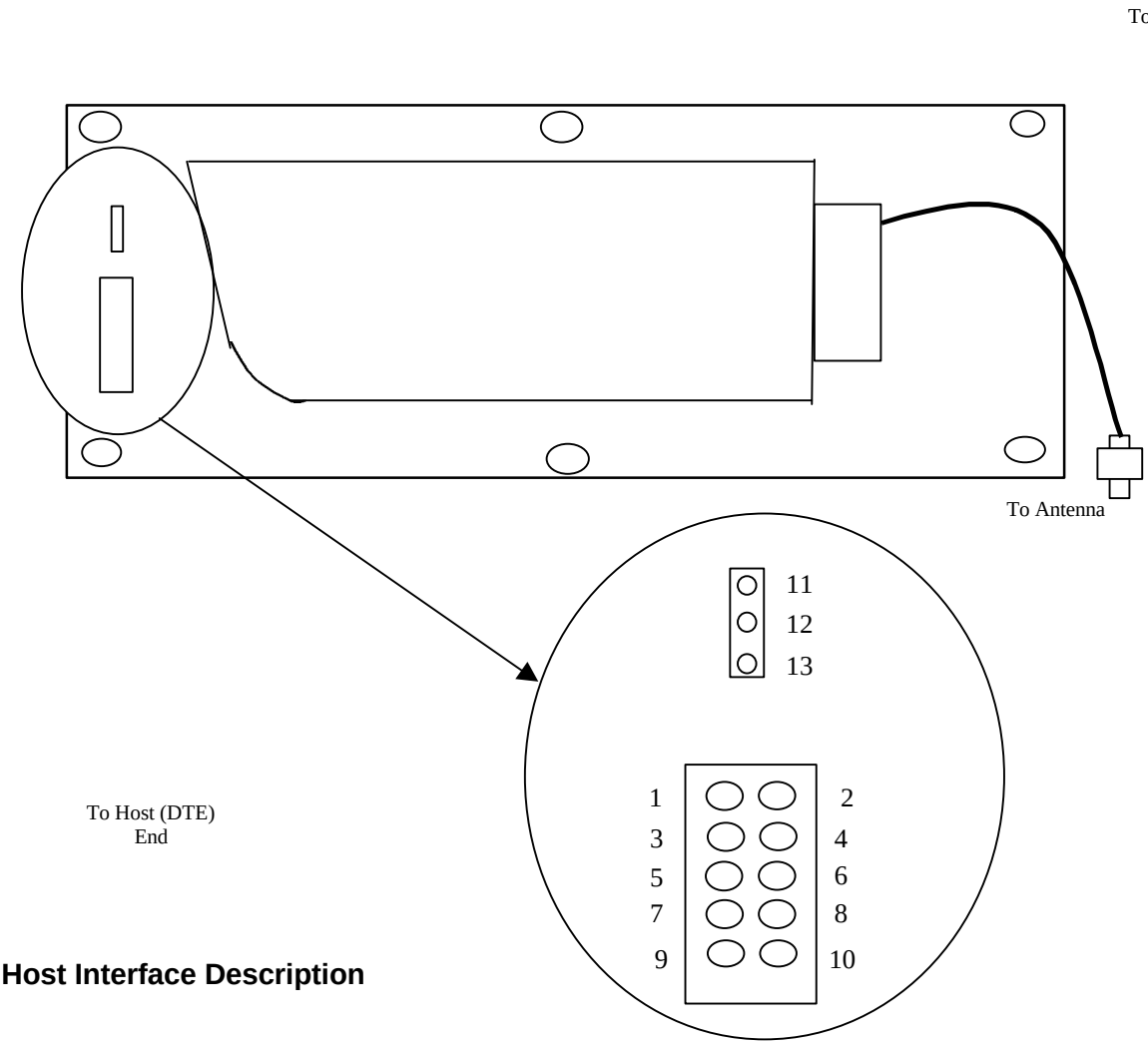
- Auto-calling and auto-answering.
- Detection of initial proceed indication and operation in the presence or absence of such indication.
- Tone detection of Dial tone, Ring Tone, Busy and Equipment Engaged.

This modem will not automatically redial on failure to establish a call.

Any other usage will invalidate the approval of the apparatus, if as a result, it then ceases to conform to the standards against which it was approved. The modem is only approved for use with the GSM network.

11. Connector Specification

11.1 Serial Host Interface



Host Interface Description

PIN	NAME	DESCRIPTION
1	+5v	External Power Supply (5.5V Max)
2	GnD	External Ground
3	RxD	Receive Data (TTL o/p)
4	TxD	Transmit Data (TTL i/p)
5	/DTR	Data Terminal Ready (TTL i/p)
6	/DCD	Data Carrier Detect (TTl o/p)
7	/RTS	Request To Send (TTL i/p)
8	/CTS	Clear to Send (open collector o/p)
9	/RI	Ring Indicator (TTL o/p)
10	/RESET	Reset (TTl i/p)
11	W/Dog	Watchdog
12	GnD	External Ground
13	STATUS	Status

All signal lines are 3 volt logic but will accept without damage 5 volt TTL levels.

12. Electrical Characteristics

12.1 DC Electrical Characteristics

TA = 0 to 60 degrees Centigrade

	Min	Typ	Max	Units	Comments
Vcc	4.75	5	5.5	Volts	
Icc (reset)		5		mA	/RESET active
Icc (idle)	18	30	120 peak	mA	Idle network connection
Icc (active)	300	500*	1000 peak	mA	Active network connection
Vil	Gnd - 0.3v		0.8	V	
Vih	0.7 Vcc		Vcc + 0.3	V	
Voh	Vcc - 0.4			V Ioh=-2.0mA	
Vol		0.1	0.4 @ Vcc max	V Iol = 4mA	
Iil input leakage	-1		2	uA Vin=0v,Vcc	
Iol output leakage	-1		2	uA Vin=0v,Vcc	

** the typical current consumption will vary dependent on location of the module within the GSM network*

12.2 AC Electrical Characteristics

	Min	Max	Units
Frequency Range (GSM 900MHz)	890	960	MHz
Frequency Range (GSM 1800MHz)	1710	1880	MHz
RF Output Power (GSM 900MHz)		2	W
RF Output Power (GSM 1800MHz)		1	W
Receiver Sensitivity (GSM 900MHz)	-102		dBm
Receiver Sensitivity (GSM 1800MHz)	-100		dBm
Transmit attack time		25	mS

12.3 Environmental Characteristics

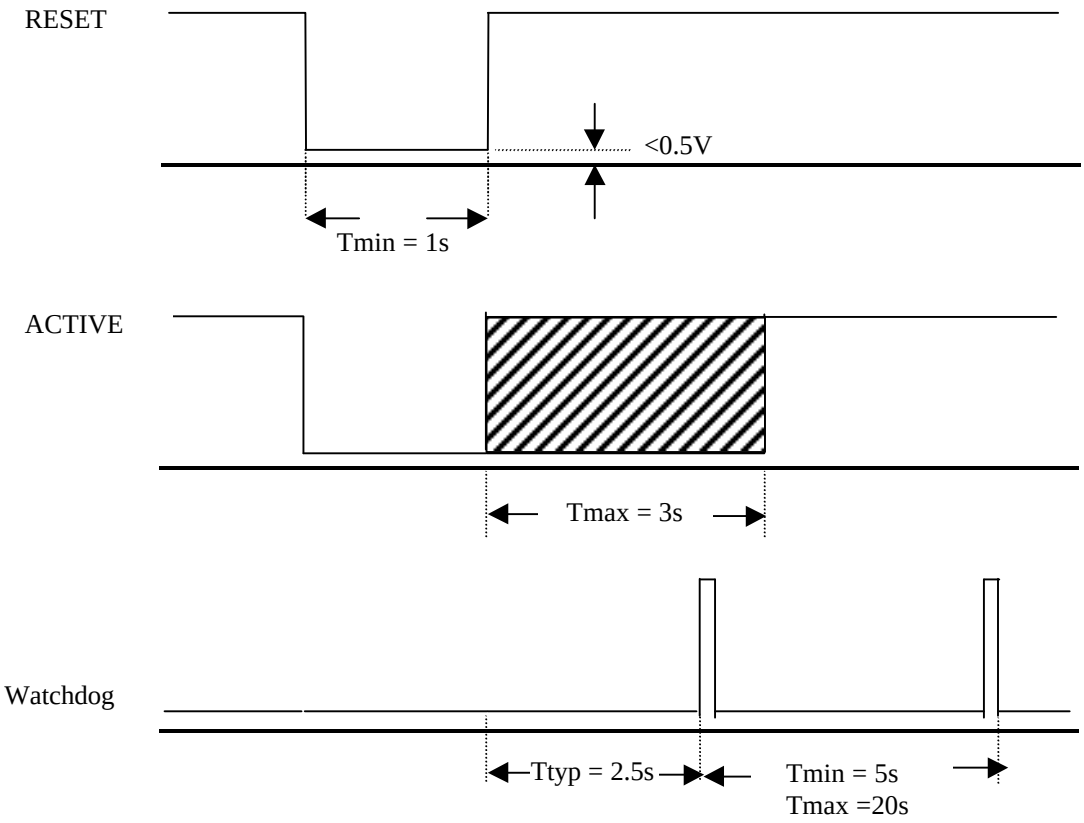
	Min	Max	Units
Operating Temperature Range	- 20	+ 60	Deg C
Storage Temperature Range	- 20	+ 70	Deg C

12.4 Control and Date Characteristics

	Min	Typ	Max	Units
Reset (idle)	4.75	5	5.5	Volts
Reset (active)	0.0	0.0	0.5	Volts
Reset (active)	4.5	5	5.5	mA

12.5 Resetting the OEM-GSM-10

The module can be reset by exercising the /RESET pin (active low).



The typical recovery time from resetting the module to a new network connection being established is 3 to 20 seconds and is confirmed by the LED flashing GREEN. This assumes, of course, that the SIM is registered for use on the network, is unlocked and has the correct PIN code.

The OEM-GSM-10 has a number of features built in to allow the host to verify that the unit is functioning and can, if necessary, be restarted correctly. These features include the provision of two status outputs and the reset control line as well as the ability to be interrogated by the serial connection.

12.6 Status Outputs

The two status outputs provided on the OEM-GSM-10 are WATCHDOG pulse output, (typically 8ms) and ACTIVE output. The active output is derived from the watchdog output and is provided to remove the need for the host to monitor the watchdog pulses. The STATUS and WATCHDOG outputs have a source impedance of 10 K Ohms. The ACTIVE output level indicates a fault typically 30 seconds after watchdog pulses have stopped

As the network can significantly vary the interval of watchdog pulses during online connections, it is possible for system “unhealthy” levels to occasionally occur on the ACTIVE output during online connections.
It is recommended that the serial interface activity should be used to determine the “health” of the OEM-GSM-10 during online connections and not the ACTIVE output.

12.7 Reset input

The reset input resets the unit by disconnecting the power supply to the GSM module. After the reset condition has been removed, by allowing the reset line to go high the module start up circuit will activate switching the unit back on. Please note that any unsaved configuration changes will be lost. To stop this happening any configuration changes must be saved by using the AT&W command.
By holding the reset line in a low state the module will draw significantly less power but will be unable to receive any incoming calls or messages. This may be useful in applications where the power consumption has a higher priority than the need for immediate access.

12.8 Reset Timing

The reset line must be taken low for a minimum of 1 second to ensure that the module will reset correctly.
After this period the rest line can be released at any time to restart the unit. The unit will be able to accept Hayes commands after 3 seconds but can take up to 20 seconds to log into the network. Until the module has logged into the network any commands that are used to ascertain the network status (AT+CSQ etc) will return an error or zeros. By polling the unit with these commands the host can determine when the OEM-GSM-10 has fully connected to the network.

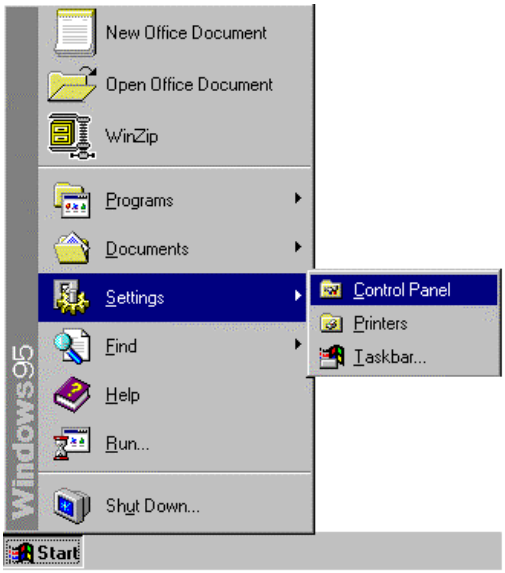
13. Mechanical Specifications

- See separate mechanical drawing.

14. Setting up Windows Modem interface

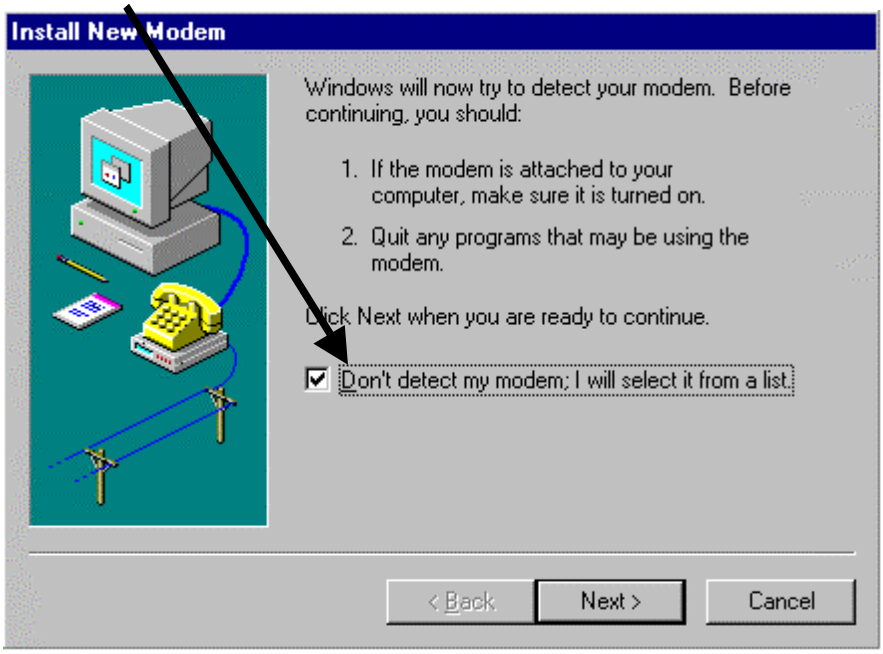
Follow these step-by-step instructions to set up the Windows Modem interface for use with TAPI interface software (such as WinFax Pro).

- **Open up the Control Panel**

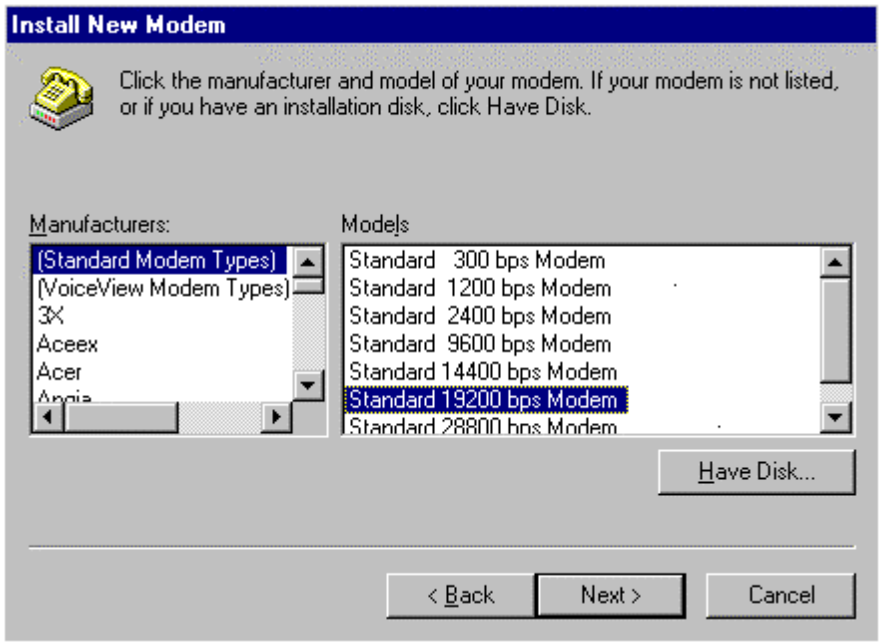


- **Double click on the modem icon**

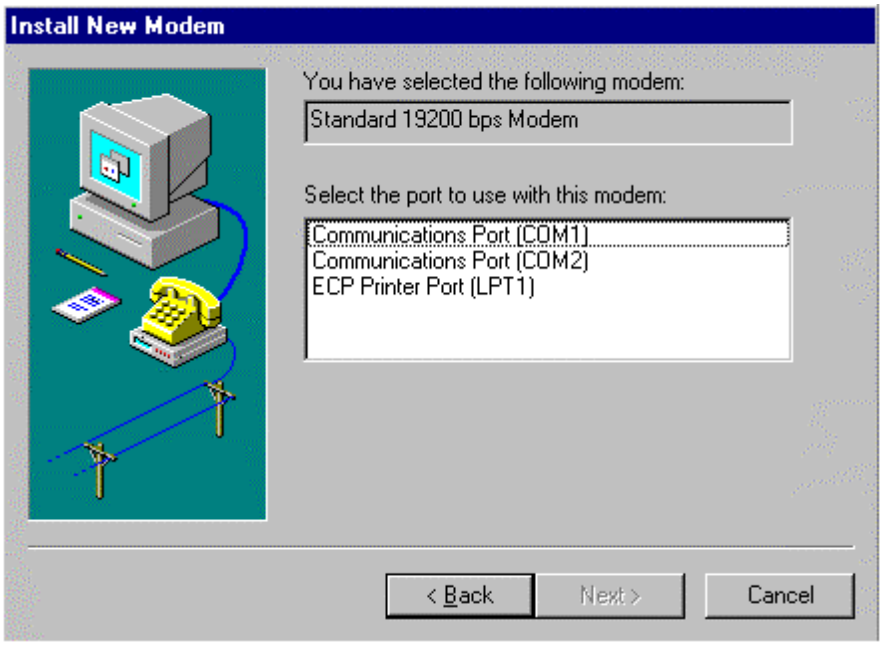
- **Highlight the don't detect my modem box**



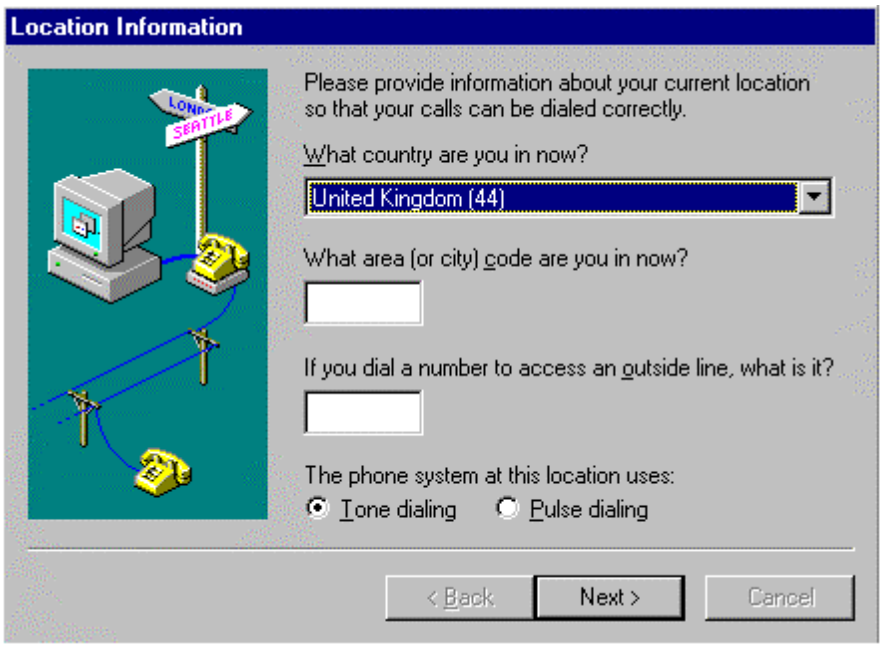
- **Select the standard 19200 modem**



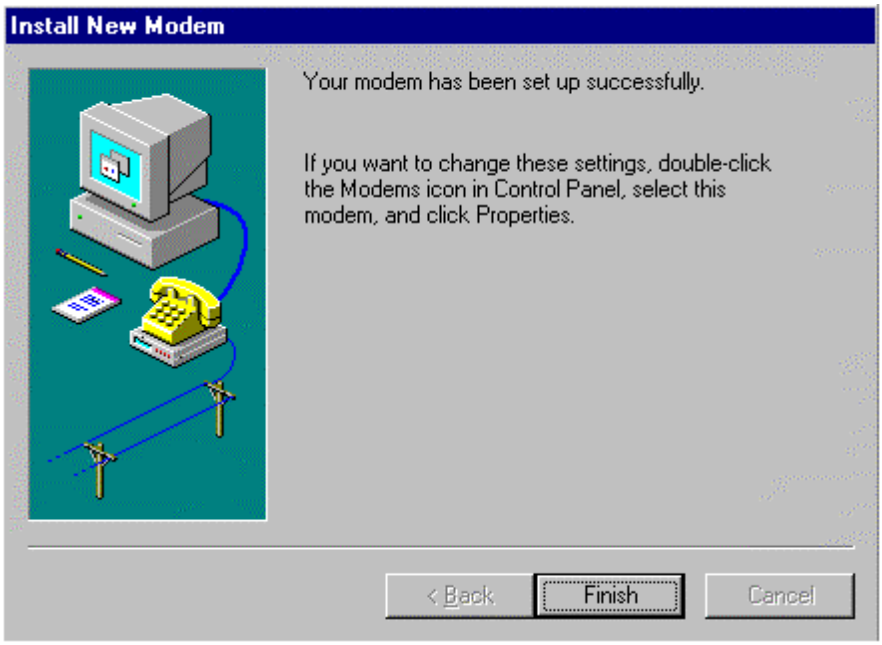
- **Select the appropriate COM port**



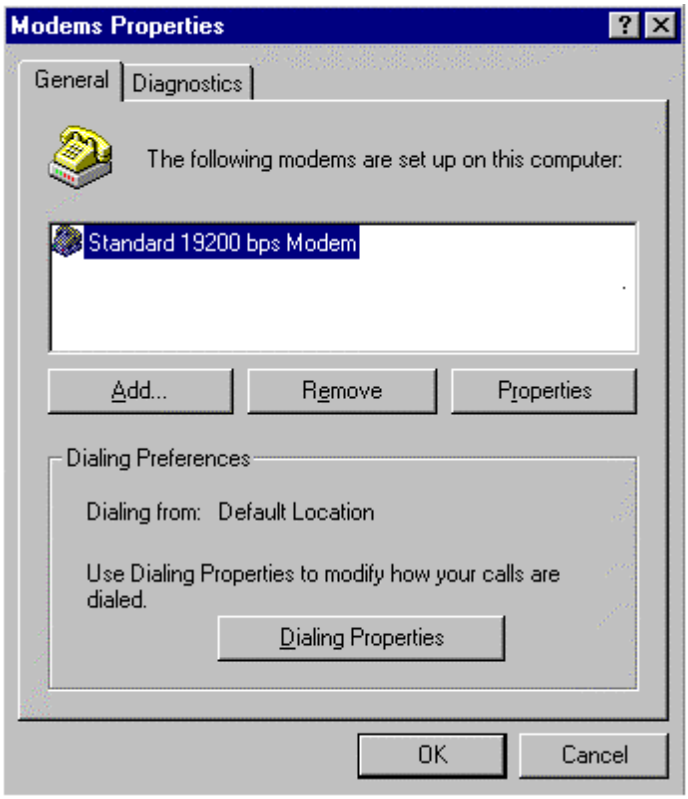
- **Set the location information**



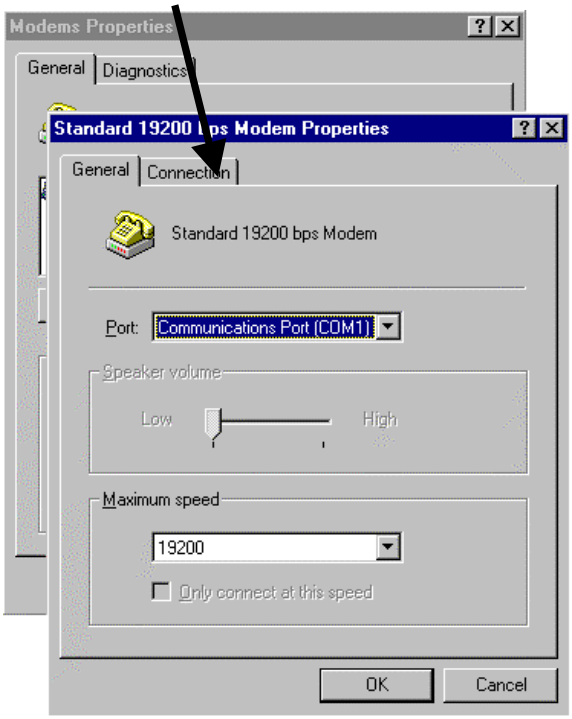
- **Finish Installation**



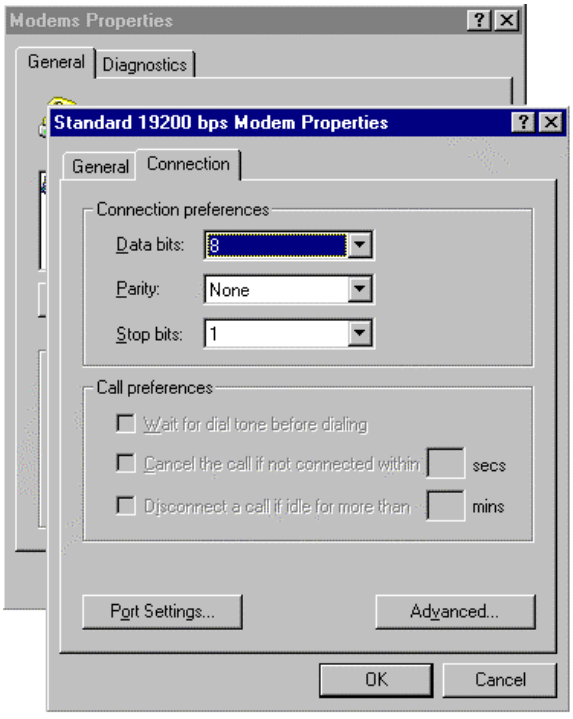
- **Select Properties**



- **Select Connection**

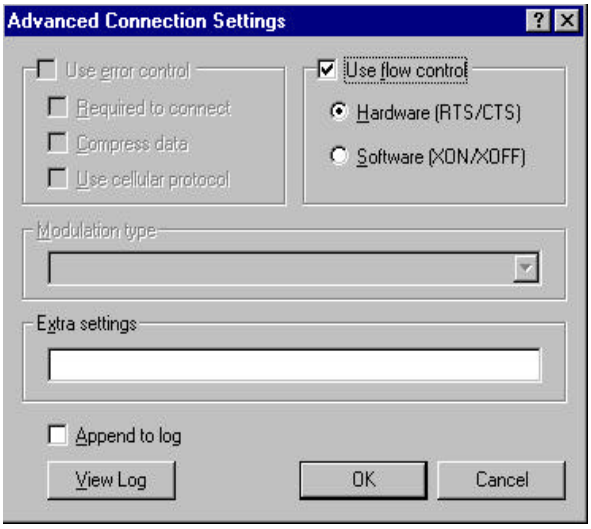


- **Set Data Bits, Parity and Stop bits**



- **Select Advanced**

- **Select Flow Control and Software (Hardware)**

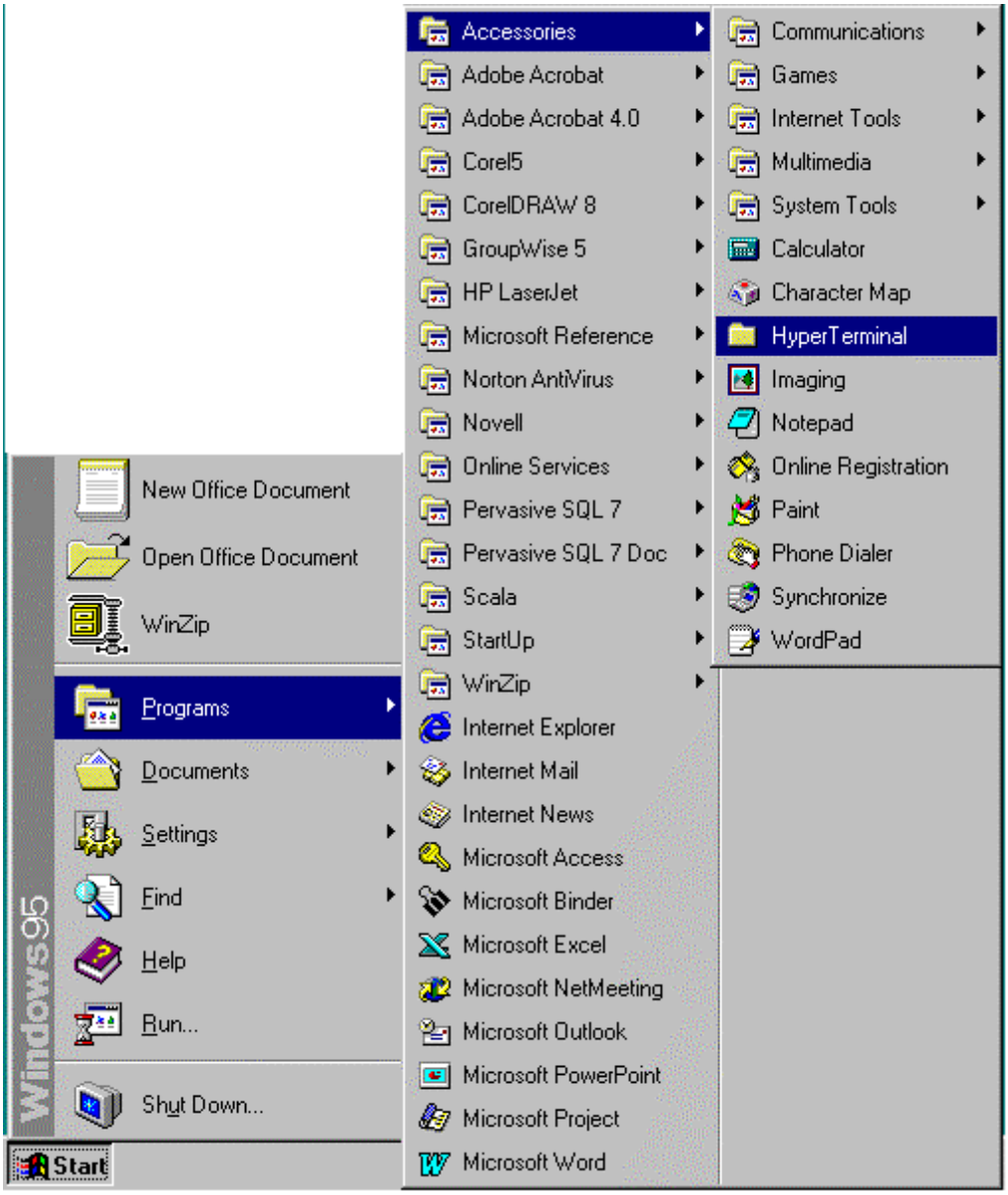


Note:- Software flow control may be used but it is recommended that wherever possible hardware flow control should be used.

15. Setting up Hyper Terminal

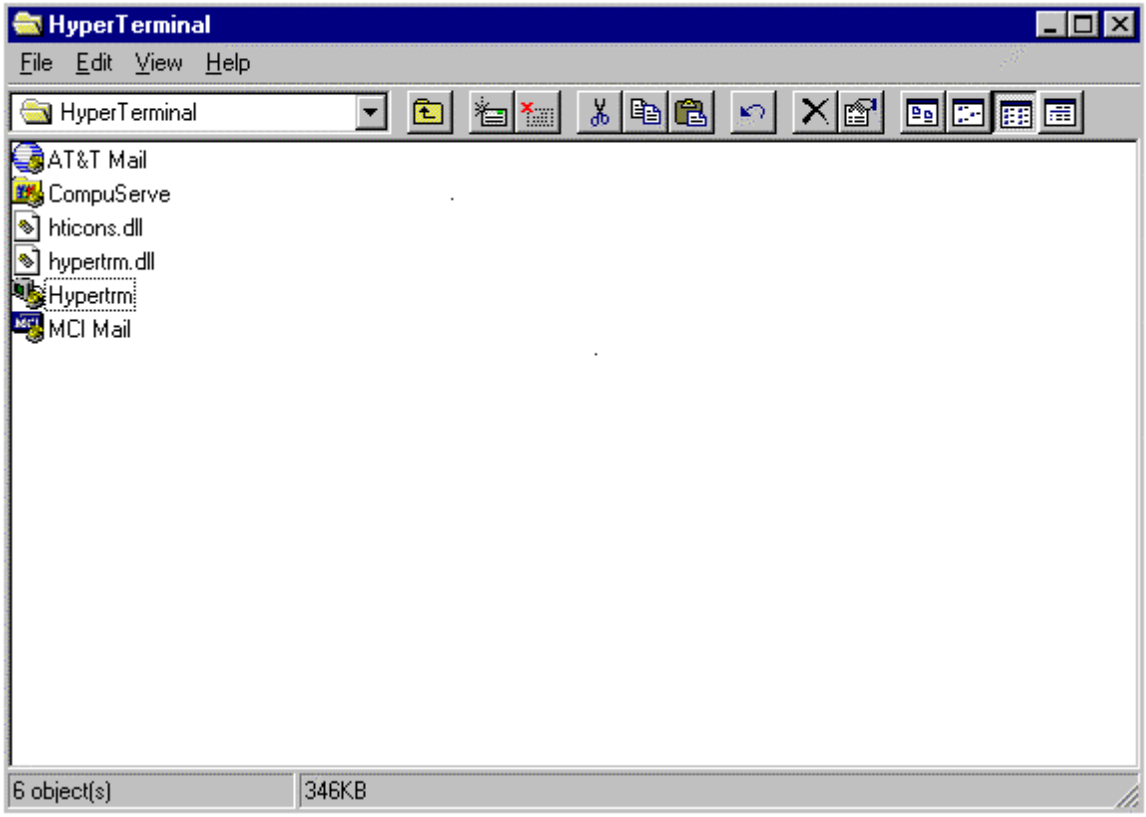
Hyper Terminal is a very simple terminal package which can be used to send simple commands to / from the modem.

- **Select Hyper Terminal from Programs Menu**

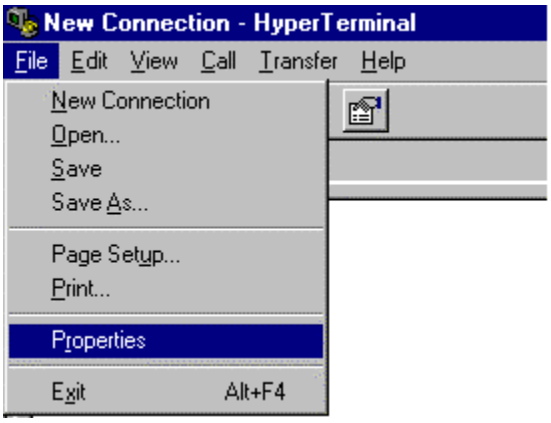


- **Select Hyper Terminal**

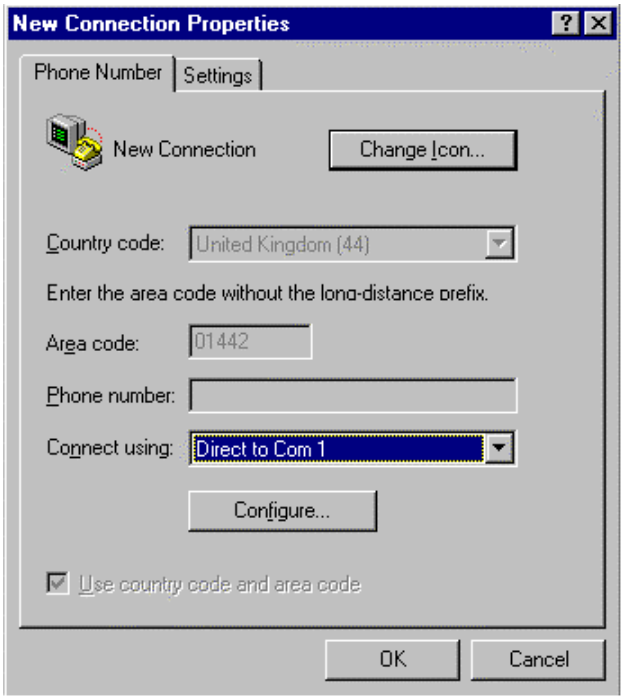
- **Double click to open Hyper Terminal.**



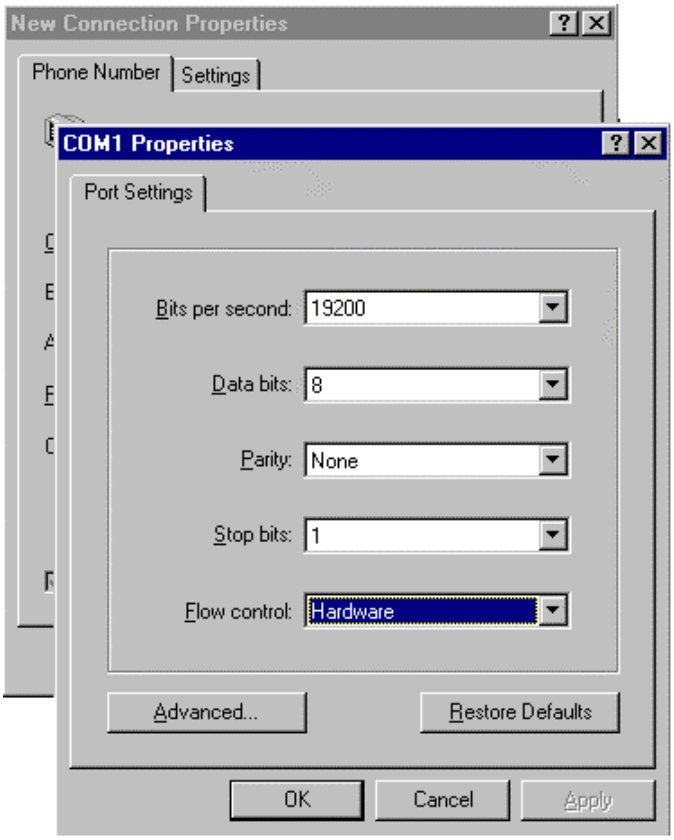
- **Select Properties**



- **Set Port**



- **Port Settings**

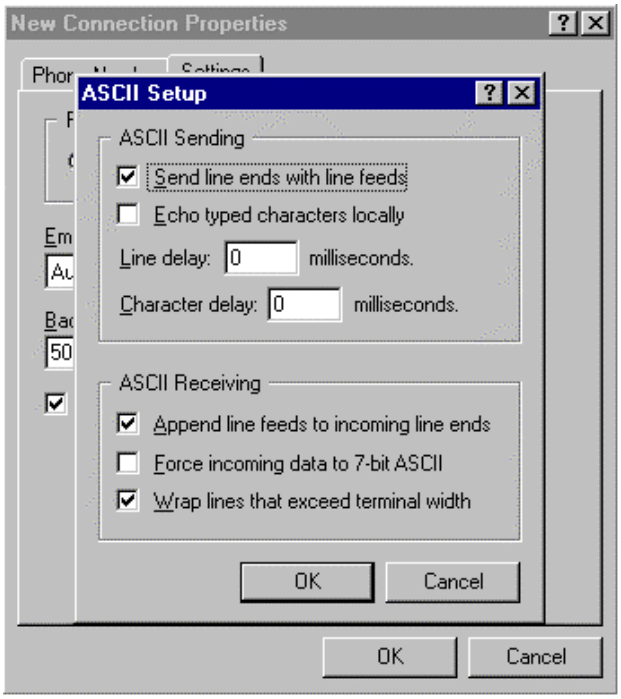


- **Properties**

(Set Beep, if required)

- **ASCII settings**

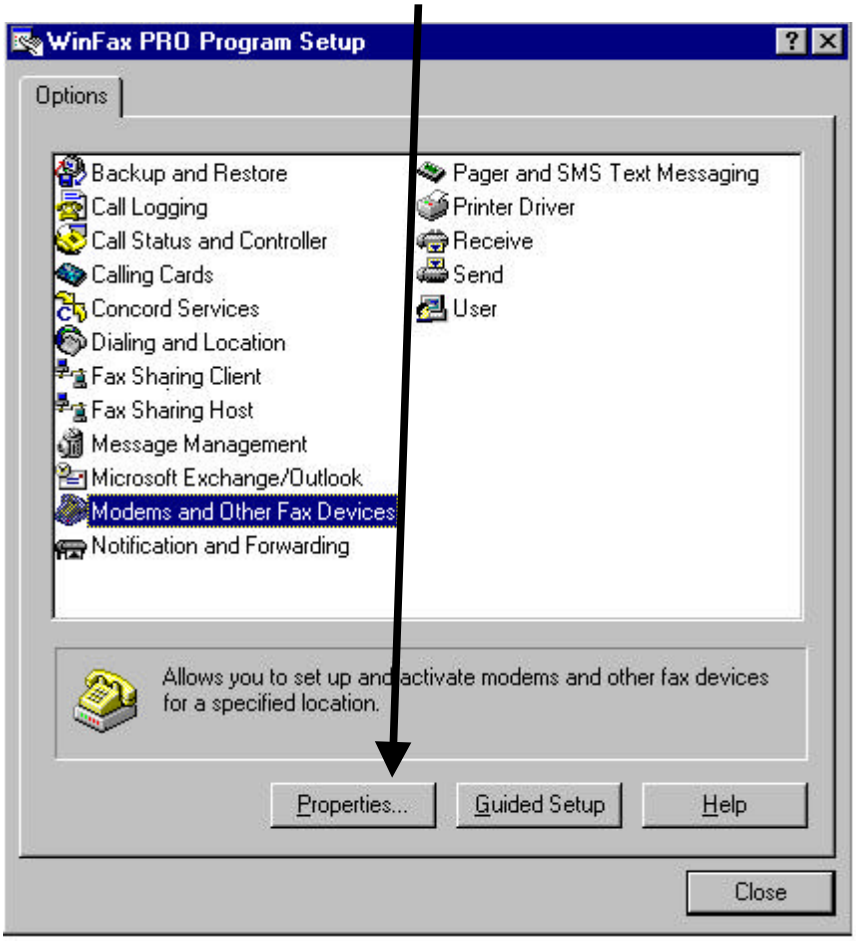
(Append line feeds, send line ends and wrap lines, if required)



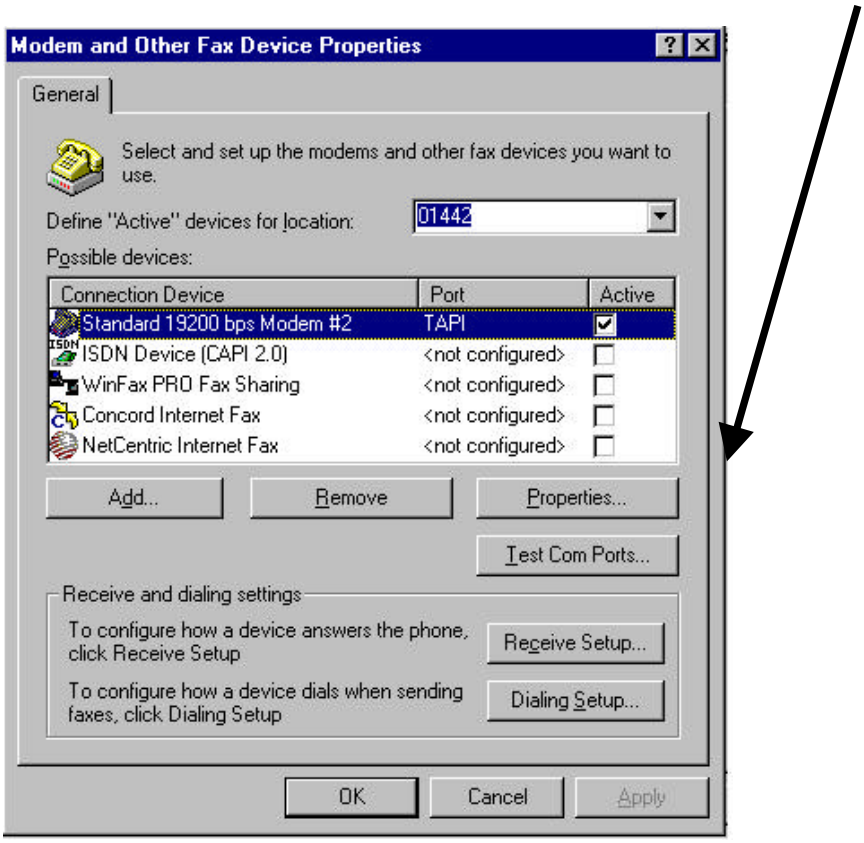
16. Setting up Win Fax Pro

The following section illustrates how to set up Win Fax Pro. Other Fax software is available and this section should not be taken as an endorsement of Win Fax Pro.

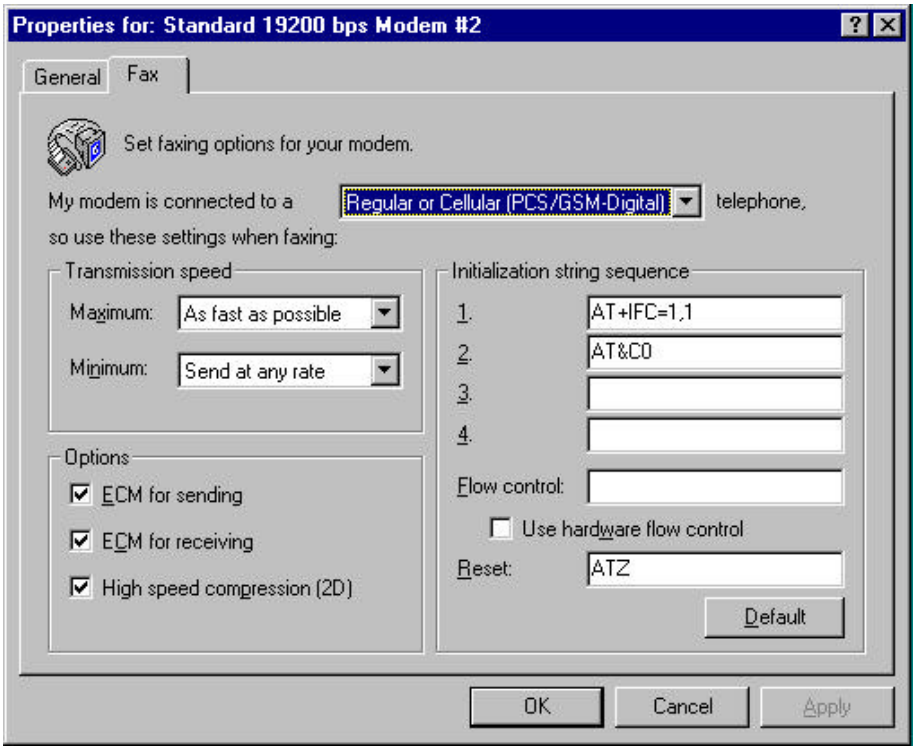
- **Ensure that the computer modem settings are set to 19200,8,n,1,.**
- **Win Fax Pro Setup**
- **With Win Fax Pro Installed, setup the modem as follows**:
- **Under Program Setup, select Properties**



- **Check Modem is Standard 19200, if not, go to 10.1.4. Select Properties**



- **Check that the following setting are made:**



17. Using the OEM-GSM-10 to send and receive SMS messages

The OEM-GSM-10 can be used to send and receive short messages over the GSM network to other GSM equipment. This can be another OEM-GSM-10 or a standard mobile phone. The SMS service utilises a call centre through which all SMS messages are sent.

17.1 Call centre set-up

If the SIM does not have the call centre number set up then the OEM-GSM-10 will not be able to transmit or receive any SMS messages. The call centre number is unique for each network and is obtainable from your network provider. The SMS call centre number for Vodafone is +447785016005. This number is usually pre-programmed into the SIM and should not be changed.

Should the call centre number need to be set up the following command should be used:

AT+CSCA="+447785016005" <CR>

If the OEM-GSM-10 is using a SIM from a network other than Vodafone then the call centre number in the above command will need replacing by the number that will be available from the network provider.

To check the address that has been set the AT+CSCA? Command is used. The OEM-GSM-10 will then return the current value.

```
AT+CSCA?
+447785016005,147
```

The first value returned by the OEM-GSM-10 is the actual message centre number and the number after the comma is a number which identifies the network that the OEM-GSM-10 is connected to.

17.2 SMS message structure

Transmitted messages require a destination address which is the telephone number that you wish to send to and the actual message which is limited to 150 characters.

Received messages contain the originating telephone number and the actual message.

17.2.1 Transmitting a SMS Message

Before SMS's can bes used the SMS mode must be set to ASCII. This can be done using the command AT+CMGF=1.
The SMS can then be sent using AT+CMGS="tel No" where tel No is replaced by the telephone number that you wish to send to i.e. +447970689434 (For UK only the +44 can be replaced with 0). This number must be enclosed by the speech marks and must be a mobile telephone number.
When the command has been accepted a prompt (>) will be returned. The required text to be sent is entered, up to the 150 character limit, followed by an <Esc> or <ctrl Z> character to terminate it.
If the message has been accepted an OK message will be returned to the host.

Example of using the AT+CMGS (Send SMS) command

AT+CMGS="07932123456" <CR>
><TEXT UP TO 150 CHARACTERS> <ctrl Z>
OK

If ERROR is reported in place of OK then the message has failed to be sent. This could be due to an incorrect number or the network may be busy. If this occurs then the message will need to be resent until the OK result is returned. It must be noted that messages can only be sent to other GSM phones or terminals.

17.2.2 Reading Received SMS Messages

This command allows the reading of received or stored SMS's. When a SMS is received the user can be informed that the SMS has been received and what SIM location that message is stored at.

Ie. +CMTI: "SM", 16 (indicating a received SMS stored in location 16.)

The AT+CMGR command can then be used to read the message

AT+CMGR=16 <CR>

17.2.3 Deleting Received SMS Messages

The AT+CMGD command is used to delete messages from the SIM storage. This will be necessary at times to prevent the SIM becoming full as it has a limited storage.

AT+CMGD=n

Where n is replaced by the location that is to be deleted.

18. Changing Serial Link Settings

The OEM-GSM-10 comes supplied with the serial port set to 19200 BPS and with a data format of 8 data bits, no parity, and 1 stop bit.

This port can be reconfigured in software to allow the target system to use different settings by using the following commands.

AT&W this command SAVES the new configuration in non volatile memory.

AT+IPR this command is used to set the data rate used by the serial link.

AT+ICF this command is used to set the number of data bits, the parity setting and the number of stop bits.

AT+IFC this command is used to set up the flow control.

Please note that if you are typing these commands by hand the AT+ICF and AT+IFC commands are very similar.

18.1 Saving Changes to Memory

The AT&W command is used AFTER the port has been reconfigured using the other commands listed above and SAVES the new configuration. The command has no arguments and is simply used as follows.

AT&W

18.2 Changing host serial link baud rate

The AT+IPR command sets the data rate used by the serial link. This rate can be set to the following values: 300,600,1200,2400,4800,9600,19200,28800,38400 and 57600 BPS.

The command is simply entered by typing the following:

AT+IPR=9600

The value 9600 can be any of the values in the above list.

Typing AT+IPR? will display the current data rate (although if you do not know this already your serial link will not work to enter a valid command).

Typing AT+IPR=? will display the list of Supported Data Rates.

18.3 Changing host serial link framing

This command is used to set the character framing used by the serial link. The available formats are:

Number of data bits	Parity	Number of stop bits	<Format>	<Parity>
8	None	2	1	2
8	Even	2	2	1
8	Odd	2	2	0
8	None	1	3	2
7	None	2	4	2
7	Even	1	5	1
7	Odd	1	5	0
7	None	1	6	2

To set the character framing the command must be typed as follows:

AT+ICF=<FORMAT>,<PARITY>

Where the values for FORMAT and PARITY are taken from the above table.

19. Accessories

Description of Accessory	Comtech Part Number
Evaluation board with RS232 and power supply	UWEB-EVAL-BRD
9 way D-type Male to Female RS-232 Interface Lead	CABLE-DATA
Surface mount dual band GSM antenna with FME connector	OEM-GSM-A1

20. Glossary

Abbreviation	Meaning
AT	Hayes AT modem serial command set commonly used for land line modems
CI	Command Interpreter.
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
GPS	Global Positioning System
GSM	Global System Mobile
I/O	Input / Output
LED	Light Emitting Diode
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSC	Short Message Service Centre

Document Control

Document name	Rev	Change Details	ECN	Date	Sign-off
OEM-GSM-10 DM	4.04	New Issue		14/12/00	G.Greenwood