- 4 APR 2000

Data-Link 33.6 Dual Modem Card

How To Contact your Local Black Box

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Contents

Introduction

This section is to familiarize the user with the operation of a modem. Note: <CR> indicates that the user must press the return key after a command sequence.

The modem

A modem is a device that allows two terminals (DTE, PC...) to communicate via a telecommunication line (phone line).

The data is converted by the modem into electrical signals adapted to the telecommunication network. This conversion is called modulation and demodulation.

Various conversion techniques have been developed to speed-up the data flow. The different speeds are particular to each type of modulation: 300 bps in V21, 2400 bps in V22bis, 14400 bps in V32bis, 19200 bps in V32terbo and 33600 bps in V34.

The modem-fax

A fax device transmits scanned images via the telephone network.

In addition to traditional fax machines, the fax modem also allows transfer of computer data such as:
- ASCII files from a text processor,
- PCX or TIF files from a graphic editor, etc.

The Fax mode operation is controlled by a fax software which:
- Converts files to T4 format (fax graphic format),
- Transmits and receives faxes,
- Supervises fax modem operation.

Supervision of the fax modem is carried out by a standard protocol: "Asynchronous Facsimile DCE Control Standard", Class 1 Service - TR 29.2188 or Class 2 Service - TR 29.2388.

The computer equipped with a fax modem will be able to transmit and receive fax in Group III mode:
- At about one A4 page per minute,
- In fine or standard resolution.

See Specifications section, page 22, for the list of modem class 1 and 2 commands.

Calling modes dialing

The modem can be in 2 modes:
- Send or calling,
- Receive or answer.

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Calling Mode

The modem switches to originate mode when the dial command: ATD 37487126 is sent (example number).

The calling modem then waits for the remote modem to respond.

Answering Mode

The modem switches to answer mode when it detects ringing on the phone line.

The answer is carried out automatically if the command ATS0 = 2 was sent to the modem by the local PC. A training sequence is then initiated. A training sequence is the handshake sequence between modems to establish a communication link. It establishes speed, modes...

Protocols

Two types of protocols can be used to improve communication performance between two modems:

- Error correction:
- MNP4 or V42 detect errors which occurred during data transmission, and either correct them or re-transmit the data.
- Data compression:
- MNP5 or V42bis compress the data and thus transmit at a higher effective speed.

These two types of protocols improve efficiency and reliability of a connection.

Memory

Beyond these basic principles, the modem offers other functions, aimed at improving performance and ease of use.

These functions are controlled via the memory (S-Registers) of the modem, and are available via the extended AT command set.

These functions are described in security and memory section, page 18, of this manual.
Some of the extra functions are:

- Storage of phone numbers,
- Forced V24 signals,
- Exchange of a password between two modems ("Answer Back"),
- Pre-qualification of the telephone line,
- Storage of user modem configuration.

Installation

Rackmount version

Package Contents:

Before installing your modem, check all these items are present:
- One MDU905C card
- Two RJ11 phone cables
- Two RJ45/DB25 cables
- AT command set reference manual
- User manual
- Software (as an option)

The busy out function forces the line to be active when there is:
- A faulty power supply,
- No answer to a call after N rings (N is set by the S20 register). This maybe due to a non-connected data terminal (DTR/108 absent).
- N successive ineffective connection sequences (N is set by the S20 register). This maybe due to a bad connection to the telephone line.

This option is particularly useful for line pooling applications, and in case of fault, incoming calls are switched to another modem in the pool.

Your MDU905C board provides an interface to the CF1 controller board that is an option to your Data-Link rack. Refer to the CF1 manual for managing the MDU905C modem through the CF1 board.

Installation:

See rack operation manual to install your modem.

Find an empty location in the rack and insert the MDU905C card into its card guide.

Connection:

Connect your modem from the rear of the rack, according to the following diagram:

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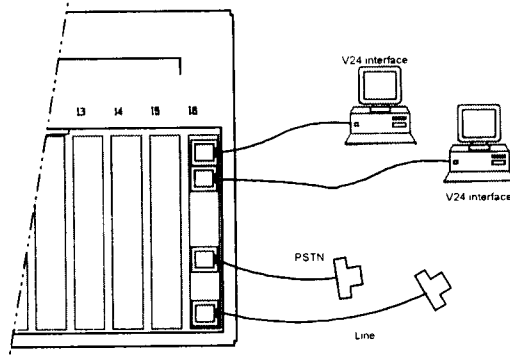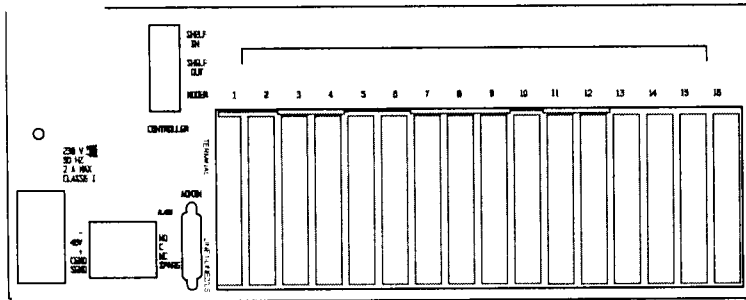
Power On:

Inserting the modem card connects it to the power supply of the rack. Power-on is carried out by the power switch located at the rear of the rack.

Power-up self-test

When the modem is turned on, an automatic self-test is performed, which tests:
- Its program memory
- Its data memory
- Its stored memory
- Its data processing unit

The test lasts a few seconds and ends with a series of:
- Different tones if the test is ok,
- The same tone if a failure is detected. This failure is detailed by the ATi7 command. See page 26, "Troubleshooting".

Operating modes

Operating modes

The modem can operate in one of the four following modes:

1. IDLE MODE:
   - The modem enters the idle mode after powering up if it passes its power-up self test. Beeps announcing the end of the test can be heard unless the speaker is turned off (see corresponding command).
   - From this mode, the modem will enter in command mode by receiving a command from the DTE, or in ONLINE mode if an automatic call is initiated from the front panel, or if a call is received when the modem is configured to answer calls.

2. COMMAND MODE:
   - The modem enters the command mode when it receives a recognized command. In this mode, commands are interpreted and executed. (Configuration set up - automatic call request...). The modem also enters in command mode when it recognizes an escape sequence in the data when in an on-line rude.

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ONLINE MODE:
- The on-line mode starts, when detecting a carrier signal from a remote modem or when dialling is successfully completed.

TEST:
- The test mode is selected when in a command mode using appropriate test commands.

The Front Panel

The front panel of the modem has six red LEDs and two push buttons. The different LEDs indicate the state of the modem and the status of the self test sequence.

The following table list these functions:

Indicators	Circuit	Function
DTR 1/2	108	Indicates that the data terminal equipment connected to the modem is ready for data communication (also bad Ram during power up test).
CD 1/2	109	Indicates that the remote modem's carrier signal has been received by the modem. In test mode, this light will flash if the test is negative. Also flashes if bad ram during power up test.
DATA 1/2	103/104	Flashes as data is transmitted by the modem.

The Push Button Mode ½

The MODE push button programs different functions depending on the current mode:

In Command Mode:
- Performs automatic dialling of the number stored in memory or holds the line in originate mode if no number was stored, or starts answering if rings were detected on the line. The length of the press is signalled by a single flash of the DSR LED.
- A twosecond push holds the line in answer mode. The length of this push is signalled by two flashes of the DSR LED.
- If the button is pressed for more than 10 seconds (three flashes of the DSR LED), the modem resets.

In Online Mode:
- Pressing the button once disconnects the modem and selects idle mode again

MDU
9
0
5
DTR2
CD2
DATA2
MODE2

DTR1
CD1
DATA1
MODE1

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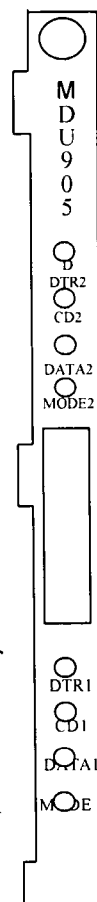
Dialogue

For your first dialogue with your modem, install a communication software on your micro-computer.

Your MDU905C modem will recognize automatically the communication speed and format of your computer, up to 115200 bps, as soon as you enter the following characters:

- AT <CR> (Carriage return)
- Answer: OK
- ATI3 <CR>
- Answer: AJ 2890 FTRX Rev-4.19*
- AT&S <CR>
- Answer: Displays configuration pages.
- *Identification model.

Once this first dialogue is established, the reference manual will help you to perform complete operation of your modem.

Configurations

This section describes commonly used configurations through the AT command set: These commands may be used as part of software drivers for example.

Factory configuration

This configuration applies when the modem is first powered on, or after complete reset by the following commands:

- AT&W255 <CR>
- Answer : OK
- ATZ <CR>
- Answer : OK

This configuration is designed for most common applications and has the following characteristics:

DTE - V24:
- Normal CD, DTR,
- DSR activated on handshake,
- CTS controlled by DTR in command mode and RTS in on line mode.

Automatic answer S0 = 2

Automatic hunt: V34, V32bis, V32, V22bis, V21 and V23 modes

Error correction and data compression: V42bis and MNP automatic mode (S0?)

Flow control: RTS/CTS

This configuration can be modified for a specific application. The following examples describe the most common applications.

Rate and connection mode selection

The MDU905C provides several solutions to determine the mode of connection.

- *Selecting connection mode for speeds of 2400 to 19200bps:* the modem can connect these speeds in V34 mode or in older V22, V22Bis, V32Bis or V32 is modes. The AT @OM command selects the wanted mode of connection This command should be left as @OM3 for automatic mode adaptation since the V34 mode is designed to recognise V32 / V32Bis remote modems during the handshake.

- *Auto baud:* the modem recognises automatically the speed and the data format of the terminal when it sends an AT command. If the 'full' auto baud is active - AT @A1 - then the modem will adapt the connection rate to the nearest lower connection speed. This is the default factory configuration. The auto baud must be changed to select a special speed. It can be limited to the DTE auto baud - AT @A2 - which means that the modem still recognises the terminal data format and speed but does not change the connection rate. Alternatively, it can be disabled - AT @A0 - which means that both the DTE data format and speed, and connection mode are selected by Commands.

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The following picture lists all connection modes on the first row, and the configuration in full auto baud and limited or disabled auto baud.

Rate - modulation	Modem auto baud : AT@A1 DTE speed / AT command	DTE autobaud : AT@A0 or AT@A2 AT command
300 - V21	300 / -	@M0
1200T,75T - V23	Modem can not be auto baud	@M10
75R,1200T - V23	Modem can not be auto baud	@M11
1200 - V22	1200 / AT @OM2	@OM2 @M1
2400 - V22 Bis	2400 / AT @OM2	@OM2 @M2
4800 - V32	4800 / AT @OM2	@OM2 @M3
9600 V32	9600 / AT @OM2	@OM2 @M4
7200 - V32 Bis	V32Bis fall down speed	@OM2 @M9
12000 - V32 Bis	V32Bis fall down speed	@OM2 @M5
14400 - V32 Bis	V32Bis fall down speed	@OM2 @M6
16800 - V32 Ter	V32Ter fall down speed	@OM2 @M7
19200 - V32 Ter	19200 / AT @OM2	@OM2 @M8
2400 - V34	2400 / @OM3	@OM3 @M2
4800 - V34	4800 / @OM3	@OM3 @M3
7200 - V34	V34 fall down speed	@OM3 @M9
9600 - V34	9600 / @OM3	@OM3 @M4
12000 - V34	V34 fall down speed	@OM3 @M5
14400 - V34	V34 fall down speed	@OM3 @M6
16800 - V34	V34 fall down speed	@OM3 @M7
19200 - V34	19200 / @OM3	@OM3 @M8
21600 - V34	V34 fall down speed	@OM3 @M12
24000 - V34	V34 fall down speed	@OM3 @M13
26400 - V34	V34 fall down speed	@OM3 @M14
28800 - V34	V34 fall down speed	@OM3 @M15
31200 - V34	V34 fall down speed	@OM3 @M16
33600 - V34	>= 38400 / @OM3	@OM3 @M17

Notes:
- The status page 3 details all information on DTE and modem speeds, data format, parity, synchronous or asynchronous mode (answer to the AT&S3 command).

Error correction and data compression:

The modem is set in default factory configuration in automatic mode so that it can negotiate the best protocol with the remote modem.

Flow control should be configured in asynchronous mode to avoid loss of received data. The following commands apply:

Command	Function
*M0	direct mode, no protocol. The modem is transparent to the transferred data. No flow control is possible. The XON.XOFF flow control is passed over the line.
*M1	Normal, no protocol. The modem buffers transferred data. Flow control can be RTS-CTS or XON XOFF.
*M2	Automatic. The modem tries to negotiate V42 or MNP modes
*M3	Exclusive. The modem only accepts connection in the configured protocol.
*T	Protocol type : MNP (*T1), V42 (*T2), automatic (*T3).
*G	Error alarm : the internal high speaker may beep when it detects an errored packet in the received data flow (*G0 : disable, *G1 : enable).

Flow control:

Through Xon-Xoff : :

AT *LG1	generates a local Xon-Xoff,
AT *LR1	answers to the local Xon-Xoff

These commands are the original commands. For compatibility with standard general purpose modems the following command may be used: AT &K4

Through RTS-CTS:

AT *LG2	generates a CTS flow control
AT * LR2	answers to the RTS flow control
AT %C1	sets the CTS signal for flow control
AT&R1	sets the RTS signal for flow control

The *LG and %LR commands are the original commands. For compatibility with standard general purpose modems the following command may be used: AT &K3

Automatic dialing directory

Each port of the MDU905C has a non-volatile memory that allows the user to store frequently used numbers. Each phone number can have a name and control sequence associated. Therefore, instead of remembering every number, the user can type in the recipient name, thus greatly easing the task of making a connection.

The following example shows how to store a number, name and control sequence at location 3 of the directory memory.

Dialling a direct line, send the command:
- ATDT36062424 <CR>

Dialling via a PABX, send the command:
- ATDP0W36062424 <CR>

Storing a number in the directory (number 3), send the command:
- AT&Z3:NAME:CONTROL:P0W36062424:::A <CR>

Show directory contents, send the command:
- AT&N <CR>

Dialing from the directory:

- The ATDSn command dials the stored telephone number specified by n where n is 0 to 99.
- By CCITT 108/1 operation. The modem autodials a stored number when an off-to-on transition of the DTR occurs. The modem disconnects when an on to off transition of the DTR occurs. AT&D1 command selects the dialling mode of the DTR signal.
- By the phone number name by the ATD$name command.

Saving user configurations

The MDU905C modem can store up to 2 user configurations.

The AT&Wn command saves the current configuration in non-volatile memory (n = 0 or 1). This configuration is saved even when the modem is turned off. The modem will load the last saved user configuration at power-up.

V54 – Maintenance

The MDU905C modem provides V54 loop test functions.
The A terminal can monitor the following tests:

Analogue local loop or B3: the A modem connects on its own carrier. The A terminal can check characters it sends are well returned. The good operation of the A modem is tested.

Remote digital loop or B2: the B modem sends back all characters received from the line. The A terminal can test the entire link to the remote modem.

A   B

AT command operation

The status page 10 lists all V54 test features (command AT&S10)
- B 3: local analogue loop: the A modem is in local command mode. The local loop may be started by the following commands:
- AT&T1: simple loop. The modem connects and sends a CONNECT xxxx message. All characters sent by the A terminal are sent back after modulation.
- AT&T8: in the same kind of local loop the A modem sends and checks automatically test characters. The error counter is displayed at the end of test.
- End of test: the test ends at the test timeout defined by S18, or by entering an escape sequence ('+++')and an AT&T0 command
- Front panel LED: the CD led is on when the modem is connected.

Example: A   A

AT&T1 <RC>.................. start the test
CONNECT 19200............. Connect message
ABCDE....................... characters sent by the terminal
+++............................ Escape to command mode
OK
AT&T0....................... End of test command

- Note: the connection status (AT&s8) page can be displayed during the test after an escape to command mode.
- B 2: remote digital loop: modems are connected before starting the test. The remote loop on the B modem is initiated from modem A by the following commands:

  o AT&T6: simple loop. The A terminal checks returned characters. The connection must be done without any error correction protocol (AT*M1)
  o AT&T7: same loop with automatic character sending and checking by the A modem. It displays the error counter at the end of test. The connection must be done without any error correction protocol (AT*M1)
  o End of test: the test ends at the test timeout defined by the S18 register, or by entering an escape sequence ('+++') and an AT&T0 command.
  o Front panel LED: on the B modem, the CD led flashes and the CTS signal is dropped during the test.

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- Example:

A   A   B   B

Connection at 19200bps

+++
OK... escape to local command mode on modem A

AT&T6
OK... requests a remote digital loop to B modem

ABCDE...Characters issued by the A terminal are sent back by the B modem
+++
OK
AT&T0... End of test

OK
ATO..Return to connected mode and reactivate the data link between the A and B terminals.

Security and memory

Principles

The modem contains three types of memory:
> The PROM, where factory configuration is stored permanently,
> The RAM, where the modem configurations are stored temporary,
> The NVRAM where semi-permanent data is stored even when the modem is turned off.

The first time your modem is turned on, or after a complete reset, these three memories are identical and set to the default factory configuration.

The AT&Wn command saves the current configuration in the non-volatile memory, (n = 0 or 1).

The last stored user configuration will be loaded automatically on next power-up.

These memory operations are shown on the following diagram:
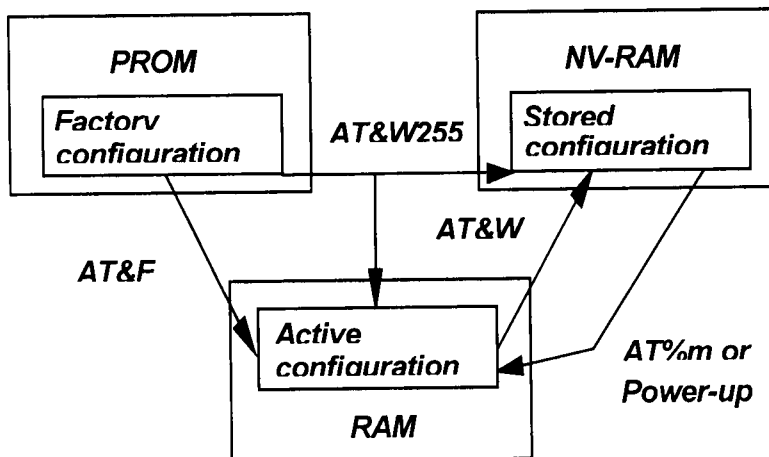
Memory reset	AT&W255
Memory store	AT&W0 or AT&W1
Loading of a factory configuration without loosing the stored memory	AT&F0 or AT&F1
Loading the user configuration	AT%M0 or AT%M1

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The phone directory

Up to 100 phone numbers can be stored in the modem's non-volatile memory, to be used by the automatic dialler.

Save a number	AT&Z0:Directory::11:::A
This command saves automatically the directory in non-volatile memory	
Dial a number	ATDS0 <CR>
Display the directory	AT&N <CR>

Answerback security

This security mode is controlled by the answering modem, and relies on a password exchange, which authorizes a modem connection, i.e.:
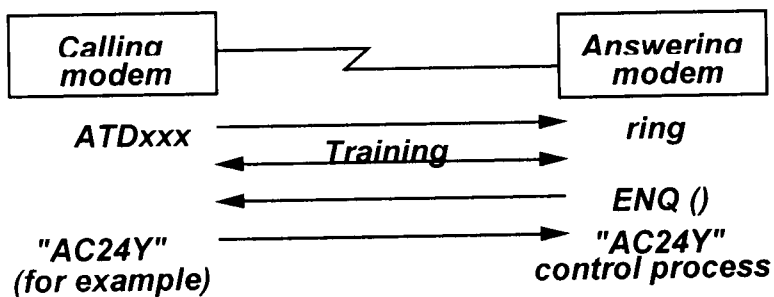
If the answerback matches the one stored in memory within two seconds after an ENQ code was sent by the answering modem, access is granted. Otherwise, the modem disconnects automatically.

To store the answerback code, see the following example. The password can be up to 12 characters long.

Store answerback (for example: AC24Y)	AT&A:AC24Y:AC24Y <CR>
To disable answerback security	AT&A:: <CR>

Call Back Security

```
┌────────┐      ┌────────┐
│ HERE   │──Z──│ THERE  │
│ N 3132 │      │ N 4142 │
└────────┘      └────────┘

ATS0=2              ATS0=2
AT%SB1              AT%SA1
        AT&Z3:HERE:CALLB1:3132:::CD

ATD4142    Calling
        ────────────────►
           Training
        ◄────────────────
           Password?
        ◄────────────────
            « call B1 »
        ────────────────►
           Disconnecting
        ◄────────────────
           Calling (3132)
        ◄────────────────
           Training
        ◄────────────────
           Password ?
        ◄────────────────
            « Call B1 »
        ────────────────►
       Modems are connected
        ◄───────────────►
```
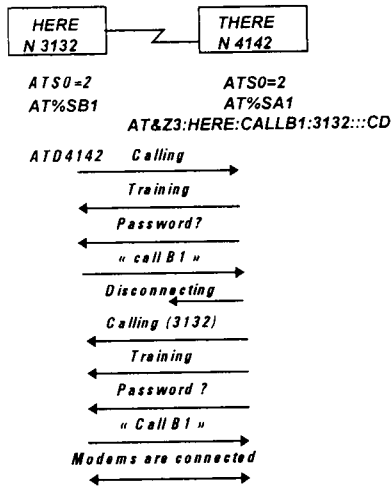
This security mode is controlled by the answering modem.

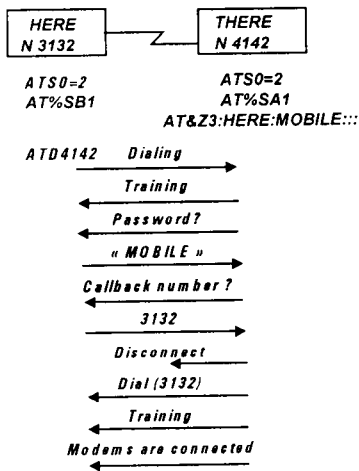It sends a password and then calls back the telephone number associated with that password.

See %SA and %SB commands in the reference manual.

This double security guarantees password and localization of the calling modem.

Dial number request call-back.

The remote user may provide the call-back number after password control.

Example:

```
┌────────┐      ┌────────┐
│ HERE   │──Z──│ THERE  │
│ N 3132 │      │ N 4142 │
└────────┘      └────────┘

ATS0=2              ATS0=2
AT%SB1              AT%SA1
        AT&Z3:HERE:MOBILE:::

ATD4142    Dialing
        ────────────────►
           Training
        ◄────────────────
           Password?
        ◄────────────────
            « MOBILE »
        ────────────────►
       Callback number ?
        ◄────────────────
              3132
        ────────────────►
           Disconnect
        ◄────────────────
           Dial (3132)
        ◄────────────────
           Training
        ◄────────────────
      Modems are connected
        ◄────────────────
```

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Inactivity password

The modem asks for a password when no data passes through it for a presented delay. If this password matches the operator or supervisor password stored in memory then the modem will reconnect otherwise it will drop the line.

S32: number of minutes of inactivity that will start the password request.
S96: number of seconds that the modem will wait for the password.
AT%ST 0/1: number of password trials (0: one trial / 1: three trials).
AT%In: inactivity is detected if:

> n=0: no detection, i.e. feature is disabled.
> n=1: detects transmitted data inactivity.
> n=2: detects received data inactivity.
> n=3: detects both received and transmitted data in activities.

AT%PS: SUPER: SUPER: stores the supervisor password, (SUPER as an example).
AT%PO: OPE:OPE: stores the operator password (OPE as an example).

Specifications

Line side characteristics

Mode	Switched network
Receiver sensitivity	- 43 dBm
Carrier detection:	
Open threshold	< - 48 dBm
Close threshold	> - 43 dBm
Transmission level:	
Nominal	- 10 dBm
Maximum	- 8 dBm
Minimum	- 16 dBm

Recommendations	Call/Answer	Speed Bps	Xmit 0	Xmit 1	Received 0	Received 1
V22 bis	Call	2400	1200	1200	2400	2400
	Answer	2400	2400	2400	1200	1200
V22	Call	1200	1200	1200	2400	2400
	Answer	1200	2400	2400	1200	1200
V21	Call	300	1180	980	1850	1650
	Answer	300	1850	1650	1180	980
V23	Call	75	450	390	2100	1300
	Answer	1200	2100	1300	450	390
V32		9600	1800 Hz			
V32 bis		14400	1800 Hz			
V32 terbo		19200	1800 Hz			
V34		33600	Adaptive			

Automatic call & answer

Originating

Automatic dialing or calling by the originating modem is initiated by:
- "AT" or V25bis commands
- Push button on front panel
- DTR 108/1 being enabled
- Pulse or tone dialing.

Tone recognition occurs when there is:
- A dial request (public network or private exchange).
- A busy line.
- The call monitoring by the internal high speaker can be disabled.
-

Answering a Call

When the modem is set in answer mode, it will go off hook after 2 rings (if the command ATS0=2 is sent). This is in conformity with CCITT V25bis recommendation.

Connection - Disconnection

In calling mode, the modem will automatically recognize the remote modem modulation type and adapt correspondingly.

It will disconnect only if:
- The carrier is lost,
- No carrier tone is detected within 35 to 90 seconds,
- No data activity has occurred for the selected period of time dictated by the Inactivity Timer.

Serial interface

The V24 serial interface of the modem conforms to the DCE specifications. A straight ribbon cable is all that is needed to connect to the DTE port of your computer or terminal. The serial port will automatically recognize DTE speeds up to 115200 bps. This is called auto-bauding.

Fax-mode

Automatic Call and Answer

Transmission Modes

The modem provides the ability to send and receive faxes at speeds up to 9600 bps. The following modulations are supported:

ITU-T	Speed Bps	Carrier (Hz)
V21	300	1650 - 1850
V27 ter	2400 / 4800	1800
V29	7200 / 9600	1700

Operating Mode

In fax mode, the modem support the following standards:

- Group III Fax, EIA 578 class 1 and class 2 compatible,
- CCITT T4 - T30 recommendations.

Service Class 1 Command Set

The following AT commands control the operation of a class 1 modem/fax:

+FCLASS   Service class identification and control
+FTS   Stop transmission and wait
+FRS   Receive silence

+FTM   Transmit mode
+FRM   Receive mode
+FTH   Transmit T30 command mode
+FRH   Receive T30 command mode
+FCERROR   Error code

Service Class 2 Command Set

The following AT commands control the operation of a class 2 modem/fax:

+FCLASS   Service class identification and control
+FMDL   Fax-modem model
+FMFR   Fax-modem manufacturer
+FREV   Fax-modem checkup
+FBUG   Frame report
+FAA   Automatic answer
+FBOR   Data bit order
+FDCC   Fax-modem capability selection
+FDIS   Capability initialization for transmission
+FLID   Identification selection of the fax-modem
+FCON   Remote fax detection
+FCIG   Identification of called subscriber by CIG
+FCSI   Identification of called subscriber by CSI
+FTSI   Identification of calling subscriber by TSI
+FDTC   Called fax return capability - DCS frame
+FDCS   Discussed capability for process - DCS frame
+FHR   Content of received frame
+FHT   Content of transmitted frame
+FBUF?   Buffer state
+FDT   Fax message transmission
+FPTS   Page transmission result
+FDR   Fax message reception
+FCFR   Reception mode confirmation
+FPTS   Remote reception status
+FET   End of page status
+FHNG   End of procedure status
+FAXERR   Error code

General characteristics

Dimensions: Length: 260 mm,
                                   Width: 170 mm,
                                   Height: 35 mm.
Weight: 0,5kg.
External power supply module: 230V/50Hz.
Power consumption: 5Vdc / 0.8A.
Operating temperature: 0 to 50°C.

Relative humidity: 0 -> 90% non-condensing.

Conforms to European security standards: EN41003, EN60950,

Conforms to European Electromagnetic Standards: EN50082, EN55022.

Troubleshooting

Problem:

This section lists most modem operating problems.

Problem	Check	
No tone when modem is turned on	Connection to the mains. On/Off switch in On position. Power supply of the rack and fuse of the card (rack version), DTR indicator on or flashing	
Single and continuous tone when modem is turned on	Send commands: **AT&W255 <CR>** **ATZ <CR>** Then restart the modem to see if the same continuous tone is heard. See Ati7 section below.	
Modem does not answer commands	Flashing of the DATA indicator when sending characters. No flash: check V24 cable. Flashes: <CR> command: **AT&S4 <CR>** and check for a long flash of DATA indicator. Long flash: check V24 cable.	
Modem answers "NO DIAL TONE"	Try to dial an outside line using the ADT command. Make sure that you select a valid telephone number and dialing mode (P-Pulse, T-Tone). Listen to the internal speaker to hear the normal dial tone is heard. If not check the line connection.	
Modem refuses to dial	Check for any blacklisting: **AT&NB <CR>** (see reference manual) Turning the modem off and on resets the blacklist.	

ATI7 command:

Check the answer to the ATI7 command. It provides a clear message in case of self-detected problem.

ATI7 Response	
BAD ROM	Code EPROM checksum bad
BAD RAM	Write and read failure in RAM
BAD NON VOLATILE MEMORY	Non volatile memory checksum bad
BAD DSP ROM	DSP checksum bad
BAD DSP	DSP bad
ALB FAILED	Analog loopback test bad

If problems persist or any assistance is required, please contact Black Box technical support.
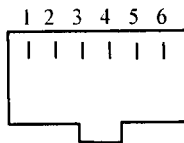
26   **SALES: 0118 965 5100**

Appendix A - V24 Signals

RJ45/DB25 cable:

RJ45	DB25	
1		Non connected
2	6	Data Set Ready (107)
7	8	Carrier Detect (108)
4	20	Data Terminal Ready (108)
5	7	Ground (102)
6	3	Receive Data (104)
7	2	Transmit Data (103)
8	5	Clear to send (106)
9	4	Request to send (105)
10	22	Ring indicator (125) (optional)

V24-V28 interface

```
  1 2 3 4 5 6 7 8 9 10
  ┌────────────────────┐
  │ I I I I I I I I I I │
  │                    │
  └──────┐    ┌────────┘
         └────┘
```
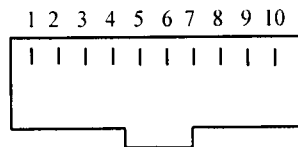
Dial line connector: RJ11 connector

Pin	Signal
1	Not used
2	Telset Tip
3	Tip PSTN
4	Ring PSTN
5	Telset Ring
6	Not used

```
  1 2 3 4 5 6
  ┌───────────┐
  │ I I I I I I │
  │           │
  └───┐   ┌───┘
      └───┘
```

TECHNICAL: 0118 965 6000   **27**

Appendix B - Country specific information

UK	Although this equipment can use either loop disconnect or DTMF signaling, only the performance of the DTMF signaling is subject to regulatory requirements for correct operation. It is therefore strongly recommended that the equipment is set to use DTMF signaling for access to public or private emergency services. DTMF signaling also provides faster call set up.

SALES: 0118 965 5100