

**Industrial PSTN Modem
UCM-81/82**

V. 2.00

40164 UCM-Sx 24-03-03

12.03

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1. Introduction

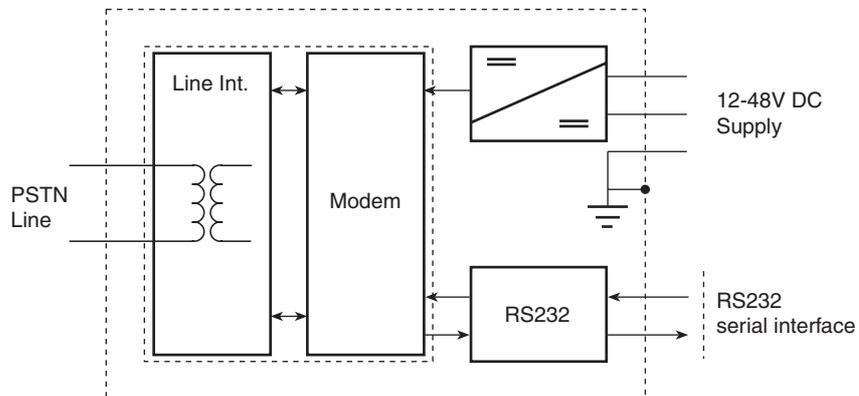
The UCM-81/82 modems are a series of general-purpose industrial modems, which can be used for data communication through Public Switched Telephone Networks (PSTN). The modems can operate in 2-wire, full-duplex, asynchronous modes at line rates up to 56 Kbps and can perform complete handshake and data rate negotiations. Tone and pattern detection functions required by the applicable ITU or Bell standards are supported and dialling, call progress, and the telephone line interface are supported and controlled through the AT command set. The modem connects to the DTE (Data Terminal Equipment, such as a PC, industrial controller or telemetry outstation) via a serial interface (EIA RS232).

The module has 2 interface ports: Serial interface, RS 232 (9 pole sub-D) with hardware handshake control lines - and the telephone line interface. (6 pole RJ11 modular jack).

The built-in power supply for 12-48VDC, is provided with galvanic isolation.

The modems are made in industrial 108mm wide aluminium housing for DIN rail mounting.

2. Block Diagram



3. Technical Data

Serial interface:

Signal level:	RS232C/V24.
Connector:	9 pole sub-D, female.
Hardware handshake:	DCD, DTR, DSR, RTS, CTS, RI
Baud Rate:	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230.400.
Format:	7, 8 bit (binary), 1 start bit. Odd, even, No parity, 1, 2 stop bit (if 7 data bit, no parity).
Default setup:	9600bps, no parity, automatic format/speed sensing

Telephone line interface

Connector:	6 pole RJ11 type modular jack
Modem Speeds:	K56flex, V.90, V.34, V.32bis, V.32, V.23, V22bis, V.22A/B, V.21, Bell 212A and 103 See the AT and MS command in the AT command section.
Data mode:	Speed buffering at all line speeds up to 115.200bps supported. XOFF/XON or RTS/CTS flow control supported.
Error correction:	V.42 LAPM and MNP 2-4
Data compression:	V.42 bis and MNP5 (MNP10 data throughput enhancement)
REN:	Ring Equivalent Number <1

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Modem control: Hayes compatible. AT command set.

Dial-up: DTMF dialling

Approvals: Pan European CTR21 standard.
Can be configured to support a wide range of national settings.

Indicators:

Rxd: Red, indicating receiving data activity.
Txd: Red, indicating transmitting data activity.
DCD: Red, carrier detect/modem connect.
DTR: Red, ready to transmit/receive data.
Power: Green.

Isolation

Power supply to electronics: 500 V.
Line interface: 1500 V.

Power supply:

Supply voltage: 12 - 48V DC (10,5-60,0V).
Reverse polarity protected.
Protective earth required

Current consumption:

Supply voltage	Typical	Max.
12V	115	140
24V	55	75
48V	30	49

Ambient temperature: -10 to +55 degrees C (+5% to +95% humidity).

EMC: EN 50081-1/EN50082-2.

Climatic:

Dry heat: IEC 68-2-2, Test Bd, Temp. +55°C, Duration 8h.
Cold: IEC 68-2-1, Test Ad, Temp. -10°C, Duration 8h.
Damp heat: IEC 68-2-3, Test Ca, Temp. 40°C, RH 95%, duration 8h.

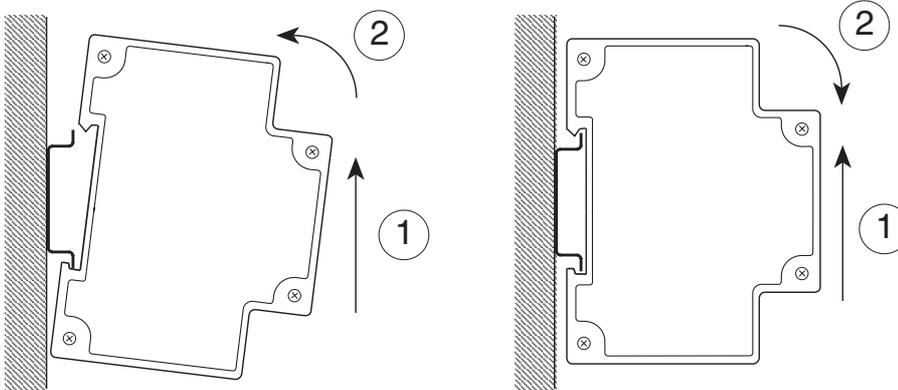
Mechanical:

Vibration: IEC 68-2-6, Test Fc (sinusoidal), Freq.10-150Hz,
Amp.4g, 5 sweeps in 3 orthogonal axes.

Shock:	IEC 68-2-27 (half sine), Acc. 15g, Pulse time 11msec., 3 x 6 shocks.
Protection:	IP20.
Mounting:	35 mm DIN-rail, EN50022.
Terminals (power):	Max. 1.5 mm ² wire.
Housing:	Anodized aluminium with plastic ends. According to DIN 43880.
Dimensions:	HxWxD: 80 (+ connectors) x108 x 62 mm.

4. Mounting / Installation

The Modem module is mounted on a DIN rail in the application. See the mounting advices as follows. The DTE (PC, PLC, RTU or other industrial controller) is connected to the serial port via the 9 pole D-SUB connector, standard modem cable can be used but shielded cables is highly recommended in industrial applications. The telephone line is connected to the RJ11 connector and finally the supply voltage is connected via the screw terminal connector. Remember to connected the ground connection to safety earth.



Mounting a modem module

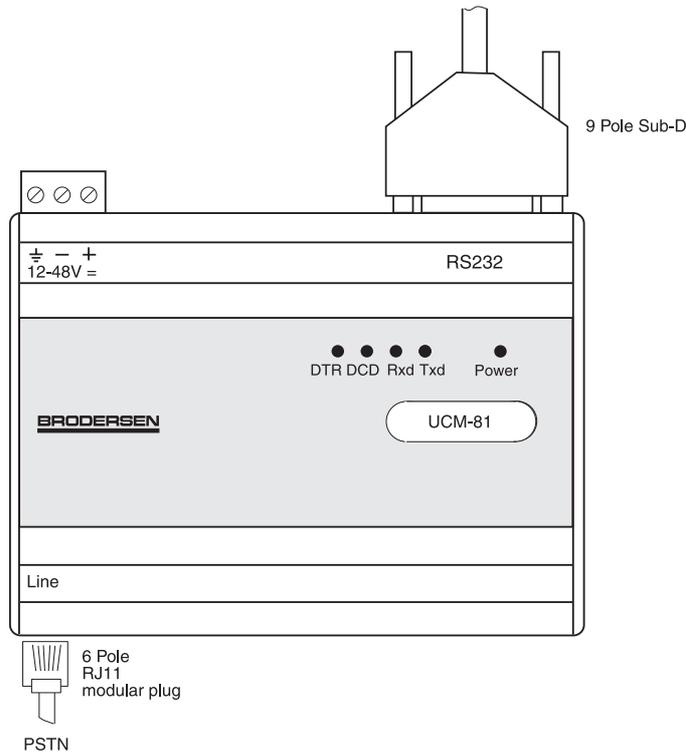
Fix the module at the bottom of the DIN rail and lift it (1) while pressing slightly on the top of the module (2).

De-mounting a modem module

Lift the module (1) and twist it out from the top (2) and the module is released from the DIN rail.

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Wiring Diagram



Telephone line interface (RJ11 modular jack - 6 pole)

Pin no	Signal name	IO Type	Interface
1	-	-	Not used . No connection needed.
2	-	-	Not used . No connection needed
3	A	BI	Bi-directional phone line (A= TIP)
4	B	BI	Bi-directional phone line (B = RING)
5	-	-	Not used . No connection needed
6	-	-	Not used . No connection needed

RS232 serial interface (9 pole sub-D female)

Pin	Signal label	IO type	Interface
1	DCD	Out	Data Carrier Detect
2	RXD	DCD	Receive Data. The interface uses the RX to send data received from the telco line to the DTE
3	TXD	In	Transmit Data. The DTE uses the TX line to send data to the interface for transmission over the telco line
4	DTR	In	Data Terminal Ready. Turned On when DTE is ready to transmit or receive data
5	SG	Gnd	
6	DSR	Out	Data Set Ready. OFF (high) indicates that the DTE is to disregard all signals appearing on the interface
7	RTS	In	Request To Send. RTS is used to condition the interface for data transmission
8	CTS	Out	Clear To Send. Indicates whether or not the interface (modem) is ready to transmit data. CTS is a response to DTR and RTS
9	RI	Out	Ring indication

6. Modem configuration / DTE commands

The modem is configured by AT commands when in command mode. Command mode is normally when no dial up sequence is executed and when connection to other modem is not established. A command is a line of characters sent from the DTE to the Modem via the serial interface. When setting up your modem you can use a PC with Terminal Software, such as Hyper Terminal supplied Microsoft Windows. A command line always starts with AT (except A/ and +++) followed by the specific command and terminated by a carriage return (Enter). When a command is followed by a "n" it mean that the command have several options, such as ATEn. When the modem receives a carriage return the command is executed.

You may use both upper case and lower case characters, but not both.

A command line starting with AT can be followed by many commands in sequence, except for the commands Z, D or A. The maximum number of characters in a command line is 39 including the A and T.

Up to four telephone numbers can be stored in the modem.

See the section "AT Command" for a list of the valid AT commands.

9. AT Commands

Command	Description
AT**	<u>Starting the flash-loading-function</u>
ATA	<u>Answer mode</u> The modem is set into answer mode (manual answer). In certain countries such as Germany this is only effective, when the parallel connected telephone is picked-up, or a call comes in.
A/	<u>Repeat last command</u> The last command entered is repeated.
ATB	<u>CCITT or Bell</u> ATB0 Select CCITT modulation ATB1 Select Bell modulation
AT\B	<u>Send break to the remote modem</u> <ul style="list-style-type: none">· For not error corrected connections, the modem sends a break signal to the remote modem. The signal length is: the parameter given multiplied by 1/10 of a second.· The modem sends a break signal according to the active error correction protocol without considering a parameter data for error corrected connections.· If no connection exists or a fax connection is active, an error message will be issued. ATVB1 1/10 seconds break signal until ATVB9 9/10 seconds break signal
AT*B	<u>Display blacklisted numbers</u> Command return a list of blacklisted no to the DTE. Note: The list is erased at power up.
AT%C	<u>Enable data compression</u> Enable or disable a certain type of data compression. The modem can only carry out data compression for error-corrected connections. AT%C0 No data compression enabled AT%C1 Enable MNP5 data compression AT%C2 Enable V.42bis data compression AT%C3 Enable MNP5 and V.42bis data compression

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Command	Description
AT&C	<p><u>DCD (CT109) options</u> Behavior of RS232 DCD output of the modem.</p> <p>AT&C0 DCD is always on AT&C1 DCD follows the telephone line carrier signal</p>
ATD	<p><u>Dialing</u> The modem picks up and dials according to the dialing string handed over with the ATD command. After dialing, the modem tries to set up a connection. If the ATD command has been executed without dialing string, the modem picks up and tries (with out dialing) to set up a connection to the other modem. The behavior of the modem depends on the activation of the line current detection (see ATX command). The execution of the ATD command depends also on the time of the last dialing attempt. In the FCLASS=0 mode, the modem acts like a data modem. It tries to connect to an other data modem. The attempt will be retried until the waiting period, given in register S7, is expired. If this period is exceeded, the modem hangs up and displays the error message: NO CARRIER. In FCLASS=1 or FCLASS=2, the modem acts like a fax modem. It will try to set up a connection to another fax modem or fax machine. (The modem adopts HDLC V.21 Channel 2 receive status, acting as if the AT+FRH command had been executed). The following characters may be sent as parameters (parentheses, punctuation marks, space, and dashes are ignored):</p> <p>0 to 9 Digits 0 to 9 inclusive * Asterisk: only with tone dialing # Pound: only with tone dialing A - D Tone dial characters A, B, C, D P <i>Set pulse dialing:</i> (deactivated) T <i>Set tone dialing:</i> According to the region, pulse or tone dialing is required. W <i>Waiting for dialing tone:</i> The modem waits for the dialing tone before starting to dial. If no dialing tone can be detected within the period, which is given in register S6, the modem hangs up and displays an error message.</p>

	<p>@ <i>Waiting for silence:</i> The modem waits at least five seconds for silence on the line before executing the next character of the parameter string. If these five seconds of silence can not be detected and the termination period in register S7 is not exceeded, the modem terminates the dial-up with the message: NO ANSWER.</p> <p>If the busy tone detection is not activated, the modem terminates the dial-up with the message: BUSY.</p> <p>If the other modem responds with an answering tone within the waiting period, a connection will be set up.</p> <p>, <i>Dialing pause:</i> The modem makes a dialing pause before executing the next character of the parameter string. The length of the pause is set in register S8.</p> <p>L Redial the last number dialed.</p> <p>; Return to command mode after dialing. Will be added to the end of the dialing string. Gets the modem to return to command mode when reaching the ; (with: OK message). This allows to enter AT commands even with picked up phone. The additional AT commands may follow in the same command line after the ; or handed over in further command lines. The connection can be terminated with the ATH command and the <i>phone</i> will be put down.</p> <p>S=n Dials the n-th number of the number directory which has been set up with the AT&Z command.</p> <p>! Flash. If the ! character is in a dialing string, the modem hangs up after the time stored in S29 and picks up then again.</p> <p>Ù Suppresses sending a calling tone.</p> <p>Default setting: Call tone is sent for fax operation. No call tone for data operation.</p> <p>() Are ignored: They are only used for clarity</p> <p>- Are ignored: They are only used for clarity</p> <p>' ' Spaces are ignored: They are only used for clarity.</p>
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	<p>Examples</p> <p>ATD12345 Dials the telephone number 12345</p> <p>ATDT12345 Dials with tone dialing the number 12345</p> <p>ATD12345; With the semicolon (;) the modem returns to the command mode after dialing.</p> <p>ATX3D0W12345</p> <p>- <i>For PABX, which access an outside line with a preceding 0 (or 9):</i> At first the blind dialing will be activated by :X3 (see “ATX3 command”) to be able to dial a preceding 0 without hearing a dialing tone. After the 0 has been dialed by :D0, the dialing tone detection can be reactivated by the parameter :W. With this, the modem waits for the dialing tone AND finishes the LAST PART of the dial-up (by :12345) first, after the dialing tone has been detected. The waiting for the dialing tone may also be omitted. In this case, the dialing command is ATX3D012345.</p> <p>- <i>For PABX, which access an outside line with a flash key function:</i> At first the blind dialing will be activated by :X3 (see ATX3 command) to be able to execute the flash key function without hearing a dialing tone. After the flash key has been acknowledged by >, the dialing tone detection can be reactivated by the parameter :W. With this, the modem waits for the dialing tone AND finishes the LAST PART of the dial-up (by :12345) first, after the dialing tone has been detected. The waiting for the dialing tone may also be omitted. In this case, the dialing command is ATX3D012345.</p>
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Command	Description
AT&D	<p><u>DTR (CT108/2) operation</u> DTR (CT108/2) operation - monitoring of on/off state changes of the RS232 DTR line of the PC.</p> <p>AT&D0 DTR is ignored, permits operation with PCs that do not support DTR.</p> <p>AT&D1 A DTR on/off change causes the modem to act as if it had received a +++ break sequence. The modem returns to command mode without hanging up.</p> <p>AT&D2 A DTR on/off change causes the modem to hang up. Automatic pick-up is not possible.</p> <p>AT&D3 A DTR on/off change causes the modem to execute a reset, as if an ATZ command had been executed. A preceding AT&Y command decides whether one of the two configurations, 1 or 2, should be loaded.</p>
ATE	<p><u>Command echo</u> This command switches the response messages on or off which are returned by the modem in response to commands generated by the PC.</p> <p>ATE0 Echo off</p> <p>ATE1 Echo on</p>
AT%E	<p><u>Automatic retrain</u> The modem executes a retrain process when a transmission problem occurs. After three unsuccessful retrain attempts, the modem hangs up.</p> <p>AT%E0 Retrain disabled</p> <p>AT%E1 Retrain enabled</p> <p>AT%E2 Fall-back, fall-forward enabled</p> <p>AT%E3 Fast fall-back, fall-forward. Not supported by all modem models.</p>
AT&F	<p><u>Loading the default factory configuration.</u> The modem loads the factory settings from the internal read-only memory. This enables to set the modem to a defined basic state. With AT&F, some S register settings are overwritten too. (The modems can have two different factory settings, AT&F0 and AT&F1).</p>

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Command	Description																																																
AT+GCI	<p><u>Setting the country code</u></p> <p>The command AT+GCI enables to adapt the modem to different countries. The modem is set to Europe (CTR21) with AT+GCI=FD by default. The modem is only certified for this country profile at the moment (worldwide certification in preparation).</p> <p>The following country settings are possible:</p> <table> <tbody> <tr> <td>0F = Belgium</td> <td>16 = Brazil</td> </tr> <tr> <td>26 = China</td> <td>31 = Denmark</td> </tr> <tr> <td>42 = Germany</td> <td>FD = Europe (TBR21) = default</td> </tr> <tr> <td>3C = Finland</td> <td>3D = France</td> </tr> <tr> <td>46 = Greece</td> <td>B4 = Great Britain</td> </tr> <tr> <td>53 = India</td> <td>57 = Ireland</td> </tr> <tr> <td>00 = Japan</td> <td>61 = Korea</td> </tr> <tr> <td>6C = Malaysia</td> <td>73 = Mexico</td> </tr> <tr> <td>7B = Netherlands</td> <td>82 = Norway</td> </tr> <tr> <td>0A = Austria</td> <td>8A =Poland</td> </tr> <tr> <td>8B = Portugal</td> <td>A5 = Sweden</td> </tr> <tr> <td>A6 = Switzerland</td> <td>9C = Singapore</td> </tr> <tr> <td>A0 = Spain</td> <td>FE = Taiwan</td> </tr> <tr> <td>B5 = USA</td> <td></td> </tr> </tbody> </table> <p>Furthermore, the following countries are supported via the country setting Taiwan (FE):</p> <table> <tbody> <tr> <td>Algeria</td> <td>Belarus</td> </tr> <tr> <td>Bolivia</td> <td>Bosnia-Herzegovina</td> </tr> <tr> <td>Brunei</td> <td>Costa Rica</td> </tr> <tr> <td>Ecuador</td> <td>El Salvador</td> </tr> <tr> <td>Guatemala</td> <td>Honduras</td> </tr> <tr> <td>Jordan</td> <td>Lithuania</td> </tr> <tr> <td>Morocco</td> <td>Nicaragua</td> </tr> <tr> <td>Peru</td> <td>Oman</td> </tr> <tr> <td>Tunisia</td> <td>Ukraine</td> </tr> <tr> <td>Yemen</td> <td></td> </tr> </tbody> </table> <p>The country profile Europe (FD) supports in addition: Latvia</p> <p>Note: Please obey that the country setting causes a reset of ALL modem settings to the defaults (like AT&F&W). Please select therefore the country profile first, and then make your settings.</p>	0F = Belgium	16 = Brazil	26 = China	31 = Denmark	42 = Germany	FD = Europe (TBR21) = default	3C = Finland	3D = France	46 = Greece	B4 = Great Britain	53 = India	57 = Ireland	00 = Japan	61 = Korea	6C = Malaysia	73 = Mexico	7B = Netherlands	82 = Norway	0A = Austria	8A =Poland	8B = Portugal	A5 = Sweden	A6 = Switzerland	9C = Singapore	A0 = Spain	FE = Taiwan	B5 = USA		Algeria	Belarus	Bolivia	Bosnia-Herzegovina	Brunei	Costa Rica	Ecuador	El Salvador	Guatemala	Honduras	Jordan	Lithuania	Morocco	Nicaragua	Peru	Oman	Tunisia	Ukraine	Yemen	
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Command	Description
ATH	<u>Disconnect</u> The modem hangs up.
ATI	<u>Identification</u> The modem sends an identification to the PC according to the parameter. ATI0 Product code ATI1 Previously calculated checksum of the EPROM ATI2 Calculation of EPROM's checksum and comparison with the previously calculated checksum stored in the EPROM. Output of OK if comparison is correct. ATI3 EPROM firmware version number ATI4 Modem version number ATI5 Country code parameter (Germany 006, Europe 253) ATI6 Data pump version number and revision state.
AT+IPR	<u>Setting baud rate</u> With the command AT+IPR , the automatic baud rate detection can be enabled or disabled. AT+IPR=0 enables the automatic baud rate detection (default) AT+IPR=n sets the modem to a fix baud rate n. Supported baud rates are 300, 1.200, 2.400, 4.800, 9.600, 19.200, 38.400, 57.600, 115.200, and 230.400. The setting AT+IPR is not stored with AT&W , i.e. if autobauding is to be deactivated, the AT+IPR command has to be sent to the modem for every start-up.
AT&K	<u>Select data flow control between modem and PC</u> Default for fax operation is RTS/CTS. T-Online requires AT&K0 AT&K0 No data flow control AT&K3 Select data flow control RTS/CTS AT&K4 Select data flow control XON/XOFF AT&K5 Select transparent data flow control XON/XOFF AT&K6 Select RTS/CTS and XON/XOFF data flow control

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Command	Description
AT\K	<p><u>Break control</u> The modem reacts to a break command from a remote modem or from the PC, or to an AT\B command according to the parameter.</p> <p>1st Situation In case of a break from the PC during a data connection to a remote modem:</p> <p>AT\K0 Modem returns to command mode and does not send a break signal to the remote modem.</p> <p>AT\K1 Modem erases the data buffer and sends a break signal to the remote modem.</p> <p>AT\K2 Like AT\K1</p> <p>AT\K3 Modem sends a break immediately to the remote modem, data buffer will not be erased.</p> <p>AT\K4 Like AT\K0</p> <p>AT\K5 The modem inserts a break signal into the data transmitted to the remote modem.</p> <p>2nd Situation The modem has been returned into command mode during a data connection with the escape sequence ++++. In this condition an AT\B command results a transmission of a break signal to the remote modem. The parameter n has the following effect in this situation:</p> <p>AT\K0 Modem erases the data buffer and sends a break signal to the remote modem.</p> <p>AT\K1 Like AT\K0</p> <p>AT\K2 Modem sends a break immediately to the remote modem.</p> <p>AT\K3 Like AT\K2</p> <p>AT\K4 The modem inserts a break signal into the data transmitted to the remote modem.</p> <p>AT\K5 Like AT\K4 – return from online command mode using the ATO command.</p> <p>3rd. Situation In case of receiving a break signal from the remote modem during a non-error-corrected connection, the parameter has the following effect:</p> <p>AT\K0 Modem erases the data buffer and sends a break signal to the remote modem.</p> <p>AT\K1 Like AT\K0</p> <p>AT\K2 Modem sends a break immediately to the PC.</p> <p>AT\K3 Like AT\K2</p> <p>AT\K4 Modem sends a break to the PC embedded into the data received from the remote modem.</p> <p>AT\K5 Like AT\K4 (default setting)</p>

Command	Description
ATL	<p><u>Speaker volume</u> This command controls the speaker volume (see ATM).</p> <p>ATL1 speaker low volume ATL2 speaker medium volume ATL3 speaker high volume Note: The speaker output is optional and not supported in the standard version.</p>
AT%L	<p><u>Displays level of received signal</u> The value indicated by the modem is the already amplified signal in the modem, not the level on the telephone line. Large AT%L values indicate a low signal level, small values a large signal level. (009 = -9dB, 043 = -43 dB)</p>
ATM	<p><u>Speaker control</u> This command controls the activity of the speaker (see ATL).</p> <p>ATM0 speaker always OFF ATM1 speaker ON when dialing and connection set-up ATM2 speaker always ON ATM3 speaker ON at connection set-up Note: The speaker output is optional and not supported in the standard version.</p>
AT+MR	<p><u>Displaying the modulation type</u> The command “AT+MR” enables to display the modulation type after the CONNECT message.</p> <p>AT+MR=0 disables the display function (default) AT+MR=1 enables the display function. The displayed value is valid for sent data. AT+MR=2 enables the display function. The displayed value is valid for received data.</p> <p>If the display function is enabled, the modem displays the modulation type and the line speed after the CONNECT message. After the CONNECT message, the line “+MCR:” followed by the modulation type (see AT+MS command) and the line “+MRR” followed by the line speed appear. The AT+MR command is useful for checking the connection.</p>

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Command	Description																																					
AT+MS	<p><u>Select modulation type</u> The modulation type is set with the AT+MS command. The command enables or disables automatic modulation detection and sets the highest and lowest possible connection speed. The command is in the form AT+MS=MODULATION, [Automode], [Send: Minbaud, Maxbaud]; [Receive: Minbaud, Maxbaud]</p> <p>AT+MS? displays the current setting. AT+MS=? displays a list of possible parameters.</p> <p>Modulation parameter: The modulation parameter sets the preferred (automode = 1) or the specified (Automode = 0) modulation type.</p> <p>The following values are available:</p> <table> <tbody> <tr> <td>0</td> <td>V.21</td> <td>300</td> </tr> <tr> <td>1</td> <td>V.22</td> <td>1200</td> </tr> <tr> <td>2</td> <td>V.22bis</td> <td>2400 or 1200</td> </tr> <tr> <td>3</td> <td>V.23</td> <td>1200</td> </tr> <tr> <td>9</td> <td>V.32</td> <td>9600 or 4800</td> </tr> <tr> <td>10</td> <td>V.32bis</td> <td>14400, 12000, 9600, 7200, or 4800</td> </tr> <tr> <td>11</td> <td>V.34</td> <td>33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400 (only Modem 56K)</td> </tr> <tr> <td>12</td> <td>V.90</td> <td>56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000 (only Modem 56K)</td> </tr> <tr> <td>56</td> <td>K56flex</td> <td>56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000 (only Modem 56K)</td> </tr> <tr> <td>64</td> <td>Bell 103</td> <td>300</td> </tr> <tr> <td>69</td> <td>Bell 212</td> <td>1200/75</td> </tr> </tbody> </table> <p>Automode parameter: With the optional automode parameter it is possible to determine if the modem can automatically adapt to the required modulation type. The following values are accepted:</p> <table> <tbody> <tr> <td>0</td> <td>Automatic adaption to modulation disabled.</td> </tr> <tr> <td>1</td> <td>Automatic adaption to modulation enabled.</td> </tr> </tbody> </table>	0	V.21	300	1	V.22	1200	2	V.22bis	2400 or 1200	3	V.23	1200	9	V.32	9600 or 4800	10	V.32bis	14400, 12000, 9600, 7200, or 4800	11	V.34	33600, 31200, 28800, 26400, 24000, 21600, 19200, 16800, 14400, 12000, 9600, 7200, 4800, or 2400 (only Modem 56K)	12	V.90	56000, 54667, 53333, 52000, 50667, 49333, 48000, 46667, 45333, 42667, 41333, 40000, 38667, 37333, 36000, 34667, 33333, 32000, 30667, 29333, 28000 (only Modem 56K)	56	K56flex	56000, 54000, 52000, 50000, 48000, 46000, 44000, 42000, 40000, 38000, 36000, 34000, 32000 (only Modem 56K)	64	Bell 103	300	69	Bell 212	1200/75	0	Automatic adaption to modulation disabled.	1	Automatic adaption to modulation enabled.
0	V.21	300																																				
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2	V.22bis	2400 or 1200																																				
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1	Automatic adaption to modulation enabled.																																					

	<p>Receive Minbaud parameter: The optional minbaud parameter sets the lowest possible baud rate at which the modem receives.</p> <p>Receive Maxbaud parameter: The optional maxbaud parameter sets the highest possible baud rate at which the modem receives.</p> <p>Send Minbaud parameter: The optional minbaud parameter sets the lowest possible baud rate at which the modem sends.</p> <p>Send Maxbaud parameter: The optional maxbaud parameter sets the highest possible baud rate at which the modem sends.</p>
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BRODERSEN

Command	Description
AT\N	<p><u>Selection of the error correction</u> This command determines which type of error correction is the preferred choice to be used for following connections.</p> <p>AT\N0 Disable error correction (buffered normal mode) AT\N1 Bit-direct mode (only for special data formats) AT\N2 Selects V.42 LAPM or MNP4 error correction. If an error corrected connection can not be made, it results a hang-up. AT\N3 Selects V.42 LAPM or MNP4 error correction. If such a link is not possible, a non error corrected connection is attempted. AT\N4 Exclusively selects V.42 LAP-M connection. AT\N5 Exclusively selects MNP 4 connection.</p>
ATO	<p><u>Return to online data mode.</u></p> <p>ATO1 Returns to online data mode. If the modem is in online command mode it returns to online data mode. If the modem is in online data mode it returns an ERROR message. ATO1 Causes retrain process, before the modem goes into online data mode.</p>
ATQ	<p><u>Quiet control</u> This command enables or disables the sending of messages from the modem to the PC.</p> <p>ATQ0 Send messages to the PC ATQ1 Send no messages to the PC.</p>
AT%Q	<p><u>Display telephone connection quality</u> A modem message with a value between 000 and 007 denotes a good quality telephone connection. The lower the value, the better the quality. Values between 008 and 127 indicate a poor quality. These values are constantly updated during a call. If the value increases above 007 during a call i.e. the quality has deteriorated, an <i>autoretrain</i> is executed, providing a preceding AT%E command has enabled this facility.</p>

Command	Description
AT&R	<u>RTS/CTS options</u> This command determines how the modem responds to RTS/CTS (CT105/CT106) data flow control connections. (see also the AT&K command) AT&R0 CTS reaction like V.25bis AT&R1 RTS signals are ignored. CTS only goes to <i>off</i> if required by data flow control.
ATS	<u>Write to/read from S register</u> Some S registers can only be changed within certain limits. The modem still gives an OK , even if the value has not been altered as shown. Some registers can only be read. Therefore, it is recommended to check the results of every write attempt to the register with the ATSn? command. ATSn=x Sets the S register n to the value x. ATSn? Displays the value of the S register n.
AT&S	<u>DSR options</u> This command determines how the modem responds to its DSR (CT107) output. AT&S0 DSR always on AT&S1 DSR <i>on</i> , once a reply tone is detected, DSR <i>off</i> once carrier is no longer detected.
ATT	<u>Enable tone dialing</u> After this command has been executed, all subsequent calls will be dialed using tone dialing, until either an ATP or ATDP command is executed to return to pulse dialing.
ATV	<u>Form of modem message</u> This command determines whether the modem sends messages to the PC in long form or short form. ATV0 Messages to the PC in short form, i.e. only the error number ATV1 Messages to the PC in long form, i.e. the error text

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Command	Description
AT+VCID	<p><u>Set caller ID</u> This function enables the modem to display the telephone number of the caller for ingoing calls. (Only for telephone connections or PABXs which support the caller ID. If you want to use caller ID, ask your net provider whether your connection has caller ID).</p> <p>AT+VCID=0 disables the caller ID function (default) AT+VCID=1 enables the caller ID function and displays the ID pre-formatted for calls AT+VCID=2 enables the caller ID function and displays the ID unformatted for calls</p>
AT+VRID	<p><u>Set last received caller ID</u> With the command AT+VRID you can display the ID of the last caller.</p> <p>AT+VRID=0 displays the ID pre-formatted AT+VRID=1 displays the ID unformatted</p>
AT&V	<p><u>Displays configuration</u> This command activates the display of current active configuration of the modem, the stored user configurations, and the stored telephone numbers 0 to 3.</p>
AT\V	<p><u>Form of the connect rate messages</u> This command enables the display of the connect message in one (\V1) or three (\V0) lines.</p>
ATW	<p><u>Error correction messages</u> This command defines which specification of data transmission rates are made for a CONNECT message</p> <p>ATW0 The modem sends the baud rate between the modem and the PC</p> <p>ATW1 The modem sends the speed of the telephone line, the error correction protocol, and the PC baud rate.</p> <p>ATW2 The modem sends the speed of the telephone line.</p>

Command	Description
AT&W	<p><u>Store configurations</u> This command stores the current modem configuration including the S registers to one of the two user-definable default settings.</p> <p>AT&W0 Storing to user default setting 0 AT&W1 Storing to user default setting 1</p>
ATX	<p><u>Extended result reporting, dial tone detection</u> This command determines which group of messages are sent to the PC by the modem. This is important for PABXs, because a leading 0 or 9 must be dialed before a dial tone can be heard on the line. <i>Blind dialing</i> (dialing without detecting a dial tone) is activated or deactivated depending on parameter. Dial tone detection, however, can always be forced with the W parameter in an ATD dial string (see ATD command). In AT+FCLASS=1,2 mode, the modem always sends the CONNECT message to the PC at connection set-up without giving the transmission speed.</p> <p>ATX0 No dial tone detection, i.e. an unsuccessful dial attempt results the message NO CARRIER. No busy tone detection, i.e. a busy line results the message NO CARRIER. Message is displayed without giving the speed.</p> <p>ATX1 Like ATX0, but CONNECT message with speed information.</p> <p>ATX2 Dial tone detection active, i.e. a dial attempt without the presence of a dial tone being detected leads to the message NO DIALTONE. No busy tone detection, i.e. a busy line results the message NO CARRIER.</p> <p>ATX3 No dial tone detection, i.e. an unsuccessful dial attempt results the message NO CARRIER. Busy tone detection active, i.e. calling a busy line results the message BUSY.</p> <p>ATX4 Dial tone detection active, i.e. a dial attempt without the presence of a dial tone being detected results the message NO DIALTONE. Busy tone detection active, i.e. calling a busy line results the message BUSY.</p>

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Command	Description
AT&Y	<p><u>Selecting user configuration 0 or 1 on a hardware reset</u></p> <p>AT&Y0 On a hardware reset following the command AT&Y0, user configuration 0 (generated by the AT&W0 command) is loaded to the current modem configuration.</p> <p>AT&Y1 On a hardware reset following the command AT&Y1, user configuration 1 (generated by the AT&W1 command) is loaded to the current modem configuration.</p>
ATZ	<p><u>Software reset / load default setting</u></p> <p>This command causes the modem to execute a software reset. The modem loads the configuration stored by the user. If no parameter is given, then user configuration 0 is loaded.</p> <p>ATZ0 Software reset, followed by loading user configuration 0.</p> <p>ATZ1 Software reset, followed by loading user configuration 1.</p>
AT&Z	<p><u>Store telephone numbers</u></p> <p>This command stores four entries (0 to 3) permanently in the EEPROM. Each entry may have be up to 35 characters in length. The entries can be overwritten and must correspond to the dial string as specified in the ATD command.</p> <p>AT&Zn=x n is the number of the entry in the list (from 0 to 3) x is the dial string with the telephone number</p>

S-Register

The modem has status register which control the operation.

S-register can be read and written using the **ATS** command. Some S register can only be read, other can only be set in a certain value range.

In case of value range exceeding, the modem responds with **OK**, but the value will not be taken over. Therefore, it is recommended that changes are immediately checked by reading (**ATSn?**).

Short Overview of the S Register

Register	Function	Units	Range	Default
S0*	Rings until auto answer	Rings	0-5	5
S1	Ring counter	Rings	0-255	0
S2*	Escape character	ASCII	0-255	43
S3	Carriage return character	ASCII	0-127	13
S4	Line feed character	ASCII	0-127	10
S5	Backspace character	ASCII	0-255	8
S6*	Waiting time for dial tone	s	4-7	4
S7*	Waiting time for carrier signal	s	0-100	60
S8*	Pause time for dial delay modifier	s	1-7	2
S9*	Carrier detection response time	0.1 s	1-255	6
S10*	Carrier loss disconnect time	0.1 s	20-254	20
S12*	Escape prompt delay	0.02 s	0-255	50
S14*	General settings	-	-	138
S21*	Settings for V.24	-	-	116
S22*	Settings	-	-	75h (117)
S24*	Sleep inactivity timer	s	0-255	0
S25	Delay to DTR Off	0.01 s	0-255	5
S26	RTS-to-CTS delay	0.01 s	0-255	1
S27*	General settings	-	-	137
S29	Flash dial modifier time	10 ms	17	17
S30	Disconnect inactivity time	10 s	0-255	0
S31*	General settings	-	-	C2H (194)
S36*	Resetting the error protocols	-	-	135
S38	Delay until forced hang-up	s	0-255	20
S39*	Flow control	-	-	3
S40*	General settings	-	-	104
S41*	General settings	-	-	195
S46*	Data compression	-	-	138
S48*	Setting for V.42 negotiation phase	-	-	7
S86	Failure code	-	-	read only

* These registers are stored to the EEPROM using the **AT&W** command.

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S register details

- S0*** Rings to auto answer
The number of call ring signals before the modem answers.
A value of S0=0 means that the modem will not answer. S0 can accept a value between 0 and 5.
- S1** Ring Counter - counter for call ring signals
S1 can only be read. S1 resets to zero when the modem is waiting for a call.
- S2*** Escape character – escape character, which effects a switch from data mode to online command input mode. Values greater than 127 have the effect that an escape character is not recognized.
- S3** Carriage return character
- S4** Line feed character
- S5** Backspace character
- S6*** Waiting time for dial tone (before blind dialing) - the maximum time to wait for a dial tone.
After the modem has picked up, it waits 7 seconds (this is fixed because of the certification). If a dial tone is detected during the wait period, dialing begins.
If no dial tone is detected, the modem checks whether dial tone detection is activated, or whether the parameter **W** (chapter 8 “AT command set”, **ATD** command) is present in the dial string. If the dial tone detection is inactive, the modem waits for the time given in S6 (in seconds) for the dial tone.
S6 can have a value between 4 and 7.
- S7*** Waiting time for carrier signal - waiting for a carrier frequency from the remote modem. S7 determines the maximum time, that the modem waits for a reply from the remote modem. The time begins to run when the modem has finished dialing. S7 can have a value between 0 and 180 seconds.
- S8*** Pause time for dial delay modifier - dial pause time if a comma is in the dial string.
The modem waits during dialing for the time specified in S8 (in seconds) if a comma is present in the dial string. S8 can have a value between 1 and 7 seconds.

- S9*** Carrier detection response time - DCD reaction time for a carrier frequency received from the remote modem.
The DCD output of the modem's RS232 interface (CT109) goes to **on** if a carrier frequency is detected from the remote modem within the time defined in S9 (in tenths of a second). S9 must be less than S10.
- S10*** Carrier loss disconnect time - the time of a carrier loss required for the modem to terminate the connection.
S10 gives the time, in tenths of a second, which the modem waits when the carrier from the remote modem is no longer detected before disconnecting the connection.
- S12*** Escape prompt delay - the minimum time period, in tenths of a second, that must be maintained before, between, and after two characters so that the modem correctly detects an escape sequence (normally +++).
- S14*** General bitmapped options status – general settings

Bit	Signification	
Bit 0	Reserved	
Bit 1	Echo input	Command echo 0: Echo off 1: Echo on
Bit 2	Feedback (ATQ)	0: Feedback on (ATQ0) 1: Feedback off (ATQ1)
Bit 3	Results format	Result codes: 0: Message numbers (ATV0) 1: Message texts (ATV1)
Bit 4	Reserved	
Bit 5	Tone / pulse dialing	Tone / pulse 0: Tone dialing (ATT) 1: Pulse dialing (ATP)
Bit 6	Reserved	
Bit 7	Call / answer	Originate / answer 0: Answer mode 1: Call mode (originate)

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S21* General bitmapped options status – setting for V24

Bit	Signification	
Bit 0, 1	Reserved	
Bit 2	CTS behavior	CT106 (CTS) behavior: 0: as for AT&R0 1: as for AT&R1
Bit 3 - 4	DTR behavior	CT108 (DTR) behavior: 0: as for AT&D0 1: as for AT&D1 2: as for AT&D2 3: as for AT&D3
Bit 5	DCD behavior	CT109 (DCD) behavior: 0: as for AT&C0 1: as for AT&C1
Bit 6	DSR behavior	CT107 (DSR) behavior: 0: as for AT&S0 1: as for AT&S1

S22* General bitmapped options status – settings for speaker

Bit	Signification	
Bit 0, 1	Speaker volume	Speaker volume: 0: Off (ATL0) 1: Quiet (ATL1) 2: Medium (ATL2) 3: Loud (ATL3)
Bit 2 – 3	Speaker function	Speaker control: 0: Off (ATM0) 1: Off till carrier (ATM1) 2: Always on (ATM2) 3: On during set-up (ATM3)
Bit 4 – 6	Error message group	Limit results codes: 0: Like ATX0 4: Like ATX1 5: Like ATX2 6: Like ATX3 7: Like ATX4
Bit 7	Reserved	

S24 Sleep timer
In S24, the time (in seconds) is set, after which the modem changes to energy-saving (sleep) mode.
The modem returns from energy-saving mode as soon as characters are sent to the modem or a call comes in.
Note: The first “**AT**” ends the sleep mode, but is not safely detected. If the modem is in sleep mode, it is required to send an “**AT**” first before further commands follow. This first “**AT**” may possibly not be responded with “**OK**”.

S25 Delay to DTR Off
The time that the modem permits the DTR signal to remain off before hanging up (in hundredths of a second).

S26 RTS-to-CTS delay
Time between the activity of RTS and CTS in 1/100 second.

S27* General bitmapped options status – general settings

Bit	Signification	
Bit 0 - 3	RS232 mode	Asynchronous mode selection: 0: as AT&M0 or AT&Q0 9: as AT&Q5 10: as AT&Q6
Bit 4,5,7 Bit 6	Reserved CCITT or Bell modulation	CCITT/Bell Select 0: CCITT modulation 1: Bell modulation

S29 Flash dial modifier time
Sets the time, in tenths of a second, that the modem takes to hang up if a flash is included in the dial string.

S30 Disconnect inactivity timer
The time that the modem waits without activity before it hangs up. The unit is seconds (fax class 1 only).

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S31* General bitmapped options status

Bit	Signification	
Bit 0		
Bit 1	Representation Connect message	0: 3-line message (\V0) 1: extended 1-line message (\V1)
Bit 2 - 3	Error correction messages	Error correction messages: 0: PC baud rate only (ATW0) 1: PC and phone baud rate (ATW1) 2: Phone baud rate only (ATW2)
Bit 4 - 7	Reserved	

S36* LAPM failure control

Bit	Signification	
Bit 0..2	This register determines what happens if an attempt to set up a V.42 LAP-M connection fails. It is used in conjunction with the S48 register.	0 The modem hangs up. 1 The modem stays online and sets up a direct mode connection. 2 Reserved 3 The modem stays online and sets up a normal mode connection. 4 The modem tries to set up an MNP connection. It hangs up if this fails. 5 The modem tries to set up an MNP connection. A direct mode connection is made if this fails. 6 Reserved 7 The modem tries to set up an MNP connection. A normal mode connection is made if this fails.
Bit 3..7	Reserved	

S38 Delay until forced hang-up

Maximum time in seconds that remains for the buffers to erase their data after the command to hang up has been received. Only valid for error corrected links.

S39* PC / Flow control modem – selection of the data flow control between PC and modem.

S39=0 No flow control (**AT&K0**)
S39=3 RTS/CTS flow control (**AT&K3**)
S39=4 XON/XOFF flow control (**AT&K4**)
S39=5 Transparent XON flow control (**AT&K5**)
S39=6 RTS/CTS and XON/XOFF flow control

S40* General bitmapped options status – general settings

Bit	Signification	
Bit 0	Reserved	
Bit 1	Reserved	
Bit 2	Reserved	
Bit 3 - 5	Break handling	Break handling 0: Like ATK0 1: Like ATK1 2: Like ATK2 3: Like ATK3 4: Like ATK4 5: Like ATK5
Bit 6 - 7	Reserved	

S41* General bitmapped options status – general settings

Bit	Signification	
Bit 0, 1	Select compression type	Compression selection 0: No compression (AT%C0) 1: MNP5 (AT%C1) 2: V.42bis (AT%C2) 3: MNP5 or V.42bis (AT%C3)
Bit 2	Auto retrain	Auto retrain control 0: No auto retrain (AT%E0) 1: Auto retrain (AT%E1)
Bit 3..5 Bit 6 Bit 7	Reserved Fallback / fall forward Reserved	Fallback/fall forward control 0: No fallback/fall forward 1: FB/FF (AT%E2)

S46* V.42bis data compression control

S46=136 No data compression.
S46=138 V.42bis data compression on.

S48* V.42 negotiation control

S48=0 Only LAP-M connection possible
S48=7 LAP-M or MNP 4 connection
S48=128 Connection protocol as specified in S36

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S86	<u>Failure Code</u> On a connection break (NO CARRIER) an occurrence (ERROR) code is written to this register.
S86=0	normal connection set-up, no error
S86=4	carrier lost
S86=5	an error corrected (V.42) connection could not be established
S86=6	extensions could not be negotiated
S86=7	remote site only supports synchronous mode
S86=8	no mutual framing found
S86=9	no protocol at all could be established
S86=10	invalid response when negotiating extensions
S86=11	no synchronous marks received from remote site
S86=12	normal connection termination by remote site
S86=13	remote site does not react any longer (ten attempts)
S86=14	protocol error
S86=15	DTR drop
S86=16	remote site required termination (GSTN clear-down)
S86=17	inactivity timer timed out
S86=18	required speed not supported
S86=19	long space disconnect
S86=20	key abort (characters have been sent during connection set-up)
S86=22	no connection set-up possible
S86=23	termination after 3 retrains
S86=26	remote site hung up

10. Accessories

Please contact your local Brodersen Controls A/S distributor for a list of accessories.

Appendix A Distributer list**Australia:**

Motherwell Automation
Nobel House
672 Murray Street
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F-38500 Voiron
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