

**REDHAWK 2000
BETA RELEASE NOTES
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OMNIPOINT CONFIDENTIAL

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1. Introduction

The REDHAWK™ 2000 Data Terminal Module (DTM) is a compact, wireless modem that utilizes the international standard Global System for Mobility (GSM) enabling low-cost, application-specific, two-way communication and control. It takes full advantage of GSM capabilities such as Subscriber Identity Modules (SIMs), which are “smart cards” that provide numerous advantages, such as quick, remote programming. Over-the-air communication lets the REDHAWK™ 2000 DTM accomplish tasks that use to require on-site visits and offers innovative new services. In addition, terminal authentication and data encryption ensure confidential communication between the DTM user and the data recipient.

These Release Notes describe the BETA unit. While the intent of the first BETA units was to deliver the same functionality as the production unit. There are some design differences due to engineering delivery schedules or just plain oversights (i.e. bugs). We thank you for your patience and cooperation in the BETA trials.

NOTE: Differences in functionality of BETA unit versus production DTM are noted with a BOX.

1.1. Modes of Operation

1.1.1. Circuit Switched Data

GSM provides two connection modes of transmission: Transparent and Non-Transparent. The DTM supports both modes. The Transparent data mode delivers a service with a variable error rate, with a guaranteed throughput and delay, whereas the Non-Transparent mode delivers a constantly low error rate but with a non-guaranteed throughput or delay. The Non-Transparent service provides a performance that is closest to using a modem over a fixed PSTN line.

Transparent mode is not supported by all GSM service providers. In those cases, the DTM switches automatically to Non-Transparent mode.

1.1.2. SMS

SMS is a very feature rich GSM service with a multitude of options defined. The following lists the key characteristics and assumptions regarding the form of SMS supported in the DTM.

- Support of both DTM originated and DTM terminated SMS.
- Delivery of message to either phone number or IP address (translated by SMSC)
- 8-bit data
- Message Class 1
- Message concatenation up to 255 messages
- Validity Period
- Service Center Time Stamp

Message Waiting

1.1.3. SIM Provisioning Requirements

To enable the use of the DTM on the GSM network a SIM (subscriber information module) is required. This can be obtained from your local GSM provider or see OTI technical support personnel.

The SIM must be provisioned correctly for the services (or modes of operations). For the REDHAWK 2000, the SIM must have the ability to send and receive SMS messages; and be able to make and receive DATA calls. In GSM nomenclature, this is known as mobile originate and mobile terminated SMS and mobile originate and mobile terminated DATA. The VOICE number is used to receive SMS messages, but an additional phone number is required to receive DATA calls. Each GSM operator may have different tariffs for these services.

NOTE: The SIM must have a separate DATA phone number to receive DATA phone calls.

1.2. Installation and Interfaces

The DTM has a variety of interfaces. Care should be taken when installing all interfaces to the DTM.

1.2.1. Power Interface

Power to the DTM is provided via a Molex (part number **39-01-2025**) Mini-fit Jr. 2 pin power connector. Input voltage may vary from +5.3VDC to + 16VDC. Average current draw does not exceed 0.3 Amp @ 12 VDC. The input source voltage ripple should be less than 20% of the average supply voltage peak-to-peak under normal operating conditions. +VDC is top pin.

Power Dissipation:

Transmit mode	For a circuit switched all, average of approximately 210mA and up to a 850mA peak
Idle mode (receiver operating, waiting to communicate)	2.5 Watts

NOTE: limited functionality of BETA unit. Production DTM will have input voltage from +7V to +32V DC.

1.2.2. Radio Frequency (Antenna) Interface

The antenna connector is a female SMA type. The DTM is designed to support interchangeable antenna types provided they have an impedance of 50 ohms. The DTM operates in the US licensed PCS frequency bands between 1850 MHz to 1990 MHz.

1.2.3. Subscriber Interface Module (SIM) carrier

The SIM, an integral part of any GSM terminal device, is a "smart card" programmed with subscriber information. The user information consists of an identity (IMEI number) registered with the GSM provider and an encryption Ki (pronounced key). It consists of a microprocessor chip and memory installed on a plastic card. REDHAWK uses the "mini-SIM" or Plug In configuration. The SIM (which is removable) is installed on a carrier on the REDHAWK circuit card.

The SIM is not provided with the REDHAWK unit. It is provided by the GSM service provider (see SIM provisioning requirements.) Care must be taken to protect the SIM. A GSM terminal will not operate without the SIM installed.

The SIM card performs authentication. To gain access to the GSM network, the network must recognize the IMEI number and the terminal must be able to properly decrypt the data sent by the network. The SIM also serves as a buffer for SMS messages, storing the messages until a radio link is available.

Power should always be off when changing a SIM in the carrier.

1.2.4. Data Port Interface

The physical connector is a DB9 type. This supports both the CPE/Local interface and diagnostic servicing. The electrical Input/ Output interface is RS-232 with RS-232 and TTL voltage levels supported.

DB9 pin		RS232 Signals
1	DCD	Data Carrier Detect/
2	RxD	Receive Data
3	TxD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request to Send
8	CTS	Clear to Send
9	RI	Ring Indicator (Not available as separate pin)

The default settings for the REDHAWK 2000 DTM data port is 9600 BPS, 8 bits data, 1 bit stop, no parity, RTS/CTS flow control. Please use the commands +IPR, +IFC, +ICF to change these settings.

1.2.5. Status Indication

A single LED is provided that indicates two levels of DTM status.

- LED off indicates that DTM has power off
- LED on indicates that DTM has power on

NOTE: The limited functionality of the BETA unit has only two states. The production REDHAWK will have levels:

- Level 1 (LED off) indicates terminal not ready.
- Level 2 (Green LED - blinking) indicates power ON; but not attached to the network.
- Level 3 (Green LED) indicates that the terminal is ready and attached to the network.

2. DTM Initialization and Setup Examples

2.1. AT commands

In the GSM vocabulary, a call from GSM mobile to the PSTN is named "mobile originated call" or "outgoing call", and a call from fixed network to a GSM mobile is called "mobile terminated call" or "incoming call".

Data exchange from the customer application to the DTM will be noted as "app -> DTM", while the inverse data exchange will be noted "DTM -> app".

With the exception of the "+++" command (Online Escape Sequence), all commands must be preceded by the AT attention code (or command prefix) and terminated by pressing the <CR> character..

Upon applying power to the unit, it will be a few seconds while the REDHAWK completes its power on self test. When queried with the AT command, the REDHAWK responds with the result code OK, which means it is ready and understands and can execute the command, or with ERROR, which means that the modem does not understand the command or that the command is invalid.

App -> DTM	AT	
DTM -> app	OK	command valid, REDHAWK ready

The modem must be in command mode when any command other than the online escape sequence is entered. Commands entered when the modem is in online mode are treated as data and transmitted as such to the modem at the other end of the line.

In the following examples <CR> and <CR><LF> will be intentionally omitted.

NOTE: Limited functionality of BETA unit. All AT COMMANDS should be entered in UPPERCASE only

2.2. DTM Initialization

Upon first using the REDHAWK, the following is the recommended initialization string:

- Reset factory defaults
- Enable character echo
- Verbose mode on, display result codes as words
- DCD is on
- Monitor DTR

App -> DTM	AT& FE1Q0V1&C1&D2	Initialization string
DTM -> app	OK	command valid
App -> DTM	ATSO=1	Auto answer on 1st ring

DTM -> app	OK	command valid
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2.3. Data Call Setup (DTM origination)

To setup a call, the bearer service must be set. The default bearer service is 9600, non-transparent mode.

App -> DTM	AT+CBST=7,0,1	9600 baud, non-transparent mode
DTM -> app	OK	command valid

2.4. DTM AT Status Commands

After the REDHAWK has been powered on successfully. The following commands can be used to query the status of the unit.

The first command checks if the DTM has successfully registered with the GSM network.

App -> DTM	AT+CREG?	get registration status
DTM -> app	+CREG: 0,1 OK	Registered with home network +CREG=0,2 registration in progress +CREG=0,5 registered as roaming

If there is any doubt to the RF coverage for the DTM, the following command can be used to query the strength of the RF coverage.

App -> DTM	AT+CSQ	get signal strength (NOTE: no "?")
DTM -> app	+CSQ: 10,99 OK	Rcv signal strength = 10, -95dBm RXQUAL =99, unknown

App -> DTM	AT+COPS?	ask for current PLMN
DTM -> app	+COPS: 0,2,31016 OK	Home PLMN is Omnipoint

2.5. DTM Send SMS command

To be able to send SMS text messages, the DTM must be initialized with the proper SMS mode:

App -> DTM	AT+CSMP=17,167,0,0	Set text mode parameter: (17) sets reply pat, user data header, status report request, validity period format, reject duplicates and message type. (167) sets validity period
DTM -> app	OK	command correct

Then the proper service center must be selected. The service center is the PLMN that the SME phone number belongs.

App -> DTM	AT+CSCA="+1917907004"	<i>Service center initialization Omnipoint SMSC - NJ</i>
DTM -> app	OK	
App -> DTM	AT+CMGF=1	<i>Set message format to TEXT mode</i>
DTM -> app	OK	<i>command correct</i>

App -> DTM	AT+CNMI=0,1,0,0,0	<i>Set new message indicators</i> <i>AT+CNMI=<mod>,<mt>,<bm>,<ds>,<bfr></i> <i><mod>:0 Buffer unsolicited result codes</i> <i>indications.</i> <i><mt>:1 SMS-DELIVERs are routed using unsolicited</i> <i>code</i> <i><bm>: 0 no CBM indications are routed to the DTM</i> <i><ds>:0 no SMS-STATUS-REPORTs are routed.</i> <i><bft>:0 TA buffer of unsolicited result codes</i> <i>defined within this command is flushed to</i> <i>the TE</i>
DTM -> app	OK	<i>successful command</i>

App -> DTM	AT+CSAS	<i>Save SMS settings</i>
DTM -> app	OK	<i>Successful transmission</i>

Once the aforementioned commands have been saved, the initialization commands do not need to be sent again until they are changed. The REDHAWK is now ready to send an SMS message. The phone number of the SME is entered. (NOTE: SME must belong to SMS service center.)

App -> DTM	AT+CMGS="12015552673" Hello, how are you ? ^ Z	<i>Send message... enter SME addr</i> <i>(phone number) followed by the text</i> <i>message End with Control Z.</i>
DTM -> app :	OK	<i>Successful transmission</i>

Contact GSM provider for its local service center number.

2.6. DTM Receive SMS command

To receive SMS messages from the REDHAWK 2000, the unit is asked to send all received messages via the following command.

App -> DTM	AT+CMGL="ALL"	<i>read ALL messages received, incl. Status, originator, message number and message content</i>
DTM -> app	+CMGL: 1, "REC UNREAD", "43322449"<CR> To be or not to be! +CMGL: 3, "REC READ", "46290800"<CR> Hello Test Message! OK	

3. AT Commands for Call Control / Network

3.1. ATD Dial command

This AT command is used by the external application to establish a call.

For a data call, the application sends to the REDHAWK DTM the following ASCII string : (the bearer has to be selected before with the +CBST command)

ATD<nb> where <nb> is the called phone number.

For a voice call, the application sends to the REDHAWK DTM the following ASCII string : (the bearer may be selected before, if not a default bearer is used)

ATD<nb>; where <nb> is the called phone number.

The REDHAWK DTM responds to the command as follows :

Verbose result code	Description
OK	if the call succeeds, for voice call only
CONNECT <speed>	if the call succeeds, for data call only, <speed> takes the value negotiated by the REDHAWK DTM .
BUSY	if the called party is in communication
NO ANSWER	if no hang up is detected after a fixed network time-out

3.2. ATH Hang-Up command

This command is used by the application to disconnect the remote user. The application sends :

App -> DTM	ATH	<i>ask for disconnection</i>
DTM -> app	OK	<i>even if there is no communication established</i>

3.2.1. Remote disconnection

This message is used by the REDHAWK to indicate to the application that the communication has been released by the remote user.

The REDHAWK sends "NO CARRIER" to the application, and set the DCD signal.

3.3. AT+CHUP Hang Up call

All active calls and held calls are cleared.

App -> DTM	AT+CHUP	
DTM -> app	OK	<i>All active calls are cleared.</i>
App -> DTM	AT+CHUP	
DTM -> app	ERROR	<i>if NO calls are active</i>

3.4. ATA Answer a call

When the REDHAWK DTM receives a call, it set the **ringing** signal and sends to the application the ASCII string RING. Then it waits for the application to accept the call.

App -> DTM	ATA	
DTM -> app		<i>Now in data mode, no "OK"</i>
App -> DTM	ATA	
DTM -> app	NO CARRIER	<i>if ATA is sent when no incoming call was indicated (operation not allowed)</i>

3.5. ATSO Automatic answer

This S-parameter controls the automatic answering feature of the mobile.

App -> DTM	ATSO=2	<i>automatic answer after 2 rings</i>
DTM -> app	OK	
App -> DTM	ATSO?	<i>Current value</i>
DTM -> app	002 OK	<i>Always 3 characters with leading zeros</i>

To disable automatic answer, set number of rings to zero.

App -> DTM	ATSO=0	<i>no automatic answer</i>
DTM -> app	OK	<i>command valid</i>

All others S-parameters (S6,S7,S8 ...) are not yet implemented.

3.6. AT+COPS Operator selection

AT+COPS= <mode> , <format> , <operator>

The first parameter indicates either automatic (value 0) or manual (value 1). The second parameter indicates the format of the third parameter. The only format supported by DTM module is the numerical format (value 2). The third parameter is the operator identifier .

Here is a partial list of USA operators:

Omnipoint : 31016 Bell South : 31015
 Voice Stream : 31026 Aerial Comms: 31031
 Powertel : 31027 Wireless 2000 : 31011

App -> DTM	AT+COPS?	<i>ask for current PLMN</i>
DTM -> app	+COPS: 0,2,31016 OK	<i>Home PLMN is Omnipoint</i>
App -> DTM	AT+COPS=?	<i>ask for PLMN list</i>
DTM -> app	+COPS: (2,31016), (0,31016) OK	<i>Home PLMN is Omnipoint Omnipoint network has been seen</i>
App -> DTM	AT+COPS=1,2, 31016	<i>ask for registration on Omnipoint network</i>
DTM -> app	+CME ERROR: 3	<i>failed</i>
App -> DTM	AT+COPS=1,1, 31016	<i>ask for registration on Omnipoint network</i>
DTM -> app	+CME ERROR: 4	<i>wrong parameters</i>
App -> DTM	AT+COPS=0,2	<i>ask for registration on home network</i>
DTM -> app	OK	<i>succeeded</i>

To select the operator, two possibilities exist :

- 1- The mobile enters the manual mode, and then try to find an operator which is indicated by the application. If it finds and registers correctly, then the mobile stays in idle mode.
- 2- The mobile enters the automatic mode, and then try to find the home operator. If it finds and registers correctly, then the mobile stays in idle mode ; if not, the mobile looks itself automatically for another network.

To force an attempt to select and register a GSM network operator, the application must send the following command :

3.7. AT+CR Service Reporting – Outgoing

This commands controls whether an intermediate response is given before sending the CONNECT response to the application, the GSM module will precise the type of data connection that have been established.

App -> DTM	AT+CR=0	<i>extended reports disabled</i>
DTM -> App	OK	<i>command valid</i>
App -> DTM	AT+CR=1	<i>extended reports enabled</i>
DTM -> App	OK	<i>command valid</i>

These report types are :

+CR: ASYNC for asynchronous transparent
 +CR: REL ASYNC for asynchronous non-transparent

3.8. AT+CR Service Reporting – Incoming

This command enables a more detailed ring indication, in case of incoming call (voice or data). Instead of the string "RING", an extended string is used to indicate which type of call is ringing (e.g. +CRING: VOICE).

App -> DTM	AT+CR=0	<i>extended reports disabled</i>
DTM -> App	OK	<i>command valid</i>
App -> DTM	AT+CR=1	<i>extended reports enabled</i>
DTM -> App	OK	<i>command valid</i>

These extended indications are :

+CRING: ASYNC for asynchronous transparent
 +CRING: REL ASYNC for asynchronous non-transparent
 +CRING: VOICE for normal speech.
 +CRING : FAX for fax calls

3.9. AT+CREG Network registration

This command is used by the application to know the registration status of the mobile.

< mode >	
0	Disable network registration unsolicited result code
1	Enable network registration code result code +CREG : <stat >
< stat >	
0	not registered, DTM is not currently searching a new operator
1	registered, home network
2	not registered, DTM currently searching for operator to register to
3	registration denied
4	unknown
5	registered, roaming

App -> DTM	AT+CREG?	
DTM -> app	+CREG: <mode> , <stat > OK	as defined before
App -> DTM	AT+CREG= <mode >	disable/enable network registration unsolicited result
DTM -> app	OK	command valid

3.10. AT+CRLP Radio Link Protocol

This command selects the radio link protocol parameters used for non transparent data transmission.

AT+CRLP= <up-win> , <dn-win> , <ack timer> , <retrans> , <reset>

<up-win> := up window size, IWF to DTM

<dn-win> := down window size, DTM to IWF

<ack timer> := acknowledgement timer in 10ms

<retransm> := retransmissions attempts

<reset allowed> := reset allowed (values 0-no, 1-yes)

App -> DTM	AT+CRLP=10,10,90,10,0	set new parameters
DTM -> app	OK	command valid
App -> DTM	AT+CRLP?	current values
DTM -> app	AT+CRLP: 10,10,90,10 OK	command valid

<ber>	
0...7	as RXQUAL values in the table GSM 05.08
99	not known or not detectable

App -> DTM	AT+CSQ	
DTM -> app	+CSQ: <rssi> , <ber> OK	<rssi> and <ber> as defined above

3.11. AT+CSQ Signal Quality

This command will read the *received signal strength indication* (<rssi>) and the *channel bit error rate* (<ber>) with or without any SIM card inserted.

NOTE: There is no "?" after CSQ for signal quality.

<rssi>		<rssi>	
0	-113 dBm or less	16	-81 dBm
1	-111 dBm	17	-79 dBm
2	-109 dBm	18	-77 dBm
3	-107 dBm	19	-75 dBm
4	-105 dBm	20	-73 dBm
5	-103 dBm	21	-71 dBm
6	-101 dBm	22	-69 dBm
7	-99 dBm	23	-67 dBm
8	-97 dBm	24	-65 dBm
9	-95 dBm	25	-63 dBm
10	-93 dBm	26	-61 dBm
11	-91 dBm	27	-59 dBm
12	-89 dBm	28	-57 dBm
13	-87 dBm	29	-55 dBm
14	-85 dBm	30	-53 dBm
15	-83	31	-51dBm or greater
		99	Not detectable

4. AT Commands for Data

4.1. ATO Back to online mode

If you have established a connection and the mobile is in online command mode, this command allows to return to online data mode.

App -> DTM	ATO	
DTM -> app	OK	<i>command valid</i>

4.2. ATO Result code suppression

Determines whether the mobile sends result codes or not

App -> DTM	ATQ0	<i>DCE transmits result codes</i>
DTM -> app	OK	<i>command valid</i>
App -> DTM	ATQ1	<i>Result codes are suppressed and not transmitted</i>
DTM -> app	(none)	<i>no response</i>

4.3. ATV DCE response format

Determines the DTM response format, with or without header characters <CR><LF>, and with the use of numeric result codes.

	V0	V1
Information responses	<text><CR><LF>	<CR><LF> <text><CR><LF>
Result codes	<numeric code><CR>	<CR><LF> <verbose code><CR><LF>

App -> DTM	ATV0	<i>DCE transmits limited headers and trailers and numeric result codes</i>
DTM -> app	0	<i>command is valid (0 means OK)</i>
App -> DTM	ATV1	<i>DCE transmits full headers and trailers and verbose response text</i>
DTM -> app	OK	<i>command is valid</i>

4.4. ATX Result Code Selection

Determines whether or not when the DTM detects the dial tone or busy signal and whether or not DTM responds with result codes.

Value	
0	CONNECT result code only returned,

	dial tone and busy detection disabled
1	CONNECT <tesxt> result code only returned, dial tone and busy detection disabled
2	CONNECT <text> result code only returned, dial tone detection enabled, busy detection disabled
3	CONNECT <text> result code only returned, dial tone is disabled; busy detection enabled
4	CONNECT <text> result code only returned, dial tone and busy detection enabled

App -> DTM	ATX4	<i>Select CONNECT <text> message enable dial tone and busy detection</i>
DTM -> app	OK	
App -> DTM	ATD5551234	<i>Dial number</i>
DTM -> app	CONNECT 9600	<i>When connected....</i>
DTM -> app	BUSY	<i>When number is busy</i>

4.5. AT+CBST Bearer type selection

The selection of the bearer impacts both incoming and outgoing calls. No data compression is provided and only asynchronous modem is supported.

AT+CBST=<speed>,0,<ce>

<speed>	Description	Modem type
1	300 BPS	V.21
2	1200 BPS	V.22
3	1200/75 BPS	V.23
4	2400 BPS	V.22bis
5	2400 BPS	V.26ter
6	4800 BPS	V.32
7	9600 BPS	V.32
65 (*)	300 BPS	V.110
66 (*)	1200 BPS	V.110
68	2400 BPS	V.110
70	4800 BPS	V.110
71	9600 BPS	V.110

(*) Only for non transparent mode

<ce>	connection element
0	Transparent only
1	Non transparent only

100	Transparent preferred
101	Non transparent preferred

App -> DTM	AT+CBST=7,0,1	<i>ask for a bearer</i>
DTM -> app	OK	<i>bearer supported</i>
App -> DTM	AT+CBST=81,0,0	<i>ask for a bearer</i>
DTM -> app	+CME ERROR : 4	<i>bearer not supported</i>

5. AT Commands for Terminal Control

5.1. AT+IPR Fixed DTE rate

This commands specifies the data rate at which the DCE will accept commands.

AT+IPR= <baud rate>

App -> DTM	AT+IPR?	
DTM -> app	+IPR: 9600 OK	<i>current rate is 9600 BPS</i>
App -> DTM	AT+IPR=?	
DTM -> app	+IPR:(0),(2400,9600,19200,38400, 57600,115200) OK	<i>possible values. No autodecetable rate supported</i>
App -> DTM	AT+IPR=19200	
DTM -> app	OK	<i>new rate is 38400 BPS</i>

5.2. AT+ICF DTE-DCE character framing

This command is used to determine the local serial port start-stop (asynchronous) character framing that the DCE shall use.

AT+ICF= <format> , <parity>

<format>		<parity>	
1	8 Data 2 Stop	0	Odd
2	8 Data 1 Parity 1 Stop	1	Even
3	8 Data 1 Stop	2	Mark
4	7 Data 2 Stop	3	Space
5	7 Data 1 Parity 1 Stop	4	None
6	7 Data 1 Stop		

App -> DTM	AT+ICF?	
DTM -> app	+ICF: 3,4 OK	<i>current values</i>
App -> DTM	AT+ICF=?	
DTM -> app	+ICF: (1-6),(0-4) OK	<i>possible values.</i>
App -> DTM	AT+ICF=0,0	

DTM -> app	OK	<i>new values</i>
------------	----	-------------------

5.3. ATZ Default configuration

Restores the configuration profile.

App -> DTM	ATZ	
DTM -> app	OK	<i>command valid</i>

5.4. AT&C Set DCD signal

This commands controls the Data Carrier Detect (DCD) signal.

App -> DTM	AT&C0	<i>DCD always on</i>
DTM -> app	OK	<i>Command valid</i>
App -> DTM	AT&C1	<i>DCD matches state of the remote modem's data carrier</i>
DTM -> app	OK	<i>Command valid</i>

5.5. AT&D Set DTR signal

This commands controls the Data Terminal Ready (DTR) signal.

App -> DTM	AT&D0	<i>The DTR signal is ignored</i>
DTM -> app	OK	<i>Command valid</i>
App -> DTM	AT&D1	<i>Modem switches from data to command mode when DTR switches from on to OFF</i>
DTM -> app	OK	<i>Command valid</i>
App -> DTM	AT&D2	<i>Upon DTR switch from on to OFF, the call is cleardown</i>
DTM -> app	OK	<i>Command valid</i>

5.6. AT&S Set DSR signal

This commands controls the Data Set Ready (DSR) signal.

App -> DTM	AT&S0	<i>DSR always on</i>
DTM -> app	OK	<i>Command valid</i>
App -> DTM	AT&S1	<i>DSR off in command mode, DSR on in data mode</i>
DTM -> app	OK	<i>command valid</i>

5.7. AT&W Save configuration

This commands writes the active configuration to nonvolatile RAM.

App -> DTM	AT&W	<i>writes current configuration</i>
DTM -> app	OK	<i>command valid</i>

5.8. AT+CMEE Report Terminal Equipment error

This command disables or enables the use of result code +CME ERROR : <xxx> or +CMS ERROR : <xxx>

App -> GSM	AT+CMEE=0	<i>disable « +CME ERROR : <xxx> » and use « ERROR »</i>
GSM -> app	OK	
App -> DTM	AT+CMEE=1	<i>enable « +CME ERROR : <xxx> »</i>
DTM -> app	OK	

6. AT Commands for SMS

Parameters definition

- <da> destination address.
- <dt> discharge time.
- <index> place of storage in memory.
- <len> number of characters in text mode or the length of data binary string in PDU mode.
- <mr> message reference.
- <oa> originator address.
- <pid> protocol identifier.
- <pdu> binary string coded
- <ra> recipient address.
- <sca> address of the service center.
- <scts> service center time stamp.
- <st> status.
- <stat> status of message in memory.
- <vp> validity period of the message.

6.1. AT+CSMS Select message service

The supported services are GSM originated and terminated short message services. The Cell broadcast service is not supported yet.

App -> DTM	AT+CSMS?	<i>Current service</i>
DTM -> app	+CSMS: 0, 1, 1, 1 OK	<i>GSM 03.40 et 03.41, SMS-MO,SMS-MT and SMS-CB supported</i>
App -> DTM	AT+CSMS=?	<i>Possible service</i>
DTM -> app	+CSMS: (0) OK	<i>Only GSM 03.40 et 03.41 is possible</i>

6.2. AT+CSCA Service center address

This command shall be used to indicate to which service center the message has to be sent.

AT+CSCA=<csc>

The REDHAWK DTM has no default value for this address. If the application tries to send a message without having indicated the service center address, an error will be generated. The service center address may be set by the last received SMS.

So, the application has to indicate this address at initialization. This address is then valid all the time. The application may change it if needed. See GSM operator for correct service center address.

App -> DTM	AT+CSCA="+19179070004"	<i>Service center initialization</i>
DTM -> app	OK	
App -> DTM	AT+CMGS?	<i>Query center address</i>
DTM -> app :	+CMGS : +19179090004	<i>Omnipoint SMSC Addr</i>

6.3. AT+CSCB Select Cell Broadcast Type

This command selects which types of Cell Broadcast Msgs (CBM) are to be received by the DTM. This command is allowed in PDU mode only (AT+CMGF=0) with <bm>=2 in AT+CNMI command (ex : AT+CNMI=2,2,2).

Syntax : AT+CSCB= <mode>, [<mids>, [<dcss>]]

- <mode> = 0, allow specific Cell Broadcast Messages in <mids> and <dcss> list
- = 1, do not allow Cell Broadcast Messages in <mids> and <dcss> list
- <mids> = message identifier string type. 0-999. Message Identifiers indicates which type of message identifiers the ME should listen to. Up to eight mids can be selected
- <dcss> = supported language parameter. A maximum of five are supported. The language values are: 0 for German, 1 for English, 2 for Italian, 3 for French, 4 for Spanish, 5 for Dutch, 6 for Swedish, 7 for Danish, 8 for Portugese, 9 for Finnish, 10 for Norwegian, 11 for Greek, 12 for Turkish, 13 for Hungarian, 14 for Polish and 32 for Czech.

Test command (AT+CSCB ?) returns supported <mode> values as a compound value.

App -> DTM	AT+CSCB=0,"15-17,50,86", ""	<i>Accept SMS-CB types 15,16,17,50 and 86 in any language</i>
DTM -> app	OK	<i>CBMs can be received</i>

6.4. AT+CPMS Preferred Message Storage

The incoming messages are automatically stored in the SIM.

App -> DTM	AT+CPMS?	<i>Read it</i>
DTM -> app	+CPMS: "SM", 3, 10 OK	<i>3 messages are stored in SIM. 10 is the total available SIM memory.</i>
App -> DTM	AT+CPMS=?	<i>Possible storage</i>
DTM -> app	+CPMS: "SM" OK	<i>Only SIM is possible</i>

6.5. AT+CMGF Preferred Message Format

The formats implemented are the *text mode* and the *PDU mode*.

In PDU mode, a complete SMS Message including all header information is passed as a binary string (in hexadecimal format, so only this set of characters is allowed :

{'0','1','2','3','4','5','6','7','8','9','A','B','C','D','E','F'}). Each pair of characters is converted to a byte (ex : '41' is converted to the ASCII character 'A', whose ASCII code is 0x41 or 65).

In Text mode, every commands and responses are in ASCII characters.

The chosen format is stored in E2PROM by the command +CSAS.

App -> DTM	AT+CMGF?	<i>current message format</i>
DTM -> app	+CMGF: 1 OK	<i>Text mode</i>
App -> DTM	AT+CMGF=?	<i>Possible message format</i>
DTM -> app	+CMGF: (0,1) OK	<i>Text or PDU modes are available</i>

Example to send a SMS Message in PDU mode

App -> DTM	AT+CMGF=0	<i>PDU message format</i>
DTM -> app	OK	<i>PDU mode valid</i>
App -> DTM	AT+CMGS=14<CR> 01F60691214365000004C9E9340B	<i>Send complete MSG in PDU mode</i>
DTM -> app	+CMGS: 246 OK	<i>MSG correctly sent</i>

14 is the length of **octets** of the PDU buffer coded as GSM 03.40 . In this case this buffer is 0x01 0xF6 0x06 0x91 0x21 0x43 0x65 0x00 0x00 0x04 0xC9 0xE9 0x34 0x0B which means regarding to GSM 03.40 :

TP-MTI :	0x01 (SMS-SUBMIT)
<mr>:	0xF6
<da>:	0x06 0x91 0x21 0x43 0x65 (destination add +123456)
<pid>:	0x00 (Protocol Identifier)
<dc>:	0x00 (Data Coding Scheme : 7 bits alphabet chosen)
TP-UDL:	0x04 (User Data Length)
TP-UD :	0xC9 0xE9 0x34 0x0B (User Data : ISSY)

TPDU in hexadecimal format must be converted into two ASCII characters. E.G octet with hexadecimal value 0x2A is presented to the mobile as two characters '2' (ASCII 50) and 'A' (ASCII 65).

6.6. AT+CSCS Select TE character set

This commands informs the ME which character set is used by the TE. ME is then able to convert character strings correctly. This is used for commands +CMGS in text mode.

App -> DTM	AT+CSCS="GSM"	<i>GSM default alphabet</i>
DTM -> app	OK	<i>Command valid</i>

App -> DTM	AT+CSCS="PCCP437"	<i>PC character set Code Page 437</i>
DTM -> app	OK	<i>Command valid</i>

6.7. AT+CSDH Show text Mode Parameters

This command gives more information in text mode result codes. The information is in brackets in commands +CMTI, +CMT, +CDS, +CMGR, +CMGL.

App -> DTM	AT+CSDH?	<i>current value</i>
DTM -> app	+CSDH: 0 OK	<i>do not show header values</i>

6.8. AT+CSMP Set Text Mode Parameters

This command shall be used to select value for the <vp>, <pid>, the <dc>. The application must send the following command :

AT+CSMP=<fo>, <vp>, <pid>,<dc>

<fo> byte is composed of 6 different fields :

b7	b6	b5	b4	b3	b2	b1	b0
RP	UDHI	SRR	VPF		RD	MTI	

- RP : Reply Path, not used in text mode.
- UDHI : User Data Header Information, b6=1 if the beginning of the User Data field contains a Header in addition to the short message. This option is not supported in +CSMP command, but can be used in PDU mode (+CMGS).
- SRR : Status Report Request, b5=1 if a status report is requested. This mode is supported.
- VPF : Validity Period Format
b4=0 & b3=0 -> <vp> field is not present
b4=0 & b3=1 -> <vp> field is present in relative format
Others formats (absolute & relative) are not supported.
- RD : Reject Duplicates, b2=1 to instruct the SC to reject an SMS-SUBMIT for an SM still held in the SC which has the same <mr> and the same <da> as the previously submitted SM from the same <oa>.
- MTI : Message Type Indicator
b1=0 & b0=0 -> SMS-DELIVER (in the direction SC to MS)
b1=0 & b0=1 -> SMS-SUBMIT (in the direction MS to SC)

In text mode <vp> is only coded in "relative" format. The default value is 167 (24 hours). This means that one octet can describe different values :

VP value	Validity period value
0 to 143	(VP + 1) x 5 minutes (up to 12 hours)

144 to 167	12 hours + (VP - 143) x 30 minutes)
168 to 196	(VP - 166) x 1 day
197 to 255	(VP - 192) x 1 week

<pid> is used to indicate the higher layer protocol being used or indicates interworking with a certain type of telematic device. For example, 0x22 is for group 3 telefax, 0x24 is for voice telephone, 0x25 is for ERMES.

<dc> is used to determine the way the information is encoded. UCS2 alphabet and compressed text are not supported. Only GSM default alphabet and 8 bit data are supported.

App -> DTM	AT+CSMP?	<i>current values</i>
DTM -> app	+CSMP: 0,0,0,0 OK	<i>no validity period</i> <dc> = PCCP437 alphabet (8 bits -> 7 bits)
App -> DTM	AT+CSMP=17,167,0,0	<fo> =sets reply path, user data hdr status report request, validity period format, reject duplicates and message type <vp> = 24 hours <pid>...higher level protocol indicator <dc> = GSM 8 bits alphabet
DTM -> app	OK	<i>command correct</i>

	+CMT : <oa> , <scts> [, <toa> , <fo> , <pid> , <dc> , <sca> , <tosca> , <length>] <CR> <LF> <data>
3	class 3 SMS-DELIVERS are routed directly using code in <mt> = 2 ; message of other classes result in indication <mt> = 1

<bm>	set the rules for storing received CBMs (Cell Broadcast Message) types depend on its coding scheme, the setting of Select CBM Types (+CSCB command) and <bm>
0	no CBM indications are routed to the TE.
2	New CBMs are routed directly to the TE using unsolicited result code. +CBM : <length> <CR> <LF> <pdu> (PDU mode) or +CBM : <sn> , <mid> , <dc> , <page> , <pages> <CR> <LF> <data> (Text mode)

<ds>	SMS-STATUS-REPORTs
0	no SMS-STATUS-REPORTs are routed.
1	SMS-STATUS-REPORTs are routed using unsolicited code : +CDS : <pdu> (if PDU mode chosen) or +CDS : <fo> , <mr> [, <ra> , <tora>] , <scts> , <dt> , <st>

6.9. AT+CNMI New message

This command selects the procedure how receiving the message from the network. The Terminal is the device attached to the DTE port. The application must send the following command :

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

<mode> :	controls the processing of unsolicited result codes
0	Buffer unsolicited result codes.
1	Discard indication and reject new received message unsolicited result codes when DTM-Terminal link is reserved.
2	Buffer unsolicited result codes in the DTM when DTM-Terminal link is reserved and flush them to the Terminal after reservation. Otherwise forward them directly to the Terminal.
3	Forward unsolicited result codes directly to the Terminal.

<mt>	sets the result code indication routing for SMS-DELIVERS
0	no SMS-DELIVER indications are routed.
1	SMS-DELIVERS are routed using unsolicited code : +CMTI : « SM » , <index>
2	SMS-DELIVERS (except class 2 messages) are routed using unsolicited code : +CMT : <pdu> (if PDU mode chosen) or

<bfr>	
0	TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes)
1	TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

App -> DTM	AT+CNMI=0,1,0,0,0	<mt> = 1
DTM -> app	OK	
DTM -> app	+CMTI : « SM » , 1	Message received
App -> DTM	AT+CNMI=0,2,0,0,0	<mt> = 2
DTM -> app	OK	
DTM -> app	+CMT : "123456", "13/01/96 12h30m00s", 129, 4, 32, 240, "15379", 129, 5 <CR> <LF> HELLO	Message received
App -> DTM	AT+CNMI=0,0,0,1,0	<ds> = 1
DTM -> app	OK	
App -> DTM	AT+CMGS="12017572673" <CR>	Send a message

	Hello, how are you ? ^ Z	<i>in text mode</i>
DTM -> app	+CMGS : 116 OK	<i>Successful transmission</i>
DTM -> app	+CDS : 2,116, "12017572673",145, "13/01/96 12h30m00s","14/01/96 20h51m05s",16	

6.10. AT+CMGR Read message

This command allows the application to read incoming stored messages.

AT+CMGR=<index>

+CMGR stat>,<oa>,<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data> (for SMS-DELIVER only)

This command is also available in PDU mode.

+CMGR <stat>,<length><CR><LF><pdu>

DTM -> app	+CMTI: "SM",1	<i>New message received</i>
App -> DTM	AT+CMGR=1	<i>read the message</i>
DTM -> app	+CMGR: "REC UNREAD", "43322449"<CR> To be or not to be! OK	
App -> DTM	AT+CMGR=1	<i>read again the message</i>
DTM -> app	+CMGR: "REC READ", "43322449",20<CR> To be or not to be! OK	
App -> DTM	AT+CMGR=2	<i>read + bad index</i>
DTM -> app	+CMS ERROR: 321	<i>error : invalid index</i>
App -> DTM	AT+CMGR=1	<i>in PDU mode</i>
DTM -> app	+CMGR: "REC READ", <length><CR><LF><pdu> OK	

6.11. AT+CMGL List messages

This command allows the application to read stored messages, by indicating the type of the message to read.

AT+CMGL=<stat>

<stat>	(status of message in memory) :
0	"REC UNREAD" (received unread message)
1	"REC READ"(received read message)

2	"STO UNSENT"(stored unsent message)
3	"STO SENT"(stored sent message)
4	"ALL"(all messages)
"ALL"	"ALL" (all messages)

+CMGL=<index>,<stat>,<da/oa>[,<alpha>,<scts>,<tooa/toda>,<length>]<CR><LF><data>

This command is also available in PDU mode.

+CMGL=<index>,<stat>,<length><CR><LF><pdu>

Examples :

App -> DTM	AT+CMGL=0	<i>read the message</i>
DTM -> app	+CMGL: 1, "REC UNREAD", "43322449"<CR> To be or not to be! +CMGL: 3, "REC UNREAD", "46290800"<CR> Hello Test Message! OK	
App -> DTM	AT+CMGL=1	<i>read again the message</i>
DTM -> app	+CMGL: 2, "REC READ", "43322449",20<CR> Keep cool OK	
App -> DTM	AT+CMGL=2	<i>read + bad index</i>
DTM -> app	+CMS ERROR: 321	<i>error : invalid index</i>

6.12. AT+CMGS Send message

The <address> field is the address of the terminal network to whom the message is sent. To send the message, simply type <ctrl-Z> character (ASCII 26). The text can contain all existing character except <ctrl-Z> and <ESC> (ASCII 27).

This command is abortable using the <ESC> character when entering text.

In PDU mode, only hexadecimal characters are used ('0'...'9','A'...'F').

Example of use :

App -> DTM	AT+CMGS="12017572673"<CR> Hello, how are you ?<ctrl-Z>	<i>Send a message in text mode</i>
DTM -> app	+CMGS : <mr> OK	<i>Successful transmission</i>
App -> DTM	AT+CMGS=<length><CR> <pdu><ctrl-Z>	<i>Send a message in PDU mode</i>
DTM -> app	+CMGS : <mr> OK	<i>Successful transmission</i>

The message reference <mr> which is returned back to the application is allocated by the REDHAWK DTM . This number begins with 0 and is incremented by one for each outgoing message (successful and failure case) ; it is cyclic on one byte (0 follows 255).

Note : this number is not a storage number - outgoing messages are not stored.

6.13. AT+CMGW Write Message to Memory

The entering of text is done similarly as specified in command Send Message +CMGS.

In Text Mode :

+CMGW: <oa/da>[, <tooa/toda>[, <stat>]]] <CR> enter text <ctrl-Z/ESC>

In PDU Mode:

+CMGW=<length>[, <stat>] <CR> give PDU <ctrl-Z/ESC>

Parameter Definition :

<oa/da> Originating or Destination Address Value in string format. If <oa/da> is omitted it must be entered with +CMSS command.

<tooa/toda> : Type of Originating or Destination Address.

<stat> : Integer type in PDU mode (default 2 for CMGW), or string type in text mode (default « STO UNSENT » for CMGW). It indicates the status of message in memory. If <stat> is omitted , the stored message is considered like a message to be send.

<length> : The length of the actual data unit in octets

TEXT MODE	PDU MODE
« REC UNREAD »	0
« REC READ »	1
« STO UNSENT »	2
« STO SENT »	3
« ALL »	4

App -> DTM	AT+CMGW="12017572673" <CR> Hello, how are you ?<ctrl-Z>	Write a message in text mode
DTM -> app	+CMGW : 4 OK	Message stored in index 4
App -> DTM	AT+CMGW=<length> <CR> <pdu> <ctrl-Z>	Write a message in PDU mode
DTM -> app	+CMGW : <index> OK	Message stored in <index>

6.14. AT+CMSS Send Message From Storage

This command sends message with location value <index> from storage.

+CMSS=<index>

<mr> is returned

If new recipient address <da> is given, it will be used instead of the one stored with the message.

Example of use in Text Mode:

App -> DTM	AT+CMGW=1 <CR> Today is my birthday<ctrl-Z>	Write a message in text mode
DTM -> app	+CMGW : 5 OK	Message stored in index 5
App -> DTM	AT+CMSS=5,0660123456	Send the message 5
DTM -> app	+CMSS : <mr> OK	Successful Transmission
App -> DTM	AT+CMSS=5,0680654321	Send the message 5 to a different GSM
DTM -> app	+CMSS : <mr> OK	Successful Transmission

6.15. AT+CMGD Delete message

This command shall be used after a read-command in order to delete the received stored message.

For example :

DTM -> app	+CMTI: "SM",3	New message received
App -> DTM	AT+CMGR=3	Read it
DTM -> app	+CMGR: "REC UNREAD", "43322449",20 <CR> To be or not to be! OK	
App -> DTM	AT+CMGD=3	Delete it
DTM -> app	OK	

AT Commands Generic

6.16. + + + Online Escape Sequence

The escape sequence is used to switch to command mode from online mode during a session with a remote modem. Type three "plus signs." The escape sequence is not preceded by the AT command prefix, nor does it require the Enter key. Use the ATO ("AT" and letter "oh") command to return to online mode.

6.17. AT Request TA attention

When queried with the AT command, the REDHAWK responds with the result code OK, which means it is ready and understands and can execute the command, or with ERROR, which means that the modem does not understand the command or that the command is invalid.

App -> DTM	AT	
DTM -> app	OK	<i>command valid, REDHAWK ready</i>
App -> DTM	AT	
DTM -> app	ERROR	<i>command invalid, REDHAWK NOT ready</i>

6.18. ATE Enables Local Echo

This command sets the DTM to echo characters from the Application during command mode.

App -> DTM	ATE1	<i>Enable local enco</i>
DTM -> app	OK	
App -> DTM	ATE0	<i>Disable local echo</i>
DTM -> app	OK	

6.19. ATZ Reset to Default values

This command resets the DTM to all default values.

App -> DTM	ATZ	<i>Reset values</i>
DTM -> app	OK	

6.20. AT+CGMI Manufacturer identification

This command gives the manufacturer identification.

Application to GSM	AT+CGMI	<i>get manufacturer identification</i>
GSM to application	REDHAWK OK	<i>Prototype: wireless module modem command valid!)</i>

6.21. AT+CGMM Request model identification

This command is used to get the hardware version.

App -> DTM	AT+CGMM	<i>get hardware version</i>
DTM -> app	GSM P 900 OK	<i>GSM 900 MHz primary band</i>

6.22. AT+CGMR Request revision identification

This command is used to get the software version.

App -> DTM	AT+CGMR	<i>get software version</i>
DTM -> app	V2.74 OK	<i>command valid</i>

6.23. AT+CGSN Product Serial Number

This command allows the user application to know the IMEI of the REDHAWK DTM . The application sends :

App -> DTM	AT+CGSN	<i>request IMEI</i>
DTM -> app	135790248939 OK	<i>IMEI present in E2PROM</i>
App -> DTM	AT+CGSN	<i>request IMEI</i>
DTM -> app	+CME ERROR: 22	<i>IMEI not found in E2PROM</i>

6.24. AT+CNUM Subscriber number

This command returns the MSISDN(s) related to the subscriber.

If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line.

Format : AT+CNUM

+CNUM : <alpha1> <number1> <type1>
<alpha2> <number2> <type2>

Defined values

<alphax> : optional alphanumeric string associated with <numberx>
<numberx> : string type phone number of format specified by <typex>
<typex> : type of address octet in integer format

App -> DTM	AT+CNUM	<i>Get MSISDN(s)</i>
DTM -> app	+CNUM : « phone » ,»0612345678 », 129 +CNUM : « fax » ,»0687654321 »,129	<i>MSISDNs</i>

App -> DTM	AT+CNUM?	<i>Get current values</i>
DTM -> app	+CNUM : « phone » ,»0612345678 », 129 +CNUM : « fax » ,»0687654321 »,129	<i>MSISDNs</i>
App -> DTM	AT+CNUM= ?	<i>Get possible values</i>
DTM -> app	OK	

6.25. AT+CPAS Phone activity status

This command returns the activity status of the mobile.

<pos>	
0	<i>: ready (allow commands from TA/TE)</i>
1	<i>unavailable (does not allow cmds)</i>
2	<i>: unknown</i>
3	<i>ringing (ringer is active)</i>
4	<i>call in progress</i>
5	<i>asleep (low functionality)</i>

App -> DTM	AT+CPAS	<i>Current activity status</i>
DTM -> app	+CPAS: <pas> OK	<i>Phone activity status (see above)</i>

6.26. AT+CPIN Enter PIN code

This command is used to validate the PIN code (CHV1), or to validate the PUK code (UNBLOCK CHV1) and to define a new PIN code.

The PIN length is between 4 and 8 digits, the PUK length is 8 digits only.

If the user application tries to establish an outgoing call before having validated the SIM PIN code (CHV1), then the REDHAWK DTM will refuse the "ATD" command with a "+CME ERROR: 11" (SIM PIN required).

It's up to the application to validate the PIN after each reset or power on if the PIN was enabled. The application shall therefore use the command :

AT+CPIN=<pin>

App -> DTM	AT+CPIN=1234	<i>enter PIN</i>
DTM -> app	OK	<i>PIN code is correct</i>
App -> DTM	AT+CPIN=5678	<i>enter PIN</i>
DTM -> app	+CME ERROR: 3	<i>operation not allowed, PIN previously entered</i>

After 3 unsuccessful codes, the PUK will then be required. The PUK validation forces the user to enter as a second parameter a new PIN code which will be the new PIN code if the PUK validation succeeds. The application shall therefore use the command :

AT+CPIN=<puk>,<new_pin>

App -> DTM	AT+CPIN=00000000,1234	<i>enter PUK and new PIN</i>
DTM -> app	+CME ERROR: 16	<i>Incorrect PUK</i>
App -> DTM	AT+CPIN=12345678,1234	<i>enter PUK and new PIN, 2nd attempt</i>
DTM -> app	OK	<i>PUK correct, new PIN stored</i>

To know which code has to be entered (or not), the following interrogation command can be used :

AT+CPIN?

The possible responses are :

+CPIN: READY	No PIN is needed
+CPIN: SIM PIN	PIN is required
+CPIN: SIM PUK	PUK is required
+CME ERROR: <err>	SIM failure (13) absent (10) etc...

Please note that in this case the mobile does not finish its response with the OK string.

The response +CME ERROR : 13 (SIM failure) is returned after 10 unsuccessful PUK presentations. The SIM card is then out of order and shall be replaced by a new one.

Example : 3 failed PIN validations + 1 successful PUK validation

App -> DTM DTM -> app	AT+CPIN? +CPIN: SIM PIN	read the PIN status the REDHAWK DTM requires SIM PIN
App -> DTM DTM -> app	AT+CPIN=1235 +CME ERROR: 16	First attempt to enter a SIM PIN bad PIN
App -> DTM DTM -> app	AT+CPIN=1236 +CME ERROR: 16	Second attempt bad PIN
App -> DTM DTM -> app	AT+CPIN=1237 +CME ERROR: 16	Third attempt bad PIN
App -> DTM DTM -> app	AT+CPIN? +CPIN: SIM PUK	Read PIN state the REDHAWK DTM requires PUK
App -> DTM DTM -> app	AT+CPIN=99999999,5678 OK	the PUK is entered, the new PIN shall be 5678 PUK validation is OK. New Pin is 5678
App -> DTM DTM -> app	AT+CPIN? +CPIN: READY	Read PIN state REDHAWK DTM is ready

6.27. AT+CRES Restore settings

All settings specified in command +CSCA, +CMGF, +CSMP, +CNMI, +CSDH are restored from E2PROM if the SIM card is phase 1 or from the SIM card if this one is phase 2.

Application to GSM	AT+CRES	<i>Restore</i>
GSM to application	OK	<i>command correct</i>

6.28. AT+CSAS Save settings

All settings specified in command +CSCA, +CMGF, +CSMP, +CNMI, +CSDH are stored in E2PROM if the SIM card is phase 1 or in the SIM card if this one is phase 2.

Application to GSM	AT+CSAS	<i>Store</i>
GSM to application	OK	<i>command correct</i>

6.29. AT+GCAP Capabilities list

This command gives the complete capabilities list.

App -> DTM	AT+GCAP	<i>get capabilities list</i>
DTM -> app	GCAP: +CGSM +FCLASS OK	<i>supports GSM commands and FAX</i>

6.30. AT+GMI Manufacturer identification

This command gives the manufacturer identification.

Application to GSM	AT+CGMI	<i>get manufacturer identification</i>
GSM to application	WM MODEM OK	<i>Prototype: wireless module modem command valid!</i>

6.31. AT+GMM Request model identification

This command is used to get the hardware version.

App -> DTM	AT+CGMM	<i>get hardware version</i>
DTM -> app	GSM P 900 OK	<i>GSM 900 MHz primary band</i>

6.32. AT+GMR Request revision identification

This command is used to get the software version.

App -> DTM	AT+CGMR	<i>get software version</i>
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DTM -> app	V2.74 OK	command valid
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6.33. AT+GSN Product Serial Number

This command allows the user application to know the IMEI of the REDHAWK DTM . The application sends :

App -> DTM	AT+CGSN	request IMEI
DTM -> app	135790248939 OK	IMEI present in E2PROM
App -> DTM	AT+CGSN	request IMEI
DTM -> app	+CME ERROR: 22	IMEI not found in E2PROM

7. Result codes

7.1. +CME <error> ME error

<error>	
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
17	SIM PIN2 required
18	SIM PUK2 required
20	Memory full
21	Invalid index
22	Not found
24	Text string too long
26	Dial string too long
30	No network service
256	Protocol stack : bad state
257	Bad cell (not in the synchronized ones
258	Lost cell (due to DSF...)

7.2. +CMS <error> Message service failure

1 to 127	error cause values from the GSM recommendation 04.11 Annex E-2
301	SMS service of ME reserved
302	operation not allowed
303	operation not supported
305	invalid text mode parameter
313	SIM failure
321	Invalid memory index
322	SIM memory full
330	SC address unknown
512	MM establishment failure
513	Lower layer failure
514	CP error

Error cause values from GSM 04.11 are given below.

7.3. +CMEE Report Mobile Equipment errors

This command disables or enables the use of result code +CME ERROR : <xxx> or +CMS ERROR : <xxx>

App -> DTM	AT+CMEE=0	disable « +CME ERROR : <xxx> » and use « ERROR » instead
DTM -> app	OK	
App -> DTM	AT+CMEE=1	enable « +CME ERROR : <xxx> »
DTM -> app	OK	

7.4. Summary of result codes

Verbose result code	Description
+CBST <speed>,0,<ce>	Bearer setting
+CDS	Incoming SMS report
+CMS ERROR	Message service failure
+CMT	Incoming SMS
+CMTI	Incoming SMS in storage
+CPIN: READY	No PIN is needed
+CPIN: SIM PIN	PIN is required
+CPIN: SIM PUK	PUK is required
+CREG : <stat>	Network registration indication
+CR: ASYNC	for asynchronous transparent
+CR: REL ASYNC	for asynchronous non-transparent
+CRC	Cellular result code
+CRING : <type>	Incoming call (VOICE, FAX ...)
+CSCA: <address>	Service Center Address
+CSMS: <value>	SMS values, MO, MT, CB
+CSQ :<rsqi	Signal strength
+IPR: <baud>	Current DTE baud
+ICF: <format>,<parity?	8/7 bit data byte, parity value

BUSY	Busy signal detected
CONNECT 300	Data connection at 300 bauds
CONNECT 1200	Data connection at 1200 bauds
CONNECT 1200/75	Data connection at 1200/75 bauds
CONNECT 2400	Data connection at 2400 bauds
CONNECT 4800	Data connection at 4800 bauds
CONNECT 9600	Data connection at 9600 bauds
ERROR	Command not accepted
NO ANSWER	Connection completion timeout
NO CARRIER	Connection terminated
OK	Acknowledges execution of a command line
RING	Incoming call signal from network

8. Modem S-Registers

The DTM uses memory storage locations, or S-Registers, to hold information controlling its operating environment. Few of these S-Registers require attention from modem users. S-Registers are used in conjunction with AT commands .

To display the value of an S-Register, type ATSn? where n is the number of the S-Register, then press Enter.

To modify the value of an S-Register, type ATSn=r where n is the S-Register number and r is the new value or setting, then press Enter.

8.1. S0 Ring to Answer After

The contents of register S0 sets the number of rings required before the modem goes off-hook to answer an incoming call (auto answer). The value can range from 0 to 255. ATSO=0 disables the auto-answer function. The default is 0.

8.2. S3 Command Line Termination Character

This register contains the ASCII value of the command line terminating character (carriage return). The factory default value is ASCII 13 — the carriage return character. You can set register S3 to any value between 0 and 127.

8.3. S4 Response Formatting Character

This register contains the ASCII value of the line feed character. The factory default value is 10. You can set register S4 to any value between 0 and 127. The modem uses a line feed character in command mode when it responds to the computer.

8.4. S5 Command Line Editing Character

This register contains the ASCII value of the backspace character and is applicable to asynchronous transmissions only. The factory default value is 8. You can set register S5 to any value between 0 and 32, or to 127. The modem will not recognize the backspace character if it is set to a value greater than ASCII 32.

8.5. S6 Wait Before Blind Dialing

This register determines how long the modem waits after going off-hook before dialing the first digit. The wait must be at least 2 seconds. Register S6 can be set to any value between 2 and 65 seconds. The default is 2 seconds. The value of the W dial modifier will override the value in register S6. This operation, however, may be affected by some ATX options according to country restrictions. There may be country-specific defaults and limits.

8.6. S7 Connection Completion Time-Out

This register determines the number of seconds the originating modem waits for a carrier signal from the answering modem before hanging up. The timer is started when the modem finishes dialing (originate), or goes off-hook (answer). In originate mode, the timer is reset upon detection of an answer tone if allowed by country restriction. The timer also specifies the wait for silence time with the @ dial modifier (in seconds). S7 is not associated with the W dial modifier. Register S7 can be set at from 1 to 255 seconds with a default of 50 seconds. There may be country-specific defaults and limits.

8.7. S8 Duration of Pause for Comma Dial Modifier

8.8. S10 Disconnect Delay

This register determines the number of seconds to pause for each comma (,) in a dial string or command line. The default is 2 seconds, but any value from zero to 65 is acceptable. Defaults and limits are country-specific.