APPLICATION		REVISION HISTORY				
NEXT ASSY	USED ON	REV	DESCRIPTION		DATE	APPROVED
	IRIDIUM HANDSET	XA	Engineering control release of ver. 1.3		9/25/01	T. Michl
		XB	Engineering control release of ver. 1.4		2/22/02	T. Michl
		XC	Engineering control release of ver. 1.5		3/29/02	T. Michl
		XD	Engineering control release of ver. 1.6		5/15/02	K. McConnon
		XE	Engineering control release of ver. 1.7		6/11/02	T. Michl
		XF	Engineering control release of ver. 1.8		7/1/02	T. Michl

ALL SHEETS ARE THE SAME REVISION STATUS

	CONTR TSA 121100	MOTOROLA, INC.			
	ISS	SCOTTSDALE, ARIZONA 85252-1417			
	APPROVALS	TITLE			
	DWN				
	CHKR	**ISU AT Command Reference**			
	QA				
	MATL				
	MANF	SIZE	CAGE CODE	DWG NO	
	ENG	**A**	**94990**	**SSP-ISU-CPSW-USER-0005**	
	CUST	SCALE: NONE			SHEET 1 OF 72

C

ISU AT Command Reference

July 1, 2002

APPROVED:

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Software Engineering Manager	**Software Lead Engineer**

Revision History

Version	Date	Author	Reason
1.0	06-Jul-99	Elenita Caturan-Hinds	Initial creation.
1.1	22-Oct-99	Elenita Caturan-Hinds	Fixed default/range values for +IPR, +WIRLP and +DS commands.
1.2	9-Dec-99	Elenita Caturan-Hinds	Added more GSM 7.07 and GSM 7.05 commands to support Starfish TrueSync application. Added result codes summary table (section 9).
1.3	26-Jan-00	Elenita Caturan-Hinds	Added +G commands (section 6). Added Motorola satellite product proprietary commands (section 9) and Phase 2 +C commands.
1.4	21-Feb-02	Terry Michl	Edited document to align with software releases INC0620, RAC0620, LAC109G, and planned future releases.
1.5	28-Mar-02	Terry Michl, Kevin McConnon	Refined edits after document inspection.
1.6	15-May-02	Kevin McConnon, Yu-Ling Langford, Terry Michl	Updated S-Register Definitions in section 8, added +CCLK command, clarified +COPS, change "ME" to "ISU".
1.7	11-Jun-02	Terry Michl	Added definitions for RI and RTS terms. Updated Sections 2 and 3 to aid user in command entry and 3-wire connection. Specified SAC0201 label for 9522 initial commercial release. Revised Phase III defaults for AT&Kn and AT&Dn. Clarified Phase III ATH implementation for voice call. Consolidated S-register items in Section 8.
1.8	1-Jul-02	Terry Michl	Incorporated feedback from ISLLC's review of version 1.7.

Table of Contents

1   Introduction

1.1   Scope

This document is intended as a reference guide to the usage of the AT command set for the Iridium™/℠ subscriber unit. This document only applies to the Motorola satellite series.

The intended audience for this document are the field test engineers, product and intelligent peripheral developers.

1.2   Reference

[1]   ITU-T Recommendation V.25ter, 08/95.

[2]   ETS 300 642: Digital Cellular Telecommunications System (Phase 2); AT Command Set for GSM Mobile Equipment (GSM 07.07).

[3]   ETS 300 585: Digital Cellular Telecommunications System (Phase 2); Use of DTE-DCE Interface SMS and CBS (GSM 07.05)

[4]   ITU-T Recommendation V.24, 03/93.

1.3   Terms /and Abbreviations

Asynchronous

A serial data transmission method that uses Start and Stop bits to synchronize reception.

AT Commands

A group of commands that can be sent by a terminal or host computer to control the ISU in Command mode.

Baud

One signalling element per second. This is a measure of the signalling rate on the telephone line. It should not be confused with Bits Per Second (bps) which can differ from the Baud rate.

BCD

Binary Coded Decimal

Bit Mapped Registers

Bit mapping is a technique that allows a single S-Register to hold up to 8 binary variables e.g.:

Reg	*Type*	*Val*	*Default*	*Function*
S14	Bit Mapped	170	Register S14 is a bit-mapped register and provides the following functions:	
			Bit 0	Reserved
			Bit 1	Echo commands to DTE
			Bit 2	Responses
			Bit 3	Word or number responses
			Bit 4	Reserved
			Bit 5	Dialing method
			Bit 6	Reserved
			Bit 7	Answer/Originate operation

CI

Cell Identifier

CTS

(V.24 Signal) Clear To Send. This signal is normally used in controlling the flow of data to the ISU. (See RTS)

DCD

(V.24 Signal) Data Carrier Detect. This is a signal from the ISU that indicates that it is connected to the far-end modem for data transfer.

DCE

Data Communications Equipment, i.e., a data adaptor or modem. In this product, DCE refers to the ISU.

DSR

(V.24 Signal) Data Set Ready. This signal, from the ISU, indicates the readiness of the phone to receive data.

DTE

Data Terminal Equipment, such as a dumb terminal, or a PC running communications software.

DTR

(V.24 Signal) Data Terminal Ready. A signal from the DTE to the ISU. Can be used to terminate calls.

ETSI

European Telecommunications Standards Institute.

GSM

Global System for Mobile communications.

IRLP

Iridium Radio Link Protocol

ISU

Individual Subscriber Unit

LAC

Location Area Code

Modem

MOdulator/DEModulator. A device used to convert digital signals to analog signals for transmission and reception of telephone lines.

RI

(V.24 Signal) Ring Indicate. This is a signal from the ISU which indicates that an incoming call is ringing.

RP

Relay Protocol (used in SMS).

RTS

    (V.24 Signal) Request To Send. This signal is normally used in controlling the flow of data from the ISU.

SMS

    SMS Short Message Service.

SMSSC

    Short Message Service - Service Centre (used in SMS).

TP

    Transfer Protocol (used in SMS).

XON/XOFF

    A standard method of controlling the flow of data to and from a ISU to prevent overflow/overrun conditions.

2   Modem Overview

2.1   DTE-ISU Interchange Circuits

The communication between the ISU (Iridium Subscriber Unit) and the DTE (Data Terminal Equipment) follows the ITU-T V.24 (RS-232) recommendation. Please see reference [4] for details.

2.2   9-Wire and 3-Wire Operation

The ISU supports a full 9-wire interface to the DTE, incorporating hardware handshaking and flow control. A 3-wire DTE interface, where only transmit, receive, and ground signals are used, is supported in those ISUs where the AT&D0 command has been revised to ignore the DTR (Data Terminal Ready) signal. When operating with a 3-wire connection, the following limitations apply:

- AT&Dn must be set to AT&D0 to ignore the DTR input from the DTE, as it will not be present as an input from the DTE

- AT&Kn must be set to AT&K0 for no flow control or AT&K4 for XON/XOFF software flow control, as RTS (Request To Send) and CTS (Clear To Send) hardware flow control signals will not be present

- AT&Cn setting will have no affect, as DCD (Data Carrier Detect) output to the DTE will not be present

- AT&Sn setting will have no affect, as DSR (Data Set Ready) output to the DTE will not be present

- RI (Ring Indicate) output to the DTE will not be present

2.3   Configuration Settings

The ISU allows the DTE to configure the communication parameters. The three configuration types are active, factory default, and stored.

The active configuration is the set of parameters currently in use. They can be changed by the DTE individually via specific AT commands.

The factory default configuration is stored in permanent memory. This configuration can be recalled at any time by through use of the AT&Fn command.

Two groups of settings, or "profiles", can be stored as user-defined configuration. The DTE first creates desired active configurations and then writes them to memory using the AT&Wn command. These profiles can be designated to be loaded as the active configuration upon ISU power-up through use of the AT&Yn command. Similarly, the ISU can be reset without loss of power to these profiles through use of the AT&Zn command.

Most of the configuration settings are reflected in "S-register" locations. S-register is the term used by Hayes-compatible modems for a specific physical location in memory.

2.4 Mode of Operation

The ISU is always in one of two modes: command mode or data mode.

When the ISU is in command mode, AT commands can be entered to control the phone. Note that command mode can be accessed while on-hook (i.e. not in a call) or in-call.

When in data mode, the ISU is connected to a remote system and any characters sent to it will be transmitted to the remote system. Note that data mode can be only accessed while in-call.

While in-call, the Escape Sequence (+++) is used to enter the command mode. The Online command (ATOn) is used to return to the data mode. These mode transitions are made without terminating the call.

3   Command Overview

3.1   Command Types

The ISU employs two principle types of AT commands: basic and extended. The two types have differing syntax used to query and adjust their settings. They also have unique reference standards.

A specific basic AT command is used to reference S-registers and query and adjust their settings. Its syntax is similar to that of extended AT commands.

3.2   Basic Commands

Basic commands are industry standard and originally developed for Hayes-compatible PSTN modems. In many cases, basic commands consist of a single ASCII alpha character.

In other cases, a special character precedes the alpha character. Prefix characters used in ISU basic commands include &, \, %, and *.

Most alpha characters in basic commands are followed by a numeric parameter, n. To adjust its setting, a basic command is entered with the appropriate numeric value of n. Note that if the numeric parameter n is omitted from the basic command entry, a value of zero is assumed for n. For example, ATXn is set to a value of 4 by entering ATX4, whereas it is set to value of 0 by entering either ATX0 or ATX.

To query a basic command setting, the AT&V command is entered to view the active configuration of a group of basic commands.

Some basic commands listed in this document are marked with "***No action, compatibility only***". In these cases, the basic command is accepted in the same fashion as is with other modems, but has no effect on the operation of the ISU, since it has no meaning in the Iridium™/SM environment.

3.3   Extended Commands

Extended commands perform actions or set parameters that extend the capability of the ISU beyond that which is allowed by basic commands. In some cases, they were designed for non-PSTN networks, such as the GSM network.

Most extended commands include a prefix of + followed by a single alpha character. Prefixes used in ISU extended commands include +C, +D, +G, and +I. Extended commands designed specifically for the Motorola Satellite Series product line include a -MS prefix.

Most extended commands include three alpha characters after the prefix, but some commands include just one or two alpha characters after the prefix.

Some extended commands have a single execution mode. No further syntax is added after the prefix and body of the command. For example, AT+GSN is entered as shown to query the ISU for its assigned serial number (i.e. IMEI).

Some extended commands incorporate a test mode to query their range of valid responses. For example, AT+CBC is entered as shown in execution mode to query the ISU for its battery connection and charge status. The command is entered as AT+CBC=? in test mode to query its range of valid responses.

Some extended commands incorporate set, read, and test modes. For example, AT-MSVTR is entered as AT-MSVTR=n in set mode to enable/disable receipt of DTMF messages. It is entered as AT-MSVTR? in read mode to query its current setting and is entered as AT-MSVTR=? in test mode to query its range of valid settings.

Extended commands are grouped as shown on the following page.

Extended Cellular Commands

- `+C` prefix
- Used for GSM cellular phone-like functions
- Standards: ETSI specifications GSM 07.07 (reference [2]) and GSM 07.05 (reference [3])

Extended Data Compression Commands

- `+D` prefix
- Used for data compression
- Standard: V.25ter (reference [1])

Extended Generic Commands

- `+G` prefix
- Used for generic DCE issues such as identities and capabilities
- Standard: V.25ter (reference [1])

Extended Interface Control Commands

- `+I` prefix
- Used to control the DTE interface
- Standard: V.25ter (reference [1])

Motorola Satellite Product Proprietary Commands

- `-MS` prefix
- Proprietary to the Motorola Satellite Series product line

3.4   Command and Response Characters

The execution of a command string follows a left-to-right execution of each command followed by the reporting of a result code for the entire string.

The ASCII character set (CCITT T.50 International Alphabet 5, American Standard Code for Information Interchange) is used for the issuance of commands and responses. Only the low-order 7 bits of each character are used for commands or parameters; the high-order bit is ignored. Upper case characters are equivalent to lower case characters.

3.5 Command Entry

An AT command is a string of characters sent by the DTE to the ISU while the ISU is in command mode. A command string has a prefix, a body, and a terminator. The prefix consists of the ASCII characters `AT` or `at`. The body is a string of commands restricted to printable ASCII characters. The default terminator is the `<CR>` character.

AT command entry syntax is critical, and the following rules apply:

- All commands (apart from `A/` and `+++`) begin with a prefix of `AT` or `at`.

- The commands in a command string (apart from `A/` and `+++`) are executed only after the return or enter key is pressed.

- Use of upper or lower case letters is allowed, but not a combination of both.

- The maximum number of characters in a command string is 128.

- If the numeric parameter n is omitted from the basic command entry, a value of zero is assumed for n.

- If an optional parameter is omitted from an extended command, the current value is implied. Optional parameters are enclosed by square brackets (`[...]`) in this document.

- Multiple commands can be concatenated onto a single command line by separating the additional non-prefixed commands with a space or a semicolon or with no separator whatsoever.

- Spaces entered into a command string for clarity between the `AT` prefix and the body of the command are ignored. Likewise, spaces entered for clarity within the command body between alpha characters and decimal parameters are ignored.

- The backspace or delete keys can typically be used to edit commands.

- Characters that precede the `AT` prefix are ignored.

- Ctrl-x can be used to abort a command line input.

Consider the following six commands to be entered in a single command line:

`ATX0`	(set basic command `ATXn` to `n=0`)
`AT&V`	(execute basic command `AT&V`)
`AT+GSN`	(execute extended command `AT+GSN`)
`AT+CBC=?`	(query the valid range of responses of extended command `AT+CBC`)
`AT+CPBR=1,12`	(execute extended command `AT+CPBR` with parameters `1` and `12`)
`AT-MSVLS?`	(query the current setting of extended command `AT-MSVLS`)

The following are valid single command line entries of above six commands:

`at x 0 &v +gsn +cbc=? +cpbr=1,12 -msvls?`	(all lower case)
`AT X 0 &V +GSN +CBC=? +CPBR=1,12 -MSVLS?`	(all upper case)
`ATX 0 &V +GSN +CBC=? +CPBR=1,12 -MSVLS?`	(space omitted between `AT` and `X`)
`ATX0 &V +GSN +CBC=? +CPBR=1,12 -MSVLS?`	(space omitted between `ATX` and `0`)
`ATX &V +GSN +CBC=? +CPBR=1,12 -MSVLS?`	(`0` omitted from `ATX0`)
`ATX;&V;+GSN;+CBC=?;+CPBR=1,12;-MSVLS?`	(semicolon separators)
`ATX&V+GSN+CBC=?+CPBR=1,12-MSVLS?`	(no separators)

3.6   Command Responses

A result code is sent to the DTE in response to the execution of a command. It may also occur unsolicited from other conditions such as an incoming call (e.g., RING). Responses returned as a result of a query are called information responses.

Result codes can be represented by text if the ISU is in verbose mode or with numbers if in numeric mode. The command ATVn informs the ISU whether to respond in verbose or numeric mode. Further note that responses can be suppressed with by setting the command ATQn to ATQ1. **Table 2.5-1** below shows the difference in format between these modes.

Table 2.5-1: Result Code Response Format

	Numeric Mode ATQ0 ATV0	**Verbose Mode** ATQ0 ATV1
Result codes	<NUMERIC_CODE><CR>	<CR><LF><VERBOSE_CODE><CR><LF>
Information Responses	<TEXT><CR><LF>	<CR><LF><TEXT><CR><LF>

Command entries with invalid syntax typically respond with ERROR. Command entries of valid syntax with an out-of-range parameter can respond in one of three following manners:

- Disallow out-of-range entry and respond with ERROR
- Disallow out-of-range entry and respond with OK
- Disallow out-of-range entry, accept the closest in-range value, and respond with OK

4   Phased Implementation by Software Release

The AT commands described in this document have been implemented into various ISU models in a phased software release approach, building on previous implementation. The Phase I AT Commands have been implemented in all ISU models, the Phase II and Phase III AT Commands have been implemented in the 9505 and 9522 ISU models as shown in **Table 4-1** below.

Note that some AT commands select operation that is dependent on Iridium network service capability.

Table 4-1: Phased AT Command Implementation

ISU Model	Software Release		
	Phase I Implementation	Phase II Implementation	Phase III Implementation
9500	INC0620	Not implemented	Not implemented
9520	RAC0620	Not implemented	Not implemented
9521	RAC0620	Not implemented	Not implemented
9505	LAC109G	LAC109G	LAC0201
9522	SAC0201	SAC0201	SAC0201

Table 4-2 below and on the following three pages details the implementation of individual AT commands.

Table 4-2: Phased AT Command Implementation – Command Detail

Section	Command	Phase	9500 INC0620	9520 RAC0620	9521 RAC0620	9505 LAC109G	9505 LAC0210	9522 SAC0201
5.1	AT	I	X	X	X	X	X	X
5.2	A/	I	X	X	X	X	X	X
5.3	+++	I	X	X	X	X	X	X
5.4	A (initial)	I	X	X	X	X		
5.5	Bn	I	X	X	X	X	X	X
5.6	Cn	I	X	X	X	X	X	X
5.7	D (initial)	I	X	X	X	X		
5.7.1	D> (initial)	I	X	X	X	X		
5.8	En	I	X	X	X	X	X	X
5.9	Fn	I	X	X	X	X	X	X
5.10	Hn (initial)	I	X	X	X	X		
5.11	In	I	X	X	X	X	X	X
5.12	Ln	I	X	X	X	X	X	X
5.13	Mn	I	X	X	X	X	X	X
5.14	Nn	I	X	X	X	X	X	X
5.15	On	I	X	X	X	X	X	X
5.16	P	I	X	X	X	X	X	X
5.17	Qn	I	X	X	X	X	X	X
5.18	S0=n (initial)	I	X	X	X	X		

Table 4-2: Phased AT Command Implementation – Command Detail (continued)

Section	Command	Phase	9500 INC0620	9520 RAC0620	9521 RAC0620	9505 LAC109G	9505 LAC0210	9522 SAC0201
5.19	T	I	X	X	X	X	X	X
5.20	Vn	I	X	X	X	X	X	X
5.21	Wn	I	X	X	X	X	X	X
5.22	Xn (initial)	I	X	X	X	X		
5.23	Yn	I	X	X	X	X	X	X
5.24	Zn	I	X	X	X	X	X	X
5.25	&Cn	I	X	X	X	X	X	X
5.26	&Dn (initial)	I	X	X	X	X		
5.27	&Fn	I	X	X	X	X	X	X
5.28	&Gn	I	X	X	X	X	X	X
5.29	&Jn	I	X	X	X	X	X	X
5.30	&Kn	I	X	X	X	X	X	X
5.31	&Ln	I	X	X	X	X	X	X
5.32	&Mn	I	X	X	X	X	X	X
5.33	&Pn	I	X	X	X	X	X	X
5.34	&Qn	I	X	X	X	X	X	X
5.35	&Rn	I	X	X	X	X	X	X
5.36	&Sn	I	X	X	X	X	X	X
5.37	&V	I	X	X	X	X	X	X
5.38	&Wn	I	X	X	X	X	X	X
5.39	&Xn	I	X	X	X	X	X	X
5.40	&Yn	I	X	X	X	X	X	X
5.41	\An	I	X	X	X	X	X	X
5.42	\Bn	I	X	X	X	X	X	X
5.43	\Gn	I	X	X	X	X	X	X
5.44	\Jn	I	X	X	X	X	X	X
5.45	\Kn	I	X	X	X	X	X	X
5.46	\Nn	I	X	X	X	X	X	X
5.47	%Cn	I	X	X	X	X	X	X
5.48	%En	I	X	X	X	X	X	X
5.49	%R	I	X	X	X	X	X	X
5.50	*Pn	I	X	X	X	X	X	X
5.51	+CBST	I	X	X	X	X	X	X
5.52	+CGMI	I	X	X	X	X	X	X
5.53	+CGMM	I	X	X	X	X	X	X
5.54	+CGMR	I	X	X	X	X	X	X
5.55	+CGSN	I	X	X	X	X	X	X
5.56	+CMEE	I	X	X	X	X	X	X
5.57	+CPAS	I	X	X	X	X	X	X

Table 4-2: Phased AT Command Implementation – Command Detail (continued)

Section	Command	Phase	9500 INC0620	9520 RAC0620	9521 RAC0620	9505 LAC109G	9505 LAC0210	9522 SAC0201
5.58	+CR	I	X	X	X	X	X	X
5.59	+CRC (initial)	I	X	X	X	X		
5.60	+DS	I	X	X	X	X	X	X
5.61	+DR	I	X	X	X	X	X	X
5.62	+IPR	I	X	X	X	X	X	X
6.1	+CBC (initial)	II				X		
6.2	+CEER	II				X	X	X
6.3	+CHUP	II				X	X	X
6.4	+CMGD	II				X	X	X
6.5	+CMGF	II				X	X	X
6.6	+CMGL	II				X	X	X
6.7	+CMGR	II				X	X	X
6.8	+CMGS	II				X	X	X
6.9	+CMGW	II				X	X	X
6.10	+CMOD	II				X	X	X
6.11	+CNMI	II				X	X	X
6.12	+COPS	II				X	X	X
6.13	+CPBF	II				X	X	X
6.14	+CPBR	II				X	X	X
6.15	+CPBS	II				X	X	X
6.16	+CPBW	II				X	X	X
6.17	+CPIN	II				X	X	X
6.18	+CPMS	II				X	X	X
6.19	+CREG	II				X	X	X
6.20	+CSCA	II				X	X	X
6.21	+CSCB	II				X	X	X
6.22	+CSCS	II				X	X	X
6.23	+CSMS	II				X	X	X
6.24	+CSTA	II				X	X	X
6.25	+GMI	II				X	X	X
6.26	+GMM	II				X	X	X
6.27	+GMR	II				X	X	X
6.28	+GSN	II				X	X	X
6.29	+GCAP	II				X	X	X
7.1	A (revised)	III					X	X
7.2	D (revised)	III					X	X
7.2.1	D> (revised)	III					X	X
7.3	Hn (revised)	III					X	X
7.4	S0=n (revised)	III					X	X
7.5	Xn (revised)	III					X	X

Table 4-2: Phased AT Command Implementation – Command Detail (continued)

Section	Command	Phase	9500 INC0620	9520 RAC0620	9521 RAC0620	9505 LAC109G	9505 LAC0210	9522 SAC0201
7.6	&Dn (revised)	III					X	X
7.7	+CBC (revised)	III					X	X
7.8	+CSQ	III					X	X
7.9	+CLVL	III					X	X
7.10	+CMUT	III					X	X
7.11	+CRC (revised)	III					X	X
7.12	+CVHU	III					X	X
7.13	+CCLK	III					X	X
7.14	-MSVTS	III					X	X
7.15	-MSVTR	III					X	X
7.16	-MSVLS	III					X	X
7.17	-MSSTM	III					X	X

5   Phase I AT Commands

5.1   AT - ATtention Code

This is the prefix for all commands except A/ and +++. When entered on its own, the ISU will respond OK.

5.2   A/ - Repeat Last Command

Repeat the last command issued to the ISU unless the power was interrupted or the unit is reset. A/ is not followed by <CR>.

5.3   +++ - Escape Sequence

The escape sequence is used to transfer from in-call data mode to in-call command mode without disconnecting from the remote modem. After a pause, the ISU will respond with OK. Register S2 can be used to alter the escape character from +, the factory default, to any hexadecimal value in the range 0 to 255.

5.4   A - Answer (Initial implementation; revised in Phase III)

Answer immediately. This causes the ISU to answer the incoming data call.

5.5   Bn - Communication Standards

Select the communications standard to be used for data calls.

No action, compatibility only.

Any value for n accepted.

5.6   Cn - Carrier Control

Control carrier detection.

No action, compatibility only.

Only n=1 accepted.

5.7   D - Dial (Initial implementation; revised in Phase III)

Dial a data call number. The dial command causes the ISU to enter originate mode and act as an auto dialer for connection to other modems. The usual format is `ATDnx..x` where `n` is a Dial Modifier and `x` is a number. The following are valid numbers: 0123456789*#ABC. Dial modifiers are used to alter the manner in which the ISU dials.

> L   Redial last number.
>
> P   Use pulse dialing.
>
> *No action, compatibility only.*
>
> T   Use tone dialing.
>
> *No action, compatibility only.*
>
> +   International dialing prefix. Allows the international access code to be omitted from dial string.
>
> >   Direct dial from phonebook locations. See subsection below for further details.
>
> *Direct dial from phonebook not implemented in models 9500 with INC0620, 9520 with RAC0620, or 9521 with RAC0620 .*

Any character received from the DTE during the call establishment phase will cause the call attempted to be terminated.

5.7.1   Direct Dial From Phonebook (Initial implementation; revised in Phase III)

The ISU and SIM contain phonebooks which have a phone number and an alphanumeric field for each phonebook entry location. The use of V.25ter dialing command ensures that direct dialing from phone memory and SIM phonebook is possible through ordinary communications software which just gives the phone number field to be filled and then use the D command to originate the call. Available memories may be queried with Select Phonebook Storage test command +CPBS=?, and location range for example with Read Phonebook Entries test command +CPBR=?.

Execute commands:

D><str>

Originate call to phone number which corresponding alphanumeric field is <str> (if possible, all available memories should be searched for the correct entry). <str> is of string type value and should enclosed by "" (e.g., "John").

D> mem<n>

Originate call to phone number in memory mem entry location <n> (available memories may be queried with Select Phonebook Storage test command +CPBS=?).

mem can be one of the following:

> FD   SIM fixed dialing phonebook
>
> LD   Last ten calls dialed phonebook
>
> ME   Phone memory
>
> MT   Combined phone and SIM phonebook locations
>
> SM   SIM phonebook

D><n>

Originate call to phone number in entry location <n> (the command Select Phonebook Memory Storage +CPBS setting determines which phonebook storage is used).

5.8 En - Echo

Echo command characters.

        0   Characters are not echoed to the DTE.

        1   Characters are echoed to the DTE (default).

5.9 Fn - Line Modulation

Select line modulation standard.

No action, compatibility only.

Allowed values for n are 0, 1, 3, 4, 5, 6, 7, 8, 9 and 10.

5.10 Hn - Hangup (Initial implementation; revised in Phase III)

Control the hook switch. This command is used to clear a data call connection.

        0   Place the ISU on hook.

5.11 In - Identification

Requests the ISU to display information about itself.

        0   "2400" (traffic channel rate for IRIDIUM data/fax)

        1   "0000" (ROM checksum which is not supported so zero is output)

        2   "OK"   (result of ROM checksum verification which is not supported so OK is always output)

        3   "XXXXXXX" (Software revision level)

        4   "Motorola IRIDIUM" (Product description)

        5   "XXXX" (country code)

        6   "XXXXXXX" (Hardware specification)

5.12 Ln - Loudspeaker Volume

Set the loudspeaker volume according to the parameter supplied.

No action, compatibility only.

Allowed values for n are 0, 1, 2 and 3.

5.13 Mn - Speaker Control

Select when the speaker will be on or off. Note that serially connected products have no speaker.

No action, compatibility only.

Allowed values for n are 0, 1, 2 and 3.

5.14 Nn - Automode Enable

Enable or disable automode detection.

No action, compatibility only.

Any value for n is accepted.

5.15 On - Online

Enter in-call data mode. This is used to return to in-call data mode from in-call command mode using an existing connection.   An error is reported if on-hook.

0   Switch from in-call command mode to in-call data mode.

Any value for n accepted.

5.16 P - Pulse Dial

Set pulse dial.

No action, compatibility only.

5.17 Qn - Quiet Mode

Control ISU responses.

0   ISU responses are sent to the DTE (default).

1   ISU responses are NOT sent to the DTE.

5.18 S0=n - Auto-Answer (Initial implementation; revised in Phase III)

Auto-answer. This causes the ISU to auto-answer the incoming data call.

0   Disable auto-answer.

n>0   Enable auto-answer.

5.19 T - Tone Dial

Set tone dial.

No action, compatibility only.

5.20 Vn - Verbose Mode

Set the response format of the ISU, which may be either numeric or textual.

  0   Numeric responses.

  1   Textual responses (default).

5.21 Wn - Error Correction Message Control

Set the format of the CONNECT messages.

  0   Upon connection, the ISU reports the DTE speed (default).

  1   Upon connection, the ISU reports the line speed, the error correction protocol and the DTE
         speed in that order.

  2   Upon connection, the ISU reports the DCE speed.

5.22 Xn - Extended Result Codes (Initial implementation; revised in Phase III)

Select the response set to be used by the ISU when informing the DTE of the results of a command or data call.

  0   OK, CONNECT, RING, NO CARRIER, NO ANSWER and ERROR.

  1   As X0 plus CONNECT x, where x is the DTE speed.

  2   As X1 plus NO DIALTONE.

  3   As X2 plus BUSY.

  4   As X3 plus CARRIER x, PROTOCOL: and COMPRESSION:, where x is the line speed
         (default).

  Note that the Wn command limits which connection related responses will be reported.

5.23 Yn - Long Space Disconnect

Enable or disable the generation and response to long space disconnect.

  No action, compatibility only.

  Any value for n is accepted.

5.24 Zn - Soft Reset

Reset the ISU to a user-stored configuration.

  0   Restores user configuration 0.

  1   Restores user configuration 1.

5.25 &Cn - DCD Option

Select how the ISU controls the DCD behavior.

      0   DCD is forced on at all times.

      1   DCD indicates the connection status (default).

5.26 &Dn - DTR Option (Initial implementation; revised in Phase III)

Set the ISU reaction to DTR signal.

DTR must be ON during on-hook command mode. If DTR transitions from ON to OFF during on-hook command mode, operation will be locked after approximately 10 seconds. On-hook command mode operation will resume when DTR is restored ON.

DTR must be ON at call connection.

DTR must be ON during both in-call command mode and in-call data mode. Reaction to DTR ON to OFF transitions during in-call command mode and in-call data mode is determined by the &Dn setting as shown below.

      0   If DTR transitions from ON to OFF during in-call command mode, and DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

             If DTR transitions from ON to OFF during in-call data mode, the mode will remain in in-call data mode. If DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

      1   If DTR transitions from ON to OFF during in-call command mode, and DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

             If DTR transitions from ON to OFF during in-call data mode, the mode will change to in-call command mode. If DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

      2   If DTR transitions from ON to OFF during either in-call command mode or in-call data mode, the call will drop to on-hook command mode (default).

      3   If DTR transitions from ON to OFF during either in-call command mode or in-call data mode, the call will drop to on-hook command mode and the ISU will reset to AT command profile 0.

5.27 &Fn - Restore Factory Settings

Recall factory defaults.

      0   Recall factory default 0.

5.28 &Gn - Guard Tone

Select guard tone.

      No action, compatibility only.

      Any value for n is accepted.

5.29 &Jn - Jack Control

Control the telephone jack configuration.

No action, compatibility only.

Allowed values for n are 0 and 1.

5.30 &Kn - Flow Control

Select the flow control method between the ISU and DTE.

0   Disables flow control.

3   Enables RTS/CTS flow control (default).

4   Enables XON/XOFF flow control.

6   Enables both RTS/CTS and XON/XOFF flow control.

5.31 &Ln - Leased Line Operation

Request leased line or dial-up operation.

No action, compatibility only.

Any value for n is accepted.

5.32 &Mn - Asynchronous/Synchronous Mode

Select the DTR operating mode.

0   Selects normal asynchronous operation (default). (See &Q0.)

5.33 &Pn - Pulse Dial Make/Break Ratio

Select the make/break ratio during pulse dialing.

No action, compatibility only.

Allowed values for n are 0, 1, 2 and 3.

5.34 &Qn - Sync/Async Mode

Select asynchronous mode. This is an extension of the &M command and is used to control the connection modes permitted.

0   Normal asynchronous operation with no error correction (unacknowledged mode). (default).

5   Asynchronous operation with error correction (acknowledged mode).

5.35 &Rn - RTS/CTS Option

Select how the ISU controls CTS.

No action, compatibility only.

Allowed values for n are 0 and 1.

5.36 &Sn - DSR Override

Define the behavior of DSR.

0   DSR always active (default).

1   Same as 0.

5.37 &V - View Active and Stored Configuration

View the current active configuration and stored profiles.

5.38 &Wn - Store Active Configuration

Store the active profile in non-volatile memory. This is used to store user configurations for later use.

0   Store current (active) configuration as profile 0.

1   Store current (active) configuration as profile 1.

5.39 &Xn - Select Synchronous Clock

Select the source of the transmit clock for synchronous mode of operation.

No action, compatibility only.

Any value for n is accepted.

5.40 &Yn - Designate Default Reset Profile

Select profile for use after power-up.

0   Select profile 0 (default).

1   Select profile 1.

5.41 \An - MNP Block Size

Select maximum MNP block size.

No action, compatibility only.

5.42 \Bn - Transmit Break

Transmit break to remote. In non-error correction mode, the ISU will transmit a break signal to the remote modem with a length in multiples of 100 ms according to the parameter specified. Values for n is 1-9.

No action, compatibility only.

5.43 \Gn - XON/XOFF Flow Control

Set the use of XON/XOFF flow control in normal mode.

No action, compatibility only.

5.44 \Jn - DTE Auto Rate

Enable DTE auto rate adjustment

No action, compatibility only.

5.45 \Kn - Control Break

Control the response of the ISU to a break received from the DTE or the remote modem according to the parameter specified. The response is different in three separate states:

When a break is received from DTE when ISU is in data transfer mode:

0   Enter in-call command mode, no break sent to remote modem.

1   Clear data buffers and send break to remote modem.

2   Same as 0.

3   Send break to remote modem immediately.

4   Same as 0.

5   Send break to remote modem in sequence with transmitted data (default).

When a break is received from the remote modem during a non-error corrected connection:

0   Clear data buffers and send break to DTE.

1   Same as 0.

2   Send break to DTE immediately.

3   Same as 2.

4   Send break to DTE in sequence with received data.

5   Same as 4 (default).

5.46 \Nn - Link Type

Define the link type to be used.

No action, compatibility only.

5.47 %Cn - Compression Control

Enable/disable data compression. Data compression can only be performed on an error corrected link (i.e., acknowledged mode).

No action, compatibility only. Use the +DS command to set data compression.

5.48 %En - Auto Retrain

Enable/disable auto retrain.

No action, compatibility only.

Allowed values for n are 0, 1 and 2.

5.49 %R - Display Registers

Display all the S registers in the system.

5.50 *Pn - Power Phone

Turn ISU off.

0   Turn phone OFF.

5.51 +CBST - Select Bearer Service Type

Set Command: **+CBST=[<speed>[,<name>[,<ce>]]]**

Select the bearer service type for mobile originated calls.

<speed> can have the following values:

0	Autobauding
1	300 bps V.21
2	1200 bps V.22
4	2400 bps V.22bis
6	4800 bps V.32 (default)
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

<name> takes the following value:

     0   data circuit asynchronous

<ce> can only take the following value:

     1   non-transparent

Read Command: **+CBST?**

Query the current bearer service type settings. Response is in the form:

    +CBST: <speed>,<name>,<ce>

Test Command: **+CBST=?**

List the supported <speed>, <name>, <ce>. Response is in the form:

    +CBST: (supported <speed>s),(supported <name>s),(supported <ce>s)

5.52 +CGMI - Manufacturer Identification

Exec Command: **+CGMI**

Query phone manufacturer.

5.53 +CGMM - Model Identification

Exec Command: **+CGMM**

Query phone model.

5.54 +CGMR - Revision

Exec Command: +CGMR

Query the phone revision.

5.55 +CGSN - Serial Number

Exec Command: **+CGSN**

Query the phone serial number (i.e. IMEI).

5.56 +CMEE - Report Mobile Equipment Error

Set Command: **+CMEE=[<x>]**

Set mobile equipment error reporting level.

<x> takes the following values:

0	Disable error reporting (use ERROR result code) (default).
1	Enable numeric error reporting.
2	Enable verbose error reporting.

An example of an error report is:

        +CME ERROR: <y>

where <y> can be the number or text listed below:

0	phone failure
1	no connection to phone
2	phone-adaptor link reserved
3	operation not allowed
4	operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy
15	SIM wrong
16	incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	memory full
21	invalid index
22	not found
23	memory failure
24	text string too long
25	invalid characters in text string
26	dial string too long
27	invalid characters in dial string

30	no network service
31	network timeout
32	emergency calls only
40	network personalization PIN required
41	network personalization PUK required
42	network subset personalization PIN required
43	network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	corporate personalization PIN required
47	corporate personalization PUK required
100	unknown

Read Command: **+CMEE?**

Query mobile equipment error reporting level. The response is in the form:

```
+CMEE: <x>
```

Test Command: **+CMEE=?**

List the supported error reporting level. The response is in the form:

```
+CMEE: (supported <x>s)
```

5.57 +CPAS - Phone Activity Status

Exec Command: **+CPAS**

Query phone activity status. The response is in the form:

```
+CPAS: <x>
```

where <x> can take the following values:

0	Ready (allows commands).
1	Unavailable (does not allow commands).
2	Unknown (may not respond to commands).
3	Data Call Ringing (allows commands).
4	Data Call In Progress (allows commands).

Models 9500 with INC0620, 9520 with RAC0620, and 9521 with RAC0620 return from status 4 to status 3 at the end of a data call. They subsequently return to status 0 after reset or power cycle.

5.58 +CR - Service Reporting Control

Set Command: **+CR=[<mode>]**

Set the service reporting level.

<mode> takes the following values:

   0   Disable reporting (default).

   1   Enable reporting.

If reporting is enabled, the intermediate result code `+CR: <serv>` is returned by the ISU.

<serv> can have one of the following values:

   `ASYNC`   asynchronous transparent

   `SYNC`   synchronous transparent

   `REL ASYNC` asynchronous non-transparent

   `REL SYNC` synchronous non-transparent

Read Command: **+CR?**

Query the current service reporting level settings. The response is in the form:

   `+CR: <mode>`

Test Command: **+CR=?**

List the supported reporting levels. The response is in the form:

   `+CR: (supported <mode>s)`

5.59 +CRC - Cellular Result Codes (Initial implementation; revised in Phase III)

Set Command: **+CRC=[<mode>]**

Set the extended format of incoming data call indication.

<mode> takes the following values:

   0   Disable extended format (default).

   1   Enable extended format.

If extended format is enabled, the unsolicited result code `+CRING: <type>` is returned by the ISU instead of `RING`, where <type> can be one of the following:

   `ASYNC`   asynchronous transparent

   `SYNC`   synchronous transparent

   `REL ASYNC` asynchronous non-transparent

   `REL SYNC` synchronous non-transparent

Read Command: **+CRC?**

Query the current result code settings. The response is in the form:

   `+CR: <mode>`

Test Command: **+CRC=?**

List the supported result code settings. The response is in the form:

   `+CR: (supported <mode>s)`

5.60 +DS - Set Data Compression Function

Set Command: **+DS=[<direction>[,<comp_neg>[,<max_dict>[,<max_string]]]]**

Set the V.42bis data compression function.

<direction> can take on the following values:

        0   No compression (default)

        1   Transmit only

        2   Receive only

        3   Both directions

<comp_neg> can take on the following values:

        0   Do not disconnect if V.42bis is not negotiated by the remote DCE as specified in <direction> (default)

        1   Disconnect if V.42bis is not negotiated by the remote DCE as specified in <direction>

<max_dict> can take on the following values: 512 to 2048. Default is 512.

<max_string> can take on the following values: 6 to 250. Default is 6.

Read Command: **+DS?**

Query the current data compression parameter settings. The response is in the form:

```
+DS: <direction>,<comp_neg>,<max_dict>,<max_dict>
```

Test Command: **+DS=?**

List the supported data compression parameters. The response is in the form:

```
+DS: (supported <direction>s),(supported  <comp_neg>s,(supported
<max_dict>s),(supported <max_dict>s)
```


Data compression will not work if IRLP is in unacknowledge mode.

5.61 +DR - Data Compression Report Level

Set Command: **+DR=[<mode>]**

Set the data compression reporting level.

<mode> can take on the following values:

0	Disable data compression reporting (default)
1	Enable data compression reporting

If reporting is enabled, the following intermediate result codes are transmitted by the ISU:

+DR: NONE	No data compression.
+DR: V42B	Data compression in use in both directions.
+DR: V42B RD	Data compression in use in receive direction only.
+DR: V42B TD	Data compression in use in transmit direction only.

Read Command: **+DR?**

Query the current reporting level setting. The response is in the form:

```
+DR: <mode>
```

Test Command: **+DR=?**

List the supported parameter settings. The response is in the form:

```
+DR: (supported <mode>s)
```

5.62 +IPR - Fixed DTE Rate

Set Command: **+IPR=<rate>**

Set the data rate at which the ISU will accept commands. The change in data rate takes into effect after the result code (e.g., OK) is received by the DTE.

<rate> takes the following values:

1	600 bps
2	1200 bps
3	2400 bps
4	4800 bps
5	9600 bps
6	19200 bps (default)
7	38400 bps

Read Command: **+IPR?**

Query the current data rate. The response is in the form:

```
+IPR: <rate>
```

Test Command: **+IPR=?**

List the supported data rates. The response is in the form:

```
+IPR: (supported <rate>s)
```

Models 9505 with LAC109G and 9522 with initial commercial release software will automatically adjust to changes in the DTE rate and override the +IPR setting when dissimilar.

6 Phase II AT Commands

6.1 +CBC - Battery Charge (Initial implementation; revised in Phase III)

Exec Command: **+CBC**

Execution command returns the battery connection status <bcs> and battery charge level <bcl> of the phone. The response is in the form:

        +CBC: <bcs>,<bcl>

where <bcs>:

000	ISU is powered by the battery.
001	ISU has a battery connected, but is not powered by it.
002	ISU does not have a battery connected.
003	Recognized power fault, calls inhibited.

and <bcl>:

000	Battery is exhausted, or ISU does not have a battery connected.
001...100	Battery has 1-100 percent of capacity remaining.

Test Command: **+CBC=?**

Test command returns the values for <bcs> and <bcl> supported by the ISU. Response is in the form:

        +CBC: (list of supported <bcs>s),(list of supported <bcl>s)

6.2 +CEER - Extended Error Report

Exec Command: **+CEER**

Execution command causes the phone to return information text <report> which offers the user an extended report of the reason of the failure in the last unsuccessful call setup (originating or answering) or the reason for last call release. The response is in the form:

        +CEER: <report>

An example of a <report> is:

        User alerting, no answer

6.3 +CHUP - Hangup call

This command causes the phone to hangup the current data or voice call.

6.4   +CMGD - Delete SMS Message

Exec Command: **+CMGD=<index>**

Execution command deletes message from preferred message storage <mem1> (<mem1> is the selected message storage from the +CPMS command) location <index>. If deleting fails, final result code +CMS ERROR: <cms_err> is returned.

An example of an error report is:

        +CMS ERROR: <cms_err>

where <cms_err> can be one of the numbers below:

1	unassigned number
8	operator barred
10	call barred
21	SM transfer rejected
27	destination out of service
28	unidentified subscriber
29	facility rejected
30	unknown subscriber
38	network out of order
41	temporary failure
42	congestion
47	resources unavailable
50	facility not subscribed
69	facility not implemented
81	invalid SM reference value
95	invalid message
96	invalid mandatory information element
97	nonexistent message type
98	incompatible message
99	nonexistent information element
111	protocol error
127	interworking
128	telephony interworking not supported
129	SM type 0 not supported
130	cannot replace SM
143	unspecified TP-PID error
144	coding scheme not supported
145	message class not supported
159	unspecified TP-DCS error
160	command not actioned

161	command unsupported
176	TPDU not supported
192	SC busy
193	no SC subscription
194	SC system failure
195	invalid SME address
196	destination SME barred
197	SM rejected
208	SIM SMS storage full
209	no SMS storage capability in SIM
210	error in MS
211	memory capacity exceeded
255	unspecified error
300	phone failure
301	SMS service reserved
302	operation not allowed
303	operation not supported
304	invalid PDU mode parameter
305	invalid text mode parameter
310	no SIM
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
320	memory failure
321	invalid memory index
322	memory full
330	SM-SC address unknown
331	no network service
332	network timeout
500	unknown error

6.5 +CMGF - SMS Message Format

Set Command: **+CMGF=[<mode>]**

Set command tells the phone, which input and output format of messages to use. <mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters). Only PDU mode is supported at this time.

Valid values for <mode> are:

>   0   PDU mode (default)

Read Command: **+CMGF?**

Read command returns the current <mode> set. Response is in the form:

>   +CMGF: <mode>

Test Command: **+CMGF=?**

Test command returns the list of supported <mode>s. Response is in the form:

>   +CMGF: (list of supported <mode>s)

6.6 +CMGL - List SMS Messages

Exec Command: **+CMGL[=<stat>]**

Execution command returns messages with status value <stat> from message storage <mem1> (<mem1> is the selected message storage from the +CPMS command) to the DTE. If listing fails, final result code +CMS ERROR: <cms_err> is returned.

Valid values for <stat> are:

PDU	Text	
0	"REC UNREAD"	received unread message (i.e. new message) (default)
1	"REC READ"	received read message
2	"STO UNSENT"	stored unsent message (only applicable to SMs)
3	"STO SENT"	stored sent message (only applicable to SMs)
4	"ALL"	all messages (only applicable to +CMGL command)

Response is in the following format for PDU mode:

>   +CMGL: <index>,<stat>,[<alpha>],<length><CR><LF><pdu>
> [<CR><LF>+CMGL:<index>,<stat>,[<alpha>],<length><CR><LF><pdu> [...]]

where:

> <alpha>: string type alphanumeric representation of TP-destination address or TP-originating address corresponding to the entry found in the phonebook (optional field);

> <length>: in PDU mode, this is the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)

> <pdu>: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format.

Test Command: **+CMGL=?**

Test command gives a list of all status values supported by the phone. Response is in the form:

>   +CMGL: (list of supported <stat>s)

6.7 +CMGR - Read SMS Message

Exec Command: **+CMGR=<index>**

Execution command returns the SMS message with location value <index> from message storage <mem1> (<mem1> is the selected message storage from the +CPMS command). If status of the message is 'received unread', status in the storage changes to 'received read'. If reading fails, final result code +CMS ERROR: <cms_err> is returned.

Response is in the following format for PDU mode:

```
+CMGR: <stat>,[<alpha>],<length><CR><LF><pdu>
```

where:

<alpha>: string type alphanumeric representation of TP-destination address or TP-originating address corresponding to the entry found in the phonebook (optional field);

<length>: in PDU mode, this is the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)

<pdu>: GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format.

6.8 +CMGS - Send SMS Message

Exec Command: **+CMGS=<length><CR><pdu><ctrl-Z/ESC> (PDU mode)**

Execution command sends message from a DTE to the network (SMS-SUBMIT). In PDU mode, <length> is the length of the actual TP data unit in octets; <pdu> is the GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format.

PDU entry must be terminated by <ctrl-Z>. Sending can be cancelled by the <ESC> character.

Response is in the following format for PDU mode:

```
+CMGS: <mr>
```

where <mr> is the message reference value of the message.

If sending fails, final result code +CMS ERROR: <cms_err> is returned.

6.9 +CMGW - Write SMS Message To Memory

Exec Command: **+CMGW=<length>[,<stat>]<CR><pdu><ctrl-Z/ESC> (PDU mode)**

Execution command stores a message to memory storage <mem2> (<mem2> is selected by the +CPMS command). In PDU mode, <length> is the length of the actual TP data unit in octets; <pdu> is the GSM 04.11 SC address followed by GSM 03.40 TPDU in hexadecimal format. By default, message status will be set to 'stored unsent', but parameter <stat> allows also other status values to be given.

PDU entry must be terminated by <ctrl-Z>. Storing can be cancelled by sending the <ESC> character.

Response is in the following format for PDU mode:

```
+CMGW: <index>
```

where <index> indicates the memory location where the message is stored.

If storing fails, final result code +CMS ERROR: <cms_err> is returned.

6.10 +CMOD - Call Mode

Set Command: +CMOD=[<mode>]

Set command selects the call mode of further dialing commands (D) or for next answering command (A). Mode can be either single or alternating (the terms "alternating mode" and "alternating call" refer to all GSM bearer and teleservices that incorporate more than one basic service (voice, data, fax) within one call). For the satellite phones, only a single call is supported.

<mode>:

0   single mode (default)

Read Command: +CMOD?

Query the current call mode settings. The response is in the form:

        +CMOD: <mode>

Test Command: +CMOD=?

List the supported call modes. The response is in the form:

        +CMOD: (supported <mode>s)

6.11 +CNMI - New SMS Message Indications to DTE

Set Command: +CNMI=[<mode>[,<mt>[,<bm>[,<ds>[, <bfr>]]]]]

Set command selects the procedure, how receiving of new messages from the network is indicated to the DTE when DTE is active, e.g. DTR signal is ON.

Valid values for <mode> are:

    0   Buffer unsolicited result codes in the phone. If result code buffer is full, older indications are discarded and replaced with the new received indications. (default)

    1   Discard indication and reject new received message unsolicited result codes when ISU-DTE link is reserved (e.g. in in-call data mode). Otherwise forward them directly to the DTE.

    2   Buffer unsolicited result codes in the phone when ISU-DTE link is reserved (e.g. in in-call data mode) and flush them to the DTE after reservation. Otherwise forward them directly to the DTE.

Valid values for <mt> are:

    0   No SMS-DELIVER indications are routed to the DTE. (default)

    1   If SMS-DELIVER is stored in the phone, indication of the memory location is routed to the DTE using unsolicited result code:

               +CMTI: <mem>,<index>

    2   SMS-DELIVERs (except class 2 messages and messages in the message waiting indication group (store message)) are routed directly to the TE using unsolicited result code:

               +CMT: [<alpha>],<length><CR><LF><pdu> (PDU mode)

    3   Class 3 SMS-DELIVERs are routed directly to TE using unsolicited result codes defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1.

Valid values for <bm> are:

    0   No CBM indications are routed to the DTE. (default)

Valid values for <ds> are:

    0   No SMS-STATUS-REPORTs are routed to the DTE. (default)

    1   SMS-STATUS-REPORTs are routed to the DTE using unsolicited result code:

                `+CDS: <length><CR><LF><pdu> (PDU mode)`

Valid values for <bfr> are:

    0   Buffer of unsolicited result codes defined within this command is flushed to the DTE when <mode> 1...3 is entered (OK response is returned before flushing the codes). (default)

    1   Buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

Read Command: **+CNMI?**

Read command returns the current settings for the SMS message indication. Response is in the form:

    `+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr>`

Test Command: **+CNMI=?**

Test command returns the supported settings of the phone. Response is in the form:

    `+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s)`

<oper> is of string type enclosed by quotes""; for example "IRIDIUM". <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters; numeric format is the Location Area Identification number which consists of a three BCD (Binary Coded Decimal) digit country code plus a two BCD digit network code; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 2)(network code digit 1). Since IRIDIUM is the only operator, the short and long format is "IRIDIUM" and the numeric format is "90103". These are the only values accepted.

Note that setting the <mode> to manual does not disable automatic registration of the phone to the network. It just forces a manual registration procedure when entered.

Read Command: +COPS?

Read command returns the current mode, and will always respond with as "000" for <mode>. This is due to the continually enabled nature of the automatic registration mode. The response is in the form:

        +COPS: <mode>

For example:

        +COPS:000

Test Command: +COPS=?

Test command returns the list of operators present in the network. Response is in the form:

        +COPS: [list of supported (<stat>,long alphanumeric <oper>,short
alphanumeric <oper>,numeric <oper>)s] [,,(list of supported
<mode>s),(list of supported <format>s)]

where <stat> indicates:

        2   current

For example:

        +COPS:(002),"IRIDIUM","IRIDIUM","90103",,(000-001),(000-002)

6.13 +CPBF - Find phonebook entries

Exec Command: **+CPBF=<findtext>**

Execution command returns phonebook entries (from the current phonebook memory storage selected with +CPBS) which alphanumeric field start with string <findtext>. <findtext> should of string type enclosed by ""; for example, "John".

Entry fields returned are location number <index n>, phone number stored there <number> (of address type <type>), and text <text> associated with the number. Response is in the following format:

```
+CPBF:           <index1>,<number>,<type>,<text>[[...]<CR><LF>+CBPF:
<index2>,<number>,<type>,<text>]
```

Test Command: **+CPBF=?**

Test command returns the maximum lengths of <number> and <text> fields for phonebook entries. Response is in the form:

```
+CPBF: <nlength>,<tlength>
```

where <nlength> indicates the maximum length of <number> and <tlength> shows the maximum length of <text>.

6.14 +CPBR - Read phonebook entries

Exec Command: **+CPBR=<index1>[,<index2>]**

Execution command returns phonebook entries in location number range <index1>... <index2> from the current phonebook memory storage selected with +CPBS. If <index2> is left out, only location <index1> is returned.

Entry fields returned are location number <index n>, phone number stored there <number> (of address type <type>) and text <text> associated with the number. Response is in the form:

```
+CPBR:     <index1>,<number>,<type>,<text>[[...]     <CR><LF>+CPBR:
<index2>,<number>,<type>,<text>]
```

Test Command: **+CPBR=?**

Test command returns location range supported by the current storage and the maximum lengths of <number> and <text> fields. Response is in the form:

```
+CPBR: (list of supported <index>s),<nlength>,<tlength>
```

where <nlength> indicates the maximum length of <number> and <tlength> shows the maximum length of <text>.

6.15 +CPBS - Select phonebook storage

Set Command: **+CPBS="<storage>"**

Set command selects phonebook memory storage <storage>, which is used by other phonebook commands.

<storage> takes the following values:

FD	SIM fixed dialing phonebook
LD	Last ten calls dialed phonebook
ME	ISU phonebook
MT	combined ISU and SIM phonebook (default)
SM	SIM phonebook

Read Command: **+CPBS?**

Read command returns currently selected memory, the number of used locations and total number of locations in the memory. Response is in the form:

```
+CPBS: <storage>,<used>,<total>
```

where <used> indicates the number of used locations and <total> shows the total capacity of <storage>.

Test Command: **+CPBS=?**

Test command returns supported storages.

6.16 +CPBW - Write phonebook entry

Exec Command: **+CPBW=[<index>][,<number>[,<type>[<text>]]]**

Execution command writes phonebook entry in location number <index> in the current phonebook memory storage selected with +CPBS. Entry fields written are phone number <number> (of address type <type>) and text <text> associated with the number. If those fields are omitted, phonebook entry is deleted. Both <text> and <number> should be of string type enclosed by ""; for example, "John","1234".

Test Command: **+CPBW=?**

Test command returns the location range supported by the current storage, the maximum length of <number> field, supported number formats of the storage, and the maximum length of <text> field. Response is in form:

```
+CPBW: (list of supported <index>s),<nlength>,(list of supported
<type>s),<tlength>
```

6.17 +CPIN - Enter PIN

Set Command: **+CPIN=<pin>[,<newpin>]**

Set command sends to the phone a password which is necessary before it can be operated (SIM PIN, SIM PUK, etc.). If no PIN request is pending, no action is taken by the phone.

If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <newpin>, is used to replace the old pin in the SIM.

Both <pin> and <newpin> should be of string type enclosed by ""; for example,"1234".

Read Command: **+CPIN?**

Read command returns an alphanumeric string indicating whether some password is required or not. Response is in the form:

    +CPIN: <code>

where <code> can be one of the following:

READY	ISU is not pending for any password.
SIM PIN	ISU is waiting for SIM PIN to be given.
SIM PUK	ISU is waiting for SIM PUK to be given.
SIM PIN2	ISU is waiting for SIM PIN2 to be given.
SIM PUK2	ISU is waiting for SIM PUK2 to be given.

6.18 +CPMS - Select Preferred SMS Message Storage

Set Command: **+CPMS=<mem1>[, <mem2>[,<mem3>]]**

Set command selects memory storages <mem1>, <mem2> and <mem3>. <mem1> is the memory from which messages are read and deleted; <mem2> is the memory to which writing and sending operations are made; <mem3> is the memory to which received SMS messages are to be stored. If a chosen storage is not appropriate for the phone, final result code +CMS ERROR: <cms_err> is returned.

Valid values for <mem1>, <mem2> and <mem3> are:

        "SM"   SIM message storage

Response is in the form:

```
+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3>
```

where <used1>: number of messages currently in <mem1>

    <total1>: total number of message locations in <mem1>

    <used2>: number of messages currently in <mem2>

    <total2>: total number of message locations in <mem2>

    <used3>: number of messages currently in <mem3>

    <total3>: total number of message locations in <mem3>

Read Command: **+CPMS?**

Read command returns the current storage selected, usage and capacity. Response is in the form:

```
+CPMS:            <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,
<mem3>,<used3>,<total3>
```

Test Command: **+CPMS=?**

Test command returns lists of memory storages supported by the phone. Response is in the form:

```
+CPMS: (list of supported <mem1>s),(list of supported <mem2>s),
(list of supported <mem3>s)
```

6.19 +CREG - Network Registration

Set Command: **+CREG=[<n>]**

Set command controls the presentation of an unsolicited result code +CREG: <stat> when <n>=1 and there is a change in the ISU network registration status, or code +CREG: <stat>[,<lac>,<ci>] when <n>=2 and there is a change in the registration status of the phone.

Valid values for <n> are:

0	disable network registration unsolicited result code (default)
1	enable network registration unsolicited result code +CREG: <stat>
2	enable network registration and location information unsolicited result code +CREG: <stat>[,<lac>,<ci>]. <lac> indicates the location area code in string format; <ci> is in the cell identifier which is not applicable to IRIDIUM.

<stat> can be one of the following:

0	not registered, ISU is not currently searching a new operator to register to
1	registered, home network
2	not registered, but ISU is currently searching a new operator to register to
3	registration denied
4	unknown
5	registered, roaming

Read Command: **+CREG?**

Read command returns the status of result code presentation and an integer <stat> which shows whether the network registration status of the phone. Location information elements <lac> and <ci> are returned only when <n>=2 and phone is registered in the network. Response is in the form:

    +CREG: <n>,<stat>[,<lac>,<ci>]

Test Command: **+CREG=?**

Test command lists the supported settings for +CREG. Response is in the form:

    +CREG: (list of supported <n>s)

6.20 +CSCA - SMS Service Center Address

Set Command: **+CSCA=<sca>[,<tosca>]**

Set command updates the SMSC address, through which mobile originated SMs are transmitted. In PDU mode, setting is used by the send and write commands, but only when the length of the SMSC address coded into <pdu> parameter equals zero.

<sca>: GSM 04.11 RP SC address Address-Value field in string format (i.e., enclosed by quotes """);

<tosca>: GSM 04.11 RP SC address Type-of-Address octet in integer format;

Read Command: **+CSCA?**

Read command returns the current service center address. Response is in the form:

    +CSCA: <sca>,<tosca>

6.21 +CSCB - Select Cell Broadcast Message Types

Set Command: **+CSCB=[<mode>[,<mids>[,<dcss>]]]**

Set command selects which types of CBMs are to be received by the ME.

> *No action, compatibility only.*

Read Command: **+CSCB?**

Read command returns the current values for <mode>, <mids> and <dcss>. Response is in the form:

```
+CSCB: <mode>,<mids>,<dcss>
```

Test Command: **+CSCB=?**

Test command returns supported modes. Response is in the form:

```
+CSCB: (list of supported <mode>s)
```

6.22 +CSCS - Select TE Character Set

Set Command: **+CSCS=[<chset>]**

Set command informs the phone which character set <chset> is used by the DTE. Only the IRA character set is currently supported. <chset> should be of string type enclosed by ""; for example, "IRA".

Valid values for <chset> are:

> "IRA"   international reference alphabet (ITU-T T.50)

Read Command: **+CSCS?**

Read command returns the current character set used. Response is in the form:

```
+CSCS: <chset>
```

Test Command: **+CSCS=?**

Test command returns the supported character set of the phone. Response is in the form:

```
+CSCS: (list of supported <chset>s)
```

6.23 +CSMS - Select SMS Message Service

Set Command: **+CSMS=<service>**

Set command selects short messaging service <service>. It returns the types of messages supported by the phone: <mt> for mobile terminated messages, <mo> for mobile originated messages and <bm> for broadcast type messages. If chosen service is not supported, final result code +CMS ERROR: <cms_err> shall be returned. Only message service type 0 is currently supported.

Valid values for <service> are:

0 GSM 03.40 and 03.41 (the syntax of SMS AT commands is compatible with GSM 07.05 Phase 2 version 4.7.0) (default)

Response is in the form:

```
+CSMS: <mt>,<mo>,<bm>
```

where, <mt>, <mo>, <bm>:

0 type not supported

1 type supported

Read Command: **+CSMS?**

Read command returns the current message service type set. Response is in the form:

```
+CSMS: <service>,<mt>,<mo>,<bm>
```

Test Command: **+CSMS=?**

Test command returns the supported message services of the phone. Response is in the form:

```
+CSMS: (list of supported <service>s)
```

6.24 +CSTA - Select Type of Address

Set Command: **+CSTA=[<type>]**

Select the type of number for the dial command D. <type> is the type of address in integer format specified in GSM 4.08 subclause 10.5.4.7. Typical values for <type> are:

129 Unknown type (default)

145 International number.

Read Command: **+CSTA?**

Query the current address type settings. The response is in the form:

```
+CSTA: <type>
```

Test Command: **+CSTA=?**

List the supported address type settings. The response is in the form:

```
+CSTA: (supported <type>s)
```

6.25 +GMI - Manufacturer Identification

Exec Command: **+GMI**

Query phone manufacturer. This command is similar to +CGMI.

6.26 +GMM - Model Identification

Exec Command: **+GMM**

Query phone model. This command is similar to +CGMM.

6.27 +GMR - Revision

Exec Command: **+GMR**

Query the phone revision. This command is similar to +CGMR.

6.28 +GSN - Serial Number

Exec Command: **+GSN**

Query the phone serial number (i.e., IMEI). This command is similar to +CGMR.

6.29 +GCAP - General Capabilities

Exec Command: **+GCAP**

Query the phone's overall capabilities.

7   Phase III AT Commands

7.1   A - Answer (Revised)

Answer immediately. This causes the ISU to answer the incoming data or voice call.

7.2   D - Dial (Revised)

Dial a data or voice call number. The dial command causes the ISU to enter originate mode and act as an auto dialer for connection to other modems or voice lines. The usual format is `ATDnx..x` where `n` is a Dial Modifier and `x` is a number. The following are valid numbers: 0123456789*#ABC. Dial modifiers are used to alter the manner in which the ISU dials.

L   Redial last number.

P   Use pulse dialing.

No action, compatibility only.

T   Use tone dialing.

No action, compatibility only.

+   International dialing prefix. Allows the international access code to be omitted from dial string.

>   Direct dial from phonebook locations. See subsection below for further details.

;   Start up a voice call. This modifier should be given after the dialing digits (or modifiers).

Any character received from the DTE during the call establishment phase will cause the call attempted to be terminated.

7.2.1 Direct Dial From Phonebook (Revised)

The ISU and SIM contain phonebooks which have a phone number and an alphanumeric field for each phonebook entry location. The use of V.25ter dialing command ensures that direct dialing from phone memory and SIM phonebook is possible through ordinary communications software which just gives the phone number field to be filled and then use the D command to originate the call. Available memories may be queried with Select Phonebook Storage test command +CPBS=?, and location range for example with Read Phonebook Entries test command +CPBR=?.

Execute commands:

D><str>[;]

Originate call to phone number which corresponding alphanumeric field is <str> (if possible, all available memories should be searched for the correct entry). <str> is of string type value and should enclosed by "" (e.g., "John").

D> mem<n>[;]

Originate call to phone number in memory mem entry location <n> (available memories may be queried with Select Phonebook Storage test command +CPBS=?).

mem can be one of the following:

> FD   SIM fixed dialing phonebook
>
> LD   Last ten calls dialed phonebook
>
> ME   Phone memory
>
> MT   combined phone and SIM phonebook locations
>
> SM   SIM phonebook

D><n>[;]

Originate call to phone number in entry location <n> (the command Select Phonebook Memory Storage +CPBS setting determines which phonebook storage is used).

7.3 Hn - Hangup (Revised)

Control the hook switch. This command is used to clear a data call connection. It is also used to clear a voice call connection when the ISU has originated the voice call with the ATD dial command or terminated the voice call with the ATA or ATS0=n answer command.

> 0   Place the ISU on hook.

7.4 S0=n - Auto-Answer (Revised)

Auto-answer. This causes the ISU to auto-answer the incoming data or voice call.

> 0   Disable auto-answer.
>
> n>0   Enable auto-answer after n rings

7.5   Xn - Extended Result Codes (Revised)

Select the response set to be used by the ISU when informing the DTE of the results of a command or data or voice call.

0   OK, CONNECT, RING, NO CARRIER, NO ANSWER and ERROR.

CONNECT response is used to inform of a data call connection; OK response is used to inform of a voice call connection.

1   As X0 plus CONNECT x, where x is the DTE speed.

CONNECT x response is used for data calls only.

2   As X1 plus NO DIALTONE.

3   As X2 plus BUSY.

4   As X3 plus CARRIER x, PROTOCOL: and COMPRESSION:, where x is the line speed (default).

CARRIER x, PROTOCOL:, and COMPRESSION: responses are used for data calls only.

Note that the Wn command limits which connection related responses will be reported.

7.6   &Dn - DTR Option (Revised)

Set the ISU reaction to DTR signal.

0   DTR is ignored in all modes. A DTR signal input is not needed when set to &D0.

For all other &Dn settings, the following applies.

DTR must be ON during on-hook command mode. If DTR transitions from ON to OFF during on-hook command mode, operation will be locked after approximately 10 seconds. On-hook command mode operation will resume when DTR is restored ON.

DTR must be ON at call connection

DTR must be ON during both in-call command mode and in-call data mode. Reaction to DTR ON to OFF transitions during in-call command mode and in-call data mode is determined by the &Dn setting as shown below. *Note that the +CVHU command can be set to override these specified reactions.*

1   If DTR transitions from ON to OFF during in-call command mode, and DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

If DTR transitions from ON to OFF during in-call data mode, the mode will change to in-call command mode. If DTR is restored ON within approximately 10 seconds, the call will remain up. If DTR is not restored ON within approximately 10 seconds, the call will drop to on-hook command mode.

2   If DTR transitions from ON to OFF during either in-call command mode or in-call data mode, the call will drop to on-hook command mode (default).

3   If DTR transitions from ON to OFF during either in-call command mode or in-call data mode, the call will drop to on-hook command mode and the ISU will reset to AT command profile 0.

7.7 +CBC - Battery Charge (Revised)

Exec Command: **+CBC**

Execution command returns the battery connection status <bcs> and battery charge level <bcl> of the phone. The response is in the form:

```
+CBC: <bcs>,<bcl>
```

where <bcs>:

000	ISU is powered by the battery.
001	ISU has a battery connected, but is not powered by it.
002	ISU does not have a battery connected.
003	Recognized power fault, calls inhibited.

and <bcl>:

000	Equivalent to 0 bars displayed on the ISU battery charge indicator, or ISU does not have a battery connected.
001	Equivalent to 1 bar displayed on the ISU battery charge indicator.
002	Equivalent to 2 bars displayed on the ISU battery charge indicator.
003	Equivalent to 3 bars displayed on the ISU battery charge indicator.

Test Command: **+CBC=?**

Test command returns the values for <bcs> and <bcl> supported by the ISU. Response is in the form:

```
+CBC: (list of supported <bcs>s),(list of supported <bcl>s)
```

7.8   +CSQ - Signal Quality

Exec Command: **+CSQ**

Execution command returns the received signal strength indication <rssi> from the ISU. Response is in the form:

```
+CSQ: <rssi>
```

where <rssi> is:

0	Equivalent to 0 bars displayed on the ISU signal strength indicator.
1	Equivalent to 1 bar displayed on the ISU signal strength indicator.
2	Equivalent to 2 bars displayed on the ISU signal strength indicator.
3	Equivalent to 3 bars displayed on the ISU signal strength indicator.
4	Equivalent to 4 bars displayed on the ISU signal strength indicator.
5	Equivalent to 5 bars displayed on the ISU signal strength indicator.

Test Command: **+CSQ=?**

List the supported signal strength indications. The response is in the form:

```
+CSQ: (supported <rssi>s)
```

Note that a signal strength response may not be immediately available, but will usually be received within two seconds of issuing the command. If the ISU is in the process of acquiring the system or in a satellite handoff, a delay in response of up to 10 seconds may be experienced.

If the ISU has no SIM, is awaiting a SIM PIN entry, has an invalid SIM, or has otherwise not proceeded to successful registration, the delay in response may exceed the 50 second timeout limit. Under such condition, an ERROR response will be received. To avoid a delayed response due to registration problems, issue the +CREG command to verify registration prior to entering the +CSQ command to obtain signal strength.

7.9   +CLVL - Loudspeaker Volume Level Control

Exec Command: **+CLVL=<level>**

This command is used to select the volume of the internal loudspeaker of the ISU. <level> is an integer type value with the smallest value representing the lowest sound level.

Read Command: **+CLVL?**

Query the current volume level settings. The response is in the form:

```
+CLVL: <level>
```

0	Equivalent to level 0 displayed on the ISU volume indicator.
1	Equivalent to level 1 displayed on the ISU volume indicator.
2	Equivalent to level 2 displayed on the ISU volume indicator.
3	Equivalent to level 3 displayed on the ISU volume indicator.
4	Equivalent to level 4 displayed on the ISU volume indicator.
5	Equivalent to level 5 displayed on the ISU volume indicator.
6	Equivalent to level 6 displayed on the ISU volume indicator.
7	Equivalent to level 7 displayed on the ISU volume indicator.

Test Command: **+CLVL=?**

List the supported volume level settings. The response is in the form:

```
+CLVL: (supported <level>s)
```

7.10 +CMUT - Mute Control

Exec Command: **+CMUT=<n>**

This command is used to enable and disable the uplink voice muting during a voice call. <n> can take one of the following values:

0	mute off
1	mute on

Read Command: **+CMUT?**

Query the current volume level settings. The response is in the form:

```
+CMUT: <n>
```

Test Command: **+CMUT=?**

List the supported volume level settings. The response is in the form:

```
+CMUT: (supported <n>s)
```

7.11 +CRC - Cellular Result Codes (Revised)

Set Command: **+CRC=[<mode>]**

Set the extended format of incoming data or voice call indication.

<mode> takes the following values:

    0   Disable extended format (default).

    1   Enable extended format.

If extended format is enabled, the unsolicited result code `+CRING: <type>` is returned by the ISU instead of `RING`, where <type> can be one of the following:

`ASYNC`	asynchronous transparent
`SYNC`	synchronous transparent
`REL ASYNC`	asynchronous non-transparent
`REL SYNC`	synchronous non-transparent
`FAX`	facsimile
`VOICE`	normal voice

Read Command: **+CRC?**

Query the current result code settings. The response is in the form:

    `+CR: <mode>`

Test Command: **+CRC=?**

List the supported result code settings. The response is in the form:

    `+CR: (supported <mode>s)`

7.12 +CVHU - Voice Hangup Control

Set Command: **+CVHU=[<mode>]**

Selects whether the Hn (hangup) or &Dn command shall cause a voice call connection to be disconnected or not. <mode> can take one of the following values:

    0   Ignore &Dn command specified reaction to DTR ON to OFF transitions. Disconnect as reaction to Hn command. OK response given.

    1   Ignore &Dn command specified reaction to DTR ON to OFF transitions. Ignore Hn command. OK response given.

    2   Comply with &Dn command specified reaction to DTR ON to OFF transitions. Disconnect as reaction to Hn command (default).

Read Command: **+CVHU?**

Query the current voice control hangup settings. The response is in the form:

    `+CVHU: <mode>`

Test Command: **+CVHU=?**

List the supported voice control hangup settings. The response is in the form:

    `+CVHU: (supported <mode>s)`

7.13 +CCLK – Real-Time Clock

Set Command: **+CCLK=[<time>]**

Sets the real-time clock of the ISU. If setting fails, ERROR is returned.

<time>: string type value; format is "yy/MM/dd,hh:mm:ss±zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. There is no blank space between the two double quotes. Since time zone feature is not supported in Iridium, this particular field (±zz) is ignored if it is entered. The range of valid years is between 1970 and 2058.

For example, 15th of May 2002, 22:10:00 hours can be set using +CCLK= "02/05/15,22:10:00".

Read Command: **+CCLK?**

Read command returns the current setting of the clock.

```
+CCLK: <time>
```

7.14 -MSVTS - DTMF Generation in Voice Call

Set Command: **-MSVTS=<string>**

Generate the specified DTMF tone (i.e., send tone DTMF message to network). The parameter <string> shall consist of elements in a list where each element is separated by a comma. Each element should either be (1) a single ASCII character; or (2) string that follows the format: <tone>[,<time>] with each string enclosed in square brackets "[]". The string parameter values are defined as follows:

<tone> specifies the string of tones to be played or generated. The valid values are (in ASCII): '0'-'9', '#', '*'

<time> specifies the duration of each tone in 180-millisecond unit. Default value is 1 for 180 ms.

For example, the command string -MSVTS=1,[9,2],[5,3] will:

1. Generate DTMF 1 with a duration of 180 ms (default).

2. Generate DTMF 9 with a duration of 360 ms (2 * 180 ms).

3. Generate DTMF 5 with a duration of 540 ms (3 * 180 ms).

Test Command: **-MSVTS=?**

List the supported parameter settings. The response is in the form:

```
-MSVTS: (supported <tone>s),(supported <time>s)
```

Note that DTMF generated with the –MSVTS command is never played back locally as tones and is therefore neither played nor muted under control of the –MSVLS command.

7.15 -MSVTR - DTMF Received in Voice Call

Set Command: **-MSVTR=[<mode>]**

Disable or enable the receiving of DTMF messages from the network.

<mode> takes one of the following values:

   0   Receiving of DTMF disabled (default).

   1   Receiving of DTMF enabled.

If receiving DTMF is enabled, the ISU sends the following unsolicited result code every time a DTMF inband signaling data is received from the network while in a voice call:

   -MSTRX: <tone>,<event>

where <tone> is the DTMF tone received ('0'-'9', '#', '*', 'A'-'D') and <event> can be one of the following:

   0   tone stopped (i.e. key released)

   1   tone started (i.e. key pressed)

Read Command: **-MSVTR?**

Query the current parameter settings. The response is in the form:

   -MSVTR: <mode>

Test Command: **-MSVTR=?**

List the supported parameter settings. The response is in the form:

   -MSVTR: (supported <mode>s)

7.16 -MSVLS - Local DTMF Feedback Selection

Set Command: **-MSVLS=[<mode>]**

Disable or enable playing of DTMF tones locally (i.e. feedback tones) while in a voice call.

<mode> takes one of the following values:

   0   No mute. Play all DTMF tones (default) when pressed or received while in voice call.

   1   Enable mute mode. Mute both pressed or received DTMF tones while in voice call.

Read Command: **-MSVLS?**

Query the current parameter settings. The response is in the form:

   -MSVLS: <mode>

Test Command: **-MSVLS=?**

List the supported parameter settings. The response is in the form:

   -MSVLS: (supported <mode>s)

Note that DTMF generated with the –MSVTS command is never played back locally as tones and is therefore neither played nor muted under control of the –MSVLS command.

7.17 -MSSTM - Request System Time

Exec Command: **-MSSTM**

Query the latest system time received from the network. The response is the form:

```
-MSSTM: <system_time>
```

<system_time> can take one of the following forms:

no network service	The ISU has not yet received system time from the network.
XXXXXXX	Where XXXXXXXX is the current Iridium system time available from the network. The system time format is as received from the Iridium Air Interface, a 32 bit integer count of 90 millisecond intervals, displayed in hexadecimal form. The count will rollover approximately every 12 years.

8   S-Register Definitions

S-registers allow control over specific ISU modem operations. Some S-registers contain a single numeric value. Other S-registers are bit mapped where individual bits, or sets of bits, control specific functions.

8.1   S-Register Commands

Commands allow S-registers to be read, written,, or simply referenced (i.e. set a pointer to designate the current, referenced S-register). S-register commands are described in the following subsections.

8.1.1   Sr - Direct S-Register Reference

Set a pointer to reference S-register r.

8.1.2   Sr? - Direct S-Register Read

Read the value of S-register r.

8.1.3   Sr=n - Direct S-Register Write

Set the value of S-register r to n, where n is a decimal value in the range 0 to 255.

8.1.4   ? - Referenced S-Register Read

Read the value of the current referenced S-register. The current referenced S-register is that which was last acted upon by a direct reference (ATSr), read (ATSr?), or write (ATSr=n) command.

8.1.5   =n - Referenced S-Register Write

Set the value of the current referenced S-register to n. The current referenced S-register is that which was last acted upon by a direct reference (ATSr), read (ATSr?), or write (ATSr=n) command.

8.2   Standard S-Registers

Table 8-2: Standard S-Registers

Register Number	Range	Default	Description	Sr=n Command Write Protected in SAC0201
S0	0-255	0	Autoanswer. Assigning a value from 1 to 255 in register S0 tells the ISU to automatically answer incoming calls. The factory setting of 0 turns off the automatic answer feature.	
S1	0-255	0	Ring count	Yes
S2	0-255	43	Escape code character	
S3	0-127	13	Carriage return character	
S4	0-127	10	Line feed character	
S5	0-32	8	Backspace character	
S6	0-255	4	Wait for dial-tone. *No action, compatibility only*	
S7	0-255	50	Wait time for carrier. *No action, compatibility only*	
S8	0-255	4	Pause time for comma. *No action, compatibility only*	
S9	0-255	6	Carrier detect response time. *No action, compatibility only*	
S10	0-255	14	Carrier loss time. *No action, compatibility only*	
S11	0-255	0	DTMF tone duration. *No action, compatibility only*	Yes
S12	0-255	40	Escape guard time. Time, in 50ths of a second, until OK displayed after entering command mode by escape sequence.	
S14	0-255	170	Bitmap register where bit 1 reflects the En setting, bit 2 reflects the Qn setting and bit 3 reflects the Vn setting.	
S21	0-255	48	Bitmap register where bits 3 and 4 reflect the &Dn setting and bit 5 reflects the &Cn setting.	Yes
S22	0-255	246	Bitmap register where bits 2 and 3 reflect the Mn setting and bits 4, 5 and 6 reflect the Xn setting.	Yes
S23	0-255	27	Bitmap register where bits 1, 2 and 3 reflect the DTE baud rate and bits 4 and 5 reflect the DTE par ity.	Yes
S25	0-255	5	Sets length of time in hundredths of a second that a change in the DTR status has to persist for before it is recognized.	
S27	0-255	9	Bitmap register where bits 0, 1 and 3 reflect the &Qn setting.	Yes

Table 8-2: Standard S-Registers (continued)

Register Number	Range	Default	Description	Sr=n Command Write Protected in SAC0201
S30	0-255	0	Disconnect activity timer. Timer used to determine how long the call connection been inactive. If the inactivity time is greater than the value contained in the register, in 10s of seconds, then the hang-up pro cess is entered. A value of 0 disables this function.	
S31	0-255	0	Bitmap register where bits 2 and 3 reflect the Wn setting.	Yes
S36	0-255	7	Bitmap register where bits 0, 1 and 2 reflect the \Nn setting. *No action, compatibility only*	Yes
S39	0-255	3	Bitmap register where bits 0, 1 and 2 reflect the &Kn setting.	Yes
S40	0-255	192	Bitmap register where bits 6 and 7 reflect the \An setting, bits 3-5 reflects the \Kn setting. *No action, compatibility only*	Yes
S41	0-255	3	Bitmap register where bits 0 and 1 reflect the %Cn setting. *No action, compatibility only*	Yes
S95	0-255	0	Bitmap register for extended result codes (overrides Wn setting). 0 = CONNECT shows DCE speed 2 = Enable CARRIER XXXX 3 = Enable PROTOCOL: XXXX 5 = Enable COMPRESSION: XXXX	

8.3 Iridium Specific S-Register Extensions

Table 8-3: Iridium-Specific S-Registers

Register Number	Range	Default	Description	Sr=n Command Write Protected in SAC0201
S13	0-255	0	Bitmap register where bits 0-1 reflect the DCE data bits, bits 2-3 reflect the DCE stop bits, bits 4-6 reflect the DCE parity settings.	Yes
S34	0-255	0	Bitmap register where bit 7 reflect the +DR setting, bits 0-1 reflect the data compression type (PT), bit 6 reflect the +DS compression negotiation setting.	Yes
S35	0-255	4	Copy of +CBST parameter <speed>.	
S42	0-255	0	GSM Call clearing code as returned by the network. Refer to GSM 04.08 Table 10.86 Cause Information Element Values.	Yes
S43	0-255	32	Bitmap register: 0 = +CMGF setting 1 = +CBST parameter <name> setting 2 = +CMEE setting 3 = +CMEE setting 5 = +CBST parameter <ce> setting 6 = +CRC setting 7 = +CR setting	Yes
S44	0-255	4	Bitmap register: 0-2 = +CPBS setting 3-4 = +CNMI parameter <bfr> setting 5-6 = +CREG setting 7 = reserved	Yes
S45	0-255	0	Bitmap register: 0-1 = +CNMI parameter <mode> setting 2-3 = +CNMI parameter <mt> setting 4-5 = +CNMI parameter <bm> setting 6-7 = +CNMI parameter <ds> setting	Yes
S47	0-4	0	Type of Number being called: 0 = Unknown 1 = International 2 = National 3 = Network Specific 4 = Dedicated PAD	

Table 8-3: Iridium-Specific S-Registers (continued)

Register Number	Range	Default	Description	Sr=n Command Write Protected in SAC0201
S49	0-5	1	Numbering Plan of called number: 0 = Unknown 1 = ISDN/Telephony 2 = Data 3 = Telex 4 = National 5 = Private	
S51	0-255	0	V.42bis maximum codewords (P1), low byte	Yes
S52	0-255	128	V.42bis maximum codewords (P1), high byte	
S54	0-255	20	V.42bis maximum string size (P2)	
S58	0-255	0	V.42 bis compression direction (P0)	
S96	0-255	0	IRLP version number (N0) parameter	
S98	1-105	105	IRLP k iwf->isu parameter	
S99	1-105	105	IRLP k isu->iwf parameter	
S100	1-15	15	IRLP N2 parameter	
S102	26-255	30	IRLP T1 parameter	
S103	10-255	10	IRLP T2 parameter	
S104	4-255	4	IRLP T4 parameter	
S106	1-10	10	IRLP r iwf->isu parameter	
S107	1-10	10	IRLP r isu->iwf parameter	
S123	0-255	8	Bitmap register: 0 = +WFRNG 1 = +WTM 2 = +WDLDM<dldm> 3 = +WIRLP<mode>	Yes
S124	0-255	15	Dynamic link measurement interval (+WDLM <mi> setting). Value in 1000 ms unit.	
S125	1-100	10	Dynamic link delay measurement delay tolerance (+WDLM<dtl> setting). Value in % unit.	
S126	0-255	2	Bitmap register: 0 = Ignore &Dn command specified reaction to DTR ON to OFF transitions. Disconnect as reaction to Hn command. OK response given. 1 = Ignore &Dn command specified reaction to DTR ON to OFF transitions. Ignore Hn command. OK response given 2 = Comply with &Dn command specified reaction to DTR ON to OFF transitions. Disconnect as reaction to Hn command.	Yes

Table 8-3: Iridium-Specific S-Registers (continued)

Register Number	Range	Default	Description	Sr=n Command Write Protected in SAC0201
S127	0-255	0	Bitmap Register containing copies of MSVTR/MSVLS parameters: Bit 0 = MSVTR: 0 = Disabled (default) 1 = Enabled Bit 1 = MSVLS: 0 = No Mute (default) 1 = Mute Enabled	Yes

9   Summary of Result Codes

The following tables list the result codes returned by the ISU.

Table 9-1: V.25ter/Hayes Result Codes

Numeric (V0)	Verbose (V1)	Description
0	'OK'	Acknowledges execution of command; voice call connection has been established.
1	'CONNECT'	Data call connection has been established.
2	'RING'	Incoming data or voice call received (unsolicited).
3	'NO CARRIER'	Data or voice call connection terminated.
4	'ERROR'	Command not accepted.
5	'CONNECT 1200'	Data call connection established at 1200 bps.
6	'NO DIALTONE'	No dialtone detected.
7	'BUSY'	Busy signal detected.
8	'NO ANSWER'	Data or voice call connection completion timeout.
9	'CONNECT 0600'	Data call connection established at 600 bps.
10	'CONNECT 2400'	Data call connection established at 2400 bps.
11	'CONNECT 4800'	Data call connection established at 4800 bps.
12	'CONNECT 9600'	Data call connection established at 9600 bps.
13	'CONNECT 7200'	Data call connection established at 7200 bps.
14	'CONNECT 12000'	Data call connection established at 12000 bps.
15	'CONNECT 14400'	Data call connection established at 14400 bps.
16	'CONNECT 19200'	Data call connection established at 19200 bps.
17	'CONNECT 38400'	Data call connection established at 38400 bps.
18	'CONNECT 57600'	Data call connection established at 57600 bps.
19	'CONNECT 115200'	Data call connection established at 115200 bps.
40	'CARRIER 300'	Data rate detected at 300 bps.
44	'CARRIER 1200/75 '	Data rate detected at V.23 backward channel.
46	'CARRIER 1200'	Data rate detected at 1200 bps.
47	'CARRIER 2400'	Data rate detected at 2400 bps.
48	'CARRIER 4800'	Data rate detected at 4800 bps.
49	'CARRIER 7200'	Data rate detected at 7200 bps.

50	'CARRIER 9600'	Data rate detected at 9600 bps.
51	'CARRIER 12000'	Data rate detected at 12000 bps.
67	'COMPRESSION: V.42 bis'	Data call connected with V.42bis compression enabled.
69	'COMPRESSION: NONE'	Data call connected with no data compression.

Table 9-1: V.25ter/Hayes Result Codes (continued)

as verbose	'+DR: V42B NONE'	Data call connected with no data compression.
as verbose	'+DR: V42B TD'	Data call connected with V.42bis compression enabled on transmit direction.
as verbose	'+DR: V42B RD'	Data call connected with V.42bis compression enabled on receive direction.
as verbose	'+DR: V42B'	Data call connected with V.42bis compression enabled on both transmit and receive direction.

Table 9-2: GSM 7.07 Result Codes

Numeric (V0)	Verbose (V1)	Description
as verbose	'+CR: ASYNC'	Asynchronous transparent data connection.
as verbose	'+CR: REL ASYNC'	Asynchronous non-transparent data connection.
as verbose	'+CME ERROR: <error>	Command not accepted. See section 4.10.
as verbose	'+CREG: <stat>[,<lac>,<ci>]	Registration indication status (unsolicited if enabled). See section 4.30.
as verbose	'+CRING: ASYNC'	Asynchronous transparent data call indication.
as verbose	'+CRING: REL ASYNC'	Asynchronous non-transparent data connection.
as verbose	'+CRING: VOICE'	Voice call connection.

Table 9-3: GSM 7.05 Result Codes

Numeric (V0)	Verbose (V1)	Description
as verbose	'+CMTI: <mem>,<index>'	SMS-DELIVER message indication (unsolicited if enabled). See section 4.18.
as verbose	'+CMT: [<alpha>],<length><CR><LF><pdu>' (PDU mode)	SMS-DELIVERs message indication (unsolicited if enabled). See section 4.18.
as verbose	'+CDS:<length><CR><LF><pdu>' (PDU mode)	SMS-STATUS-REPORTs message indication (unsolicited if enabled). See section 4.18.
as verbose	'+CMS ERROR: <error>	SMS command failed. See section 4.11.

10 Informative Examples

10.1 Unit Identification

When beginning to build a communication link, a general DTE application controlling the ISU should determine the type of ISU to which it is connected.

```
AT+CGMI                  (get manufacturer name)
Motorola
OK
AT+CGMM                  (get model number)
9500 Satellite Series
OK
AT+CGMR                  (get revision)
OK
Call processor version: INC0607
DSP version: INC0401,INC0400
NVM version: INC0400
OK
AT+CGSN                  (get serial number)
901063131000002
OK
```

10.2 Originating a Data Call

An example of how to make a data call is given below:

```
AT+CBST=6,0,1                    (asynchronous modem 4800 bps and IRLP)
OK
AT+CR=1                          (enable reporting)
OK
ATD1234567890                    (dial remote modem)
+CR: REL ASYNC
CONNECT 9600                     (call connected at DTE rate of 9600)
```

10.3 Answering a Data Call

The ISU is capable of accepting mobile terminated data calls. The following is a sequence of commands that can be used to establish the connection.

```
RING                             (indicates arrival of call request)
ATA                              (manually answer the call)
CONNECT 9600                     (call connected at DTE rate of 9600)
```

To automatically answer a call, register 0 should be set to a non-zero value.

```
ATS0=2
RING
CONNECT 9600                     (call connected at DTE rate of 9600)
```

10.4 Disconnecting a Data Call

```
AT+CBST=6,0,1                    (asynchronous modem 4800 bps and IRLP)
OK
AT+CR=1                          (enable reporting)
OK
ATD1234567890                    (dial remote modem)
+CR: REL ASYNC
CONNECT 9600                     (call connected at DTE rate of 9600)
```
                    < ... data transfer ... >
```
<+++>                                  (send escape sequence)
OK
ATH0                             (hangup call)
OK
```

10.5 Originating and Disconnecting a Voice Call

An example of how to make and disconnect a voice call is given below:
```
ATD1234567890;                   (dial remote phone)
OK                                     (call connected; phone stays in command
mode)
```
                    < ... conversation ... >
```
ATH                              (hangup call)
OK
```