IRIDIUM

Version 2.0

ISU AT Command Reference

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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.
1.9	10-Oct-02	Brian Lin, B. Nguyen, K. McConnon, Y. Langford	Added/updated AT commands for release LAC0206 and SAC0206
1.10	18-Nov-02	D. Okazaki	Updated DAV description and added missing extended command for DAV registration.
2.0	20-May-03	Steve Engelschall	Edited document to align with new software releases LAC03xx and SAC03xx. Eliminated references to software versions that were never released commercially by Iridium. Reinserted missing commands AT+CLCK and AT+CPWD. Added new ‘Phase 4’ AT Commands, including Short Burst Data commands.

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™/SM 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.

ESS

ETC SBD Subsystem

ETC

Earth Terminal Controller

ETSI

European Telecommunications Standards Institute.

FA

Field Application

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.

MO

Mobile Originated (for Short Burst Data)

MOMSN

Mobile Originated Message Sequence Number (for Short Burst Data)

MT

Mobile Terminated (for Short Burst Data)

MTMSN

Mobile Terminated Message Sequence Number (for Short Burst Data)

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.

SBD

Short Burst Data

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 ATZn 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.

2.5 RS232 DAV Service

RS232 DAV (Data After Voice) service provides data transfer between RS232 peripherals interfaced to peer Iridium Subscriber Units (ISU). While the RS232 peripheral's data application sees little difference in an RS232 DAV data transfer versus a standard data call data transfer, the call topology is quite different. An RS232 DAV data transfer uses a voice call topology, not a data call topology. The peer ISUs are connected in a voice call, but the voice packet payload is filled with data sourced from the RS232 peripherals, instead of digitized voice. As such, an RS232 DAV call is not routed through a gateway modem interworking function, as is the case with a standard data call.

From the network point of view, an RS232 DAV call is just a voice call, regardless of whether the MSISDN or MSISDN-C number is called. Note that any type of ISU to ISU call, voice (including RS232 DAV), or data, can use either phone number to place the call, relying on the network to determine the call type during call setup negotiation with the ISU. Dialing rules can be found in the *Iridium Mobile-Terminated Data User's Guide*.

A common aspect of an RS232 DAV call and a standard data call is that both calls set the ISUs to full output power in order to provide a more robust data link. Also, an RS232 DAV call, like a standard data call, defaults to an acknowledged data transfer mode (a.k.a. reliable, nontransparent mode). Again like a standard data call, the data transfer mode can be set to transparent (a.k.a. unreliable, unacknowledged mode) on a call-by-call basis. This is done by a pre-call issuance of the AT&Q0 command by both peer ISU RS232 peripherals. Note that since a standard data call is routed through a gateway modem interworking function, the call-originator and call-terminator ISUs establish their data transfer mode with their gateway modem interworking function peers. With an RS232 DAV call, data transfer mode is established directly between the peer ISUs.

Using the RS232 DAV service is very similar to a standard data call. The RS232 DAV service supports the same set of AT commands used in a standard data call, and utilizes one additional command to set the RS232 DAV mode. Issuing AT+WDAV=1 registers the RS232 peripheral as an RS232 DAV peripheral. Once issued, a subsequent data call dialing command is interpreted as a DAV dialing call command. "Data Call in Progress" is flashed on the call-originator ISU, and a voice call is placed. The call-terminator ISU, also having its RS232 peripheral registered as an RS232 DAV peripheral with the AT+WDAV=1 command, answers the voice call. At this point, the "Data Call in Progress" display on the call-originator ISU is shown steady. The call-originator ISU then sends a special DTMF sequence to the call-terminator ISU, requesting it to switch to DAV mode. The call-terminator ISU responds by sending a special DTMF sequence to the call-originator ISU to accept the DAV mode request. DAV mode is then established, and the call-terminator ISU shows the same "Data Call in Progress" display as the call-originator ISU. The RS232 peripherals can now proceed as if in a standard data call.

Subsequent data call dialing commands will continue to be interpreted as RS232 DAV dialing call commands, until the RS232 peripheral is deregistered as an RS232 DAV peripheral. Note that if the RS232 DAV peripheral is deregistered during an RS232 DAV call, the call will be dropped. RS232 DAV peripheral deregistration is accomplished by one of three means:

1. Issuance of the AT+WDAV=0 command
2. Power cycling of the ISU
3. Physical disconnection of the RS232 DAV peripheral, based on the loss of the DTR signal (Note that reaction to DTR signal loss is disabled with the AT&D0 command.)

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™/℠ 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 3-1** below shows the difference in format between these modes.

Table 3-1: 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 implementations. The Phase I AT Commands have been implemented in all ISU models. The Phase II, III, and IV AT Commands have been implemented in the 9505 and 9522 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

	Software Release			
ISU Model	**Phase I AT Commands**	**Phase II AT Commands**	**Phase III AT Commands**	**Phase IV AT Commands**
9500	INC0620	Not implemented	Not implemented	Not implemented
9520	RAC0620	Not implemented	Not implemented	Not implemented
9521	RAC0620	Not implemented	Not implemented	Not implemented
9505	LAC109G	LAC109G	LAC03xx	LAC03xx
9522	SAC0201	SAC0201	SAC0201	SAC03xx

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

			9500	**9520**	**9521**	**9505**	**9522**	**9505**	**9522**
Section	**Command**	**Phase**	**INC0620**	**RAC0620**	**RAC0620**	**LAC109G**	**SAC0201**	**LAC03xx**	**SAC03xx**
5.1	AT	I	X	X	X	X	X	X	X
5.2	A/	I	X	X	X	X	X	X	X
5.3	+++	I	X	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	X
5.6	Cn	I	X	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	X
5.9	Fn	I	X	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	X
5.12	Ln	I	X	X	X	X	X	X	X
5.13	Mn	I	X	X	X	X	X	X	X
5.14	Nn	I	X	X	X	X	X	X	X
5.15	On	I	X	X	X	X	X	X	X
5.16	P	I	X	X	X	X	X	X	X
5.17	Qn	I	X	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)

			9500	9520	9521	9505	9522	9505	9522
Section	**Command**	**Phase**	**INC0620**	**RAC0620**	**RAC0620**	**LAC109G**	**SAC0201**	**LAC03xx**	**SAC03xx**
5.19	T	I	X	X	X	X	X	X	X
5.20	Vn	I	X	X	X	X	X	X	X
5.21	Wn	I	X	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	X
5.24	Zn	I	X	X	X	X	X	X	X
5.25	&Cn	I	X	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	X
5.28	&Gn	I	X	X	X	X	X	X	X
5.29	&Jn	I	X	X	X	X	X	X	X
5.30	&Kn	I	X	X	X	X	X	X	X
5.31	&Ln	I	X	X	X	X	X	X	X
5.32	&Mn	I	X	X	X	X	X	X	X
5.33	&Pn	I	X	X	X	X	X	X	X
5.34	&Qn	I	X	X	X	X	X	X	X
5.35	&Rn	I	X	X	X	X	X	X	X
5.36	&Sn	I	X	X	X	X	X	X	X
5.37	&V	I	X	X	X	X	X	X	X
5.38	&Wn	I	X	X	X	X	X	X	X
5.39	&Xn	I	X	X	X	X	X	X	X
5.40	&Yn	I	X	X	X	X	X	X	X
5.41	\An	I	X	X	X	X	X	X	X
5.42	\Bn	I	X	X	X	X	X	X	X
5.43	\Gn	I	X	X	X	X	X	X	X
5.44	\Jn	I	X	X	X	X	X	X	X
5.45	\Kn	I	X	X	X	X	X	X	X
5.46	\Nn	I	X	X	X	X	X	X	X
5.47	%Cn	I	X	X	X	X	X	X	X
5.48	%En	I	X	X	X	X	X	X	X
5.49	%R	I	X	X	X	X	X	X	X
5.50	*Pn	I	X	X	X	X	X	X	X
5.51	+CBST	I	X	X	X	X	X	X	X
5.52	+CGMI	I	X	X	X	X	X	X	X
5.53	+CGMM	I	X	X	X	X	X	X	X
5.54	+CGMR	I	X	X	X	X	X	X	X
5.55	+CGSN	I	X	X	X	X	X	X	X
5.56	+CMEE	I	X	X	X	X	X	X	X
5.57	+CPAS	I	X	X	X	X	X	X	X

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

			9500	9520	9521	9505	9522	9505	9522
Section	**Command**	**Phase**	**INC0620**	**RAC0620**	**RAC0620**	**LAC109G**	**SAC0201**	**LAC03xx**	**SAC03xx**
5.58	+CR	I	X	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	X
5.61	+DR	I	X	X	X	X	X	X	X
5.62	+IPR	I	X	X	X	X	X	X	X
6.1	+CBC (initial)	II				X			
6.2	+CEER	II				X	X	X	X
6.3	+CHUP	II				X	X	X	X
6.4	+CLCK	II				X	X	X	X
6.5	+CMGD	II				X	X	X	X
6.6	+CMGF	II				X	X	X	X
6.7	+CMGL	II				X	X	X	X
6.8	+CMGR	II				X	X	X	X
6.9	+CMGS	II				X	X	X	X
6.10	+CMGW	II				X	X	X	X
6.11	+CMOD	II				X	X	X	X
6.12	+CNMI	II				X	X	X	X
6.13	+COPS	II				X	X	X	X
6.14	+CPBF	II				X	X	X	X
6.15	+CPBR	II				X	X	X	X
6.16	+CPBS	II				X	X	X	X
6.17	+CPBW	II				X	X	X	X
6.18	+CPIN	II				X	X	X	X
6.19	+CPMS	II				X	X	X	X
6.20	+CPWD	II				X	X	X	X
6.21	+CREG	II				X	X	X	X
6.22	+CSCA	II				X	X	X	X
6.23	+CSCB	II				X	X	X	X
6.24	+CSCS	II				X	X	X	X
6.25	+CSMS	II				X	X	X	X
6.26	+CSTA	II				X	X	X	X
6.27	+GMI	II				X	X	X	X
6.28	+GMM	II				X	X	X	X
6.29	+GMR	II				X	X	X	X
6.30	+GSN	II				X	X	X	X
6.31	+GCAP	II				X	X	X	X
7.1	A (revised)	III					X	X	X
7.2	D (revised)	III					X	X	X
7.2.1	D> (revised)	III					X	X	X
7.3	Hn (revised)	III					X	X	X

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

			9500	9520	9521	9505	9522	9505	9522
Section	**Command**	**Phase**	**INC0620**	**RAC0620**	**RAC0620**	**LAC109G**	**SAC0201**	**LAC03xx**	**SAC03xx**
7.4	S0=n (revised)	III					X	X	X
7.5	Xn (revised)	III					X	X	X
7.6	&Dn (revised)	III					X	X	X
7.7	+CBC (revised)	III					X	X	X
7.8	+CSQ	III					X	X	X
7.9	+CLVL	III					X	X	X
7.10	+CMUT	III					X	X	X
7.11	+CRC (revised)	III					X	X	X
7.12	+CVHU	III					X	X	X
7.13	+CCLK	III					X	X	X
7.14	-MSVTS	III					X	X	X
7.15	-MSVTR	III					X	X	X
7.16	-MSVLS	III					X	X	X
7.17	-MSSTM	III					X	X	X
8.1	-MSGEO	IV						X	X
8.2	+CCFC	IV						X	X
8.3	+CLCC	IV						X	X
8.4	+CNUM	IV						X	X
8.5	+WIRLP	IV						X	X
8.6	+WFRNG	IV						X	X
8.7	+WTM	IV						X	X
8.8	+WDLDM	IV						X	X
8.9	+WDAV	IV						X	X
8.10	+SBDWB	IV						X	X
8.11	+SBDRB	IV						X	X
8.12	+SBDWT	IV						X	X
8.13	+SBDRT	IV						X	X
8.14	+SBDI	IV						X	X
8.15	+SBDD	IV						X	X
8.16	+SBDC	IV						X	X
8.17	+SBDS	IV						X	X
8.18	+SBDTC	IV						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 "XXXXXXXX" (Software revision level)

4 "Motorola IRIDIUM" (Product description)

5 "XXXX" (country code)

6 "XXXXXXXX" (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.

Note: The register is not updated right after the user requests new values because the requested values may or may not be what IRLP will use once a data call is established due to negotiations with the other peer. If the register is updated right away, this may give the user the impression that those values will be used during the data call, but there is no guarantee that will be the case. The real values will only be known once a data call is established and the negotiation phase is done. For that reason, the values are written to the register only after a call is established and both sides have negotiated parameter values (such as mode of operation). The value of the register will be reset to default value (5) after the call completed.

0, 6 Normal asynchronous operation with no error correction (unacknowledged mode). .

5 Asynchronous operation with error correction (acknowledged mode) (default)

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
7	9600 bps V.32 (default)
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 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

1 Transmit only

2 Receive only

3 Both directions (default)

<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 unacknowledged mode.

Note: The register is not updated right after the user requests new values because the requested values may or may not be what IRLP will use once a data call is established due to negotiations with the other peer. If the register is updated right away, this may give the user the impression that those values will be used during the data call, but there is no guarantee that will be the case. The real values will only be known once a data call is established and the negotiation phase is done. For that reason, the values are written to the register only after a call is established and both sides have negotiated parameter values. The value of the register will be reset to default value (3) after the call completed.

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

Note: ISU models 9505 and 9522 will automatically adjust to changes in the DTE rate and override the +IPR setting when dissimilar.

***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

Note: It is recommended not to use the 38400 bps rate because the ISU can not handle this rate without losing some bits of data.

***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)`

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 +CLCK - Facility Lock

Exec Command: **+CLCK=<fac>,<mode>,<passwd>**

Execute command is used to activate or deactivate the SIM card PIN Code, or to lock or unlock the phone using the Phone Lock feature in the ISU. The current SIM card PIN Code or Phone Unlock Code is required to perform these actions. The following parameter values are currently supported:

<fac>:

"CS" CNTRL Surface (Lock/Unlock phone)

"SC" SIM (Activate/Deactivate SIM card PIN Code)

<mode>:

0 Unlock (Deactivate)

1 Lock (Activate)

<passwd>: string type, enclosed by " "; for example, "1234".

Note: Factory default SIM card PIN Code is "1111"

Note: Factory default Phone Unlock Code is "1234"

Test Command: **+CLCK=?**

Test command returns the facility values supported by the phone. The response is in the form:

+CLCK: (list of supported <fac>s)

Note: +CLCK is closely related to +CPIN and +CPWD. See these commands for additional information.

6.5 +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

6.6 +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)
```

6.7 +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)
```

6.8 +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.

6.9 +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.

6.10 +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.

6.11 +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)
```

6.12 +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)
```

6.13 +COPS - Operator Select

***Set Command:* +COPS=[<mode>[,<format>[,<oper>]]]**

Set command forces an attempt to manually register the phone to the network. Only IRIDIUM as <oper> is supported.

Valid values for the parameters are outlined below.

<mode>:

0	automatic (<oper> field is ignored) (default)
1	manual (<oper> field is optional)

<format>:

0	long format alphanumeric <oper>
1	short format alphanumeric <oper>
2	numeric <oper>

<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)
```

6.14 +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>.

6.15 +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>.

6.16 +CPBS - Select phonebook storage

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

Set command selects phonebook memory storage <storage>, which is used by other phonebook commands. <storage> should be of string type enclosed by “”; for example, “FD”.

<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.

6.17 +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. If <index> is left out, but <number> is given, entry is written to the first free location in the phonebook. 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>
```

6.18 +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 Card PIN Code, SIM PUK, etc.). If no password request is pending, no action is taken by the phone.

- If the password required is SIM PUK, then <newpin> is required, where <newpin> is the new SIM Card PIN to replace the old SIM Card PIN.
- If the password required is SIM PUK2, then <newpin> is required, where <newpin> is the new SIM Card PIN2 to replace the old SIM Card PIN2
- 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 waiting for any password.
PH PIN	ISU is waiting for Phone Unlock Code to be given.
SIM PIN	ISU is waiting for SIM Card PIN1 Code to be given.
SIM PUK	ISU is waiting for SIM PUK to be given (because SIM PIN1 is blocked).
SIM PIN2	ISU is waiting for SIM PIN2 to be given.*
SIM PUK2	ISU is waiting for SIM PUK2 to be given (because SIM PIN2 is blocked).

***Note:** The response "SIM PIN2" is somewhat misleading, because it indicates one of three possible scenarios:

1) PIN1 has already been successfully entered (thus equivalent to the READY response).
2) No PIN1 is required (thus equivalent to the READY response).
3) The phone is waiting for PIN2 (used to access Fixed Dialing settings and other subscription-based features).

In any of these three cases, the phone should be available to place and receive calls.

Note: +CPIN is closely related to +CLCK and +CPWD. See these commands for additional information.

6.19 +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)
```

6.20 +CPWD - Change Password

Exec Command: **+CPWD=<fac>,<oldpwd>,<newpwd>**

This command sets a new password for the facility lock function defined by the AT command Facility Lock +CLCK . The following parameter values are currently supported:

<fac>:

"CS" CNTRL Surface (Phone Unlock Code)

"SC" SIM (SIM Card PIN Code)

"P2" SIM PIN2 (SIM Card PIN2 Code)

Note: AT+CPWD="SC",<oldpwd>,<newpwd> will return "Error" unless the SIM Card Pin Code is currently activated (see AT command Facility Lock +CLCK).

***Test Command:* +CPWD=?**

Test command returns a list of pairs which present the available facilities and the maximum length of their password. Response is in the form:

+CPWD: list of supported (<fac>,<pwdlength>)s

where <pwdlength> indicates the maximum length for the password.

Note: +CPWD is closely related to +CLCK and +CPIN. See these commands for additional information.

6.21 +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)`

6.22 +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>
```

6.23 +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)
```

6.24 +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)
```

6.25 +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)
```

6.26 +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)
```

6.27 +GMI - Manufacturer Identification

Exec Command: **+GMI**

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

6.28 +GMM - Model Identification

Exec Command: **+GMM**

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

6.29 +GMR - Revision

Exec Command: **+GMR**

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

6.30 +GSN - Serial Number

Exec Command: **+GSN**

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

6.31 +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: 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: 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: 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 as received through the Iridium Air Interface, is a 32 bit integer count of the number of 90 millisecond intervals that have elapsed since the epoch. The return value is formatted as an ASCII hexadecimal number. The counter will rollover approximately every 12 years.

Iridium system time epoch: June 1, 1996, 00:00:11 (GMT):

Iridium system time source: The system time is available and valid only after the ISU has registered with the network and has received the Iridium system time from the network. Once the time is received, the ISU uses its internal clock to increment the counter. In addition, at least every 8 hours, or on location update or other event that requires re-registration, the ISU will obtain a new system time from the network.

Time localization: None. The system time value is always expressed in GMT time.

Resolution and accuracy: The resolution of the system time is one Iridium frame tick, or 90 ms. Accuracy as measured by the difference between the time reported and the actual time it is sent out the ISU's serial port should not exceed 4 frame ticks (.36 seconds) and in most cases will be one frame tick (.09 seconds) or less.

8 Phase IV AT Commands

8.1 –MSGEO - Request Geolocation

***Exec Command*: -MSGEO**

Query the geolocation grid code received from the network in the last Access Decision Notification message. The response is of the form:

-MSGEO: <x>,<y>,<z>,<time_stamp>

<x>, <y>, <z> is a geolocation grid code from an earth centered Cartesian coordinate system, using dimensions, x, y, and z, to specify location. The coordinate system is aligned such that the z-axis is aligned with the north and south poles, leaving the x-axis and y-axis to lie in the plane containing the equator. The axes are aligned such that at 0 degrees latitude and 0 degrees longitude, both y and z are zero and x is positive (x = +6376, representing the nominal earth radius in kilometres). Each dimension of the geolocation grid code is displayed in decimal form using units of kilometres. Each dimension of the geolocation grid code has a minimum value of –6376, a maximum value of +6376, and a resolution of 4.

<time_stamp> is assigned by the ISU when the geolocation grid code received from the network is stored to ISU internal memory. Current Iridium system time, which is a running count of 90 millisecond intervals, is used for the time stamp. Time stamp is a 32-bit integer displayed in hexadecimal form.

8.2 +CCFC - Call Forward service

Exec Command:

+CCFC=<reason>,<mode>[,<number>[,<type>[,class>[,<subaddr>[,<satype>[,<time>]]]]]]

This command allows control of the call forwarding supplementary service according to GSM02.82. Registration, erasure and status query are supported. The valid values for the parameters are as follows:

<reason> takes one of the following values:

0	unconditional
1	mobile busy
2	no reply
3	not reachable
4	all call forwarding (refer GSM 02.30)
5	all conditional call forwarding (refer GSM 02.30)

<mode> takes one of the following values:

0	disable (not used in Call Forward)
1	enable (not used in Call Forward)
2	query status
3	registration
4	erasure

<number>: string type phone number of forwarding address. It contains digits only or empty string if not applicable.

<type>: type of address octet in integer format (refer to GSM 04.08 subclause 10.5.4.7); default 145 when dialling string is international number, otherwise 129

<subaddr>: string type sub-address, not supported by Iridium

<satype>: type of sub-address, not supported by Iridium

<classx>: is a sum of integers each representing a class of information:

1 voice (telephony)

2 data

<time>: 1..30 when 'no reply' is enabled or queried, this gives the time in seconds to wait before call is forwarded. The value of this <time> parameter is controlled by the Iridium system. No need to specify it.

<status> :

0 not active

1 active

if <mode>=2 and command is successful, the ISU returns the following response:

```
+CCFC:<status>,<class>[,<number>,<type>]
```

***Test Command:* +CCFC=?**

List of supported <reason>s. The response is in the form of:

```
+CCFC:(000-005)
```

8.3 +CLCC - Request Current Call Status

***Exec Command:* +CLCC**

Returns the current call status of the ISU. The response is of the form:

+CLCC: <stat>

where <stat> (State of the ISU):

000 Active

001 Call Held

002 Dialing (MO Call)

004 Incoming (MT Call)

005 Waiting (MT Call)

006 Idle

8.4 +CNUM - Read MSISDN Numbers

***Exec Command:* +CNUM**

Get the MSISDN numbers of the SIM. If returning fails, ERROR is returned. Response is in the form:

```
+CNUM:<text>,<number>,<type>
```

<text>: alpha tag of the phone numbers.

<number>: MSISDN numbers.

<type>: if the number starts with a '+', then the type is 145; otherwise the type is 129.

Note: MSISDN numbers are only available if they were intentionally stored on the SIM.

8.5 +WIRLP - Iridium Radio Link Protocol

Set Command: **+WIRLP=[<ver>[,<k1>[,<k2>[,< t1>[,<n2>[,<t2>[,<r1>[,<r2>[,<t4>[,<mode>]]]]]]]]]**
Set IRLP parameters.

<ver> specifies the desired IRLP version and can take the following values:
0 Default IRLP version (N0)

<k1> represents the maximum number of sequentially numbered I frames that may be outstanding at any given time at downlink direction (IWF->ISU) and can take the following values: 1-105. Default is 105.

<k2> represents the maximum number of sequentially numbered I frames that may be outstanding at any given time at uplink direction (ISU->IWF) and can take the following values: 1-105. Default is 105.

<t1> is used to supervise the acknowledgment of transmitted unnumbered frames. The values are defined to be the earliest instant to enter the recovery procedure and can take on the following values: 27-255 (in 50-ms unit). Default is 30.

<n2> is used to represent the maximum number of re-transmission attempts of a frame (e.g. I,S,N,U frame) and can take on the following values: 1-255. Default is 15.

<t2 > is used to indicate the amount of time available within the acknowledging frame must be transmitted and can take on the following values: 1-255 (in 10-ms unit). Default is 10.

<r1> is used to represent the maximum number of S frames that are used to acknowledge I frames at downlink direction (IWF->ISU) and can take on the following values: 1-10. Default is 10.

<r2 > is used to represent the maximum number of S frames that are used to acknowledge I frames at uplink direction (ISU->IWF) and can take on the following values: 1-10. Default is 10.

<t4 > is used to supervise the re-sequencing of miss-ordered frames. The values are defined to be the earliest instant to consider a tardy frame as lost. It can take on the following values: 20-255 (in 10-ms unit). Default is 25.

<mode> is used to indicate the mode of operation and can take on the following values:
0 unacknowledged mode of operation
1 acknowledged mode of operation (default)

NOTE: *For the proper operation of the IRLP procedures, T2 should be less than T1 and 2*T4 should be less than T1.*

***Read Command:* +WIRLP?**
Query IRLP parameters. The response is in the form:

```
+WIRLP: <ver>, <k1>, <k2>, <t1>, <n2>, <t2>, <r1>, <r2>,
<t4>, <mode>
```

***Test Command:* +WIRLP=?**
List the supported IRLP parameter settings. The response is in the form:

```
+WIRLP: (supported <ver>s), (supported <k1>s), (supported
<k2>s), (supported <t1>s), (supported <n2>s), (supported
<t2>s), (supported <r1>s), (supported <r2s), (supported
<t4>s), (supported <mode>s)
```

8.6 +WFRNG - Force IRLP Renegotiation

***Set Command:* +WFRNG=<frng>**
Set forced renegotiation of IRLP parameters.
<frng> can take the following values:
0 Do not renegotiate (default)
1 Renegotiate
2 Disconnect

***Read Command:* +WFRNG?**
Query the current parameter setting. The response is in the form:

```
+WFRNG: <frng>
```

***Test Command:* +WFRNG=?**
List the supported parameter settings. The response is in the form:

```
+WFRNG: (supported <frng>s)
```

8.7 +WTM - IRLP Test Mode

***Set Command:* +WTM=<tm>**
Select DCE mode of operation.
<tm> can take the following values:
0 IRLP test mode off (default)
1 IRLP test mode on

***Read Command:* +WTM?**
Query the current parameter setting. The response is in the form:

```
+WTM: <tm>
```

***Test Command:* +WTM=?**
List the supported parameter settings. The response is in the form:

```
+WTM: (supported <tm>s)
```

8.8 +WDLDM - IRLP Dynamic Link Delay Measurement

Set Command: **+WDLDM=[<dldm>[,<mi>[,<dtl>]]]**
Set the DCE dynamic link delay measurement parameters.

<dldm> can take the following values:

0 measurement off (default)
1 measurement on

<mi> denotes the measurement interval and can take the following values: 1-255 (in 1000-ms unit). Default is 15 for 15000 ms.

<dtl> denotes the delay tolerance in the link delay difference and can take the following values: 1-100 (in 1% unit). Default is 10%.

Read Command: **+WDLDM?**
Query the current parameter settings. The response is in the form:

```
+WDLDM: <dldm>,<mi>,<dtl>
```

Test Command: **+WDLDM=?**
List the supported parameter settings. The response is in the form:

```
+WDLDM: (supported <dldm>s), (supported <mi>s),(supported
<dtl>s)
```

8.9 +WDAV - Register or Deregister an RS232 DAV Data Peripheral

Set Command: **+WDAV=[<DP type>[,<encrypt>]]**
Register or deregister an RS232 DAV Data Peripheral (DP).

<DP type> can take on the following values:

0 Deregister peripheral
1 Register Type 1 RS232 DAV Data Peripheral

<encrypt> can take on the following values:

0 Encryption is not supported at this time

Read Command: **+WDAV?**
Query the current DP registration parameter settings. The response is in the form:

```
+WDAV:<DP type>,<encrypt>
```

Test Command: **+WDAV=?**
List the supported DP registration parameters. The response is in the form:

```
+WDAV:(supported <type>s),(supported <encrypt>s)
```

8.10 +SBDWB - Short Burst Data: Write Binary Data to the ISU

***Exec Command:* +SBDWB=[<SBD message length>]<CR>**

This command is used to transfer a binary SBD message from the FA to the single mobile originated buffer in the ISU. The mobile originated buffer can contain only one message at any one time.

- Once the command is entered, the ISU will indicate to the FA that it is prepared to receive the message by sending the ASCII encoded string "READY<CR><LF>" (hex 52 45 41 44 59 0D 0A) to the FA.
- The <SBD message length> parameter represents the length, in bytes, of the SBD message not including the mandatory two-byte checksum.
- The maximum mobile originated SBD message length is 1960 bytes. The minimum mobile originated SBD message length is 1 byte.
- Once the FA receives the READY indication from the ISU, the SBD message must be sent from the FA formatted as follows:
  {binary SBD message} + {2-byte checksum}
  - The checksum is the least significant 2-bytes of the summation of the entire SBD message. The high order byte must be sent first. For example if the FA were to send the word "hello" encoded in ASCII to the ISU the binary stream would be hex 68 65 6c 6c 6f 02 14.
  - The mobile originated buffer will be empty upon power-up.
- If any data is currently in the mobile originated buffer, it will be overwritten.

Command Response:

0: SBD message successfully written to the ISU.
1: SBD message write timeout. An insufficient number of bytes were transferred to ISU during the transfer period of 60 seconds.
2: SBD message checksum sent from DTE does not match the checksum calculated at the ISU.
3: SBD message size is not correct. The maximum mobile originated SBD message length is 1960 bytes. The minimum mobile originated SBD message length is 1 byte.

8.11 +SBDRB - Short Burst Data: Read Binary Data from ISU

Exec Command: **+SBDRB<CR>**

This command is used to transfer a binary SBD message from the single mobile terminated buffer in the ISU to the FA. The mobile terminated buffer can contain only one message at any one time.

- The SBD message is transferred formatted as follows:
  {2-byte message length} + {binary SBD message} + {2-byte checksum}
  - The {2-byte message length} field represents the length, in bytes, of the SBD message not including the length field or the mandatory two-byte checksum. The high order byte will be sent first.
  - The maximum mobile terminated SBD message length is 1890 bytes.
  - The checksum is the least significant 2-bytes of the summation of the entire SBD message. The high order byte will be sent first. For example if the ISU were to send the word "hello" encoded in ASCII to the FA the binary stream would be hex 00 05 68 65 6c 6c 6f 02 14.
  - If there is no mobile terminated SBD message waiting to be retrieved from the ISU, the message length and checksum fields will be zero.
- The mobile terminated message buffer will be empty upon power-up.

Command Response:

There are no response codes generated by the ISU for this command.

8.12 +SBDWT - Short Burst Data: Write a Text Message to the ISU

Exec Command: **+SBDWT=[<text message>]<CR>**

This command is used to transfer a text SBD message from the FA to the single mobile originated buffer in the ISU.

- The length of <text message> is limited to 120 bytes. This is due to the length limit on the AT command line interface.
- The message is terminated when a carriage return is entered.
- The mobile originated buffer will be empty upon power-up.

Command Response:

OK: SBD message successfully stored in mobile originated buffer.
ERROR: An error occurred storing SBD message in mobile originated buffer

8.13 +SBDRT - Short Burst Data: Read a Text Message from the ISU

***Exec Command:* +SBDRT<CR>**

This command is used to transfer a text SBD message from the single mobile terminated buffer in the ISU to the FA. This command is similar to +SBDRB but does not provide a length indicator or checksum. The intent of this command is to provide a human friendly interface to SBD for demonstrations and application development. It is expected that most usage of SBD will be with binary messages.

- Once the command is entered, the SBD message in the mobile terminated buffer is sent out of the port.
- This command is similar to +SBDRB except no length or checksum will be provided.
- The maximum mobile terminated SBD message length is 1890 bytes.
- The mobile terminated message buffer will be empty upon power-up.

Command Response:

+SBDRT: <CR> {mobile terminated buffer}

8.14 +SBDI - Short Burst Data: Initiate an SBD Session

***Exec Command:* +SBDI<CR>**

This command initiates an SBD session between the ISU and the ESS. If there is a message in the mobile originated buffer it will be transferred to the ESS. Similarly if there is one or more messages queued at the ESS the oldest will be transferred to the ISU and placed into the mobile terminated buffer.

- The message, if any, in the mobile originated buffer will be sent from the ISU to the ESS.
- If there is a message queued at the ESS it will be transferred to the ISU and placed into the mobile terminated buffer.

Command Response:

+SBDI:<MO status>,<MOMSN>,<MT status>,<MTMSN>,<MT length>,<MT queued>

where:

<MO status>:

MO session status provides an indication of the disposition of the mobile originated transaction. The field can take on the following values:

0: No SBD message to send from the ISU.
1: SBD message successfully sent from the ISU to the ESS.
2: An error occurred while attempting to send SBD message from ISU to ESS.

<MOMSN>:

The Mobile Originated Message Sequence Number (MOMSN) is a value assigned by the ISU when sending a mobile-originated message to the ESS. This value is incremented each time an SBD session is successfully completed between the ISU to the ESS. This wrap around counter can range from 0 to 65535.

<MT status>:

The MT status provides an indication of the disposition of the mobile terminated transaction. The field can take on the following values:

0: No SBD message to receive from the ESS.
1: SBD message successfully received from the ESS.
2: An error occurred while attempting to perform a mailbox check or receive a message from the ESS.

<MTMSN>:

The Mobile Terminated Message Sequence Number (MTMSN) is assigned by the ESS when forwarding a message to the ISU. This value is indeterminate if the field <MT status> is zero. This wrap around counter can range from 0 to 65535.

<MT length>:

The MT length is the length in bytes of the mobile terminated SBD message received from the ESS. If no message was received, this field will be zero.

<MT queued>:

MT queued is a count of mobile terminated SBD messages waiting at the ESS to be transferred to the ISU.

8.15 +SBDD - Short Burst Data: Clear SBD Message Buffer(s)

Exec Command: **+SBDD[<Delete type>]<CR>**

This command is used to clear the mobile originated buffer, mobile terminated buffer or both.

- The <Delete type> parameter identifies which buffers are cleared.

  0: Clear the mobile originated buffer.
  1: Clear the mobile terminated buffer.
  2: Clear both the mobile originated and mobile terminated buffers.

- Using this command or power cycling the phone are the only means by which both buffers are cleared.
- The mobile terminated buffer will be cleared when an SBD session is initiated.
- Sending a message from the ISU to the ESS does not clear the mobile originated buffer.
- Reading a message from the ISU does not clear the mobile terminated buffer.

Command Response:

0: Buffer(s) cleared successfully.
1: An error occurred while clearing the buffer(s).

8.16 +SBDC - Short Burst Data: Clear SBD MOMSN

Exec Command: **+SBDC**

This command will clear (set to 0) the mobile originated message sequence number (MOMSN) stored in the ISU.

- The MOMSN is maintained even after power cycle.

Command Response:

0: The MOMSN was cleared successfully.
1: An error occurred while clearing the MOMSN.

8.17 +SBDS - Short Burst Data: Status

***Exec Command:* +SBDS**

This command returns current state of the mobile originated and mobile terminated buffers.

Command Response:

+SBDS: <MO flag>, <MOMSN>, <MT flag>, <MTMSN>

where:

<MO flag>:

The MO flag indicates the existence of a message in the mobile originated buffer. The response from the ISU is one of the following numeric codes:

0: No message in mobile originated buffer
1: Message in mobile originated buffer

<MOMSN>:

The MOMSN identifies the sequence number that will be used during the next mobile originated SBD session.

<MT Flag>:

The MT flag indicates the existence of a message in the mobile terminated buffer. The response from the ISU is one of the following numeric codes:

0: No message in mobile terminated buffer
1: Message in mobile terminated buffer

<MTMSN>:

The MTMSN identifies the sequence number that was used in the most recent mobile terminated SBD session. This value will be –1 if there is nothing in the mobile terminated buffer.

8.18 +SBDTC - Short Burst Data: Transfer MO Buffer to MT Buffer

***Exec Command:* +SBDTC**

This command will transfer the contents of the mobile originated buffer to the mobile terminated buffer. Developers of FA can use this command to test reading and writing to the ISU without actually initiating SBD sessions with the ESS.

Command Response:

0: Mobile originated buffer transferred successfully
1: An error occurred while transferring the mobile originated buffer.

9 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.

9.1 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.

9.1.1 Sr - Direct S-Register Reference

Set a pointer to reference S-register r.

9.1.2 Sr? - Direct S-Register Read

Read the value of S-register r.

9.1.3 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.

9.1.4 ? - 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.

9.1.5 =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.

9.2 Standard S-Registers

Table 9-1: 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	Communication standard used by ISU ***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 turns off command responses, bit 3 reflects the Vn setting, bit 5 reflects pulse/tone dial mode	
S21	0-255	48	Bitmap register where bit 0 reflects telephone jack control, bit 2 reflects RTS/CTS on/off, bits 3 and 4 reflect the &Dn setting,bit 5 reflects the &Cn setting, bit 6 reflects DSR on/off, and bit 7 reflects disconnecting long space.	Yes
S22	0-255	246	Bitmap register where bits 0 and 1 reflect the speaker volume setting, bits 2 and 3 reflect the speaker on/off 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 6 and 7 set guard tone.	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, bit 3 reflects leased line operation setting, bits 4 and 5 reflect synchronous clock setting.	Yes
S30	0-255	0	Disconnect activity timer. Timer used to determine how long the call connection been inactive, in increments of 1/10000ms. A value of 0 disables this function.	
S31	0-255	0	Bitmap register where bit 1 reflects line modulation method setting, bits 2 and 3 reflect the Wn setting.	Yes
S36	0-255	7	Bitmap register where bits 0, 1 and 2 reflect the link type 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 2, 3, and 4 reflect the \K setting, and 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 registers where bits 2 and 6 enable retrain on bad signal quality setting, bit 4 reflects xon/xoff usage setting, and bit 5 reflects DTE auto rate adjustment 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	

9.3 Iridium Specific S-Register Extensions

Table 9-2: 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, and bit 7 is not used	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	5	Bearer service capabilities	
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 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	0-255	0	Bits 4,5, and 6 reflect TON settings for dial string	
S49	0-255	1	Bits 0-3 reflect NPI settings for dial string	
S51	0-255	0	V.42bis maximum codewords (P1), high byte	Yes
S52	0-255	128	V.42bis maximum codewords (P1), low 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 riwf->isu parameter	
S107	1-10	10	IRLP risu->iwf parameter	
S123	0-255	8	Bitmap register: 1 = +WTM 2 = +WDLDM<dldm> 3 = +WIRLP<mode> 4,5 = +WFRNG	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
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

10 Summary of Result Codes

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

Table 10-1: 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 10-1: 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 10-2: 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 10-3: 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.

11 Informative Examples

11.1 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)
9505 Satellite Series
OK
AT+CGMR                          (get revision)
Call processor version: LAC109G
DSP version: LAC0108
NVM version: LAC0109
OK
AT+CGSN                          (get serial number/IMEI)
300001000000000
OK
```

11.2 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)
```

11.3 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)
```

11.4 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
```

11.5 Originating an RS232 DAV Data Call

RS232 DAV calls tunnel data through a voice call, and can connect only to a peer ISU, which has a registered DAV peripheral. These calls do not route through the gateway modems. The actual peripherals may be the same as those used for data calls, using the same serial connection to the ISU, as long as they are registered as DAV peripherals.

Note that although the network treats data and RS232 DAV calls very differently, from the user or application perspective, they appear to function almost identically. The only difference is in the use of the DAV peripheral registration command.

```
AT+WDAV=1                        (register RS232 DAV peripheral)
OK
ATD1234567890                    (dial remote ISU with DAV peripheral)
CONNECT 9600                     (call connected at DTE rate of 9600)
```

11.6 Answering an RS232 DAV Data Call

The answering ISU must have an RS232 DAV peripheral registered before it can connect to an incoming RS232 DAV data call.

```
AT+WDAV=1                        (register RS232 DAV peripheral)
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 before it rings.

```
ATS0=1
RING
CONNECT 9600                     (call connected at DTE rate of 9600)
```

11.7 Disconnecting an RS232 DAV Data Call

After two peer ISUs have completed an RS232 DAV connection, either side may end the call the same way

a regular data call is ended.

```
CONNECT 9600                    (call connected at DTE rate of 9600)
                < ... data transfer ... >
<+++>                           (send escape sequence)
OK
ATH                             (hang up call)
OK
```

11.8 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
```

11.9 Coordination of +CLCC and +CPAS responses

In order to determine the call state of the ISU, the +CLCC and +CPAS commands may be used. The following table demonstrates how the output of the two commands, as well as the Extended Ring Message, can be combined to provide a more detailed definition of the call state than any one of the results provides by itself.

Call State	+CLCC Response	+CPAS Response	Extended Ring Message
Idle	+CLCC: 006	+CPAS: 000 or 003	n/a
Handset dialing - Voice	+CLCC: 002	+CPAS: 000 or 003	n/a
ATD dialing - Voice	command aborts call	command aborts call	n/a
ATD dialing - Data	command aborts call	command aborts call	n/a
Alerting after ATD dialing - Voice	command aborts call	command aborts call	n/a
Alerting after ATD dialing - Data	command aborts call	command aborts call	n/a
Ringing - Voice	+CLCC: 004	+CPAS: 003	CRING: VOICE
Ringing - Data	+CLCC: 004	+CPAS: 003	CRING: DATA
In call - Voice	+CLCC: 000	+CPAS: 000 or 003	n/a
In call - Data	+CLCC: 000	+CPAS: 004	n/a
On hold - Voice	+CLCC: 001	+CPAS: 000 or 003	n/a
Call waiting - Voice	+CLCC: 005	+CPAS: 000 or 003	n/a

11.10 Usage examples of +CCFC command

```
AT+CCFC=0,2,,,3                 (query unconditional call forwarding for data)
+CCFC:0,1,"",255                (not active)

AT+CCFC=1,2                     (query mobile busy call forwarding for voice)
+CCFC:1,1,"",255                (active)

AT+CCFC=0,3,"881631012345",145,1  (register unconditional call forwarding of
                                  international number for voice)
OK
```

Before you register for mobile busy call forwarding, you need to erase the registration of unconditional call forwarding if it is set previously, or vise versa.

```
AT+CCFC=0,4    (erasure of unconditional call forwarding for voice)
OK
AT+CCFC=1,3,"881631012345",145,1 (register mobile busy call forwarding for
                                  voice)
OK
```