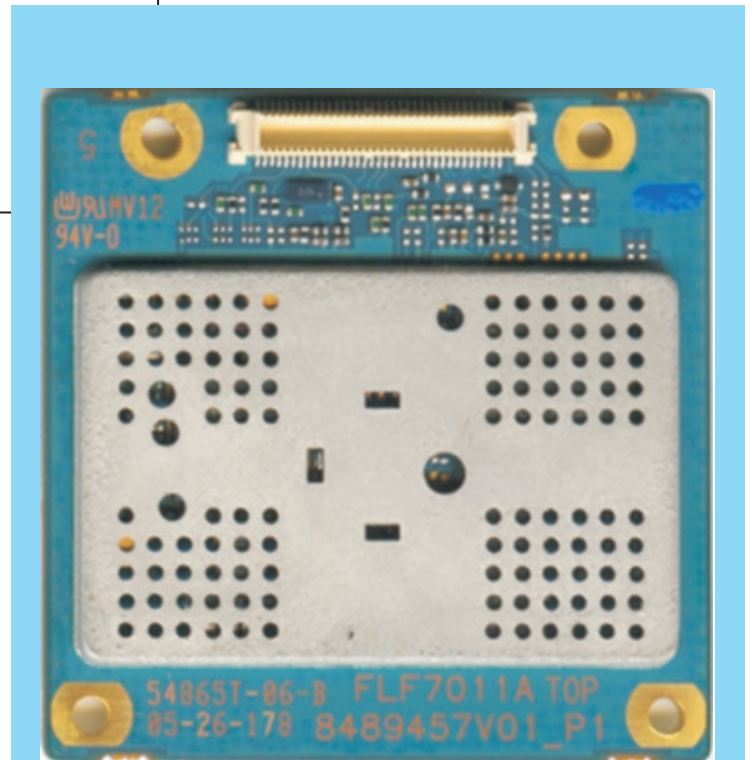


Developer's Guide

iO270 iDEN OEM Software Developer's Guide

6802978C60-A



REVISION HISTORY

Revision	Date	Purpose
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1.1 SCOPE OF THIS MANUAL

This manual introduces the iO270 AT commands, and describes how software developers can use these commands to communicate with the iO270 device, and to create software applications that communicate with the iO270.

1.2 WHO SHOULD USE THIS MANUAL

This manual is intended for software developers who communicate with the iO270 device using the AT commands, and create applications to communicate with the iO270 device using the AT commands.

1.3 APPLICABLE DOCUMENTS

- iO270 iDEN OEM Module Description - 6802978C50-A
- iO270 iDEN OEM Developer's Kit - 6802978C55-A
- Mobile Subscriber DTE/DCE Interface for Data Services - 68P81129E10-C

1.4 HOW THIS MANUAL IS ORGANIZED

This manual contains the following chapters:

Chapter 1 contains this Preface

Chapter 2 AT Commands

Chapter 3 Software Interface

Chapter 4 Call Scenario

Chapter 5 GSM MUX Integration

Chapter 6 PPP Connection Setup

2.1 OVERVIEW

2.1.1 Objective

The purpose of this section is to define the interface extensions that comprise the AT extensions to the GSM 07.07 AT interface to the iO270 processor. This chapter describes each new AT command, gives some implementation details, and provides examples of usage.

2.1.2 Scope

This chapter describes the extensions to the AT command set that are used between Terminal Equipment (TE) and the iO270 modem.

2.1.3 References

The following table lists the items that are referenced in this guide, or that are required in order to understand this guide.

Table 1. References

Reference Number	Website	Title
1	www.etsi.org	GSM 02.30: Digital Cellular Telecommunications System (Phase 2+); Man Machine Interface (MMI) of the Mobile Station (MS)
2	www.etsi.org	3GPP TS 11.11: Specification of Subscriber Identity Module – Mobile Equipment (SIM-ME) interface (Release 1999)
3	www.etsi.org	GSM 04.08: Digital Cellular Telecommunications System (Phase 2+); Mobile Radio Interface Layer 3 Specification
4	www.etsi.org	3GPP TS 07.07 v7.6.0: AT Command Set for GSM Mobile Equipment (ME)
5	www.etsi.org	3GPP Terminal Equipment Multiplexer, 27.010
6	www.etsi.org	GSM 07.05 v 7.1
7	www.etsi.org	ITU-T Draft new Recommendation V.25ter: “Serial asynchronous automatic dialing and control”
8		http://idenphones.motorola.com/iden/developer/downloads/ DTE_DCE_spec.pdf
9		3GPP TS 11.11

2.1.4 Definitions, Acronyms and Abbreviations

The following table lists the definitions for terms and acronyms used in this guide.

Table 2. Terms and Abbreviations

Term	Definition
[...]	Optional sub parameter of a command or information response is enclosed in square brackets. The brackets themselves do not appear in the command line.
<...>	Name enclosed in angle brackets is a syntactical element. The brackets themselves do not appear in the command line.
<CR>	Carriage Return character
<LF>	Linefeed character
3GPP	Third Generation Partnership Project
ACM	Abstract Control Model
AP	Application Processor
AT	Attention
CDC	USB Communications Device Class
CP	Code Plug
CTS	Clear To Send - part of RS232 interface
DCE	Data Communication Equipment
DLC	Dynamic Link Channel
DLCI	Data Link Connection Identifier
DSM	Deep Sleep Mode
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
EMS	Enhanced Message Service
EP	Endpoint
FNE	Fixed Network Equipment
GPS	Global Position System
GSM	Global System for Mobile Communications
ICL	Interprocessor Communications Link
IDEN	Integrated Digital Enhanced Network
IP	Internet Protocol
IPC	Interprocessor Communications
MCU	Micro Controller Unit
MDI	MCU – DSP Interface
MIP	Mobile IP
MMS	Multimedia Message Service
MSISDN	Mobile Station Integrated Services Digital Network
MUX	Multiplexer
NIC	Network Interface Card
PD	Packet Data
RF	Radio Frequency
SIM	Subscriber Identity Module
SMS	Short Message Service

Table 2. Terms and Abbreviations (Continued)

Term	Definition
SU	Subscriber Unit
SWF	Software Form or Template
TA	Terminal Adaptor
TCP/IP	Transport Control Protocol/ Internet Protocol
TE	Terminal Equipment (refers to an entity external to the iO270 - either the TE or an external device to the handset)
TL 9000	ISO 9000 for the Telecommunications industry
TME	Transport Management Entity
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
WAP	Wireless Application Protocol

2.1.5 Assumptions

It is assumed that the reader has access to the 3GPP, GSM and iDEN specifications that are used in this architecture. It is also assumed that the user is familiar with all iDEN services, most specifically, Dispatch. This guide uses iDEN Dispatch terms and functionality, but does not indicate how they work. Readers needing more information should refer to reference [1] in Table 1, “References”.

2.2 DATA SERVICES

The AT command set for data services (Circuit Data, Packet Data, and Facsimile) is described in the *iDEN Mobile Subscriber DTE/DCE Interface for Data Services* document, Motorola Publication part number 68P81129E10-C.

You can download this document from:

http://idenphones.motorola.com/iden/developer/downloads/DTE_DCE_spec.pdf

2.3 SUPPLEMENTARY AT COMMANDS

2.3.1 Overview

The TE interface to the iO270 uses AT commands and responses. These AT commands are a subset of the GSM 07.07 and GSM 07.05 AT commands sets, as well as iDEN extensions to the GSM specifications. These AT command extensions have been added to support the additional functions required by iDEN handsets. Existing GSM commands are used whenever possible. In cases where extensions are needed, either complete new commands are created, based on existing GSM commands (for example, +WVNUM extends to +CNUM), or new commands are created to modify the format of existing GSM commands (for example, +WVCLASS modifies the format of ATD). The Motorola commands described below can be extended in the future, however, products that do not implement these extensions will return error messages.

These AT commands follow the structure of AT commands as defined in ref [4] sub clauses 4.1 and 4.2. As defined in ref [4] sub clause 4, if all commands in a command line have been performed successfully, the result code <CR><LF>OK<CR><LF> (Verbose), or 0<CR> is returned. If any command or sub-parameter values of a command are not acceptable, the result code is <CR><LF>ERROR<CR><LF> (Verbose), or 4<CR> is returned ERROR. As defined in ref [4] sub clause 4.2, list responses are acceptable ranges. For example, 0-5,7 means values 0 through 5 inclusive and 7 are allowed. All commands inherently have OK or ERROR as possible responses.

The iO270 supports extended error result codes, which are enabled with the +CMEE AT command. For more information on mapping the error codes, refer to Section 2.4, “Extended Error Result Code Definitions”.

The following table lists the supplementary AT commands.

Table 3. Supplementary AT Commands

AT Command	Description	Page
ATD	Dial Command	9
+CFUN	Mapping Mode	16
+CMGF	Message Format	48
+CMGR	Read Message	49
+CMMS	More Messages to Send	49
+CMGS	Send Message	50
+CNMI	New Message Indication	51
+CPMS	Preferred Message Storage	52
+CSCA	Service Center Address	52
+CSMS	Select Message Service	53
+CRC	Cellular Result Codes	52
+CRSM	SIM Access	40
+CRTG	Self Tone Generation	46
+CRTS	Stop Self Tone Generation	47
+MAFEAT	Audio Mode Control	43
+MAVOL	Selectable Audio Volume	42
+MMICG	Mic-gain Volume	44
+W317	MLS Address	39
+WVANTC	GPS antenna	29
+WVAL	Status Alarms AT	26
+WVAR	Audio Status Information	45
+WVCCLK	Real Time Clock Alarms	34
+WVCDINTER	Circuit Data Interleave	15

Table 3. Supplementary AT Commands (Continued)

AT Command	Description	Page
+WVDSM	Deep Sleep Mode	12
+WVCLASS	Voice Class	8
+WVCLCC	List Current Voice Calls	10
+WVCT	Call Timer Request	30
+WVDTMF	DTMF Tone Generation	32
+WVEDIS	Enhanced Dispatch Interleave	13
+WVEIC	Enhanced Interconnect Interleave	14
+WVGPS	GPS Request	29
+WVINTER	Interleave Settings	12
+WVLIM	AT Commands Limitation Set	41
+WVLIP	Calling Line Identification Presentation	24
+WVMAIL	Voice Mail Status	31
+WVMODE	Mode Selection	15
+WVMR	Master Reset	33
+WVNET	Network IDs	28
+WVNUM	Get Subscriber Numbers	21
+WVOLP	Connected Line Identification Presentation	25
+WVPO	Power Off	33
+WVRB	Ring Back Notification Presentation	38
+WVREG	Registration Status	21
+WVRESET	Reset	33
+WVRLA	GPS and Location Services	35
+WVSCAN	Re-scan	38

Table 3. Supplementary AT Commands (Continued)

AT Command	Description	Page
+WVTRACE	Trace Mode	16
+WVTTY	TTY Support	31
+WVWAKE	Host Wakeup Support	48

2.3.2 AT Commands Overview

AT commands are sets of commands, comprised of assemblies of ASCII characters, used for communication with the iO270 modem. All AT commands start with the prefix "AT", except for the commands A/ and +++. The AT prefix is derived from the word Attention, which asks the modem to pay attention to the current request (command).

AT commands are used to request services from the iO270 modem, including:

- Call Services: Dial, answer and hang up
- Cellular Utilities: Send/receive SMS
- Modem Profiles: Auto answer
- Cellular Network Queries, and so on

2.3.2.1 Voice Class +WVCLASS

This command sets the iO270 into a particular voice-mode operation, which causes the iO270 to process information presented in the Dial command in a manner suitable for that type of information. Some modes are available in specific iO270 implementations. Devices should use the Query command to determine the allowed operations.

Command	Response/Action
+WVCLASS=<n>	
+WVCLASS?	+WVCLASS: <n>
+WVCLASS=?	+WVCLASS: (Listed of supported <n>s)

The following table shows the WVCLASS parameters.

Table 4. +WVCLASS Parameters

<Type>	Description
<n>	0 Normal interconnect (using line 1) 1 Private call 2 Call alert 3 Group call 4 Group affiliation 5 Interconnect emergency call 6 Reserved for future use 7 Normal interconnect (using line 2) 8 Reserved for future use 9 Data/fax call

2.3.2.1.1 Dial Command ATD

When performing a voice call, the setting of the +WVCLASS command shows the format and meaning of the dial parameters. The following table shows the format of the dial numbers. See Section 2.3.3, “Dial Informative”, for more information.

Table 5. Dial Reference

+WVCLASS	Description	Number Format	Refer to
0	Interconnect line 1	Normal as defined in ref [4]	Section 2.3.3.1, “Interconnect”
1	Private call	<UFMI>	Section 2.3.3.3, “Dispatch - Private Call”
2	Call alert	<UFMI>	Section 2.3.3.4, “Dispatch - Call Alert”
3	Group call	<type> [, <area>][, <talkgroup mode>]	Section 2.3.3.5, “Dispatch - Group Call”
4	Group affiliation	<mode index>	Section 2.3.3.6, “Dispatch - Group Affiliation”
5	Interconnect emergency	No number	Section 2.3.3.2, “Interconnect Emergency Call”
7	Interconnect line 2	Normal as defined in ref [4]	Section 2.3.3.1, “Interconnect”
9	Data/Fax call	Normal as defined in ref [8]	Ref [8]

2.3.2.2 List Current Voice Calls +WVCLCC

This command returns a list of current iO270 calls. If the command succeeds but no calls are available, no information response is sent to the TE. Refer to ref [4] sub clause 9.2 for possible <err> values. This command behaves similarly to the +CLCC command, ref [4] sub clause 7.17.

Command	Possible response(s)
+WVCLCC	[+WVCLCC: <id1>, <dir>, <stat>, <mode>, <mpty> [, <number>, <type>] [<CR><LF>+WVCLCC: <id2>, <dir>, <stat>, <mode>, <mpty> [, <number>, <type>]] or: +CME ERROR: <err>

The following table shows the +WVCLCC parameters.

Table 6. +WVCLCC Parameters

<Type>	Description
<idx>	Call identification number as described in GSM 02.30 [1] sub clause 4.5.5.1. This number can be used in +CHLD command operations.
<dir>	0 Mobile-originated (MO) call 1 Mobile-terminated (MT) call
<stat>	State of the call: 0 Active 1 Held 2 Dialing (MO call) 3 Alerting (MO call) 4 Incoming (MT call) 5 Waiting (MT call) 6 Talk permit (current talker in active dispatch call) 7 Listen permit (current listener in active dispatch call) 8 Dispatch silent (no current talker or listener in active dispatch call)
<mode>	Bearer/Service: 0 Normal interconnect (using line 1) 1 Private call 2 Call alert 3 Group call 4 Group affiliation 5 Interconnect emergency call 7 Normal interconnect (using line 2) 9 Data/fax
<mpty>	0 Call is not one of multiparty (conference) call parties 1 Call is one of multiparty (conference) call parties
<number>	String type phone number in format specified in Section 2.3.3, "Dial Informative"
<type>	Type of address octet in integer format (refer GSM 04.08 [3] sub clause 10.5.4.7. and Section 2.3.3.8, "List Voice Calls")

2.3.2.3 Deep Sleep Mode +WVDSM

This command is used in order to reduce the current consumption, during periods of no data activity and idle time on the system, the iO270 will switch to the 32 kHz clock and power off the 16.8 MHz reference oscillator.

Command	Possible Response(s)
+WVDSM=<mode>	
+WVDSM?	+WVDSM: <mode>
+WVDSM=?	+WVDSM: (List of supported <mode>s)

The following table shows the +WVDSM parameters.

Table 7. +WVDSM Parameters

<Type>	Description
<mode>	0 Deactivated (default). 1 Activated; enables this feature.

For more information, Refer to “deep sleep mode”, page 82.

2.3.2.4 Interleave Settings +WVINTER

This command accesses the interleave settings. For interconnect, the default interleave <n> parameter is used for setting one of the allowed interleaves.



Note

The AT+WVINTER Set command operations are blocked unless WVLIM (Limited Accesses) is enabled (see Section 2.3.2.34, “AT Commands Limitation Set +WVLIM”), and the Interleave selection flag is enabled in the iO270 codeplug.

Command	Possible Response(s)
+WVINTER=<n>	+CME ERROR: <err>
+WVINTER?	+WVINTER: <n>
+WVINTER=?	+WVINTER: (List of supported <n>s)

The following table shows the +WVINTER parameters.

Table 8. +WVINTER Parameters

<Type>	Description
<n>	Default interconnect interleave mode: 0 3:1 VSELP vocoder-only 1 6:1 VSELP vocoder-only 2 3:1 VSELP vocoder-preferred 3 6:1 VSELP vocoder-preferred



Note

The interleave settings may not be modified if the iO270 does not allow changing the interleave settings via the TE.

2.3.2.5 Enhanced Dispatch Interleave +WVEDIS

This command accesses the enhanced dispatch version in the iO270.



Note

The AT+WVEDIS Set command operations are blocked unless WVLIM (Limited Accesses) is enabled (see Section 2.3.2.34, “AT Commands Limitation Set +WVLIM”), and the Interleave selection flag is enabled in the iO270 codeplug.

Command	Possible Response(s)
+WVEDIS=<n>	+CME ERROR: <err>
+WVEDIS?	+WVEDIS: <n>
+WVEDIS=?	+WVEDIS: (List of supported <n>s)

The following table shows the +WVEDIS parameters.

Table 9. +WVEDIS Parameters

<Type>	Description
<n>	Enhanced dispatch: 0 Normal dispatch VSELP vocoder 1-255 Enable enhanced dispatch vocoder version <n> 1 AMBE++ 2-255 Undefined

**Note**

The iO270 does not enable modifying the enhanced dispatch interleave setting via the TE.

2.3.2.6 Enhanced Interconnect Interleave +WVEIC

This command accesses the enhanced interconnect vocoder version in the iO270. If an enhanced interconnect vocoder is selected, but not supported in the current system area, the interleave setting specified in +WVINTER will be used.

**Note**

The AT+WVEIC Set command operations are blocked unless WVLIM (Limited Accesses) is enabled (see Section 2.3.2.34, “AT Commands Limitation Set +WVLIM”), and the Interleave selection flag is enabled in the iO270 codeplug.

Command	Possible Response(s)
+WVEIC=<n>	+CME ERROR: <err>
+WVEIC?	+WVEIC: <n>
+WVEIC=?	+WVEIC: (List of supported <n>s)

The following table shows the +WVEIC parameters.

Table 10. +WVEIC Parameters

<Type>	Description
<n>	Enhanced interconnect: 0 Normal interconnect vocoder (selected by +WVINTER, section 2.3.2.4) 1-255 Enhanced interconnect vocoder Version <n> 1 AMBE++ 2-255 Undefined

**Note**

The interleave settings may not be modified if the iO270 does not enable changing the interleave settings via the TE.

2.3.2.7 Circuit Data Interleave +WVCDINTER

This command accesses the over-the-air circuit data rate.



Note

The AT+WVCDINTER Set command operations are blocked unless WVLIM (Limited Accesses) is enabled (see Section 2.3.2.34, “AT Commands Limitation Set +WVLIM”), and the Interleave selection flag is enabled in the iO270 codeplug.

Command	Possible Response(s)
+WVCDINTER=<n>	+CME ERROR <err>
+WVCDINTER?	+WVCDINTER: <n>
+WVCDINTER=?	+WVCDINTER: (List of supported <n>s)

The following table shows the +WVCDINTER parameters.

Table 11. +WVCDINTER Parameters

<Type>	Description
<n>	Circuit data interleave settings: 0 9600 bps only 1 4800 bps only 2 9600 bps preferred 3 4800 bps preferred



Note

The interleave settings may not be modified if the iO270 does not enable changing the interleave settings via the TE.

2.3.2.8 Mode Selection +WVMODE

This command places the iO270 into a mode other than the Normal Subscriber Operation mode. Each iDEN sub mode has its own protocol and commands, therefore the availability of AT commands varies in all iO270 sub modes. As the iO270 can be configured to not accept entry into certain modes, the Query command is used to determine which modes are supported.

Command	Possible Response(s)
+WVMODE=<n>	
+WVMODE?	+WVMODE: <n>
+WVMODE=?	+WVMODE: (List of supported <n>s)

The following table shows the +WVMODE parameters.

Table 12. +WVMODE Parameters

<Type>	Description
<n>	Reconfigure into new mode: 0 Normal Multi-service (AT fully supported) 1 Normal Phone Only (AT fully supported) 2 Airplane (AT limited support)



Note

While in Airplane mode, +CFUN is set automatically to 0. Therefore, when trying to move from Airplane mode (WVMODE=2) to Normal Phone Only (+WVMODE=1) or to Normal Multi-service (+WVMODE=0), setting +CFUN to 1 is required prior to the mode change. (The WVMODE is changed automatically to 0.)

The selected functionality controls the allowable value of the radio functionality. The following table shows the mapping mode to +CFUN.

Table 13. Mapping Mode to +CFUN

+WVMODE Setting	Setting of +CFUN	Mode Definition
0	1 Full functionality	iDEN Multi-service (MS) mode – or SIM Locked
1	1 Full functionality	Phone Only (PO) mode – or SIM Locked
0,1	0 Minimum functionality; disables both transmit and receive RF circuits	Airplane mode

2.3.2.9 Trace Mode +WVTRACE

This command accesses the iO270 trace parameters. Each iO270 parameter can be configured to be sent unsolicited to the TE from the iO270 at a specified time interval (in seconds). If the duration is omitted in a Trace Set command, the iO270 either uses the last set duration for that specific parameter, or the default interval of 2 seconds. All unsolicited responses are in the format +WVTRACE: <n>, “ASCII String”. Some iO270 parameters contain data that can be cleared by the TE. <trace=2> is used for this data. Attempting to clear non-clearable data results in a “+CME ERROR: <err>” response from the iO270. For more detailed formats, see Section 2.3.3.11, “Trace Mode Screen”.

The Query command determines which parameters the iO270 has currently enabled for unsolicited responses. If no parameters are being traced, no information response is sent.

The Range query determines the list of parameters supported by the iO270, the range of duration supported by the iO270, as well as the trace options supported by the iO270.

Command	Possible Response(s)
+WVTRACE=<n> [, <trace> [,<duration>]]	+WVTRACE: <n>, "ASCII String" or: +CME ERROR: <err>
+WVTRACE?	+WVTRACE: <n1>,<d1>[,<n2>,<d2>[,...]]
+WVTRACE=?	+WVTRACE: (List of <n>s being supported), (List of <trace>s supported), (range of duration)

Some trace parameters are shortcuts, which access multiple parameters in one command. The resulting response is not the requested parameter, but a combination of the parameters.

Current shortcuts are:

- <n>=0 (response is the combination of all non-shortcut parameters)
- <n>=1 (response is the combination of <n> = 12-17)

The duration parameter error codes trace option n=18 is not used and is ignored. Instead the iO270 responds with a character string whenever the system information changes. Additionally, only OK and no data is returned when processing the Set command.

If the iO270 does not have valid data for a parameter in a trace response, the invalid parameter will be indicated with a dash (-) in the output string.



Note

<n>=0 and <n>=1 are used for shortcuts only, and cannot be used for the trace option.

The following table shows the WVTRACE parameters.

Table 14. +WVTRACE Parameters

<Type>	Description
<n>	Refer to Table 15, "+WVTRACE Description".
<trace>	0 Disable tracing for this element <n> 1 Enable tracing for this element <n> 2 Clear logged data (usable for <n>=23, 25, and 27). If attempted for any other trace element, an error response is generated.
<duration>	1-30 Seconds

The following table shows the trace possibilities.

Table 15. +WVTRACE Description

<n>	Description	Output (<output> defined in Section 2.3.3.11)
0	Access All (short-cut)	List of all trace options 2+ +WVTRACE: 2, <output><CR><LF>+WVTRACE: 3, <output><CR><LF>...<CR><LF>+WVTRACE: n,<output>
1	List all registration Status (short-cut)	+WVTRACE: 13, <output><CR><LF> +WVTRACE: 14, <output> <CR><LF> +WVTRACE: 15,<output> <CR><LF> +WVTRACE: 16, <output> <CR><LF>+WVTRACE: 17, <output> <CR><LF>
2	Unit Information -> Phone Model	+WVTRACE: 2,<output><CR><LF> Section 2.3.3.11.1.1, "Phone Model"
3	Unit Information -> CP Version	+WVTRACE: 3,<output><CR><LF> Section 2.3.3.11.1.2, "CP Version"
4	Unit Information -> CSD Version	+WVTRACE: 4,<output><CR><LF> Section 2.3.3.11.1.4, "CSD Version"
5	Unit Information -> USR Version	+WVTRACE: 5,<output><CR><LF> Section 2.3.3.11.1.3, "USR Version"
6	Unit Information -> Software Version	+WVTRACE: 6,<output><CR><LF> Section 2.3.3.11.1.5, "Software Version"
7	Unit Information -> Software Type	+WVTRACE: 7,<output><CR><LF> Section 2.3.3.11.1.6, "Software Type"
8	Unit Information -> Software Build date.	+WVTRACE: 8,<output><CR><LF> Section 2.3.3.11.1.7, "Software Build Date"
9	Total Usage	+WVTRACE: 9,<output><CR><LF> Section 2.3.3.11.2, "Total Usage"
10	System Status	+WVTRACE: 10,<output><CR><LF> Section 2.3.3.11.3, "System Status"
11	IMEI	+WVTRACE: 11,<output><CR><LF> Section 2.3.3.11.6, "IMEI"
12	SIM ID	+WVTRACE: 12,<output><CR><LF> Section 2.3.3.11.7, "SIM ID"
13	Registration Log -> Dispatch	+WVTRACE: 13,<output><CR><LF> Section 2.3.3.11.8, "Registration Log"
14	Registration Log -> IC	+WVTRACE: 14,<output><CR><LF> Section 2.3.3.11.8, "Registration Log"

Table 15. +WVTRACE Description (Continued)

<n>	Description	Output (<output> defined in Section 2.3.3.11)
15	Registration Log -> PD	+WVTRACE: 15,<output><CR><LF> Section 2.3.3.11.8, "Registration Log"
16	Registration Log -> MIP	+WVTRACE: 16,<output><CR><LF> Section 2.3.3.11.8, "Registration Log"
17	Registration Log -> Phone RST	+WVTRACE: 17,<output><CR><LF> Section 2.3.3.11.8, "Registration Log"
18	Err/Channel Codes	+WVTRACE: 18,<output><CR><LF> Section 2.3.3.11.9, "Err/Channel Codes"
19	Current Frequency	+WVTRACE: 19,<output><CR><LF> Section 2.3.3.11.10, "Current Frequency"
20	Dispatch IDs	+WVTRACE: 20,<output><CR><LF> Section 2.3.3.11.11, "Dispatch IDs"
21	Bandmap	+WVTRACE: 21,<output><CR><LF> Section 2.3.3.11.13, "Bandmap"
22	Hardware	+WVTRACE: 22,<output><CR><LF> Section 2.3.3.11.14, "Hardware"
23	Fatal Error/#	+WVTRACE: 23,<output><CR><LF> Section 2.3.3.11.15, "Fatal Error/#"
24	Error Log Count	+WVTRACE: 24,<output><CR><LF> Section 2.3.3.11.16, "Error Log/ Reset Log Count"
25	Error Log	+WVTRACE: 25,<output><CR><LF> Section 2.3.3.11.17, "Error Log"
26	Reset Log Count	+WVTRACE: 26,<output><CR><LF> Section 2.3.3.11.16, "Error Log/ Reset Log Count"
27	Reset Log	+WVTRACE: 27,<output><CR><LF> Section 2.3.3.11.18, "Reset Log"
28	Coin Cell	+WVTRACE: 28,<output><CR><LF> Section 2.3.3.11.19, "Coin Cell"
29	GPS -> Location	+WVTRACE: 29,<output><CR><LF> Section 2.3.3.11.5.1, "Location"
30	GPS -> Time Information	+WVTRACE: 30,<output><CR><LF> Section 2.3.3.11.5.2, "Time Information"

Table 15. +WVTRACE Description (Continued)

<n>	Description	Output (<output> defined in Section 2.3.3.11)
31	GPS -> Assist	+WVTRACE: 31,<output><CR><LF> Section 2.3.3.11.5.3, "Assist"
32	GPS -> Navigation	+WVTRACE: 32,<output><CR><LF> Section 2.3.3.11.5.4, "Navigation"
33	GPS -> Summary	+WVTRACE: 33,<output><CR><LF> Section 2.3.3.11.5.5, "Summary"
34.	GPS -> GPS Version	+WVTRACE: 34,<output><CR><LF> Section 2.3.3.11.5.6, "GPS Version"
35	New 6:1 Interconnect	+WVTRACE: 35,<output><CR><LF> Section 2.3.3.11.4, "N6:1 Interconnect"
36	Band Information	+WVTRACE: 36,<output><CR><LF> Section 2.3.3.11.12, "Band Information"
37	CE Status	+WVTRACE: 37,<output><CR><LF> Section 2.3.3.11.20, "CE Status"
38	WiDEN	+WVTRACE: 38, <output><CR><LF> Section 2.3.3.11.21, "WiDEN"
39	New 6:1 Dispatch	+WVTRACE: 39, <output><CR><LF> Section 2.3.3.11.22, "N 6:1 Dispatch"
40		+WVTRACE: 40, <output><CR><LF>
41	Hardware ID	+WVTRACE: 41, <output><CR><LF> Section 2.3.3.11.23, "Hardware ID"

2.3.2.10 Get Subscriber numbers AT+WVNUM

This Action command returns the MSISDNs related to the iO270. If the iO270 has different MSISDNs for different services, each MSISDN is returned in a separate line. This command extends the service types of the GSM AT command +CNUM ref [4] sub clause 7.1.

Command	Possible Response(s)
+WVNUM	+WVNUM: <number1>, <type1> [, <speed>, <service> [, <itc>]] [<cr><LF>+WVNUM: [<alpha2>], <number2>, <type2> [, <speed>, <service> [, <itc>]] [.]] or: +CME ERROR: <err></cr>

The following table shows the +WVNUM parameters.

Table 16. +WVNUM Parameters

<Type>	Description
<numberx>	String-type phone number of format specified by typex
<typex>	Type of address octet in integer format
<speed>	As defined in ref[4] sub clause 6.7
<service>	Service related to the phone number: 0 Fax/circuit data 4 Voice 6 Private ID (UFMI) 7 Carrier IP 8 IP Address 1 9 IP Address 2 11 Voice (line 2)

2.3.2.11 Registration Status +WVREG

The Set command controls the presentation of unsolicited result codes:

- +WVREG: <scan>, <interconnect>, <dispatch>, <group>, <packet data>, <mip>, <iso>, <phone only>, <scch>, <mode index>, <area>, <stat> when <n>=1 and there is a change in the iO270 network registration status

or

- +WVREG: <scan>, <interconnect>, <dispatch>, <group>, <packet data>, <mip>, <iso>, <phone only>, <scch>, <mode index>, <area>, <stat> [, <lac>, <ci>] when <n>=2 and there is a change in the network cell

The Read command returns the status of the result code presentation and all status values, which shows what level of services are available through the iO270. Location information elements <lac>, <ci> are returned only when <n>=2 and the iO270 is registered in the network.

This is the extension of the GSM AT command +CREG, ref [4] sub clause 7.2.

Command	Possible Response(s)
+WVREG=<n>	+CME ERROR: <err>
+WVREG?	+WVREG: <n>, <scan>, <interconnect>, <dispatch>, <group>, <packet data>, <mip>, <iso>, <phone only>, <scch>, <mode index>, <area>, <stat> [,<mcc>, <mnc>, <lac>,<ci>, <dlac>] or: +CME ERROR: <err>
+WVREG=?	+WVREG: (List of supported <n>s)

The following table shows the +WVREG parameters.

Table 17. +WVREG Parameters

<Type>	Description
<n>	0 Disable network registration unsolicited result code 1 Enable network registration unsolicited result code +WVREG: ... <stat> 2 Enable network registration and location information unsolicited result code +WVREG: ... <stat> [,<lac>,<ci>]
<scan>	0 Pending 1 Scan RBM 2 Scan CBM 3 Camp 4 Sleep
<interconnect> (only valid if scan=camp)	0 Progressing 1 Restricted 2 Full service
<dispatch> (only valid if scan=camp)	0 Progressing 1 Restricted 2 Full service
<group> (only valid if scan=camp)	0 Progressing 1 Restricted 2 Invalid Group 3 Full Service
<packet data> (only valid if scan=camp)	0 Progressing 1 No service 2 Full service 3 WiDEN full service

Table 17. +WVREG Parameters (Continued)

<Type>	Description
<mip> (only valid if scan=camp)	0 Progressing 1 No service 2 Full service
<iso> (only valid if scan=camp)	0 Not ISO 1 ISO
<phone only> (only valid if scan=camp)	0 Not phone only 1 Phone only request pending 2 Phone only
<scch> (only valid if scan=camp)	0 Not SCCH 1 SCCH
<mode index> (group affiliation)	0 Invalid 1-255 Mode
<area> (service area)	0 No service area 1-254 Service area 255 All service areas
<stat>	0 Not registered; iO270 is not currently scanning 1 Registered, home network 2 Not registered; iO270 is scanning 3 Registration denied 4 Unknown (iO270 is not interconnect-registered, but dispatch or packet data-registered) 5 Registered, roaming
<mmc>	String type; two-byte mobile country code
<mnc>	String type; two-byte mobile network code
<lac>	String type; two-byte location area code in hexadecimal format
<ci>	String type; two-byte cell ID in hexadecimal format
<dlac>	String type; two-byte dispatch location area code in hexadecimal format

2.3.2.12 Cellular Result Codes +CRC

This is an existing GSM AT command that controls whether the extended format of incoming call indication is used. When enabled, an incoming call is indicated with unsolicited result code +CRING: <type> instead of the normal RING. Refer to ref [4] sub clause 6.11 for usage.

The iO270 supports the following types:

- +CRING: PRIVATE iDEN Private Call
- +CRING: GROUP iDEN Group Call
- +CRING: ALERT iDEN Call Alert
- +CRING: VOICE Interconnect phone call
- +CRING: ASYNC Data Call

Command	Possible Response(s)
+CRC=[<n>]	
+CRC?	+CRC: <n>
+CRC=?	+CRC: (List of supported <n>s)

The following table shows the +CRC parameters.

Table 18. +CRC Parameters

<Type>	Description
<n>	Parameter sets/shows the result code presentation status: 0 Disable 1 Enable

2.3.2.13 Calling Line Identification Presentation +WVLIP

This command extends the GSM supplementary service CLIP (ref [4] sub clause 7.6) that enables a called subscriber to get the dispatch calling line identity (CLI) of the calling party, when receiving a mobile-terminated call. The Set command enables or disables the presentation of the CLI at the TE.

When the presentation of the CLI at the TE is enabled, +WVLIP:<number>,<type> [,<subdata1>,<subtype1> [,<subdata2>,<subtype2> [...]]] response is returned after every RING (or +CRING: <type>; see Section 2.3.2.12, “Cellular Result Codes +CRC”) result code. The Read command returns the status of <n>.



Note

iDEN does not support the interrogation of the CLIP service in the network, as defined in the CLIP commands.

Command	Possible Response(s)
+WVLIP=[<n>]	
+WVLIP?	+WVLIP: <n>
+WVLIP=?	+WVLIP: (List of supported <n>s)

The following table shows the WVLIP parameters.

Table 19. +WVLIP Parameters

<Type>	Description
<n>	Sets/shows the result code presentation status: 0 Disable 1 Enable
<number>	String-type phone number of format specified by <type>
<type>	0 UFMI (private ID) 1 Talk group ID 3 Interconnect emergency 4 Interconnect line 1 5 Interconnect line 2 6 Data
<subdataX>	String-type data of format specified by <subtype>
<subtypeX>	0 Call alert status 1 Talker ID (UFMI format) 2 Talker ID (FMI format) 3 Initiator ID (UFMI format) 4 Initiator ID (FMI format)

2.3.2.14 Connected Line Identification Presentation +WVOLP

This command extends the GSM supplementary service COLP (ref [4] sub clause 7.6) that enables a calling subscriber to get the connected line identity (COL) of the called party after setting up a mobile-originated call. The command enables or disables the presentation of the COL at the TE.

When the presentation of the dispatch COL is enabled, +WVOLP: <number>,<type>,<service> intermediate result code is returned from the iO270 to TE.

The Read command returns the status of <n>.



Note

iDEN does not support the interrogation of the CLIP service in the network, as defined in the COLP commands.

Command	Possible Response(s)
+WVOLP=[<n>]	
+WVOLP?	+WVOLP: <n>
+WVOLP=?	+WVOLP: (List of supported <n>s)

The following table shows the +WVOLP parameters.

Table 20. +WVOLP Parameters

<Type>	Description
<n>	Sets/shows the result code presentation status: 0 Disable 1 Enable
<number>	String-type phone number of format specified by <type>
<type>	Type of address octet in integer format, as defined in +CLIP (ref [4])
<service>	Type of service being performed: 0 Normal interconnect (using line 1) 1 Private call 2 Call alert 3 Group call 4 Group affiliation 5 Interconnect emergency call 7 Normal interconnect (using line 2) 9 Circuit data call (only via MUX)

2.3.2.15 Status Alarms AT+WVAL

The iO270 performs various actions that can affect the operation of a TE. Status alarms are provided to indicate the usage of the iO270 by other entities.

The Set command with a query value will return the current operating mode, as well as any accessories attached. For example, the iO270 can be instructed to enter a special mode by a TE. The iO270 will send an alarm to any TE that has enabled alarms, informing the TE that the iO270 is reconfiguring into a new mode of operation. Likewise, after entering any mode, the iO270 informs all TEs that have enabled alarms about the current mode of the iO270.

Command	Possible Response(s)
+WVAL=[<n>]	+WVAL: I<mode><CR><LF> [+WVAL: A<accessory1>,1<CR><LF> [+WVAL: A<accessory2>,1<CR><LF> [...]]]
+WVAL?	+WVAL: <n>
+WVAL=?	+WVAL: (List of supported <n>s)

The following table shows the +WVAL parameters.

Table 21. +WVAL Parameters

<Type>	Description
<n>	Sets/shows status alarm presentation status: 0 Disable 1 Enable 2 Query

The following table shows the +WVAL status alarms.

Table 22. Status Alarms

Response	Description
+WVAL: R<mode>	The iO270 is going to reconfigure (soft reset) into a new mode. This is sent only if the mode change causes reconfiguration. (<mode> is defined in Section 2.3.2.8, "Mode Selection +WVMODE").
+WVAL: I<mode>	The iO270 is in <mode>. (<mode> is defined in Section 2.3.2.8, "Mode Selection +WVMODE").
+WVAL: E<code>	iO270 is notifying TE of a operational error. The <code> is product-specific.
+WVAL: A<accessory>,<status>	Indicates which accessory has been detected or removed by the iO270. <accessory> is defined in Table 24, Accessory Codes. <status>= 0 for removed, 1 for connected.
+WVAL: H<state>	Indicates a hardware state or failure as defined in Table 23, Hardware State.

The following table shows the hardware state.

Table 23. Hardware State

	Meaning
<state>	1 Battery end-of-life 2 Low battery 3 Battery OK 4 High battery 6 High temperature 7 Power-off request (iO270 detected a power-off signal via the bottom connector.)

The following table shows the accessory codes.

Table 24. Accessory Codes

	Meaning
<accessory>	4 Data Cable (RS232) 10 USB

2.3.2.16 Call Status Messages

Dispatch calls are by nature simplex calls, where one user talks and all the other users listen. When no user is talking, the call is in silent state, which enables any user in the call to become the talker. After a system-configurable time, the system disconnects the call if no user becomes the talker during the silent state.

The following table shows the AT responses, or call statuses, to the ATD commands.

Table 25. Call Status

Command	Description
CONNECT TPERMIT	Dispatch call connected and user is talker.
CONNECT TINHIBIT	Dispatch call connected and in silent state.
CONNECT LPERMIT	Dispatch call connected and user is listener.
CONNECT LINHIBIT	Dispatch call connected and in silent state.
CONNECT	Call connected.
NO CARRIER	Call ended.

2.3.2.17 Network IDs +WVNET

This command reads or writes the service provider codes and types used by the iO270. The iO270 compares this list of service providers codes to the SPC broadcast by the system to determine whether it should seek service. The Range Query command returns the maximum number of SPCs that can be supported. There is always 1 home SPC and N-1 roaming SPC.

Command	Possible Response(s)
+WVNET=<type1>, <id1> [, <type2>, <id2> [... [, <typeN>, <idN>] ...]]	
+WVNET?	+WVNET: <type1>, <id1>, <type2>, <id2> ... <typeN>, <idN>
+WVNET=?	+WVNET: (number of <N>s supported)

The following table shows the +WVNET parameters.

Table 26. +WVNET Parameters

<Type>	Description
<typeX>	Associated type of the SPC: 0-65535
<idX>	Associated name: 0, 65535 Reserved 1-65534 ID

2.3.2.18 GPS Antenna AT+WVANTC

This command allows specifying the configuration settings of GPS antenna.

- One shared antenna for iDEN and GPS signals.
- Two separate passive antennas for both signal types.
- Active separate GPS antenna..

Command	Possible Response(s)
+WVANTC=<mode>	
+WVANTC?	+WVANTC: <mode>
+WVANTC=?	+WVANTC: (List of supported <mode>)

The following table shows the +WVANTC parameters..

Table 27. +WVANTC Parameters

<Type>	Description
<mode>	0 Shared antenna for both signal types: iDEN and GPS. 1 Separate passive GPS antenna. 2 Separate active GPS antenna.

Default value is read from the CP.

CP fields shall be updated accordingly.

If the CP fields are changed, the states of the control lines are changed respectively.

2.3.2.19 GPS Request +WVGPS

This command enables or disables streaming NMEA data from the iO270. If the hardware supports multiple destinations, the Set command indicates on which sources the NMEA data will be sent. If the iO270 does not support GPS, an ERROR is returned.

The Read command returns the current configuration. The range indicates the type of GPS support available.

Command	Possible Response(s)
+WVGPS=<n>	
+WVGPS?	+WVGPS: <n>
+WVGPS=?	+WVGPS: (List of supported <n>s)

The following table shows the +WVGPS parameters.

Table 28. +WVGPS Parameters

<Type>	Description
<n>	<p>Enable/disable GPS data:</p> <ul style="list-style-type: none"> 0 Disable data stream 1 Enable NMEA only on DL-NMEA channel (mux over UART A) 2 Enable NMEA only on UART B 3 Enable NMEA on DL-NMEA channel and UART B 4 Enable NMEA on the serial link on which the command was executed

2.3.2.20 Call Timer Request +WVCT

This command controls the Call Timer storage in the iO270. The Set command supports Query and Reset. The Query command retrieves all call timer values.

Command	Possible response(s)
+WVCT=<n>, <mode>	<p>When <mode>=0 and command successful:</p> <p>+WVCT: <n>, "<time>"</p> <p>or:</p> <p>+CME ERROR: <err></p>
+WVCT=?	+WVCT: (List of supported <n>s, List of supported <mode>s)

The following table shows the +WVCT parameters.

Table 29. +WVCT Parameters

<Type>	Description
<n>	Call timer identification: 0 Last phone call line 1 (cannot be reset) 1 Phone line 1 2 Phone line 1 lifetime (cannot be reset) 3 Phone line 2 4 Phone line 2 lifetime (cannot be reset) 5 Dispatch 6 Dispatch lifetime (cannot be reset) 7 Circuit data 8 Circuit data lifetime (cannot be reset) 9 PD Kbytes RX/TX 10 Reserved for future use 11 Reserved for future use 12 Total phone/dispatch usage (cannot be reset) 13 Last phone call line 2 (cannot be reset) 14 Last circuit data call (cannot be reset) 15 Last dispatch call (cannot be reset)
<mode>	Shows/resets specific call timer: 0 Query 1 Reset timer to 0
<time>	Status of specific timer: (n=0-6) hours: minutes: seconds (format hh:mm:ss) (n=7-9) Kbytes

2.3.2.21 Voice Mail Status +WVMAIL

The Set command controls the presentation of an unsolicited result code “+WVMAIL: <n>, <new_cnt>, <total_cnt>, <urgent_cnt>, <fax_cnt>, <email_cnt>, <hld>, <access_nbr>”.

The Read command returns the status of the result code presentation and all status values, which shows what level of services are available through the iO270.

Command	Possible Response(s)
+WVMAIL=<n>	+CME ERROR: <err>
+WVMAIL?	+WVMAIL: <n>, <new_cnt>, <total_cnt>, <urgent_cnt>, <fax_cnt>, <email_cnt>, <hld>, <access_nbr> or: +CME ERROR: <err>
+WVMAIL=?	+WVMAIL: (List of supported <n>s)

The following table shows the +WVMAIL parameters.

Table 30. +WVMAIL Parameters

<Type>	Description
<n>	0 Disable unsolicited responses 1 Enable unsolicited responses
<new_cnt>	Number of new voice mail messages (0..255) See Note 1
<total_cnt>	Total number of voice mail messages (0...255) See Note 1
<urgent_cnt>	Number of urgent voice mail messages (0..255) See Note 1
<fax_cnt>	Number of fax messages (0...255) See Note 1
<email_cnt>	Number of email messages (0...255) See Note 1
<hld>	0 No calls on hold 1 Calls on hold Default value is 0.
<access_number>	String phone number See Note 2



Note

1. 255 represents "Ignore". This will be returned if the voice mail data in the SIM is not valid.
2. Empty string represents "Ignore". This will be returned if the voice mail data in the SIM is not valid.

2.3.2.22 DTMF Tone Generation +WVDTMF

This command transmits the DTMF tones when a voice call is active. When a press indication is requested, the iO270 sends a Tone Start to the iDEN network. When a release indication is requested, the iO270 sends a Tone Stop to the iDEN network. A Burst request sends the Tone Start/Stop to the network at the duration defined in +VTD command. The VTD command is defined using the DTE/DCE interface. For more details, see ref [8] in Table 1, "References".

Command	Possible Response(s)
+WVDTMF=<n> [,<digit(s)>]	
+WVDTMF=?	+WVDTMF: (List of supported <n>s)

The following table shows the +WVDTMF parameters.

Table 31. +WVDTMF Parameters

<Type>	Description
<n>	Command: 0 Tone Stop Stop any digit active in system 1 Tone Start Start requested digit to system 2 Tone Burst Send requested digits to system of set duration
<digit(s)>	One or more alphanumeric digits (0-9,*,#,A-D)

2.3.2.23 Power Off +WVPO

This command powers off the iO270. The iO270 de-registers from the system and shuts down all services.

Command	Possible Response(s)
+WVPO	

2.3.2.24 Reset +WVRESET

This command performs a soft reset of the iO270.

Command	Possible Response(s)
+WVRESET	

2.3.2.25 Master Reset +WVMR

This command performs a master reset of the iO270. This clears all registration information in the SIM; therefore, the next registration cycle is a full IMEI/SIMID registration. The passcode is a security password containing up to six digits.



Note

After executing WVMR, the iO270 is powered off.

Command	Possible Response(s)
+WVMR=<passcode>	
+WVMR=?	+WVMR: ("Passcode")

The following table shows the WVMR parameters.

Table 32. +WVMR Parameters

<Type>	Description
<passcode>	The passcode is a security password containing up to six digits.

2.3.2.26 Real Time Clock (RTC) Alarms

The Set command disables/enables the alarm and sets the alarm/clock time. If the alarm is set, the iO270 sends an unsolicited alarm message when triggered, in the format: +WVCCLK: ALARM. This unsolicited message is sent at a one-second interval until acknowledged by the DTE device (either a disable or new enable Set command).

The Query Request command returns the current alarm setting (enable or disable), the time set for the alarm (if the alarm has not been set, this is omitted), and the current time being tracked by the iO270 hardware.



Note

The actual RTC time may be different than the iDEN system time, since it is set by the DTE device.

The Range Query request lists the current support modes and the time format required by the Set command.

Command	Possible Response(s)
+WVCCLK=<mode> [,"<time>"]	+CME ERROR: <err>
+WVCCLK?	+WVCCLK: mode,[<alarm time>], <actual time>
+WVCCLK=?	+WVCCLK: (List of supported <mode>s),("<time>")

The following table shows the +WVCCLK parameters.

Table 33. +WVCCLK Parameters

<Type>	Description
<mode>	Mode: 0 Disable alarm 1 Set alarm (<time> required) 2 Set time (<time> required)
<time>	In the format "yyyy/MM/dd,dw,hh:mm:ss": yyyy: Year (such as 2003) MM: Month 1-12 DD: Day 1-31 dw: Day of week (0-6) (meaning Sunday to Saturday) hh: Hour (0-23) mm: Minutes (0-59) ss: Seconds (0-59)

Example

AT+WVCCLK = 2," 2003/07/11,5,8:18:00"

//Set time for Friday, July 11, 2003 8:18 am

2.3.2.27 TTY +WVTTY

The Set command determines the TTY mode and baud rate to be used. The Query command retrieves the TTY status. If TTY is enabled, an unsolicited response is sent if the mode, baud or side jack state changes. The Range Query Request command returns the supported modes and bauds.

Command	Possible Response(s)
+WVTTY=<mode>, <baud>	
+WVTTY?	+WVTTY: <mode>,<baud>
+WVTTY=?	+WVTTY: (List of supported <mode>s), (list of supported <baud>s)

.The following table shows the +WVTTY parameters.

Table 34. +WVTTY Parameters

<Type>	Description
<mode>	0 OFF 1 TTY 2 VCO 3 HCO
<baud>	0 45.45 1 50.00

2.3.2.28 GPS and Location Services +WVRLA

The Set command controls the GPS location requests. It can start a location fix, stop an ongoing location fix, or get historical location information. If <request>=4, any historical locations are returned immediately. The presentation of an unsolicited result code +WVRLA: <id>,<result>,<options>,<location1> is sent upon completion of any location request (<request>=1,2,3>).

**Note**

If there is an error, the validity of location fix is uncertain. If <result>=0 is returned indicating an error, more information is available in the Query request. A Set <request>=0 cancels the pending location fix for the ID indicated.

A Query request returns either the current status of any location fix and parameter settings. <status>=0 represents an error in the last fix and the <error> is returned in the Query response.

Requests for forced locations (values 2 and 3) are optionally supported. The Range command checks the availability.

The optional parameter <num> is used only for <request>=4. The parameters <time>, <options>, <horz>, <vert>, <threshold> are used only for <request>=1, 2 or 3. All optional parameters are ignored for <request>=0.

Command	Possible Response(s)
+WVRLA=<request>,<id>[,<time>[,<options>[,<horz>[,<vert>[,<threshold>[,<num>]]]]]]	when <request>=4 and command successful: +WVRLA:<id>,<result><options>[,<location1>[,<location2>[,<location3>]]] or: CME ERROR: <err>
+WVRLA?	+WVRLA: [<id1>,<status>,<request>,<time>,<options>,<horz>,<vert>,<threshold>,<num>[,<error>] <CR> <LF> [<id2>,<status>,<request>,<time>,<options>,<horz>,<vert>,<threshold>,<num>[,<error>]<CR> <LF> [, ...]]
+WVRLA=?	+WVRLA: (List of supported <request>s), (list of supported <id>s), (list of supported <time>s), (list of supported <options>s), (range of supported <horz>s), (range of supported <vert>s), (list of supported <threshold>s), (list of supported <num>s)

The following table shows the defined values of the +WVRLA parameters.

Table 35. +WVRLA Parameters - Defined Values

<Type>	Description
<request>	0 Cancel location fixes request for ID. 1 Perform location fix is not forced. 2 Perform location fix is forced autonomously. 3 Perform location fix is force-assisted. 4 Location history.
<id>	0 Location history request. 1-9 Indicates the ID of the request; valid for all but history request.
<time>	0 No delay. 1 Low delay. 2 Delay-tolerant.
<options>	Sum of integers, each representing a class of options: 1 Almanac override. 2 Extended info. 4 Satellite info. Default is 0.
<horz>	String type, horizontal accuracy, format XXXX.XX meters: 0-2000 Representing the meters with up to two digits of accuracy.

Table 35. +WVRLA Parameters - Defined Values (Continued)

<Type>	Description
<vert>	String type, vertical accuracy; format XXXX.XX meters: 0-2000 Representing the meters with up to two digits of accuracy.
<threshold>	A two-byte value representing the max time to wait for accuracies requested (<horz> and <vert>): 0-600 Seconds.
<num>	0-3 Indicates the request number of locations returned when <request>=4. Default is 1.

The following table shows the defined result codes of the +WVRLA parameters.

Table 36. +WVRLA Parameters - Defined Result Codes

<Type>	Description
<result>	0 Error, no fix available 1-3 Number of fixes
<status>	0 Last fix failed. See <error> for more details. 1 Location fix pending. 2 No Location fix in progress.
<error>	0 NO ERROR 1 TIMEOUT_NO_FIX 2 TIMEOUT_DEGRADED_FIX 3 RESERVED1 4 RESERVED2 5 LOW_BATTERY 6 CHIPSET_DEAD 7 RESERVED3 8 RESERVED4 9 ALMANAC_OUT_OF_DATE 10 RESERVED6 11 ERROR_CP_FIXES 12 INVALID_REQUEST 13 NOT_YET_SUPPORTED 14- TBATSAV_EXPIRATION 15 ERROR_MAX_LOC_REQUEST

2.3.2.29 Re-scan +WVSCAN

The Set command scans using the new bandmap settings. If no carriers are supplied, the iO270 rescans using the current bandmap setting. The available <bands> are subject to the iO270 hardware capabilities.



Note

The AT+WVSCAN Set command operations are blocked unless WVLIM (Limited Accesses) is enabled (see Section 2.3.2.34, "AT Commands Limitation Set +WVLIM").

Command	Possible Response(s)
+WVSCAN=<band1>, <band2> [, <car1> [, <car2> [, <car3> [, <car4>]]]]	
+WVSCAN=?	+WVSCAN: (List of supported <bands>s), (list of supported <car>s)

The following table shows the +WVSCAN parameters.

Table 37. +WVSCAN Parameters

<Type>	Description
<bandx>	1 Standard 800 MHz 2 Extended 800 MHz 4 900 MHz 5 1.5 GHz
<car>	0-1199 for 800 MHz or 900 MHz systems (in decimal format) 0-1920 for 1.5 GHz systems (in decimal format)

2.3.2.30 Ring Back Notification Presentation +WVRB

This command sends the ring-back notification as indicated by the FNE. When the presentation of the ring-back notification is enabled, the +WVRB:<value> response is returned after any MO interconnect call to another SU. The Read command returns the status of <n>.

Command	Possible Response(s)
+WVRB=<n>	
+WVRB?	+WVRB: <n>
+WVRB=?	+WVRB: (List of supported <n>s)

The following table shows the +WVRB parameters.

Table 38. +WVRB Parameters

<Type>	Description
<n>	Sets the notification: 0 Disable 1 Enable
<value>	Either ON or OFF, depending on the type of ring back

2.3.2.31 MLS Address +WV317

This command sets or queries the MLS server used for location services. The server consists of an IP and port address, which the iO270 stores for accessing assisted data for location services.

Command	Possible Response(s)
+WV317="<ip>",<port>	
+WV317?	+WV317: "<ip>",<port>
+WV317=?	+W317: ("ddd.ddd.ddd.ddd",(0-65535))

The following table shows the +WV317 parameters.

Table 39. +WV317 Parameters

<Type>	Description
<ip>	IP address in the format "ddd.ddd.ddd.ddd"
<port>	Port number 0-65535

2.3.2.32 SIM Access AT+CRSM

This command is defined in GSM07.07 sub-clause 8.18 ref [4]. The <command> parameter, defined in GSM07.07 ref [4], accesses the GSM specific EF within the GSM Data File system. Additional values are supported by the iDEN iO270 to access the iDEN-specific EF with the iDEN Data File system. Since the iDEN and GSM Data File systems support the same EF, special care must be taken to use the correct command value to access the correct Data File.

Table 40. +CRSM Parameters

<Type>	Description
<command>	175 Read binary (EF in iDEN Data File System) 177 Reserved 179 Read record (EF in iDEN Data File System) 193 Get response (EF in iDEN Data File System) 215 Update binary (EF in iDEN Data File System) 221 Update record (EF in iDEN Data File System) 242 Status



Note

The validity of the SIM data is determined by the SIM itself, and not by the iO270, which has no range checking. To determine the actual data, the user must refer to the GSM11.11 ref [9], and the SIM specification document for the SIM that was used.

2.3.2.33 Generic SIM Access +CSIM

This command enables direct control of the SIM by a remote application on the TE. AT+CSIM is defined in GSM07.07 sub-clause 8.17.

Command	Possible Response(s)
+CSIM=<length>,<command>	+CSIM: <length>,<response> or: +CME ERROR: <err>
+CSIM=?	+CSIM: (0-261),("Hexadecimal String")

The following table shows the +CSIM parameters.

Table 41. +CSIM Parameters

<Type>	Description
<length>	Integer type. Length of the characters that are sent to the TE in <command> or <response>. (Twice the actual length of the command or response.)
<command>	Command passed on by the ME to the SIM in the format described in GSM 11.11 [28] (Hexadecimal character format. Refer to +CSCS.)
<response>	Response to the command passed on by the SIM to the ME in the format described in GSM 11.11 [28] (Hexadecimal character format. Refer to +CSCS.)



Note

The validity of the SIM data is determined by the SIM itself, and not by the iO270, which has no range checking. To determine the actual data, the user must refer to the GSM11.11 ref [1], and the SIM specification document for the SIM that was used.

2.3.2.34 AT Commands Limitation Set +WVLIM

The command enables/disables limited access to the commands by the serial link over which the command was sent. This means that if the command was enabled from a specific serial link, only this serial link can access the limited commands, for example, UARTB.

Command	Possible Response(s)
+WVLIM=<state>,<password>	
+WVLIM?	WVLIM: <state>
+WVLIM=?	+WVLIM: (List of supported <state>s),("Passcode")

The following table shows the list of AT Commands Under Limitation.

Table 42. AT Commands Under Limitation (WVLIM=0)

AT Command	Short Description	Comment
+WVINTER	Interleave settings	Set option is blocked and returns Error
+WVEIC	Enhanced interconnect interleave	Set option is blocked and returns Error
+WVCDINTER	Circuit data interleave	Set option is blocked and returns Error
+WVEDIS	Enhanced dispatch interleave	Set option is blocked and returns Error
+WVSCAN	Scan specific iDEN carriers	Set option is blocked and returns Error

The following table shows the +WVLIM parameters.

Table 43. +WVLIM Parameters

<Type>	Description
<state>	Mode of limited access: 0 Disable 1 Enable

2.3.2.35 Selectable Audio Volume +MAVOL

The command stores/sets up the volume for each selected audio mode.

Command	Possible Response(s)
+MAVOL=<mode>,<vol>	
+MAVOL?	+MAVOL: <mode>,<vol> +MAVOL: <mode>,<vol> +MAVOL: <mode>,<vol>
+MAVOL=?	+MAVOL: (List of supported <mode>s,) (list of supported <vol>s)

The following table shows the +MAVOL parameters.

Table 44. +MAVOL Parameters

<Type>	Description
<mode>	Audio mode: 1 Raw Audio (Hard Install Car-kit) 2 Speaker (High Audio) 3 Headset
<vol>	Volume step: 0-5

2.3.2.36 Mute Voice Call - Interconnect +CMUT

This command enables/disables the uplink voice muting during a voice call-interconnect.

Command	Possible Response(s)
+CMUT=<mode>	
+CMUT?	+CMUT=<mode>
+CMUT=?	+CMUT: (List of supported <mode>s)

The following table shows the +CMUT parameters.

Table 45. +CMUT Parameters

<Type>	Description
<mode>	1 Mute on 2 Mute off

2.3.2.37 Audio Mode Control +MAFEAT

This command sets three different audio modes: speakerphone (high audio), headset, and RAW (hard install car-kit).

Command	Possible Response(s)
+MAFEAT=<mode>	
+MAFEAT?	+MAFEAT=<mode>
+MAFEAT=?	+MAFEAT: (List of supported <mode>s)

The following table shows the description of the audio modes.

Table 46. Audio Modes Description

	Phone (Interconnect)			Dispatch		
	Speakerphone	Headset	Raw Audio	Speaker	Headset	Raw Audio
Echo cancellation/ suppression	Y	Y	N	N	N	N
Noise Suppression	Y	Y	Y	Y	Y	Y
Side Tone	N	Y	N	N	N	N

The following table shows the +MAFEAT parameters.

Table 47. +MAFEAT Parameters

<Type>	Description
<mode>:	1 Raw audio (car-kit) 2 Speakerphone (high audio) 3 Headset

2.3.2.38 Mic-gain Volume +MMICG

The command stores/sets up the mic gain for each selected Audio mode.

Command	Possible Response(s)
+MMICG=<mode>,<gain>	
+MMICG?	+MMICG=<mode>,<gain>
+MMICG=?	+MMICG: (List of supported <mode>s), (list of supported <gain>s)

The following table shows the +MMICG parameters.

Table 48. +MMICG Parameters

<Type>	Description
<mode>	Audio control mode: 1 Raw audio (car-kit) 2 Speakerphone (high audio) 3 Headset
<gain>	Mic-gain volume level: 0-31 0 is the lowest gain value (not mute).

2.3.2.39 Audio Status Information +WVAR

The command opens/closes the audio channels in order to support voice calls (interconnect/dispatch).

Command	Possible Response(s)
+WVAR=<feature>,<state>	
+WVAR?	+WVAR: <feature>,<state>
+WVAR=?	+WVAR: (list of supported <feature>s), (list of supported <state>s)

The following table shows the +WVAR parameters.

Table 49. +WVAR Parameters

<Type>	Description
<feature>	Audio channel: 1 Uplink 2 Downlink 3 Interconnect
<state>	Audio control mode: 1 Start 2 Stop

2.3.2.40 Self Tone Generation +CRTG

This command generates iDEN-specific tones as a result of a request. In order to stop continuous tones, as listed in Table 50, “Tone Description,” on page 46, +CRTS commands, described in and Section 2.3.2.41, “Stop Self Tone Generation +CRTS”, should be send from the TE to the iO270.



Note

When a non-continuous tone has finished playing, a “Tone Completed message” is sent from the iO270 to the TE.

Command	Possible Response(s)
+CRTG=<value>	
+CRTG=?	+CRTG: (List of supported <value>s)

The following table shows the tone descriptions.

Table 50. Tone Description

<value>	Description	Continuous	Tone Completed Message
1	TONE_TOT_WARNING	No	Yes
2	TONE_EMERGENCY_RECEIVED	No	Yes
3	TONE_EMERGENCY_INIT	No	Yes
4	TONE_CA_NO_ACK_RCVD	No	Yes
5	TONE_REJECT	No	Yes
6	TONE_DISPATCH_SYSTEM_BUSY	No	Yes
7	TONE_CALL_BACK	No	Yes
8	TONE_TALK_PERMIT	No	Yes
9	TONE_PC_RCVD	No	Yes
10	TONE_GC_RCVD	No	Yes
11	TONE_CA_SENT	No	Yes
12	TONE_CA_ACK_RCVD	No	Yes
13	TONE_CLEAR_TO_SEND	No	Yes
14	TONE_TOT_TIMEOUT	Yes	No

Table 50. Tone Description (Continued)

<value>	Description	Continuous	Tone Completed Message
15	TONE_EMERGENCY_CANCEL	Yes	No
16	TONE_TALK_PROHIBIT	Yes	No
17	TONE_CA_RCVD	Yes	No
18	MODEM_TONE_PHONE_RING1	Yes	No
19	MODEM_TONE_PHONE_RING 2	Yes	No
20	MODEM_TONE_PHONE_RING 3	Yes	No
21	MODEM_TONE_PHONE_RING 4	Yes	No
22	MODEM_TONE_PHONE_RING 5	Yes	No
23	MODEM_TONE_PHONE_RING 6	Yes	No
24	MODEM_TONE_PHONE_RING 7	Yes	No
25	MODEM_TONE_PHONE_RING 8	Yes	No
26	MODEM_TONE_PHONE_RING 9	Yes	No
27	MODEM_TONE_PHONE_RING10	Yes	No
28	MODEM_TONE_PHONE_RING11	Yes	No
29	MODEM_TONE_PHONE_RING12	Yes	No

2.3.2.41 Stop Self Tone Generation +CRTS

This command stops continuous tones (that were generated by +CRTG).

Command	Possible Response(s)
+CRTS	

2.3.2.42 Host Wakeup +WVWAKE

This command triggers the host wakeup feature, and sets the value of the minimal delay before sending the data to the TE.



Note

The argument is the value, in milliseconds.

The iO270 supports the option of waking up a TE that enters sleep mode. The iO270->TE wakeup mechanism is a specific solution for an RS232 physical connection.

If the wakeup mode was activated (+WVWAKE=1,<timer>), the iO270 actually asserts the Host_wakeup (pin6).

If the iO270 has data to transmit to the TE, the iO270 de-asserts the Host_wakeup (pin6), waits for the <timer> to expire and then sends the data to the TE.

Command	Possible Response(s)
+WVWAKE=<mode><timer>	
+WVWAKE=?	+WVWAKE: (list of supported <mode>s, list of supported <timer>s)

The following table shows the +WVWAKE parameters.

Table 51. +WVWAKE Parameters

<Type>	Description
<mode>	0 Deactivated (default). 1 Activated; enables this feature.
<timer>	0-255 Each increment represents 5 ms.

For more information, Refer to “Host Wakeup”, page 81.

2.3.2.43 Message Format +CMGF

The Set command tells the TE which input and output format of messages to use. <mode> indicates the format of the messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. <mode> can only be in PDU mode.

Command	Possible Response(s)
+CMGF=[<mode>]	
+CMGF?	+CMGF: <mode>
+CMGF=?	+CMGF: (list of supported <mode>s)

The following table shows the +CMGF parameters.

Table 52. +CMGF Parameters

<Type>	Description
<mode>	0 PDU mode (default when implemented)

2.3.2.44 Read Message +CMGR

The Set command returns a message with the location value <index>, from the message storage to the TE. If the status of the message is "received unread", the status in the storage changes to "received read". If the reading fails, the final result code +CMS ERROR: <err> is returned. See the chapter on Message Service Failure Result Codes in ref [6] for <err> values.

Command	Possible Response(s)
+CMGR=<index>	+CMGR: <stat>,<length><CR><LF><pdu> or: +CMS ERROR: <err>
+CMGR=?	OK

2.3.2.45 More Messages to Send +CMMS

The Set command controls the continuity of the SMS relay protocol link. When this feature is enabled (and supported by the network), multiple messages can be sent much faster as the link is kept open.

Command	Possible Response(s)
+CMMS=[<n>]	
+CMMS?	+CMMS: <n>
+CMMS=?	+CMMS: (list of supported <n>s)

The following table shows the +CMMS parameters.

Table 53. +CMMS Parameters

<Type>	Description
<n>	<p>0 Disable.</p> <p>1 Keep enabled. The link is kept enabled until the time between the response of the latest message send command and the next send command exceeds 1-5 seconds. (The exact value depends on the iO270 implementation.) The iO270 closes the link and the TE switches <n> automatically back to 0.</p> <p>2 Enable. If the time between the response of the latest message send command and the next send command exceeds 1-5 seconds. The iO270 closes the link, but the TE does not switch <n> back to 0. (The exact value depends on the iO270 implementation.)</p>

2.3.2.46 Send Message +CMGS

The Set command sends messages from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE upon the successful delivery of the message. A value can be used to identify the message upon unsolicited delivery status report result code. If the sending fails in a network or an ME error, a final result code +CMS ERROR: <err> is returned. See the chapter, Message Service Failure Result Code in ref [6] for <err> values. This command should be abortable.



Note

Sending can be cancelled by entering an <ESC> character (IRA 27).

<ctrl-Z> (IRA 26) must be used to indicate the end of the message body.

Command	Possible Response(s)
+CMGS=<length><CR><pdu><ctrl-Z/ESC>	+CMGS: <mr> or: +CMS ERROR: <err>
+CMGS=?	

2.3.2.47 New Message Indications to TE +CNMI

The Set command selects how the reception of new messages from the network is indicated to the TE when the TE is active, meaning when the DTR signal is ON. If the TE is inactive (meaning the DTR signal is OFF), message reception should be done as specified in GSM 03.38.



Note

If the DTR signal is not available, or the state of the signal is ignored (V.25ter command &D0), reliable message transfer can be ensured by using +CNMA acknowledgement procedure.

<mode> controls the processing of unsolicited result codes specified within this command, <mt> sets the result code indication routing for SMS-DELIVERs, <bm> for CBMs and <ds> for SMS-STATUS-REPORTs. <bfr> defines the handling method for buffered result codes when <mode> 1, 2 or 3 is enabled.

If the iO270 does not support the requested item (but the TE does), final result code +CMS ERROR: <err> is returned. See the chapter, Message Service Failure Result Code in ref [6], for <err> values.

Command	Possible Response(s)
+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	+CMS ERROR: <err>
+CNMI?	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr>
+CNMI=?	+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)

The following table shows the +CNMI parameters.

Table 54. +CNMI Parameters

<Type>	Description
<mode>	3 Forward unsolicited result codes directly to the TE. TA-TE link specific in-band technique used to embed result codes and data when the TA is in the online data mode.
<mt>	0 No SMS-DELIVER indications are routed to the TE. 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 enabled).
<bm>	0 No CBM indications are routed to the TE.
<ds>	0 No SMS-STATUS-REPORTs are routed to the TE. 1 SMS-STATUS-REPORTs are routed to the TE using unsolicited result code: +CDS: <length><CR><LF><pdu> (PDU mode enabled).

Table 54. +CNMI Parameters (Continued)

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

2.3.2.48 Preferred Message Storage +CPMS

The Set command selects the memory storages <mem1>, <mem2> and <mem3> to be used for reading, writing, and so on. If the chosen storage is not appropriate for the iO270 (but is supported by the TE adaptor), final result code +CMS ERROR: <err> is returned. See the chapter, Message Service Failure Result Code, in ref [6], for <err> values.

Command	Possible Response(s)
+CPMS=<mem1>[, <mem2>[,<mem3>]]	+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> or: +CMS ERROR: <err>
+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> or: +CMS ERROR: <err>
+CPMS=?	+CPMS: (list of supported <mem1>s), (list of supported <mem2>s), (list of supported <mem3>s)

2.3.2.49 Service Center Address +CSCA

The Set command updates the SMSC address through which mobile-originated SMs are transmitted.

In PDU mode, the setting is used by the same commands, but only when the length of the SMSC address coded into the <pdu> parameter equals zero.

Command	Possible Response(s)
+CSCA=<sca>[,<tosca>]	
+CSCA?	+CSCA: <sca>,<tosca>
+CSCA=?	

2.3.2.50 Select Message Service +CSMS

The Set command selects the messaging service <service>. It returns the types of messages supported by the iO270: <mt> for mobile-terminated messages, <mo> for mobile-originated messages and <bm> for broadcast-type messages. If the selected service is not supported by the iO270 (but is supported by the TE adaptor), final result code +CMS ERROR: <err> is returned. See the chapter, Message Service Failure Result Code, in ref [6], for <err> values.

Command	Possible Response(s)
+CSMS=<service>	+CSMS: <mt>,<mo>,<bm> or: +CMS ERROR: <err>
+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm>
+CSMS=?	+CSMS: (list of supported <service>s)

The following table shows the +CSMS parameters.

Table 55. +CSMS Parameters

<Type>	Description
<service>	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; Phase 2+ features that do not require new command syntax may be supported (for example, correct routing of messages with new Phase 2+ data coding schemes))
<mt>	Mobile-terminated messages: 0 Type not supported 1 Type supported
<mo>	Mobile-originated messages: 0 Type not supported 1 Type supported
<bm>	Broadcast-type messages: 0 Type not supported 1 Type supported

2.3.2.50.1 Short Message Service (SMS) Addendum

This section describes the iO270 exceptions to the GSM specifications for short message service.

2.3.2.50.1.1 Type of Number Field

The following is a modification to GSM03.40 (version 3.5.0) section 9.1.2.4, Address fields.

One or more types of number field values must be reserved for iO270-specific address types. This exception applies at both the SM-RL and SM-TL layers. Not all the defined type of number fields specified here are valid for iO270.

The iO270 accepts the following values for SC-originated short messages:

- Bits 6-4 equals 000 indicates unknown
- Bits 6-4 equals 000 indicates international number
- Bits 6-4 equals 000 indicates national number

The iO270 does not accept any other values for this field from the SC. This restriction applies to the type of number fields formatted by the MSC for SMS DTAP messages as well.

A new type of number field is reserved for iO270 - meaning fleet extension. The value of this field is bits 6-4 equals 110. The SC is restricted from using this value.

2.3.2.50.1.2 Numbering Plan - Identification Field

The following is a modification to GSM03.40 (version 3.5.0) section 9.1.2.4, Address fields.

The numbering plan identification field specified below is not valid for the iO270-specific address types.

The iO270 accepts the following values for SC-originated short messages:

- Bits 3-0 equals 0000 indicates unknown
- Bits 3-0 equals 0001 indicates telephony numbering plan

The iO270 does not accept any other values for this field from the SC. This restriction applies to the type of number fields formatted by the MSC for SMS DTAP messages as well.

The iO270 uses value 'private' (Bits 3-0 equals 1001) for dispatch-originated short messages.

2.3.2.50.1.3 Protocol Identifier Field

The following is a modification to GSM03.40 (version 3.5.0) section 9.2.6.7, Protocol Identifier.

One or more protocol identifier field values must be reserved for iO270-specific protocols. Not all the defined protocol identifier field values specified here are valid for the iO270.

The iO270 accepts value 'default' (bits 4-0 equals 11111) for SC-originated short messages. The iO270 does not accept any other values for this field from the SC.

A new set of protocol identifier fields are reserved for the iO270. Bits 7 and 6 are set to 1's, and bit 5 is set to 0. This reserves 16 values for the iO270.

The following values are defined:

- Bits 4-0 equals 0000 indicates Message Alert
- Bits 4-0 equals 0001 indicates Network Management

The remaining values are reserved for future use. The SC is restricted from using any of the values defined here.

2.3.2.50.1.4 Data Coding Scheme Field

The following is a modification to GSM03.40 (version 3.5.0) section 9.2.6.8, Data Coding Scheme.

One or more data coding scheme field values must be reserved for iO270-specific coding schemes. Only these reserved data coding scheme field values are valid for the iO270. The SMS-SC must support the iO270-specific coding schemes.

The iO270 does not accept the value of 0 defined here, indicating the alphabet defined in Annex 2 of GSM 3.40.

The iO270 accepts the following values for both dispatch and SMS:

- Value equals 247 indicates 8-bit ASCII characters
- Value equals 248 indicates unpacked 8-bit data, meaning implicit from the protocol identifier

The iO270 does not accept any other values from the SC.

2.3.2.50.1.5 Sending/Receiving an SMS - Example

Preconditions:

- The iO270 must be registered with SMS capabilities in the network
- The user must know how to use SMS PDU format (see interface for Short Message Service (SMS), GSM 07.05)

In the example below, the following values are used:

- Phone number 795227021766 (in the opposite order), represents phone number 972572207166 of the target Radio.
- Service Center Address 7952979899F9 (in the opposite order, and "F" for empty space), represents phone number 97257989999.
- Length of data (05), represents the number of the characters that are sent in the message

Sending an SMS

```
AT+CNMI=3,2,0,1,0           // New message indicator
OK

AT+CSCA=<service center address> // Set service center address
OK

AT+CMGS=14+<length of sent data> // In this example the length of data is 5
                                // (AT+CMGS=19)
07917952979899F911000c9179522702176600f8000548656c6c6f (CTRL Z)
```

Receiving the above SMS

```
+CMT: ,24
07917952979899F9040C917952270217660015501031412253080548656C6C6F
AT+CMGR=<index>           // <index> represents the location value from the SIM.
OK                         You can use this command only if you have at least
                           1 SMS stored in the SIM.
```

2.3.2.51 Facility Lock +CLCK

This command locks and unlocks the SIM card. A password is mandatory for performing locking and unlocking actions, but not for querying.

The Set command performs the specified <mode> action on the specified <fac>.

Command	Possible Response(s)
AT+CLCK=<fac>,<mode>,<"passwd">	When <mode>=2 and command successful: +CLCK:<mode> or: +CME ERROR: <err>
AT+CLCK=?	+CLCK: (<fac>)

The following table shows the +CLCK parameters.

Table 56. +CLCK Parameters

<Type>	Description
<fac>	"SC" SIM (Lock SIM card) (SIM asks for the password during the iO270 power-up, and when this lock command issued.)
<mode>	0 Unlock 1 Lock 2 Query status (<passwd> does not apply.)
<passwd>	String type, 4-8 character password

Examples

```
AT+CLCK=?
+CLCK: ("SC")
OK
AT+CLCK="SC",2
+CLCK: 0
OK
```

```
AT+CLCK="SC",1,"correct password"
OK
```

//From now, SIM card is locked and PIN is requested on power-up.

```
AT+CLCK="SC",2
+CLCK: 1
OK
```

```
AT+CLCK="SC",0,"correct password"
OK
```

//From now, SIM card is unlocked and PIN is not requested on power-up.

2.3.2.52 PIN Verification and Change +CPIN

This command locks the SIM card, and is therefore only relevant if the SIM card is inserted. It unlocks the SIM card when the proper SIM PIN is provided, and unblocks the SIM card when the proper SIM PUK is provided. The SIM card is unlocked only once the provided PIN is verified as the SIM PIN. If the required PIN (determined by the error code returned by the requested operation or the Read command) is SIM PUK, the second PIN is required.

This second PIN, <newpin>, is used to replace the old PIN in the SIM card. When entering the PIN, a <new pin> is not required.



Note

If an incorrect password is entered three times, the SIM is blocked and the iO270 requires a master password to be entered. If the master password also fails three times, the SIM is permanently blocked, and can only be unblocked by your service provider.

The Set command sends the password, (SIM PIN or SIM PUK), which is necessary for the iO270 before it can be operated. If there is no PIN request pending, no action is taken towards the iO270, and an error message, +CME ERROR, is returned to the TE, as shown in Table 59.

The Set command issued gives the code (SIM PIN or SIM PUK) corresponding to the error code required or returned as the result of the Read command. For example, if the SIM PIN is blocked, the error code 11 or "SIM PIN required" is returned. The user must then issue the Set command with the SIM PIN.

The Query command returns an alphanumeric string indicating the status of the SIM card, and whether a password is required. This is an independent SIM card lock status check only, and does not check the phone lock status.

Command	Possible Response(s)
AT+CPIN=[<puk> or <pin>],[<newpin>]	+CME ERROR: <err>
AT+CPIN?	+CPIN: <code> or: +CME ERROR: <err>
AT+CPIN=?	+CPIN: ("SIM PIN"),("SIM NEW PIN") OK

The following table shows the SIM status codes.

Table 57. SIM Status <code>

<code>	Description
READY	iO270 is not pending any password.
SIM PIN	iO270 is waiting for the SIM PIN to be entered.
SIM PUK	iO270 is waiting for the SIM PUK to be entered.
SIM PIN2	iO270 is waiting for SIM PIN2 to be entered. This <code> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (meaning +CME ERROR: 16).
SIM PUK2	iO270 is waiting for SIM PUK2 to be entered. This <code> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (meaning +CME ERROR: 16). If PUK2 and new PIN2 are not entered correctly after the failure, it is recommended that the ME not block its operation).

The following table shows the +CPIN parameters.

Table 58. +CPIN Parameters

<Type>	Description
<puk>	PIN Unlocking Key. Entering the PIN incorrectly three times will block user access to handsets with a SIM card.
<pin>	Personal Identification Number
<newpin>	SIM new PIN (new password)

The following table shows the SIM Card +CME ERRORS.

Table 59. SIM Card +CME ERROR

Error	Description
10 SIM not inserted	SIM card is not inserted.
11 SIM PIN required	SIM card is waiting for SIM PIN to be entered.
12 SIM PUK required	SIM PIN is blocked.
13 SIM failure	SIM card is permanently blocked.
14 SIM busy	SIM is busy transferring data to the iO270.
16 Incorrect password	The given password is not valid.

Examples:

Locking the SIM:

```
AT+CPIN=?
CPIN: READY
OK
```

```
At+CLCK="SC",1,"<correct SIM PIN>" //Not case-sensitive
OK
```

The facility is enabled/disabled by the +CLCK command. (Refer to Section 2.3.2.51, “Facility Lock +CLCK”)
Power on the iO270

Unlocking the SIM:

```
AT+CPIN?
+CPIN: SIM PIN
OK
```

```
AT+CPIN="<correct PIN>"
OK
```

```
AT+CPIN?
+CPIN: READY
OK
```

The status of the SIM is still enabled, but the PIN is READY for this session.

The SIM is enabled per session. After power-up, the SIM must be unlocked again using the +CLCK command.

Disabling the SIM lock:

```
AT+CPIN?
+CPIN: SIM PIN
OK
```

AT+CPIN="<correct PIN>"
OK

At+CLCK="SC",0,"<correct SIM PIN>" //Not case-sensitive
OK

2.3.2.53 Change Password +CPWD

This command sets a new password for the facility lock. The password can be changed only once the required facility is enabled by the +CLCK command. (Refer to Section 2.3.2.51, “Facility Lock +CLCK”). A password can be changed only if the provided password <oldpwd> has been verified. The entered password <newpwd> must also comply to the password rules. The facility value <fac> is not case-sensitive. In the password value, letters are not allowed.

The Set command sets a new password for the facility lock function, defined by the +CLCK command. (Refer to Section 2.3.2.51, “Facility Lock +CLCK”).



Note

+CLCK mode has to be "Lock" in order to use the +CPWD Set command.

The Range command returns a list of pairs, which represent the available facilities, and the maximum length of their passwords.

Command	Possible Response(s)
AT+CPWD=<fac>,<oldpwd>,<newpwd>	+CME ERROR: <err>
AT+CPWD=?	+CPWD: list of supported (<fac>,<pwdlength>)s OK or: +CME ERROR: <err>

The following table shows the +CPDW parameters.

Table 60. +CPDW Parameters

<Type>	Description
<fac>	List of supported facilities. (The facilities are not case-sensitive.) SC SIM (Lock SIM card) The SIM requests the password during the iO270 power-up, and when this command is issued. P2 SIM PIN2 (Refer to “Section 2.3.2.51, “Facility Lock +CLCK”)
<oldpwd>	String type, 4-8 character current password.
<newpwd>	String type, 4-8 character new password specified by the user.

Examples:

Changing the Password:

```
at+cpwd=?  
+CPWD: ("SC",8),("P2",8)  
OK  
at+clck: "SC",1,"current pin password"  
at+cpwd="sc","incorrect old password","new password"  
+CME ERROR: "incorrect password"  
at+clck="sc",2  
+CLCK: 1  
OK  
at+cpwd="sc","old password","new password"  
OK
```

```
at+clck: "SC",0,"current pin password"  
at+clck="sc",2  
+CLCK: 0  
OK  
at+cpwd="sc","old password","new password"  
+CME ERROR: "incorrect password"
```

2.3.3 Dial Informative

All interconnect and dispatch services performed by the iO270 are executed by the ATD command. The type of service performed by the iO270 is based on the fax class (+FCLASS) and voice class (+WVCLASS). The interconnect and dispatch interleave used by the iO270 are either the iO270 stored value or the value specified in the interleave command (+WVINTER), sent before the Dial command. The meaning and possible formats of the dial string in the ATD is dependent on the selected fax class and voice class.

2.3.3.1 Interconnect

This service executes the normal interconnect voice call. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS = 8
- Either AT+WVCLASS = 0 (for line 1) or AT+WVCLASS=7 (for line 2)

The following table shows the parameters and formats that the iO270 accepts for the Dial command.

Table 61. Dial Command Parameters and Formats

<Type>	Description
<Number to dial>	V.25ter dialing digits: 0-9, *, #, +
	V.25ter modifier characters: “,” Implementation in GSM ignored. (However, the iDEN pauses for the duration specified in the S8 register, before continuing.) T, P, “!” Ignored in GSM and iDEN. W Implementation optional and ignored in GSM. (However, the iDEN waits for the duration specified in S7 for dial tone, before continuing the execution dial string.) @ Implementation optional and ignored in GSM. (However, the iDEN waits for the duration specified in S7 for one or more rings, followed by 5 seconds of silence, before continuing the execution of the dial string.) “,” , Return to command mode after dialing.

2.3.3.2 Interconnect Emergency Call

This initiates a Type-1 emergency call. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS=8
- AT+WVCLASS = 5.

The Dial command has no number or parameters.

2.3.3.3 Dispatch - Private Call

This makes a private call to the indicated number. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS=8
- AT+WVCLASS = 1

The number to dial must be in UFMI format (meaning, ATD123*456*789) with a maximum of 18 characters.

The following parameters and ranges are used for the Dial command:

<urban id>*<fleet id>*<member id>.

<Parameter>	Range
<urban id>	1-1048575
<fleet id>	1-1048575
<member id>	1-65535

2.3.3.4 Dispatch - Call Alert

This service sends a call alert to the indicated number. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS=8
- AT+WVCLASS

The number to dial must be in UFMI format (meaning ATD123*456*789) with a maximum of 18 characters.

The following parameters and range are used for the Dial command:

<urban id>*<fleet id>*<member id>

<Parameter>	Range
<urban id>	1-1048575
<fleet id>	1-1048575
<member id>	1-65535

2.3.3.5 Dispatch - Group Call

This service makes a group call on the current affiliated talkgroup mode. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS=8
- AT+WVCLASS=3

The number is the group ID with the range of 1-255.

Parameters: <type> [, <area>[, <talk id>]

<Parameter>	Range
<type>	Indicates the type of the requested group call: 0 GC_LOCAL 1 GC_WIDE 2 GC_SELECTED
<area>	Represents the targeted area. Only applicable if type is GC_SELECTED. Values are 1-99.
<talk id>	Represents the numerical tag that uniquely identifies a talkgroup. Values are 1-255.

2.3.3.6 Dispatch - Group Affiliation

This service affiliates to a talkgroup mode of the indicated number. Before executing the Dial command, the following commands must be sent:

- AT+FCLASS=8
- AT+WVCLASS=4

The number is the group ID. The group ID is in the range of 1-255.

2.3.3.7 Dispatch - Silent State

All dispatch calls except call alerts, enter a silent state for a system-specific time interval whenever no user has talk access. During this time, any user in the call may become the talker. To become the talker, the TE sends the ATD command with no parameters or number.

2.3.3.8 List Voice Calls

The <type> and <number> parameters contained in the response for +WVCLCC command denote the type of service, and the number of the target party, respectively. The iDEN iO270 supports multiple types of services. The following table lists the different services supported by the iO270, and their corresponding <type> and <number> formats.

Table 62. Services Supported by the iO270

	Mode	<type>	<number>
1	Interconnect	128 Unknown	<digits> (Max. Digits = 64)
2	Interconnect	145 International number	<digits> (Max. Digits = 64)
3	Private call	128 Unknown	<urban digit(s)>*<fleet digit(s)>*<member digit(s)> (as defined in Section 2.3.3.3, "Dispatch - Private Call")
4	Call alert	128 Unknown	<urban digit(s)>*<fleet digit(s)>*<member digit(s)>#<status> (as defined in Section 2.3.3.4, "Dispatch - Call Alert")
5	Group call	128 Unknown	Type digit#Area digit(s)#Talk ID digit(s) (as defined in Section 2.3.3.5, "Dispatch - Group Call")
6	Group affiliation	128 Unknown	Mode Index digit(s) (as defined in Section 2.3.3.6, "Dispatch - Group Affiliation")

This section provides examples of possible response scenarios for the AT+WVCLCC command. The <type> and <number> fields in each response are italicized.

2.3.3.8.1 Interconnect Calls

Refer to service 2 in Table 62, "Services Supported by the iO270", for the format of the <type> and <number> fields.

Examples

+WVCLCC: 1, 0, 0, 0, 0, "<nbr>", <type> //Mobile-originated Normal Interconnect Call on Line 1 to 9547236902 in Active State

+WVCLCC: 1, 0, 0, 9, 0, "<nbr>", <type> //Mobile-originated Circuit Data Call to 9548581564

2.3.3.8.2 Private Calls

Refer to service 3 in Table 62, “Services Supported by the iO270” for the format of the <type> and <number> fields.

+WVCLCC: 1, 0, 8, 1, 0, “<nbr>”, <type> //Mobile-originated Private Call in silent state to UFMI 158*122*24

2.3.3.8.3 Group calls

Refer to service 5 in Table 62, “Services Supported by the iO270”, for the format of the <type> and <number> fields.

+WVCLCC: 1, 0, 8, 3, 0, “<nbr>”, <type> //Mobile-originated Selected Group Call to Area 5, Talkgroup 3

+WVCLCC: 1, 0, 8, 3, 0, “<nbr>”, <type> //Mobile-originated Local Group Call to Talkgroup 8

+WVCLCC: 1, 0, 8, 3, 0, “<nbr>”, <type> //Mobile-originated Wide Area Group Call to Talkgroup 7

2.3.3.8.4 Group Affiliation

Refer to service 6 in Table 62, “Services Supported by the iO270” for the format of the <type> and <number> fields.

+WVCLCC: 1, 0, 0, 4, 0, “<nbr>”, <type> //Mobile-originated Group Affiliation to Talkgroup 9

2.3.3.8.5 Interconnect Emergency Call

Same as Interconnect Calls (Table 2.3.3.8.1, “Interconnect Calls”)

+WVCLCC: 1, 0, 0, 5, 0, “<nbr>”, <type> //Type 1 Interconnect Emergency Call

2.3.3.9 Modes of Operation

This option enables the iO270 to be placed into various modes of operation. Each sub-mode can be entered from the normal mode only. Each sub-mode can return to normal mode only. The commands to return to normal mode are as follows:

Current Mode	Command to Return to Normal
Normal	AT+WVMODE=0
HW Test	Reset the iO270
Flashing Mode	Reset the iO270

2.3.3.10 Network Services

2.3.3.10.1 Subscriber Numbers

The iO270 MSISDNs can be retrieved using two AT commands, +CNUM and +WVNUM. The +CNUM command returns the numbers as defined in ref [4] sub clause 7.1. These numbers are contained within the +WVNUM command, which also includes other iDEN-specific numbers. The +CNUM command is implemented for backward-capability only.

2.3.3.10.2 Registration

The interconnect registration status of the iO270 can be retrieved using the GSM +CREG command, as defined in ref [4] sub clause 7.2. This information can be also retrieved using the +WVREG command, which also includes that status of additional iDEN services and functionality. The +CREG command is implemented for backward-capability only.

2.3.3.10.3 Operator Selector

The IDEN iO270 does not support manual operator selection. The iO270 can either register (AT+COPS=0) or de-register (AT+COPS=2).

2.3.3.11 Trace Mode Screen

The TE accesses the iO270 parameters as described in Section 2.3.2.9, “Trace Mode +WVTRACE”.

2.3.3.11.1 Unit Information

2.3.3.11.1.1 Phone Model

The Phone Model is an ASCII string, (meaning, “iO270 A”).

2.3.3.11.1.2 CP Version

The CP version is an ASCII string representing the codeplug structure, default version and the selected bandmap, in the format: “AA.BB/CC.DD”, where:

	Description
AA	Major codeplug revision
BB	Minor codeplug revision
CC	Major bandmap revision
DD	Minor bandmap revision

2.3.3.11.1.3 USR Version

The USR version is an ASCII string representing the modem USR version, in the format: “XXc.YY.ZZ”, where:

	Description
XX	Product identifier
c	Sub ID
YY	Carrier ID
ZZ	USR file version number

2.3.3.11.1.4 CSD Version

The CSD version is an ASCII string representing the modem CSD version, in the format: “XX.YY.ZZ”, where:

	Description
XX	Bandmap version
YY	Structure version
ZZ	Data version

2.3.3.11.1.5 Software Version

The software version is an ASCII string representing the modem software version, in the format: “cXX.YY.ZZ”, where:

	Description
c	Load type, for example: D Development R Release A Alpha B Beta
XX	Product identifier
YY	Major revision
ZZ	Minor revision

2.3.3.11.1.6 Software Type

The software type is an ASCII string, (meaning “MS-PDGY-BER-LTL_PINEKEY-R8”).

2.3.3.11.1.7 Software Build Date

The software build date is an ASCII string in the format: “dw M D HH:MM:SS tz YYYY”, where:

	Description
dw	Day of the week (for example, Mon, Tue, and so on)
M	Month (for example, Apr, May, and so on)
D	Day of the month (1-31)
HH	Hours (0-23)
MM	Minutes (0-59)
SS	Seconds (0-59)
tz	Time zone (for example, EST)
YYYY	Year (for example, 2004)

2.3.3.11.2 Total Usage

The total sum of minutes used for dispatch, interconnect and circuit data calls on an iDEN network. This is an integer value.

2.3.3.11.3 System Status

The system status is a snapshot of the modem system status information. The format is defined as “SQE:<sqe> BS:<band specifier> CAR:<carrier> OB:<ob signal> POW:<tx/rx pwr> TA:<time adv> TEMP:<amp temp> SL:<amp slope> LVL:<amp lvl> NUM_CHANS:<number of channels>”, where:

Table 63. System Status

<Type>	Description
<sqe>	Single-digit precision value format XX.Y
<band specifier>	2-digit hexadecimal XX (0xFF indicates no valid band specifier available)
<carrier>	Carrier information in format XXX-YZ, where: XXX Carrier number (a 3-digit hexadecimal value, except when the iO270 is in scan back off, the value is 4-digits, FFFF) Y Color code Z Extended color code
<ob signal>	Outbound signal quality, in the format –XX
<txrx pwr>	Tx/Rx power, in integer format +/-XXX
<time adv>	Timer advance, represented as a integer

Table 63. System Status (Continued)

<Type>	Description
<amp temp>	Amplifier temperature, in integer format +/-XX
<amp slope>	Amplifier temperature slope, in integer format +/-X
<amp lvl>	Amplifier cutback level, in integer format X
<number of channels>	The number of channels being used to transmit, for WiDEN-capable phones, in integer format X

The cutback algorithm is an internal temperature regulation mechanism of the RF-PA.

The cutback level is set according to the temperature of the modem working environment and the temperature gradient.

The <amp_lvl> could be changed in the range of 0-4 as shown in the following table:

Level	The modem reduces the transmission rate by (from 100%):
1	16%
2	33%
3	50%
4	Transmission is stopped.

2.3.3.11.4 N6:1 Interconnect

This indicates the ability of the radio and network to support the New 6:1 interconnect feature. The format is “MS X FNE Y I- <interleave> O-<offset> S-<subslot> ECC-<color code> PO-<pcch>”, where:

	Description
	MS X FNE Y = X,Y are either: 0 Not supported 1 Supported
<interleave>	Channel interleave, in integer format XX
<offset>	Channel offset, in integer format XX
<subslot>	Subslot, either A, B, N
<color code>	Extended color code, in integer format XX
<pcch>	Primary control channel in integer format XX

2.3.3.11.5 GPS

2.3.3.11.5.1 Location

Indicates the last saved GPS location in the format “SAT:<sats> cLAT:<cell latitude> cLON:<cell longitude> LAT:<latitude> LON:<longitude> ALT:<altitude> hACC:<horiz acc> vACC:<vert acc>”, where:

<Type>	Description
<sats>	Number of satellites in 1- or 2-digit integer format XX
<cell latitude>	Latitude of the serving cell, in the format A BBB.CCCCC, where: <A> N or S <BBB> Degree of latitude <CCCCC> 5 precision digits
<cell longitude>	Longitude of the serving cell, in the format A BBB.CCCCCm, where: <A> E or W <BBB> Degree of longitude <CCCCC> 5 precision digits
<latitude>	Latitude of the radio, in the format A BBB.CCCCC, where: <A> N or S <BBB> Degree of latitude (up to 3 digits, no leading zeros) <CCCCC> 5 precision digits
<longitude>	Longitude of the radio, in the format A BBB.CCCCC, where: <A> E or W <BBB> Degree of longitude (up to 3 digits, no leading zero's) <CCCCC> 5 precision digits

<Type>	Description
<altitude>	Radio altitude, in format X meters
<horiz acc>	Horizontal accuracy, in format X.Y meters (-.- if unavailable)
<vert acc>	Vertical accuracy, in format X.Y meters (-.- if unavailable)

2.3.3.11.5.2 Time Information

Indicates the time in the following format: “E:<epoch> Eh:<epoch half> Tz:<time zone> DST:<dst> LS:<leap sec> F:<frame> S:<slot> ACC:<accuracy> GW:<gps week> GTOW:<gtow>”, where:

	Description
<epoch>	Epoch number, in integer format XXXX
<epoch half>	Epoch ½ X, where X = 0 or 1
<time zone>	Time zone, in format +/-X.YY: <X> Hours relative to GMT <YY> Minutes relative to GMT
<dst>	Daylight savings time X, where X = 0 or 1
<leap sec>	Leap seconds, in format XX, representing the number of seconds difference between UTC and GPS time
<frame>	Current iDEN frame number, in integer format XXX
<slot>	Current iDEN slot number, in integer format XXXX
<accuracy>	Time accuracy in format XXX.YYYYYY: <XXX> Microseconds <YYYYYY> Partial microseconds, to 5 precision digits
<gps week>	Current GPS week, in integer format XXXX
<gtow>	GPS time of the week, in format XXXXXX.YYYYYY, where: <XXXXXX> Seconds <YYYYYY> Number of partial seconds, to 6 precision digits

2.3.3.11.5.3 Assist

This indicates the GPS assist information in the following format: “<valid> LAT:<latitude> LON:<longitude> hACC:<horiz accuracy>” where:

	Description
<valid>	0 or 1 (if not valid LAT, LON, and hACC are omitted)
<latitude>	Latitude of the radio, in format A BBB.CCCCC, where: <A> N or S <BBB> Degree of latitude (up to 3 digits, no leading zeros) <CCCCC> 5 precision digits
<longitude>	Longitude of the Radio in format A BBB.CCCCC where: <A> E or W <BBB> Degree of longitude <CCCCC> 5 digits of longitude (up to 3 digits, no leading zeros)
<horiz acc>	Horizontal accuracy, in format X.Y meters (-.- if unavailable)

2.3.3.11.5.4 Navigation

This indicates modem-navigation information in the format: “H:<heading> V:<velocity> VE:<velocity error>”, where:

	Description
<heading>	Heading, in integer format XXX degrees
<velocity>	Velocity, in integer format X kilometers per hour
<velocity error>	Velocity error, in integer format X kilometers per hour (“-” if unavailable)

2.3.3.11.5.5 Summary

This indicates a summary of the GPS information in the modem in the format: “<time> <date> LAT:<latitude> LON:<longitude> ACC:<accuracy>”, where:

<Type>	Description
<time>	Time of day, in 24-hour format HH:MM (--:-- if data unavailable)
<date>	Date, in format MM/DD (--/-- if data unavailable)

<Type>	Description
<latitude>	Latitude of the radio, in format A BBB.CCC where: <A> N or S <BBB> Degree of latitude (up to 3 digits, no leading zeros) <CCC> 3 precision digits
<longitude>	Longitude of the radio, in format A BBB.CCC, where: <A> E or W <BBB> Degree of longitude (up to 3 digits, no leading zeros) <CCC> 3 digits of longitude
<accuracy>	Accuracy, in format X.Y meters (-.- if unavailable)

2.3.3.11.5.6 GPS Version

The software version is an ASCII string, representing the SiRF software version.

2.3.3.11.6 IMEI

The IMEI of the iO270 is in the format “IMEI: XXXXXXXXXXXXXXXX”.

2.3.3.11.7 SIM ID

The SIM ID is in the format “SIMID: XXXXXXXXXXXXXXXX”. If the SIM ID cannot be retrieved, a CME ERROR: <err> is returned.

2.3.3.11.8 Registration Log

The registration log of the various services of the iDEN modem is returned. Each entry can be accessed individually, or via a shortcut command. The formats are:

- Dispatch is “DIS: <service> <status> <code>”
- Interconnect is “IC: <service> <status> <code>”
- Packet Data is “PD: <service> <status> <code>”
- Mobile IP is “MIP: <service> <status> <code>”
- Phone Restricted is “PHR: <service> <status> <code>”

Where:

	Description
<service>	“NS” or “IS”
<status>	0 No info available 1 Accept 2 Reject 3 Accept widen
<code>	Numeric code Omitted if Y=0 (no info available)

2.3.3.11.9 Err/Channel Codes

Enables modem updates of the channel information. When trace is enabled, the modem does not send channel information according to the duration rate, but instead sends updates whenever the connected channel type changes. The format is an ASCII string representing the channel status.

2.3.3.11.10 Current Frequency

Represents the current frequency and band to which the modem is connected, in the format “<freq> <band>”, where:

	Description
<freq>	Channel frequency, in integer format XXXXXXXXXX (Hz)
<band>	Frequency band, in format YY

2.3.3.11.11 Dispatch IDs

Represents the current Dispatch and Individual ID currently in use in the iO270, in the format “DIS: <id> IND:<id>”, where <id> is a 6-digit hexadecimal number.

2.3.3.11.12 Band Information

Represents the primary and secondary bands in use in the iO270, in the format “PRI: <band> SEC:<band>”, where <band> is a 2-digit integer number.

2.3.3.11.13 Bandmap

Represents the bandmap information being used by the modem, in the format “<band> <version> <carrier>”, where:

	Description
<band>	A 2-digit integer
<version>	Version, in hexadecimal format 0xYY
<carrier>	ASCII string, representing the carrier name

2.3.3.11.14 Hardware

Represents hardware parameters being used by the modem, in the format “AFC Off:<value> Chan Num:<value>”, where <value> is a hexadecimal number.

2.3.3.11.15 Fatal Error/#

Represents any fatal errors logged in the modem, in the format “<error> <count>”, where:

	Description
<error>	Six-digit hexadecimal number, as XXXXXX. If no fatal errors exist in the modem, the <error> is all 0s. The TE can clear the fatal error log.
<count>	2-digit count of the errors, as YY. If no fatal errors exist in the modem, <count> is all 0s. The TE can clear the fatal error log.

2.3.3.11.16 Error Log/ Reset Log Count

Represents the number of errors or resets in the modem, in the format “<number>”, where <number> is an integer value.

2.3.3.11.17 Error Log

Represents the errors logged in the modem, in the format “E0:<error>[E1:<error>[...]]”, where <error> is an 8-digit hexadecimal value. If no errors exist, 0 is returned instead. The TE can clear the error log.

2.3.3.11.18 Reset Log

Represents the resets logged in the modem, in the format “R0:<reset> <date> <id> &<addr> T<info>[R1:<reset><date> <id> &<addr> T<info> [...]]”, where:

	Description
<reset>	4-digit hexadecimal number, XXXX
<date>	Month and day, in format MM/DD
<id>	An ASCII character
<addr>	8-digit hexadecimal number
<info>	8-digit hexadecimal number. If no resets exist, “0” is returned instead. The TE can clear the reset log.

2.3.3.11.19 Coin Cell

Represents the current charger and coin cell battery voltages controlled by the modem, in the format “<charger> <coin>”, where:

	Description
<charger>	Charger voltage, in the format X.Y (volts)
<coin>	Coin cell voltage, in the format X.Y (volts)

2.3.3.11.20 CE Status

Represents the status of the Circulator Eliminator (CE), in the format CA:<m.mm> <n.nn> HC:<pp> <qq> FA:<ww> <xx> TR:<y.yy> <z.zz>, where:

	Description
<m.mm>	Represents the running average of the CEL ATTEN (CA) values between each CE TRACE update.
<n.nn>	Represents the lowest value of the average CEL ATTEN (CA) since the CE TRACE was initiated.
<pp>	Represents the total number of hard clips between each CE TRACE update.
<qq>	Represents the maximum number of hard clips (HC) in each TRACE update since the CE TRACE was initiated.

	Description
<ww>	Represents the total number of Fast Attacks (FA) between each CE TRACE update.
<xx>	Represents the maximum number of Fast Attacks (FA) in each TRACE update since the CE TRACE was initiated.
<y.yy>	Represents the minimum amplitude training result between each CE TRACE update.
<z.zz>	Represents the lowest value of the minimum amplitude training result (TR) since the CE TRACE was initiated.

**Note**

This is a special debugging feature, which may be disabled in the modem.

2.3.3.11.21 WiDEN

Represents the WiDEN trace mode data, in the format "<LAPi data> <Backoff Timer> <Comm Backoff data>", where:

	Description
<LAPi data>	LAPi: MS<capable flag> FNE<allowed flag> <XX>dB <YY>Q <ZZZ>kHz".
<capable flag>	0 (disabled) or 1(capable).
<allowed flag>	0 (disallowed) or 1 (allowed).
<XX>	2 digit number (valid: 00-30, invalid: -1) representing Tx Shortage.
<YY>	2 digit number (valid:04, 16, or 64, invalid: -1) representing inbound forward error correction quality.
<ZZZ>	3 digit number (valid: 025, 050, 075 or 100, invalid: -1) representing inbound bandwidth quality.
<Backoff Timer>	BACKOFF TIMER: <elapsed time> of <total time>".
<elapsed time>	Actual time spent in backoff, formatted as HH:MM:SS.
<total time>	Estimated total time the radio will be in backoff, formatted as HH:MM:SS.

	Description
<Cumm Backoff data>	CUMM BACKOFF: < cumulative time> <occurrences>".
< cumulative time>	Cumulative actual time spent in backoff, formatted as HH:MM:SS.
<occurrences>	2 digit number representing the number of times the radio has been told to enter backoff mode.

**Note**

The AP can clear WiDEN data, and will have the effect of resetting the values of <Cumm Backoff data> to zero..

2.3.3.11.22 N 6:1 Dispatch

This indicates the ability of the radio and network to support the New 6:1 dispatch feature, in the format "MS X FNE Y I-<interleave> O-<offset> ECC-<color_code> PO-<pcch>".

	Description
MS X FNE Y	X, Y are either 0 (not supported) or 1(supported).
<interleave>	Channel interleave in integer format XX with leading zeros (i.e. 03 or 06).
<offset>	Channel Offset in integer format XX with leading zeros.
<color code>	Extended Color Code in integer format XX with leading zeros.
<pcch>	PCCH in integer format XX with leading zeros.

2.3.3.11.23 Hardware ID

Represents the BP Hardware ID gathered from the global byte HW_ID.

The applied Hardware ID scheme allows to the software to make a positive identification of the hardware platform on which it is operating.

2.4 EXTENDED ERROR RESULT CODE DEFINITIONS

The following table shows the extended error result code definitions.

Table 64. Extended Error Result Code Definitions

Source	Cause	Description
0x01	0x01	No further information available.
0x01	0x03	Command issued during improper state (Command/On-line).
0x01	0x04	Connection aborted by DTE.
0x01	0x05	Command operator not legal for this command (syntax error).
0x01	0x06	Connection aborted due to connection timer timeout.
0x01	0x07	Parameters were of an invalid format or out of range.
0x01	0x0A	Service class not valid.
0x01	0x0B	DTE-side stack not valid for current WDS-side stack.
0x01	0x0C	Invalid DTE-IP address specified (+WPNEI).
0x01	0x0D	Invalid Home Agent Address specified (+WV305).
0x01	0x0E	Invalid MIP Security parameter index specified (+WV309).
0x01	0x0F	DCE IP address matched HA IP address (+WV304,+WV305).
0x01	0x10	The DTE tried to lock or unlock the DCE using an incorrect PIN.
0x01	0x11	Power-up Test Mobile mode failed entry conditions.
0x01	0x12	Power-up Test Mobile mode entered.
0x01	0x13	WDS stack not compatible with command.
0x01	0x14	The DCE terminated a connection due to DTR status.
0x01	0x15	Terminated a connection due to a conflict with a new session.
0x01	0x16	Problem writing to the codeplug.
0x01	0x17	The PIN entered was of an invalid format.
0x01	0x18	The DCE terminated a session at the DTE's request (ATH).
0x01	0x19	SIM PIN is required.

Table 64. Extended Error Result Code Definitions (Continued)

Source	Cause	Description
0x01	0x20	SIM PUK is required.
0x01	0x21	SIM PUK is blocked.
0x01	0x22	SIM failure.
0x01	0x23	SIM is not inserted or controlled.
0x01	0x24	SIM is busy.
0x01	0x25	Memory full.
0x02	0x07	Requested level of encryption not allowed
0x02	0x21	Service not provisioned
0x02	0x64	Packet Data Registration Error. Contact your Service Provider.
0x04	0x01	SLIP/PPP failed to respond
0x04	0x02	SLIP/PPP failed to configure connection
0x04	0x03	SLIP/PPP link termination
0x05	0x00	No information available
0x05	0x0A	Unspecified Transmit Phase A error
0x05	0x14	Unspecified Transmit Phase B error
0x05	0x28	Unspecified Transmit Phase C error
0x05	0x32	Unspecified Transmit Phase D error
0x05	0x46	Unspecified Receive Phase B error
0x05	0x50	Unspecified Receive Phase C error
0x05	0x5A	Unspecified Receive Phase D error

Table 64. Extended Error Result Code Definitions (Continued)

Source	Cause	Description
0x06	0x38	Service not registered
0x06	0x39	Bearer Capability not authorized
0x06	0x3F	Service or option not available
0x06	0x40	Conflicting services
0x06	0x41	Bearer Service not Implemented
0x06	0x42	Channel Type not Implemented
0x06	0x48	Service or option not implemented
0x06	0x58	Incompatible destination
0x06	0x66	Network timer timeout
0x06	0x81	Network not reachable
0x8X	0xXX	System or signalling error

2.5 CONNECTION CODES

The following table shows the connection codes.

Table 65. Connection Codes

Verbose	Non-Verbose	Description
OK	0	Acknowledges execution of the command
CONNECT	1	A connection has been established
RING	2	Incoming call signal from the network
NO CARRIER	3	The connection has been terminated, or the attempt to establish a connection has failed
ERROR	4	DCE encountered a problem processing the command line
NO DIALTONE	6	Service unavailable, or not provisioned by network
BUSY	7	DCE or network resources not available for connection
NO ANSWER	8	Connection time-out during establishment
+WVRLA:	17	GPS response
CONNECT TPERMIT	20	Dispatch call connected - DTE given talk permission
CONNECT TINHIBIT	21	Dispatch call connected - DTE needs to disable microphone
CONNECT LPERMIT	22	Dispatch call connected - DTE given listen permission
CONNECT LINHIBIT	23	Dispatch call connected - DTE needs to disable transducer
DISPATCH BUSY	24	Network resources not available for connection

3.1 HOST WAKEUP

This figure illustrates the host wakeup physical mechanism.

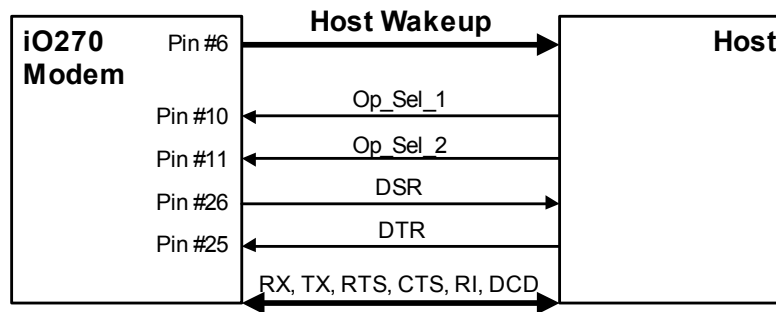


Figure 1. Host Wakeup

The Host Wakeup +WVWAKE commands set for the iO270 OEM module is described in Section 2.3.2.42, “Host Wakeup +WVWAKE”.

The iO270 enables you to wake up a terminal that enters Sleep mode.

The iO270-terminal wake-up mechanism is activated/deactivated by asserting/de-asserting Host_wakeup pin6.

If the iO270 receives the +WVWAKE command to activate a Host wake-up (when the first parameter is set to 1, it is activated; the second parameter represents a timer value), the iO270 asserts the Host_wakeup (pin6).

When the iO270 has data to transmit to the TE, it de-asserts the Host_wakeup (pin6), waits for the timer delay to expire (defined by the second parameter) and sends the data to the TE.

The different transmitting tasks TX and TXB (UART A and UART B) are synchronized so that they wait only for the interval specified by the +WVWAKE delay parameter, and not more (meaning, if one task already started to wait for the specified time, and then another task has data to transmit, the second task will wait only for the remaining time left).

If the host wakeup feature is activated and the terminal awakens by it self, it is suggested that the terminal send the +WVWAKE command with the first parameter as 0 (disabled), in order to avoid the delay timer that was set when the TE activated the host wake up. In this case, the modem will de-assert the Host_wakeup (pin6), and without waiting for any delay to expire, will send the data to the terminal.

The default state of the Host_wakeup (pin 6) is de-asserted, meaning that the Host Wake-up mechanism is not activated.

Below are the steps for using the host wake- up feature:

- The TE should set the value for activating the wake-up feature and for the delay (in ms) using the +WVWAKE command.
- The iO270 asserts the Host_wakeup (pin 6).
- When the iO270 has data to send to the TE, it de-asserts the Host_wakeup (pin6), waits for the delay time to expire, and sends the data.

3.2 DEEP SLEEP MODE

The following figure illustrates the DSM physical mechanism.

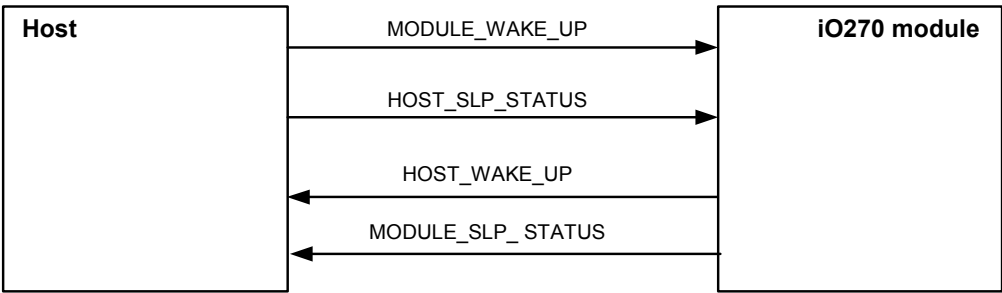


Figure 2. DSM Physical Mechanism

The DSM feature will be supported while the integrator is working with UART A only or working with UART A and UART B. The iO270 will go into DSM when it has no data to send and no data received from both UARTs. This state is identified as the state when HOST_SLP_STATUS and MODULE_SLP_STATUS lines are high. Furthermore the option select has to be in DATA cable mode.

In case that HOST is sleeping and the iO270 has data to send from UART A or UART B or from both UARTs, the iO270 will deassert MODULE_SLP_STATUS line and will generate an interrupt to the HOST with HOST_WAKE_UP line.

In case that the iO270 is sleeping and the HOST has data to send from UART A or UART B or from both UARTs, the HOST will deassert HOST_SLP_STATUS line and will generate an interrupt to the iO270 with MODOULE_WAKE_UP line.

If the HOST had generated an interrupt via MODULE_WAKE_UP line, it will wait to an ACK from the iO270 for 20μsec in the form of deasserting the HOST_WAKE_UP line.

If the iO270 had generated an interrupt via HOST_WAKE_UP line, it will wait to an ACK from the HOST for 20μsec in the form of deasserting the MODULE_WAKE_UP line.

The DSM feature will not be supported via USB connection.

In case that the DSM feature and the Host Wakeup feature are active, the Host Wakeup feature will be ignored and the DSM will be the active feature.

3.3 EXTENDED ERROR CODES

Table 66 describes the iO270 extended error codes.

Table 66. Extended Error Codes

Error	Error Description
FLASHStrap <Flashstrap_version> <Flash_identity> <ROM_version> MEM_MAP Blank Service Req'd Ready to program	This error displays when there is no memory map (blank).

Table 66. Extended Error Codes (Continued)

Error	Error Description
FLASHStrap <Flashstrap_version> <Flash_identity> <ROM_version> CSD Blank Service Req'd Ready to program	This error displays when there is no CSD (blank).
FLASHStrap <Flashstrap_version> <Flash_identity> <ROM_version> ROM mismatch HW:ROM<ROM version> SW:ROM<SU ROM version> Ready to program	This error displays when there is a ROM mismatch between the SW and the HW.
FLASHStrap <Flashstrap_version> <Flash_identity> <ROM_version> SW Mismatch SW: p<SW version> Ready to program	This error displays when there is a SW mismatch, meaning the SW does not match.
FLASHStrap <Flashstrap_version> <Flash_identity> <ROM_version> Code Corrupt! Ready to program	This error displays when the SW is corrupted.

**Note**

Text inside <> is a field that is filled in with the proper data.

4.1 GENERAL

This chapter describes interfaces that can be used by the TE to the iO270 during any call type. The TE can use these interfaces whenever the iO270 is unlocked (prior to call or during call). However, responses may vary based on the current state of the radio.

4.2 LIST CURRENT VOICE CALLS

The TE can gather information about any active calls from the iO270. This mechanism is used to select the call identifier to be used for other in-call services, the direction of call, the state of the call, the bearer service of the call, and the called/calling number.

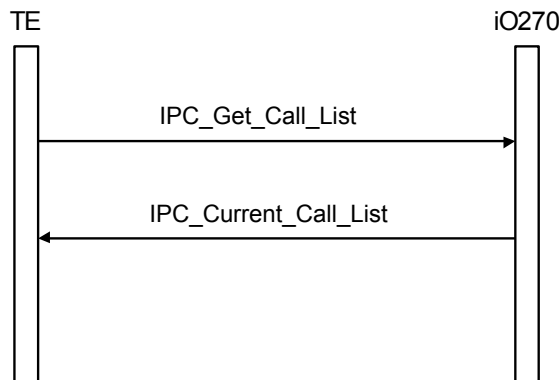


Figure 3. List Current Voice Calls

4.3 GET SUBSCRIBER NUMBERS

The TE can gather information about subscriber numbers used and stored in the iO270. These numbers are:

- Voice for lines 1 and 2
- Circuit Data
- Private ID
- Carrier IP
- Primary Talkgroup ID
- Secondary Talkgroup IDs (available in advanced feature models)
- Talkgroup Mode
- Group Affiliation

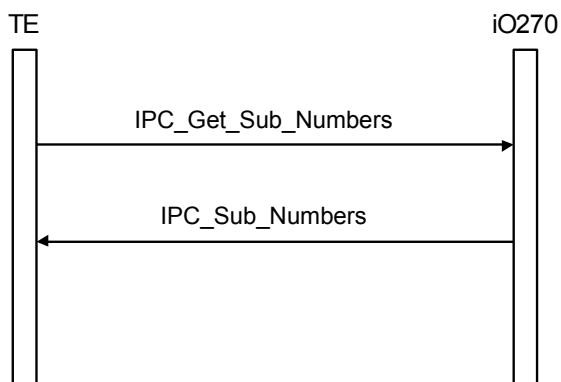


Figure 4. Get Subscriber Numbers

4.4 PHONE ACTIVITY STATUS

The TE can query the iO270 for its current activity status. This can be used to interrogate the iO270 before requesting action from it. The following diagram illustrates this interaction.

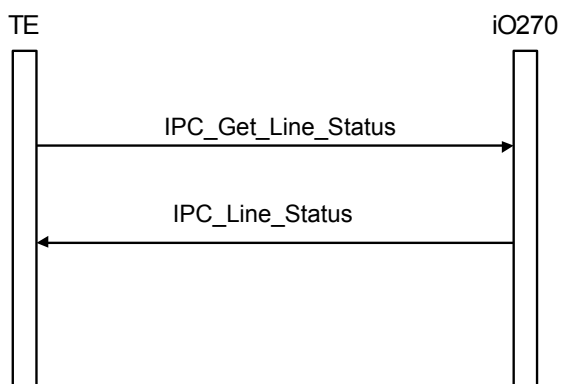


Figure 5. Phone Activity Status

4.5 GET USER IDENTITY

The TE can query the iO270 for its mobile identity (either IMSI or SIM ID). The following diagram illustrates this request.

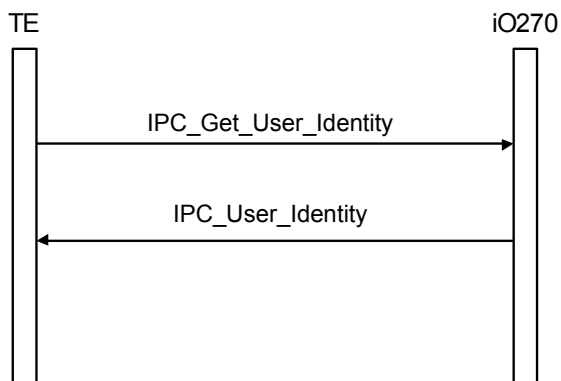


Figure 6. Get User Identity

4.6 SIM ACCESS

The TE can access the SIM for read/write/execute commands. The following diagram illustrates this access.

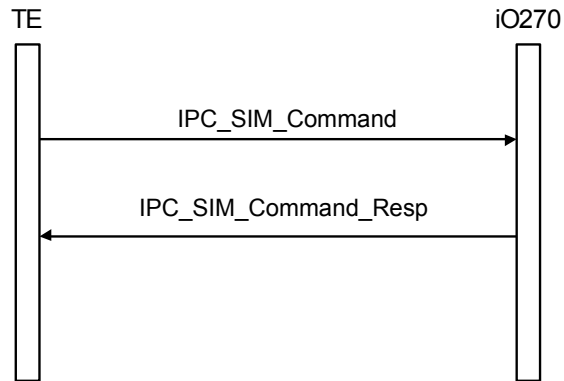


Figure 7. SIM Access

4.7 SIGNAL STRENGTH ACCESS

The TE can request from the iO270 the signal strength of the cell on which it is currently camped.

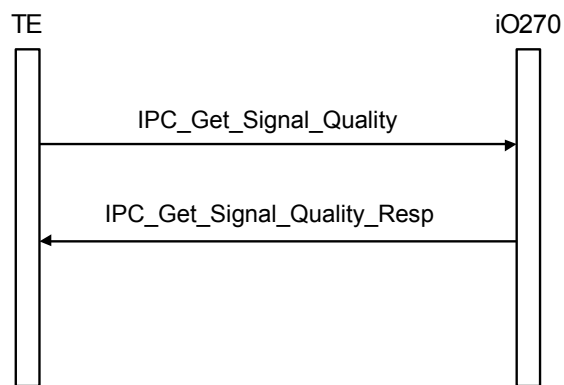


Figure 8. Signal Strength Request

4.8 CALL TIMERS

The TE can request the time durations of voice services performed by the iO270. Each service has a current cumulative time interval and a lifetime time interval. The TE can reset the cumulative value back to 0.

The following diagram illustrates querying one call timer value.

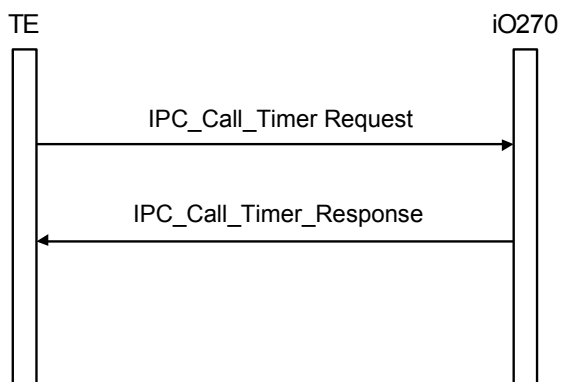


Figure 9. Call Timer Query

The following diagram illustrates the TE resetting a call timer value to 0.

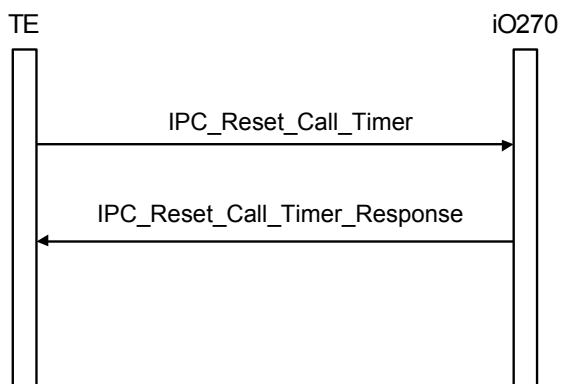


Figure 10. Reset Call Timer

4.9 CELL TOWER INFORMATION

The TE can request from the iO270 the identification of the cell on which it is currently camped.

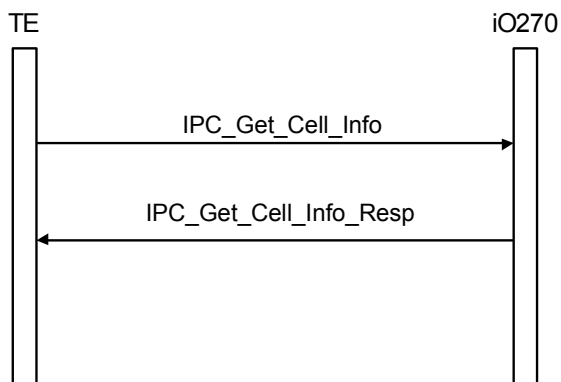


Figure 11. Cell Info Request

4.10 EQUIPMENT INFORMATION

The TE can request information about the iO270 hardware.

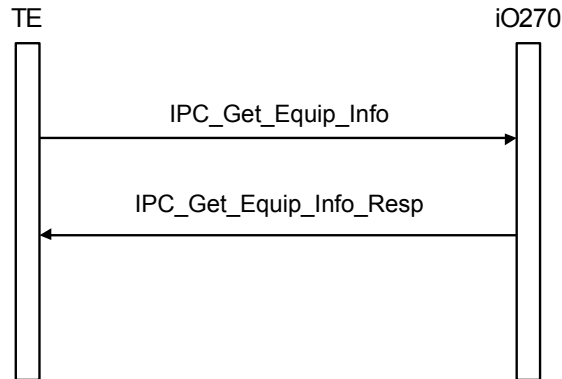


Figure 12. Equipment Information

4.11 TRACE MODE

The TE can request trace data from the iO270. In addition, the TE can enable two-second updates from the iO270 of one or more trace data fields. The following diagram shows a normal trace mode query operation.

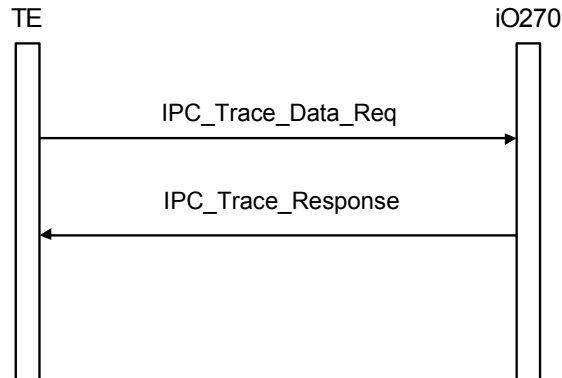


Figure 13. Trace Mode Query

The following diagram shows a trace mode query and enable of the two-second trace of data.

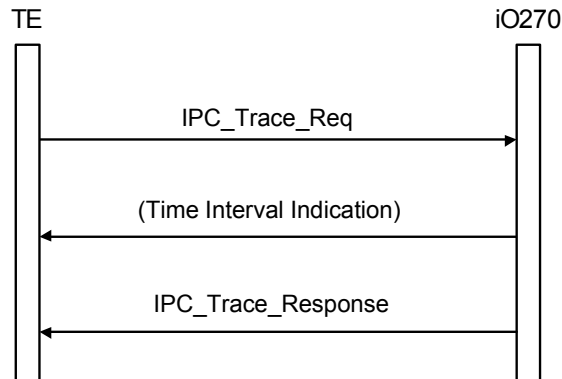


Figure 14. Trace Mode Query and Enable

The following diagram shows disabling of trace mode updates. The iO270 will send a final response after being disabled.

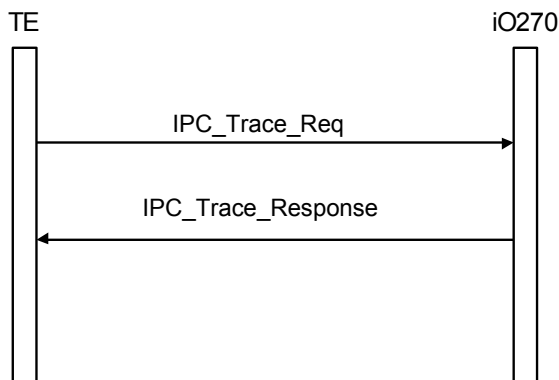


Figure 15. Trace Mode Query and Disable

4.12 GPS DATA

The iDEN iO270 supports streaming NMEA data. The iO270 can send the data to the TE via any serial I/O.

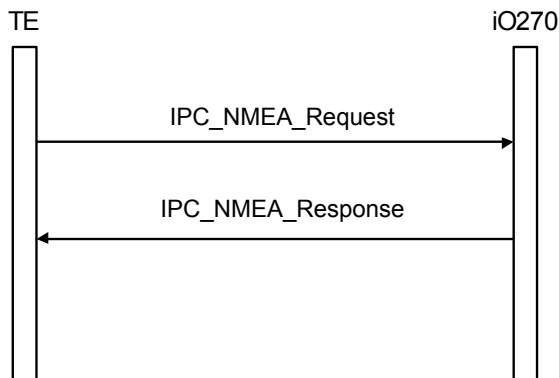


Figure 16. GPS Enable and Disable

4.13 OPERATING MODE CHANGE

The TE can request the iO270 to configure itself into different operational modes. When going from different subscriber modes, the iO270 only needs to update its operation parameters. However, when going to special modes (such as Programming mode), the iO270 must perform a reconfiguration (warm re-start). The following diagrams illustrate the mode transitions. The TE is responsible for re-initializing the transport layer interface and uses the correct protocol for the new selected mode. Some modes use the multiplexer interface, while others are a simple UART without any multiplexing.

The following diagram illustrates the iO270 entering a mode in which the GSM27.010 multiplexer is not currently active. The most typical is after the power-up sequence.

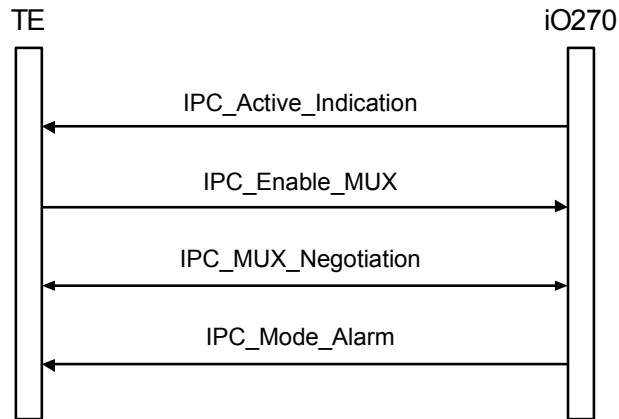


Figure 17. Invoking GSM27.010 Multiplexer

The following diagram illustrates the TE changing the iO270 operational mode, which does not require the iO270 to reconfigure.

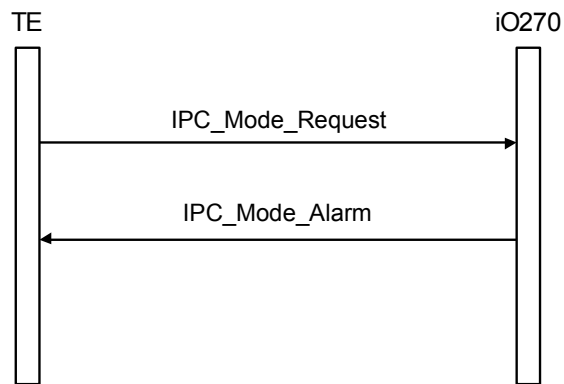


Figure 18. Non-reconfigure Mode Change

The following diagram illustrates the TE changing the iO270 operational mode, which does require the iO270 to reconfigure and the new mode supports the GSM27.10 multiplexer.

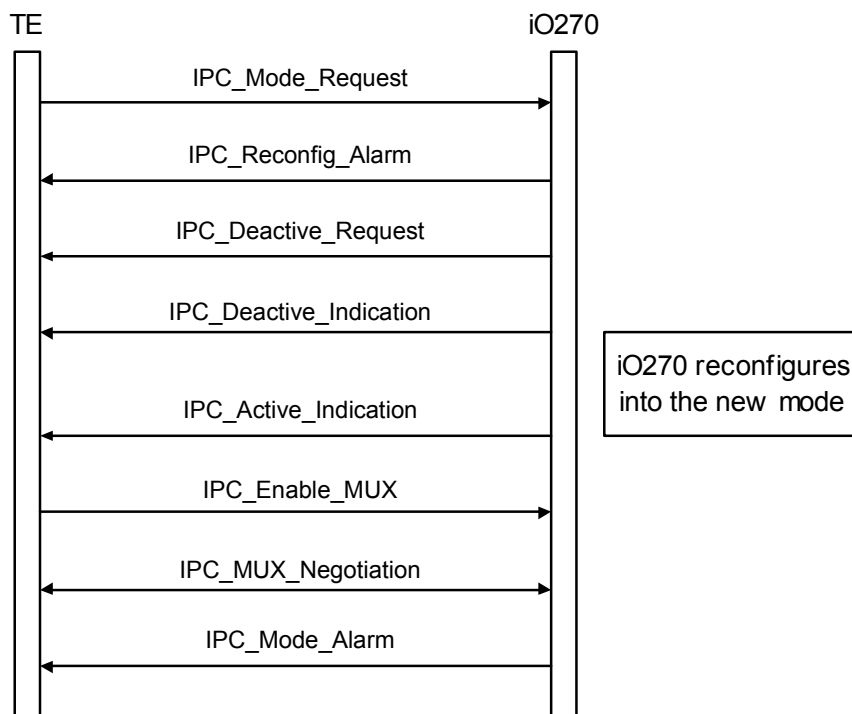


Figure 19. Reconfigure Mode Change with Mux

The following diagram illustrates the iO270 exiting a programming mode. The iO270 can enter the programming mode either from a TE request or upon power-up.

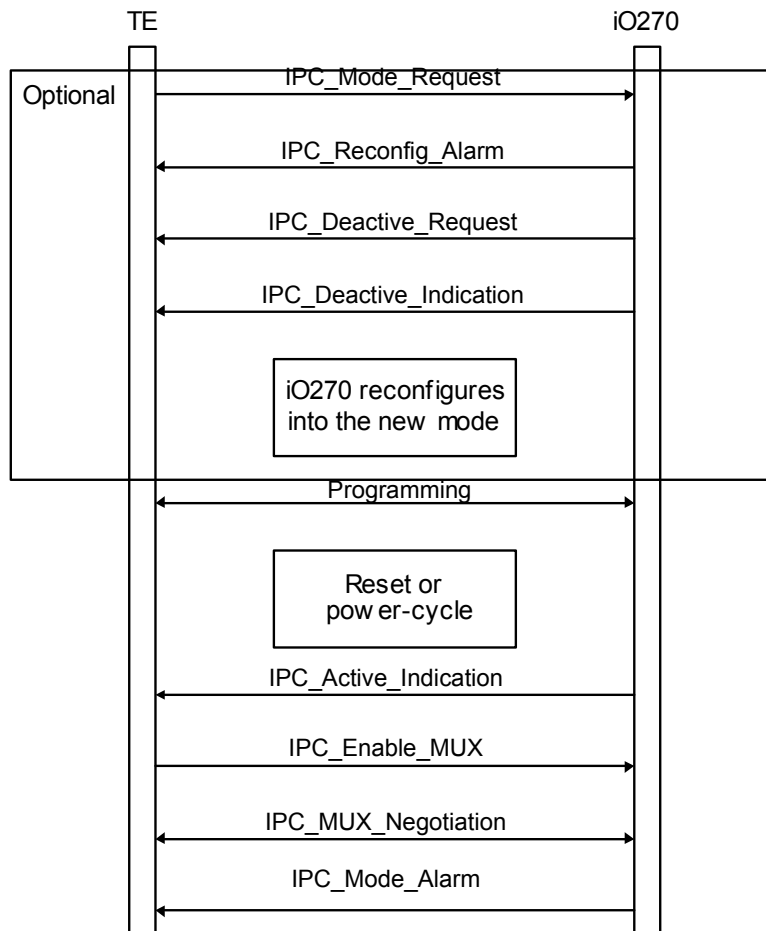


Figure 20. Reconfigure Mode Change with Mux

4.14 SECURITY FUNCTIONALITY

This section describes the interface as it relates to security.

4.14.1 Lock iO270

The TE can lock various iO270 facilities, thus requiring the TE to supply a password to unlock the facility. As the iO270 may not support all the facilities defined in GSM (most notably, Call Barring), the TE should query the baseband for supported facilities, as shown in Figure 21.

In addition, since various facilities can have a variable password length, the TE should query the facility password length using IPC_Lock_Capabilities_Req.

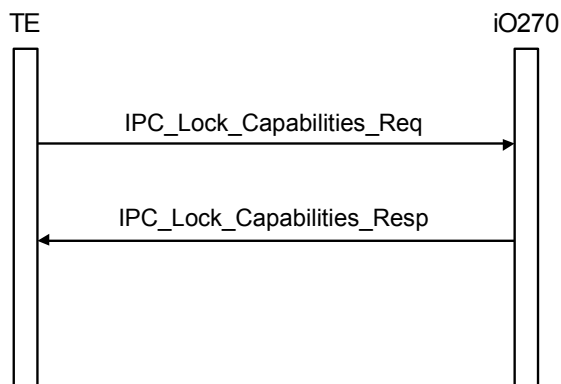


Figure 21. Locking iO270 Facility Capabilities Query

The following diagram illustrates using a locking facility.

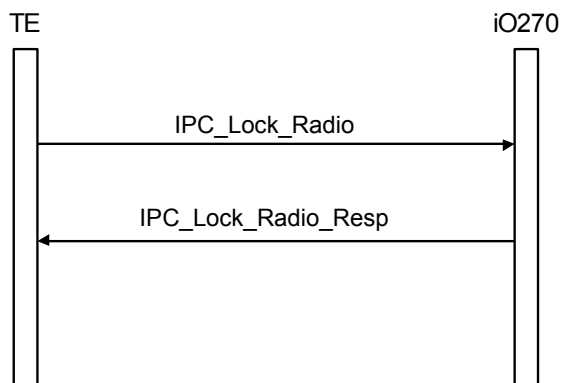


Figure 22. Locking iO270 Facility

4.14.2 Unlock iO270

The TE is required to supply a password to enable access to any iO270 facility.

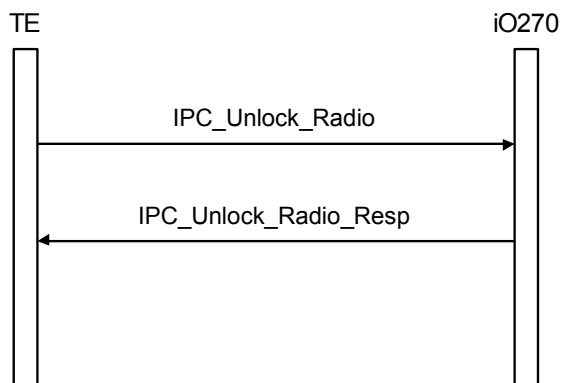


Figure 23. Unlocking iO270 Facility

4.14.3 Change Locking Password

The TE can change the password the iO270 uses for each facility that can be locked.

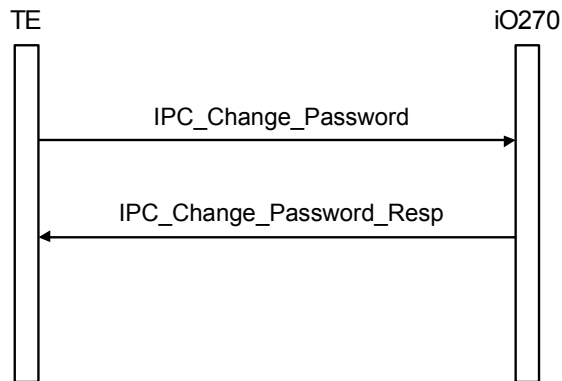


Figure 24. Change Lock Password

4.14.4 Get Locking Status

The TE can query the status of any iO270 facility that is supported and can be locked. In addition, the TE can query the state of the SIM (Lock, PUK, and so on).

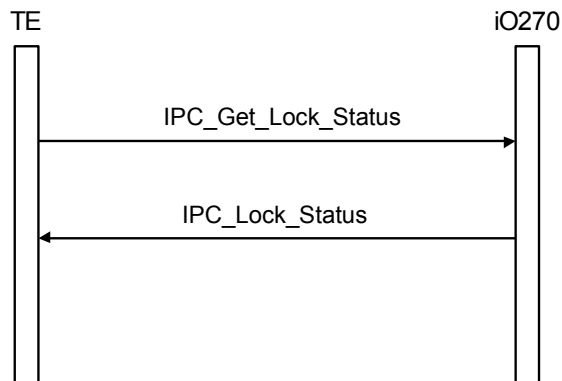


Figure 25. Get Lock Status

4.15 MASTER RESET

The TE can request the iO270 to perform a master reset. This clears all registration information in the SIM, so the next registration cycle is a full IMEI/SIMID registration. After completion, the iO270 should be powered down.

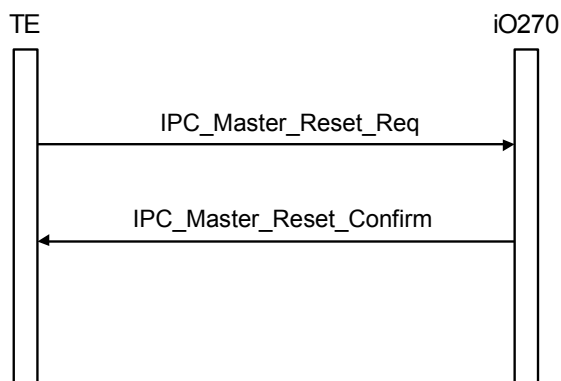


Figure 26. Master Reset

4.16 NORMAL GROUP

This section describes the interface as it relates to the normal group call service. In the diagrams, **bold** indicates unsolicited messages that may be unavailable (not provided by the system). These messages are shown as they typically occur. However, they may not occur at all, or may occur once, or many times within the life of the call.

4.16.1 Normal Group Call Origination

The following diagram illustrates a group call origination.

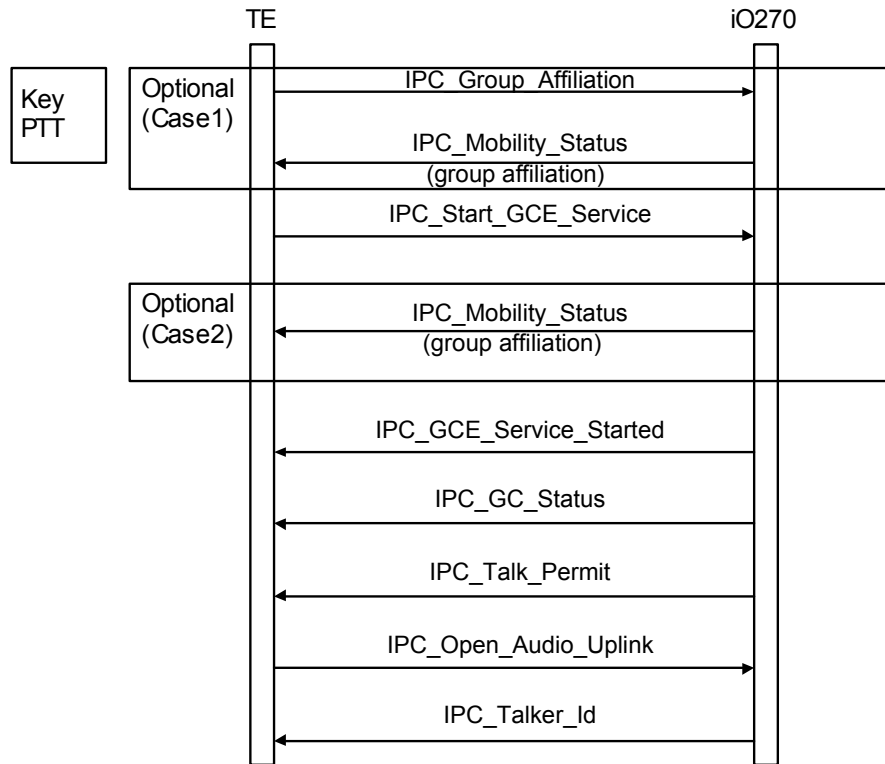


Figure 27. Normal Call Group Origination

4.16.2 Normal Group Call Join

The following diagram illustrates how the iO270 is invited to join a normal group call. The GC Status message is an optional message, which may be delivered as part of the normal group call sequence.

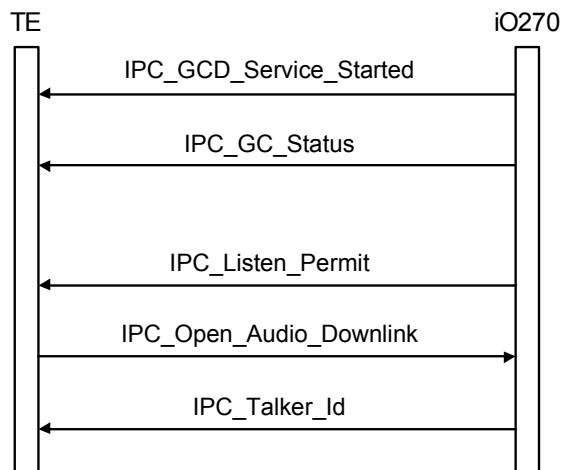


Figure 28. Normal Group Call Join

4.16.3 Normal Group Call Transmit/Receive

The following diagram illustrates the normal case scenario for transition between half-duplex transmission and reception during a group call.

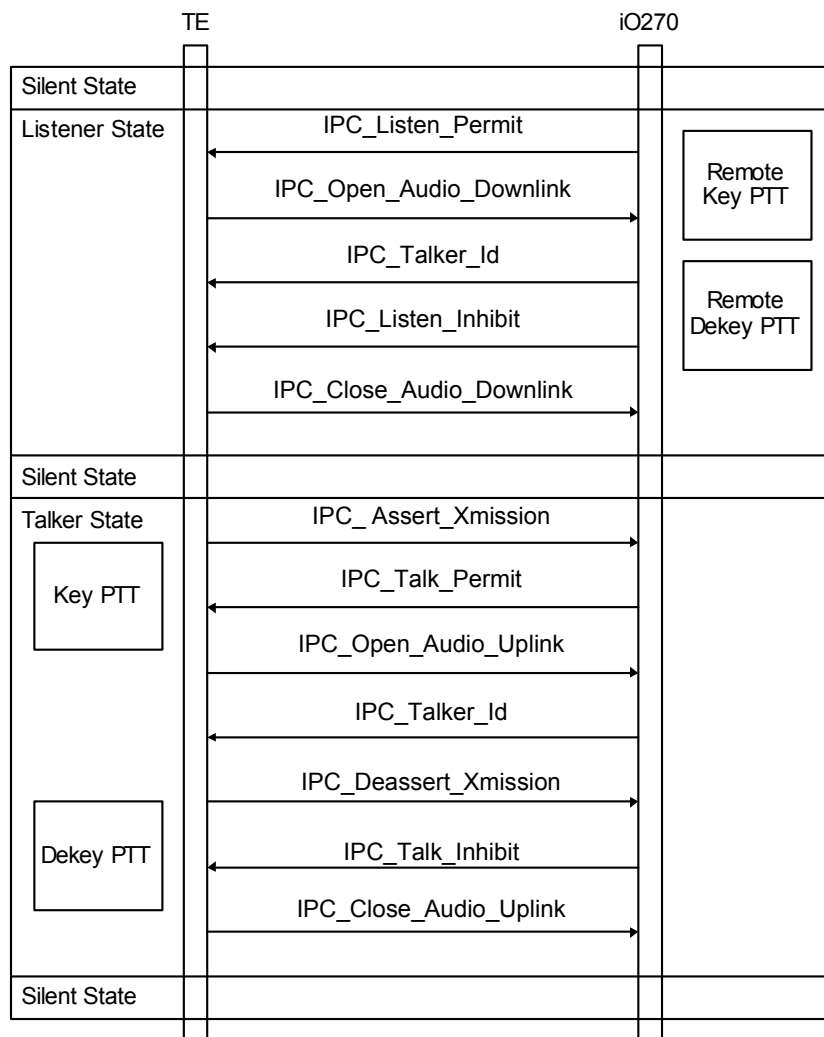


Figure 29. Normal Group Transmit/Receive

4.16.4 Normal Group Call Rejection

The following diagram illustrates a group call fail.

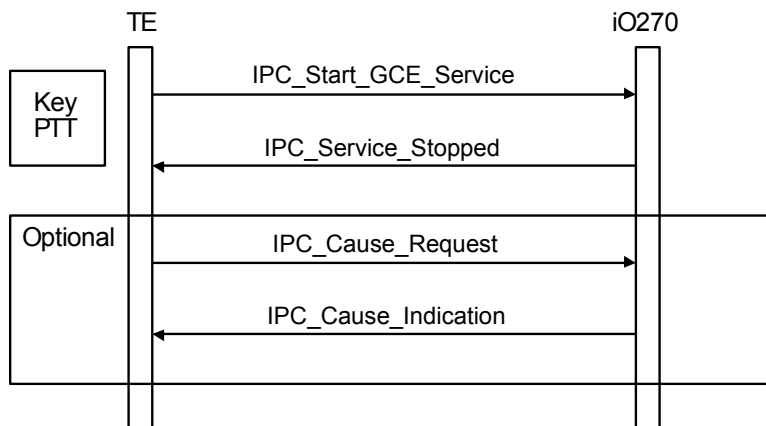


Figure 30. Normal Group Call Rejection

4.16.5 Normal Group Call Termination

There are many reasons for the termination of a normal or emergency group call. The following diagrams illustrate the messages passed regardless of the reason. The `IPC_Service_Stopped` message does not contain the reason for termination; instead the TE will need to request the 2-byte termination.

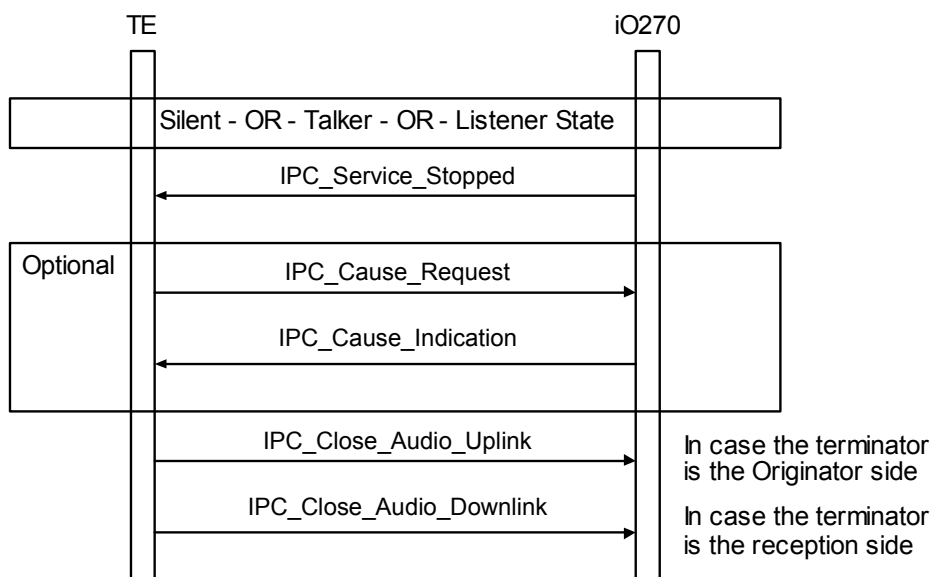


Figure 31. Normal Group Call Termination (System-terminated)

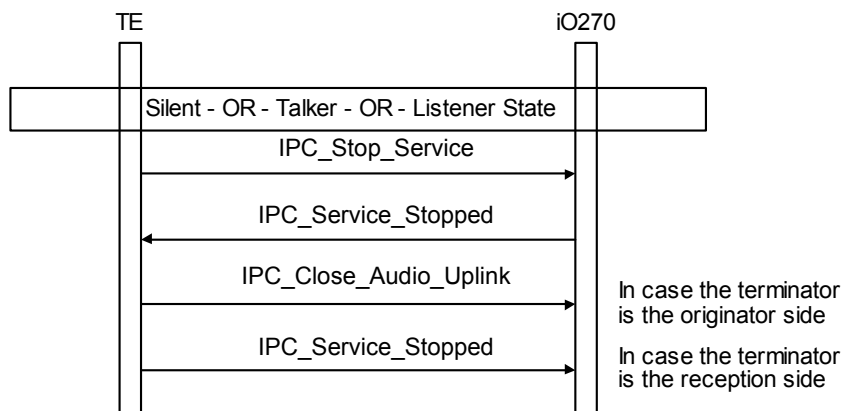


Figure 32. Normal Group Call Termination (User-terminated)

4.17 PRIVATE CALL

This section describes the interface as it relates to the private call service.

4.17.1 Private Call Origination

The following diagram illustrates a normal successful private call origination. If a failure occurs, the IPC_Service_Stopped reply will be sent from the iO270 to the TE.

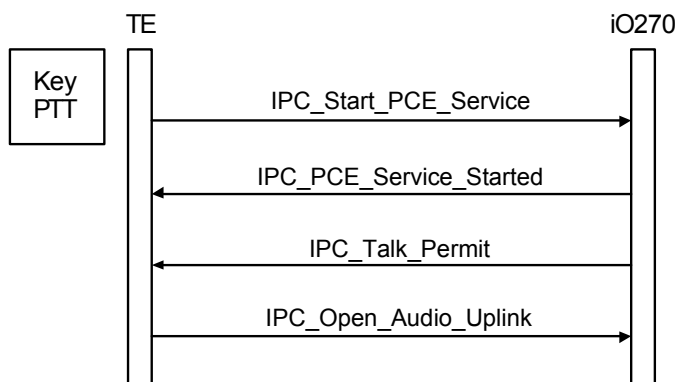


Figure 33. Private Call Origination

4.17.2 Private Call Reception

The following diagram illustrates how the iO270 receives a private call.

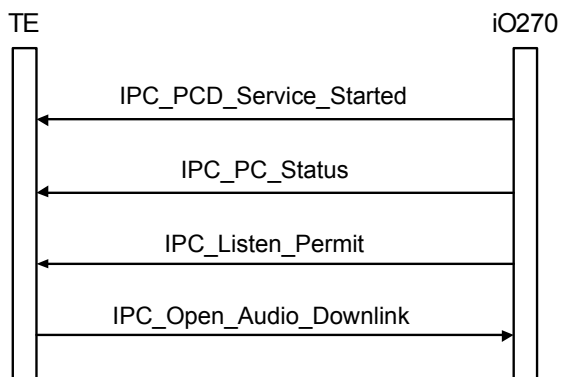


Figure 34. Private Call Reception

4.17.3 Private Call Transmit/Receive

The following diagram illustrates the normal case scenario for transition between half-duplex transmission and reception during a private call.

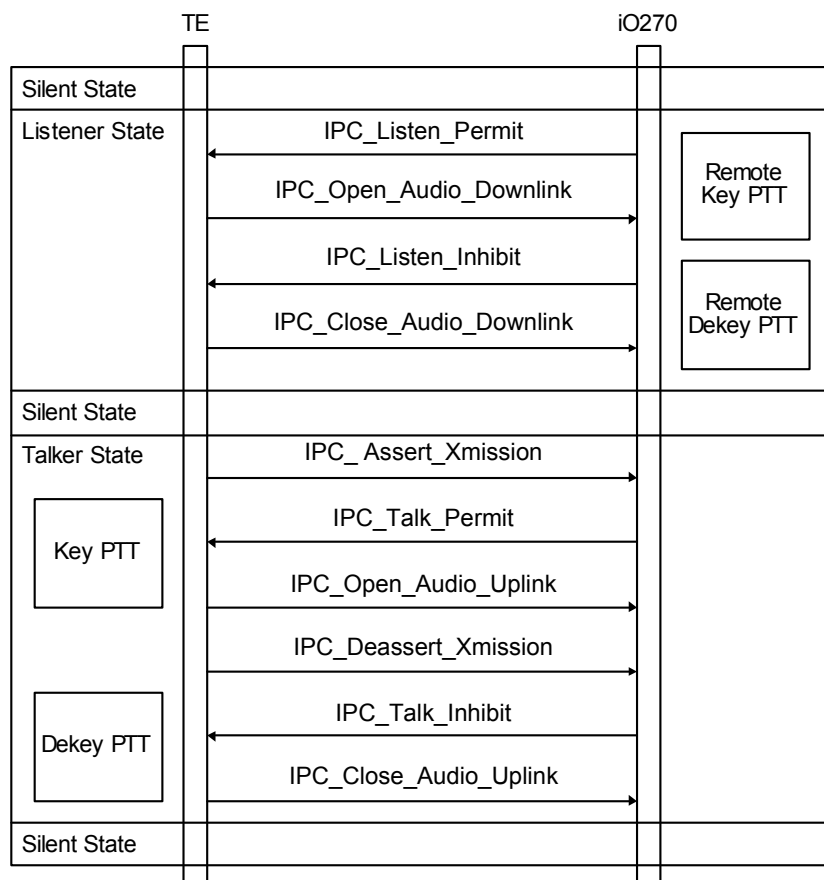


Figure 35. Private Call Transmit/Receive

4.17.4 Private Call Rejection

The following diagram illustrates a private call failure.

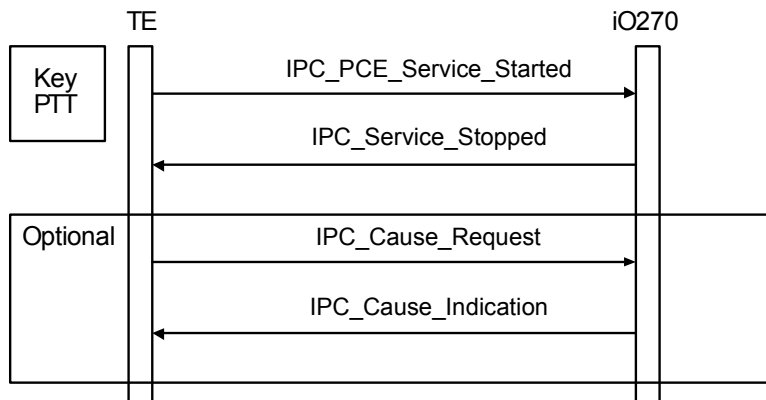


Figure 36. Private Call Rejection

4.17.5 Private Call Termination

There are many reasons for the termination of a private call. The following diagrams illustrate the messages passed regardless of the reason.

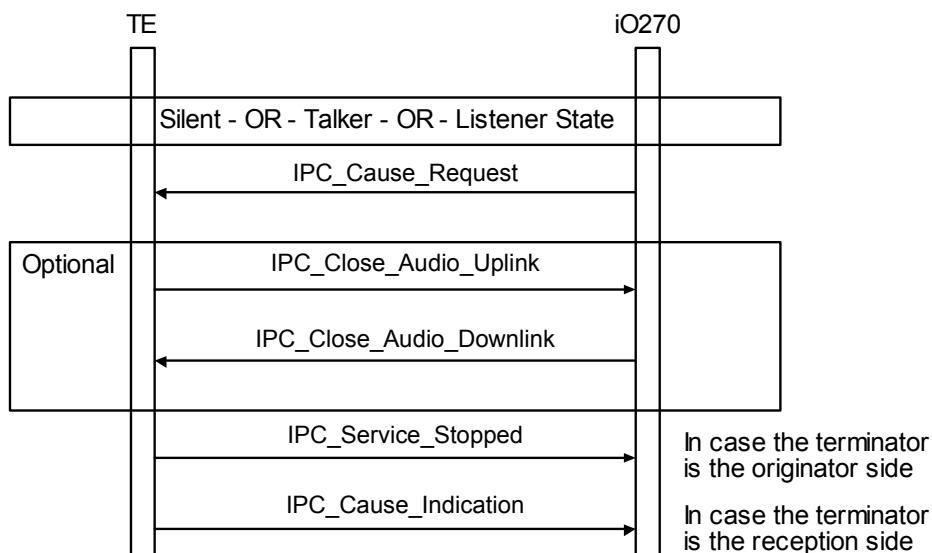


Figure 37. Private Call Termination

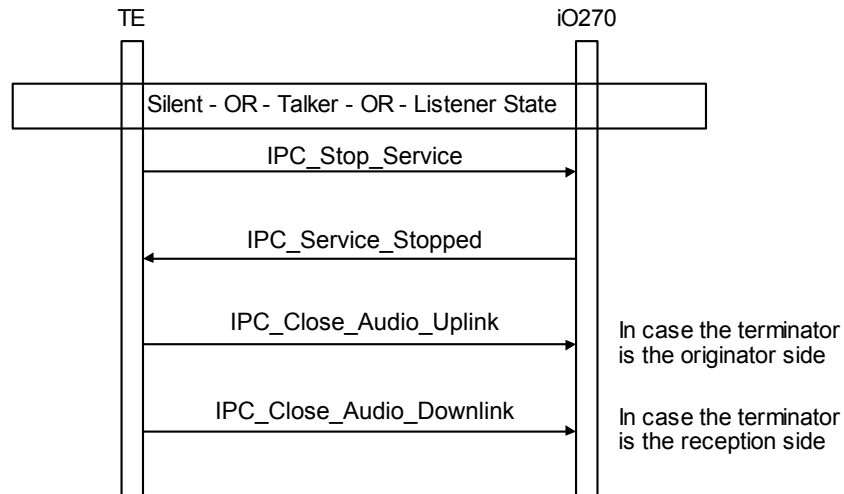


Figure 38. Private Call Termination (User-terminated)

4.18 CALL ALERT

This section describes the interface as it relates to the call alert and status message service. The status message service is only supported for the Advanced Feature model.

4.18.1 Call Alert Origination

The following diagram depicts the way in which this service is processed. The message carries the success/failure termination code of the operation.

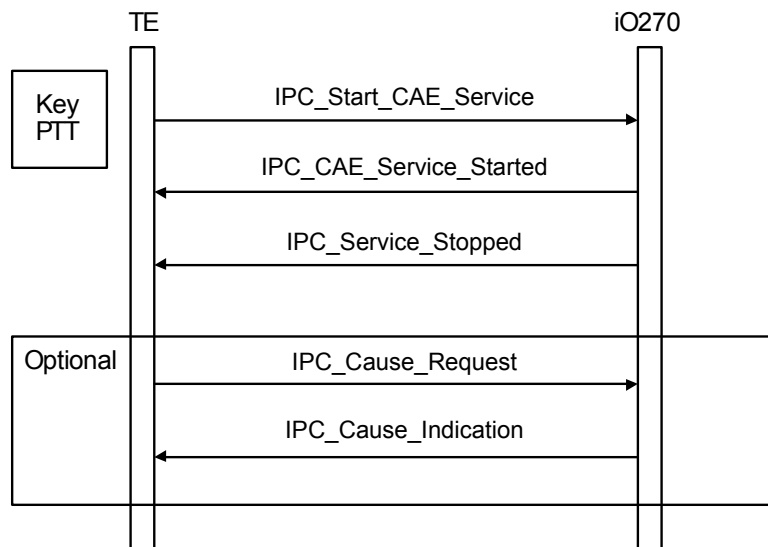


Figure 39. Call Alert Origination

4.18.2 Call Alert Reception

When the iO270 receives an alert or status indication it acknowledges it to the system and notifies the TE.

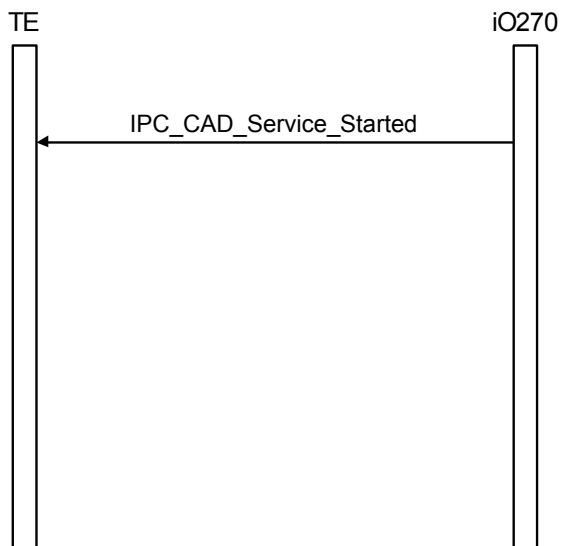


Figure 40. Call Alert Reception

4.18.3 Call Alert Failure

The call alert origination scenario can fail for various reasons, such as system reject or invalid UMFI encoding. The following diagram illustrates a call alert failure.

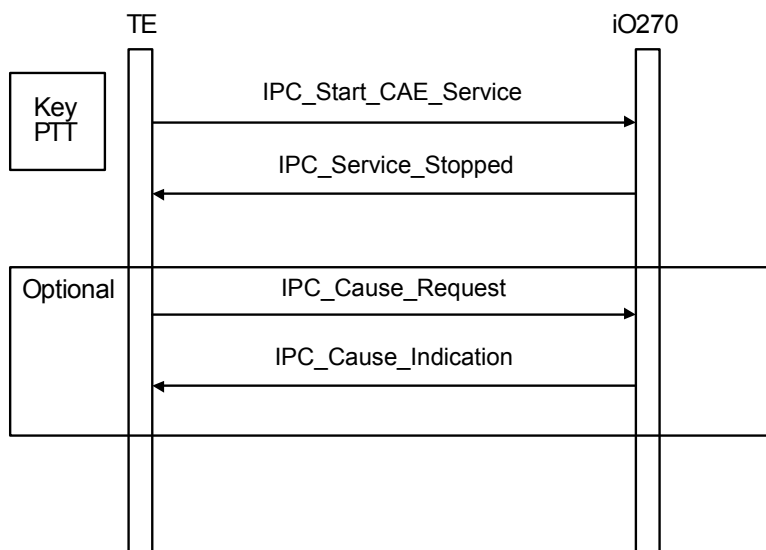


Figure 41. Call Alert Failure

4.19 TELEPHONE INTERCONNECT

This section describes the interface as it relates to the phone call service. Note that the iO270 can supply unsolicited messages at various times in the following scenarios, which implementers should be aware of.

4.19.1 Interleave

Baseband modems that use iDEN signaling can use various interleave values for selecting the type of voice/data coding used. There are separate interleave settings:

- Default Interconnect 3:1, 6:1 vocoders
- Enhanced Interconnect: Determines if default (3:1/6:1 vocoders) or a type of enhanced vocoder is used
- Dispatch Normal or different levels of enhanced vocoders
- Circuit data: Determines the rate (4800 bps vs. 9600 bps)



Note

For interconnect, the baseband will use the normal selection if either enhanced is disabled or if enhanced is not available in the system).

Interleave setting values commands operation are blocked unless WVLIM (Limited Accesses) is enabled, and the Interleave selection flag is enabled in the iO270 codeplug.

The following diagrams indicate how the current iO270 settings and capabilities can be queried and changed. However, the iO270 firmware can be configured not to allow the application to change the settings and will return an error in IPC_Set_Interleave_Confirm.

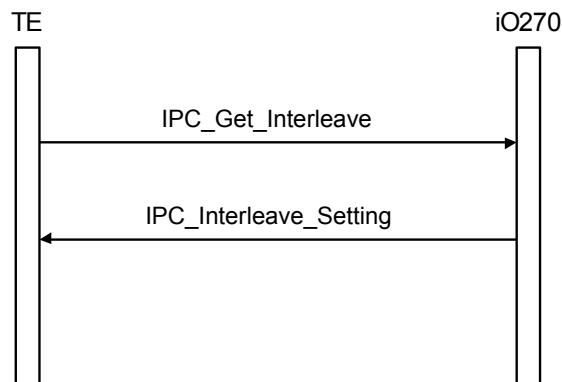


Figure 42. Query Interleave Settings

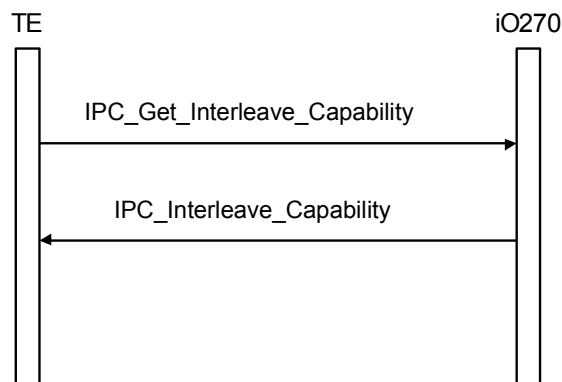


Figure 43. Query Interleave Capability

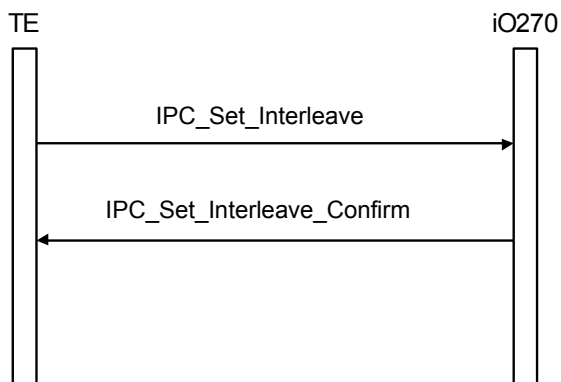


Figure 44. Setting Interleave

4.19.2 Phone Call Origination

Many scenarios are associated with phone call origination. The following sub-sections outline a few of the more common ones.

4.19.2.1 Successful Call Setup

The following diagram depicts the successful call scenario case. If the phone number specified in the Start_TIE_Service message is invalid, the iO270 will inform the TE as indicated in the Failed Call Setup scenario.

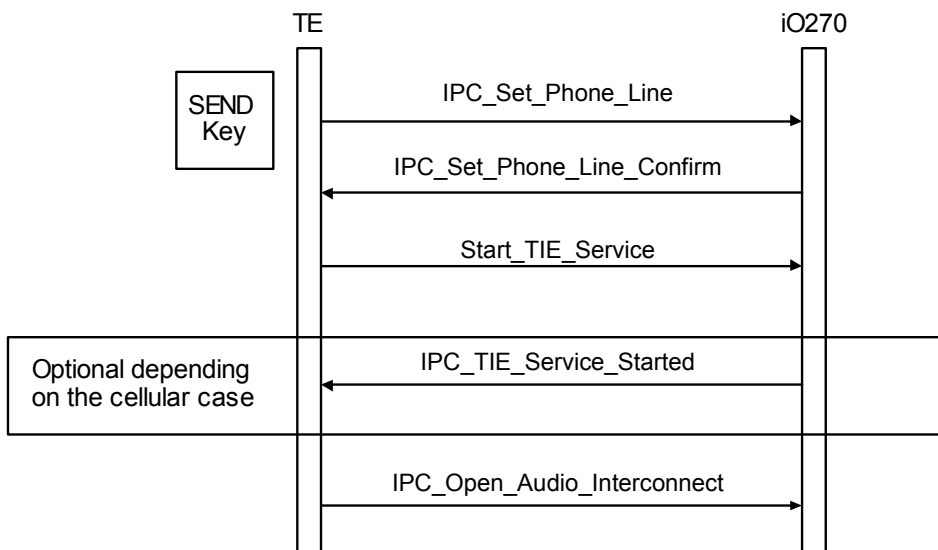


Figure 45. Successful Call Setup

4.19.2.2 Failed Call Setup

In the failed call setup scenario, the reason can be queried from the iO270, when required.

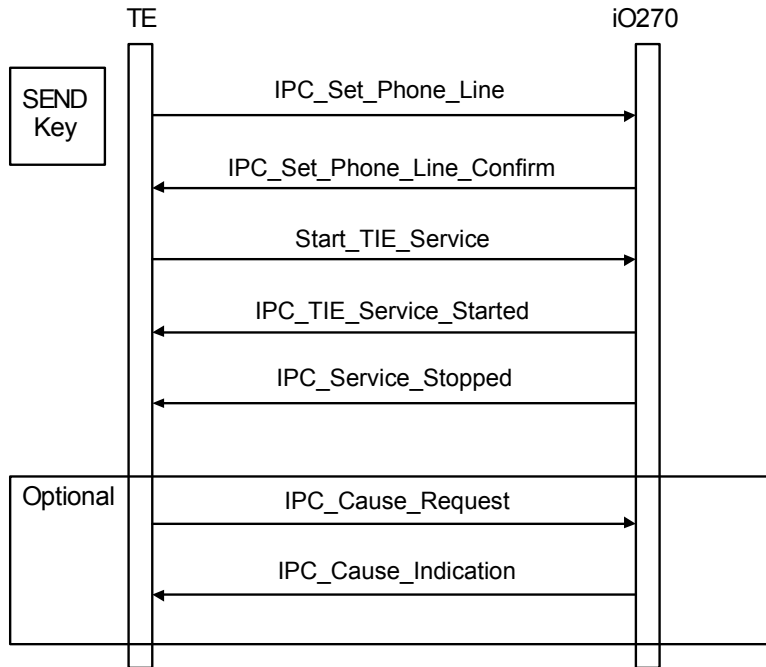


Figure 46. Failed Call Setup

4.19.2.3 Aborted Call Setup

This diagram indicates the scenario when the user aborts the call during setup.

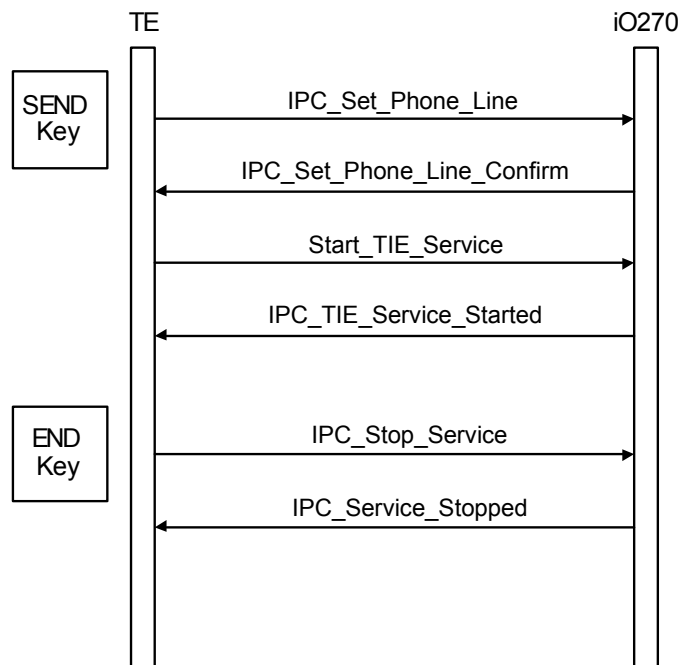


Figure 47. Aborted Call Setup

4.19.3 Mobile-terminated Call

As with call origination, many scenarios also apply for mobile-terminated calls. The following sub-sections outline a few of the more common ones.

4.19.3.1 Answered Mobile-terminated Call

The following diagram shows an answered mobile terminated call.

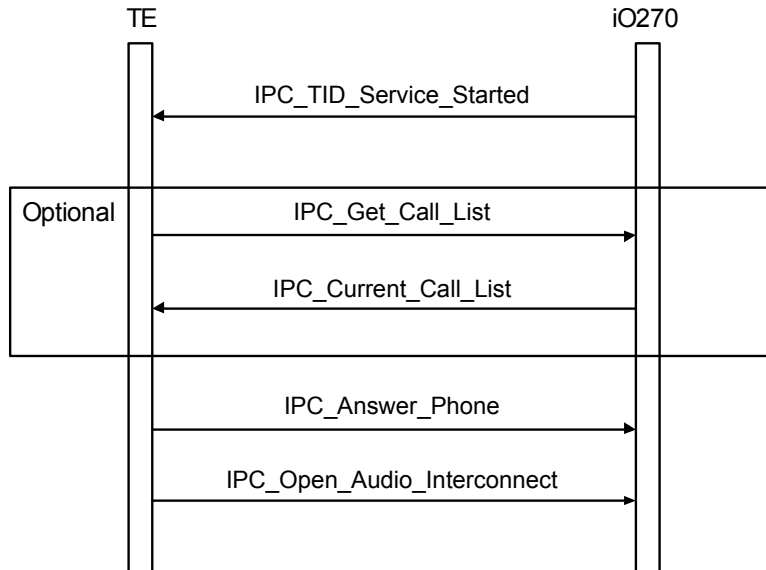


Figure 48. Answered Mobile-terminated Call

4.19.3.2 Unanswered Mobile-terminated Call

The following diagram illustrates a mobile-terminated call that is not answered. The call ends when the calling user hangs up, or if the system times out and disconnects the call. If call forwarding upon “no answer” is enabled for the called iO270, the switch will automatically forward the call after a system-defined length of time.

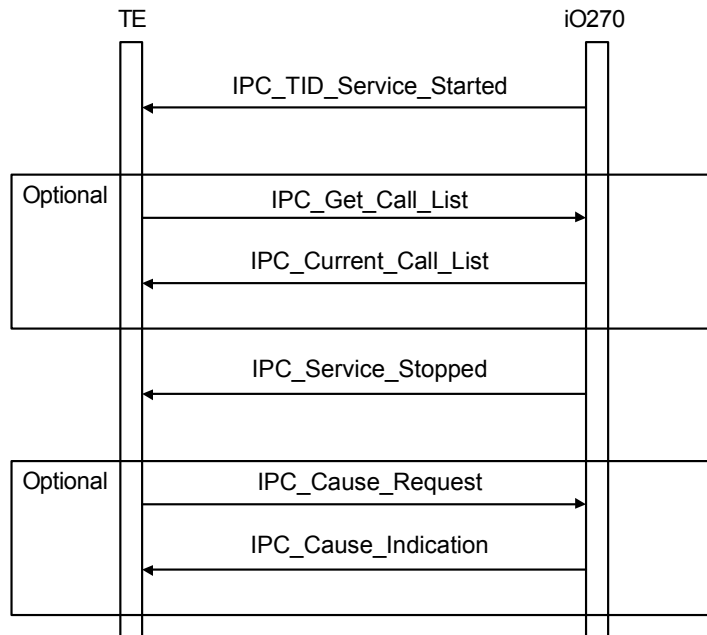


Figure 49. Unanswered Mobile-terminated Call

4.19.3.3 Deny Mobile-terminated Call

The following diagram illustrates that the called iO270 user may immediately deny a mobile-terminated phone call rather than answer it or let it ring-out on its own.

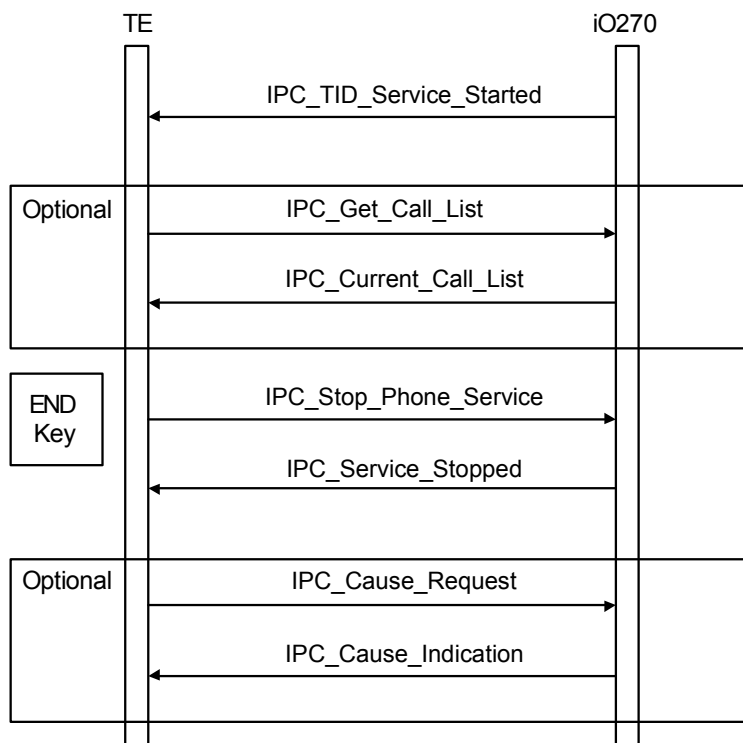


Figure 50. Deny Received Call

4.19.4 In-use Operations

This section describes some common message interactions that may occur while the phone call is connected. The iDEN iO270 can only support two calls at one time; each call can be in various states (for example, held, active, joined).

4.19.4.1 Phone Over Dial – Single Digit

This scenario shows a single digit over dial, which is generated on TE request for specific duration. The TE will not send the next DTMF tone until the iO270 indicates that the current DTMF tone is completed.

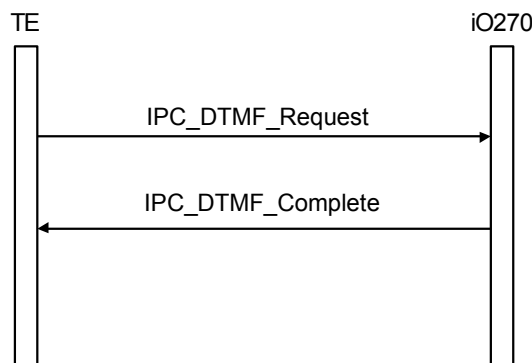


Figure 51. Phone Over Dial - Single Digit (Set Duration)

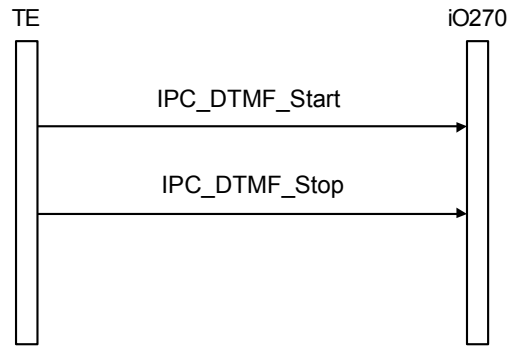


Figure 52. Phone Over Dial - Single Digit (Press-Hold Duration)

4.19.4.2 Phone Over Dial – Multi Digit

When multi digit over dial is generated, the TE can control the sequence of each over dial key or send a burst command to the iO270.

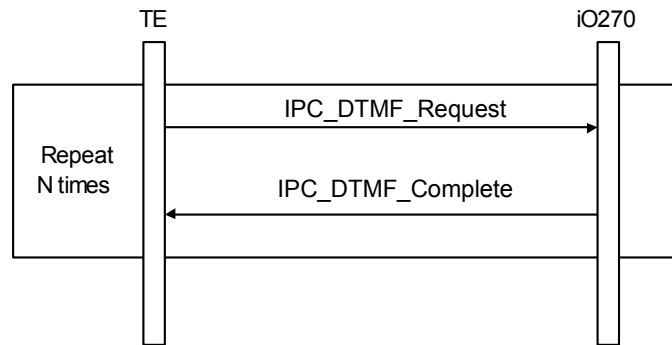


Figure 53. Phone Over Dial - Multi Digit (TE Control, Set Duration)

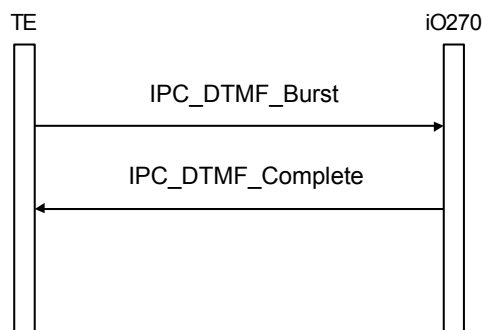


Figure 54. Phone Over Dial - Multi Digit (Burst, Set Duration)

4.19.4.3 Call Hold

The following diagram illustrates the call-hold scenario. If the requesting iO270 is not provisioned for this service, an error will be reported, and the call will remain connected.



Note

If a call is an emergency 911 call, the iO270 will not allow it to be placed on hold.

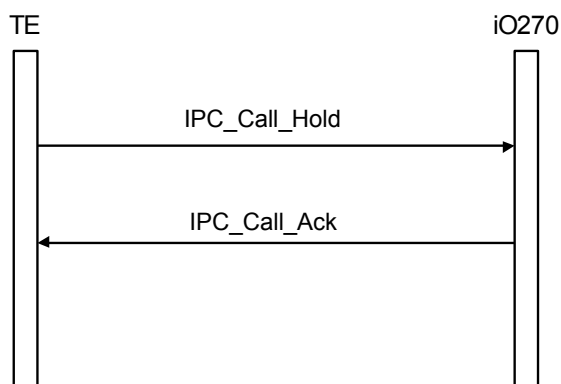


Figure 55. Call Hold

4.19.4.4 Call Hold and Dial

While a call is active, the TE can attempt to start a second call. The following diagram illustrates successful scenario messaging. The iO270 will attempt to place the current active call on hold and if successful start the second call. If the call fails, the held call remains in the held state.

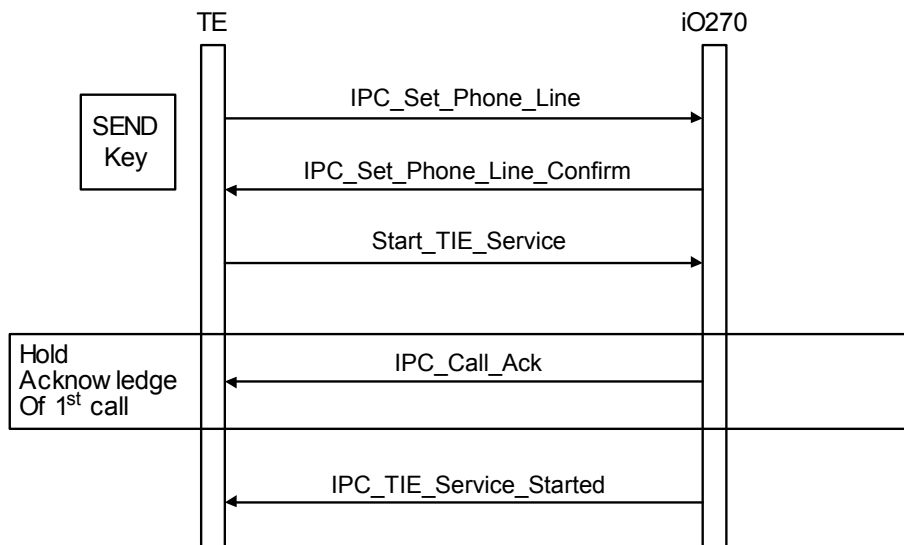


Figure 56. Call Hold and Dial

4.19.4.5 Call Retrieve

This scenario depicts a call that is retrieved from the held state.

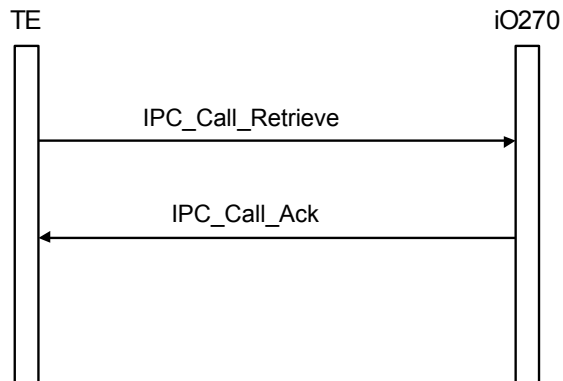


Figure 57. Call Retrieve

4.19.4.6 Call Alternate

If the iO270 is involved with two calls simultaneously, the iO270 may swap the calls from being active and on hold.

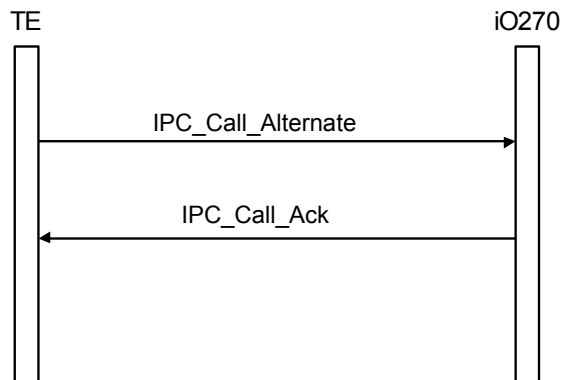


Figure 58. Call Alternate

4.19.4.7 Subscriber Termination

Any time after the TE starts an interconnect call the TE can request that the call be terminated. This can be for all calls, only the current active call, or any held call. The following diagram illustrates this request. Since the TE terminated the call, it need not query the iO270 for the cause of termination.

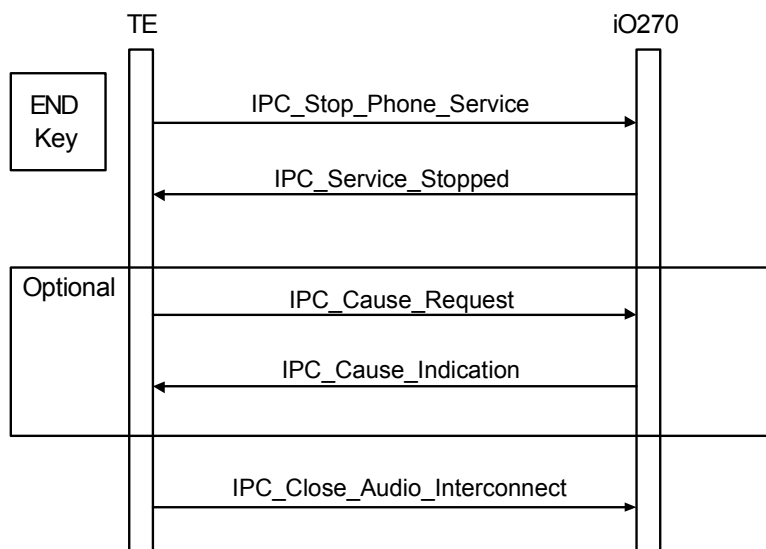


Figure 59. Subscriber Termination

4.19.4.8 Remote Termination

Any time after a call is established, the iO270 can indicate that it has been terminated. The normal scenario is the remote user hangs up. Other error conditions, such as system errors, signal failure, and so on may also result in call termination. Since the TE did not terminate the call, it may want to query the iO270 to determine the cause of termination.

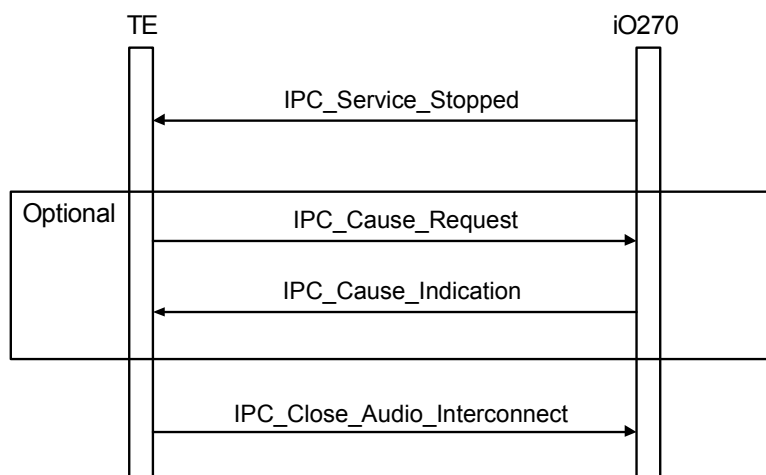


Figure 60. Remote Termination

4.19.4.9 Multi-party Conference Calling

The following diagram illustrates the multi-party conference call scenario. The iO270 supports only a three-way call. If the request cannot be completed, an error message is reported, and the other parties remain connected.



Note

When a user becomes the “vertex” of a multi-party conference (meaning, initiates the join), the iO270 is unable to initiate any further calls until both joined calls terminate.

The iO270 only allows a three-way call to be set up if the iO270 requesting the connection originated the second call being joined.

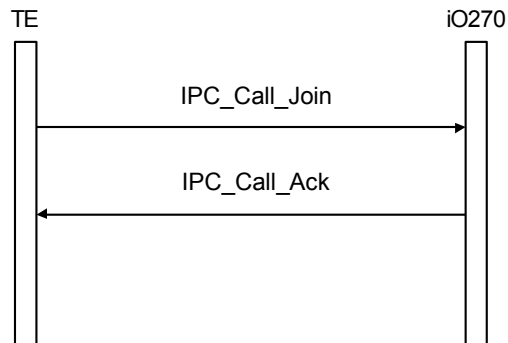


Figure 61. Multi-party Conference Calling

4.20 PHONE ONLY MODE

4.20.1 Phone-only Enable Request

The following scenario shows that a TE can request to enter phone-only mode. The mobility status message indicates if the network accepted or rejected the request.

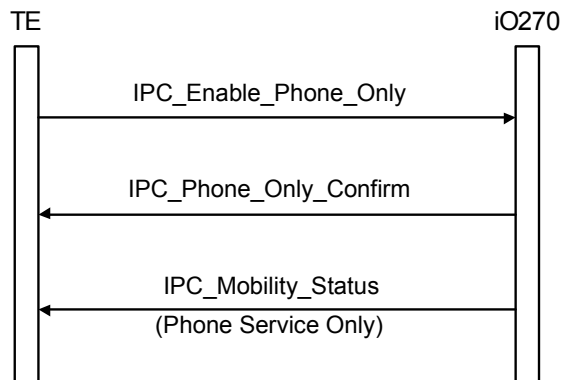


Figure 62. Phone-only Enable Request

4.20.2 Phone-only Disable Request

The following scenario shows that a TE can request to exit phone-only mode. The mobility status message indicates if the request was actually accepted by the network.

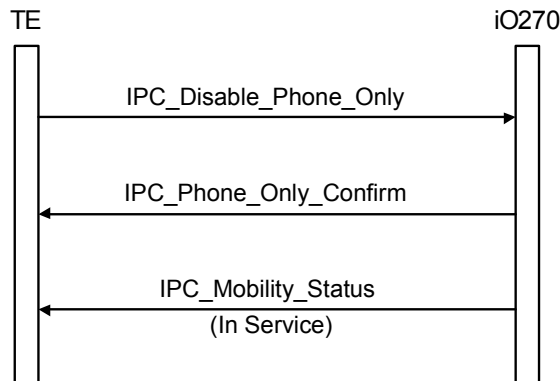


Figure 63. Phone-only Disable Request

4.21 SUPPLEMENTAL SERVICES

4.21.1 Call Forwarding

This section describes the message sequence for the call forwarding service. The iO270 performs call forwarding based on the current selected line. Therefore, the TE may need to change the selected line prior to requesting the call forwarding service to the iO270.

4.21.1.1 Call Forward Registration

A provisioned iO270 may register with any one of the four types of call forwarding:

- Unconditional: Call transfers no matter what the condition. This supersedes all other types.
- On Busy: Call transfers if the unit is busy in another phone call.
- No Answer: Call transfers if the user does not answer the call within a certain system-defined time frame.
- No Reach: Call transfers if the iO270 unit does not respond to the page (for example, when not turned on, busy in dispatch/data, out of coverage, and so on).

The following scenario illustrates a successful call forwarding registration.

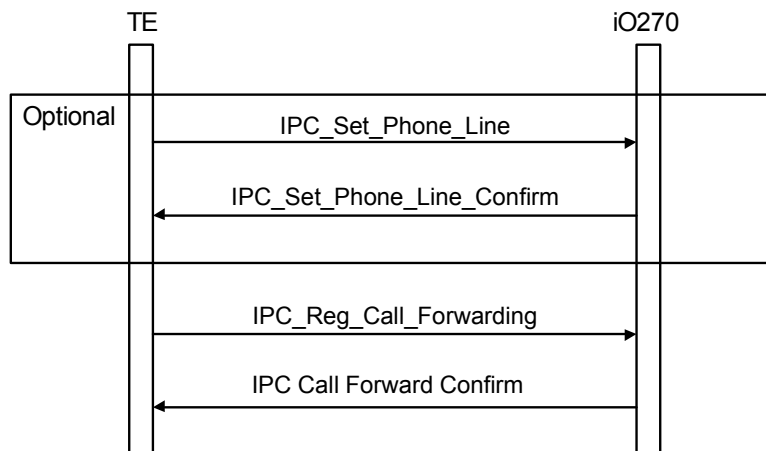


Figure 64. Successful Call Forward

4.21.1.2 Call Forward Erasure

The following scenario illustrates erasure of call forwarding for a specific reason.

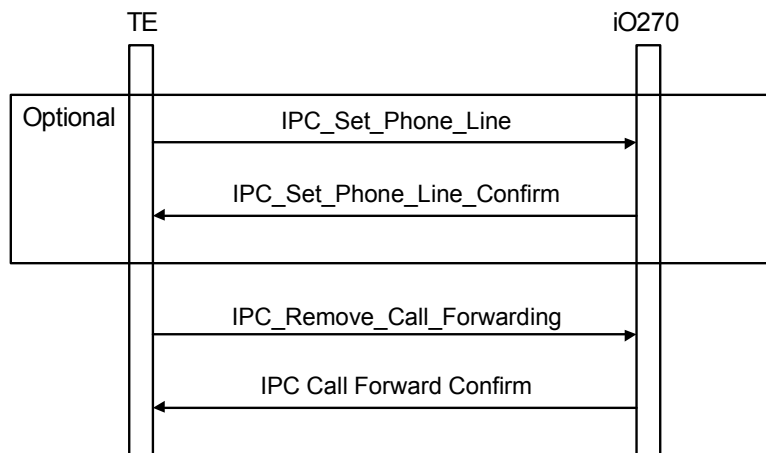


Figure 65. Call Forward Erasure

4.21.1.3 Call Forward Interrogation

Call forwarding interrogation is an operation that queries the switch for its interpretation of the call forwarding state of the requesting iO270.

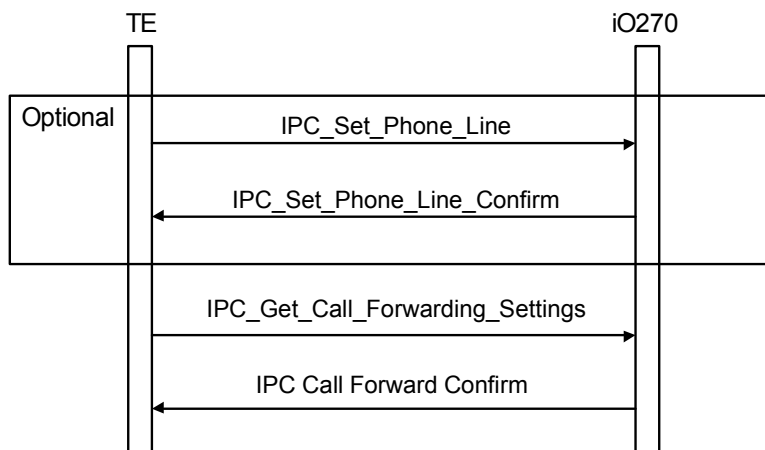


Figure 66. Call Forward Interrogation

4.21.2 Call Waiting

The call waiting service allows a subscriber to receive a call when the user is already involved in a call.

4.21.2.1 Receiving Call Waiting

The following diagram illustrates how the iO270 manages an incoming call while already connected in a phone call. Note that the setup and in-user scenarios for each call are identical. The CID field distinguishes which message belongs with which call.

Use the following key for the call scenarios in this section:

- Call 1 messages -----
- Call 2 messages _____

The following scenario illustrates an accepting call waiting.

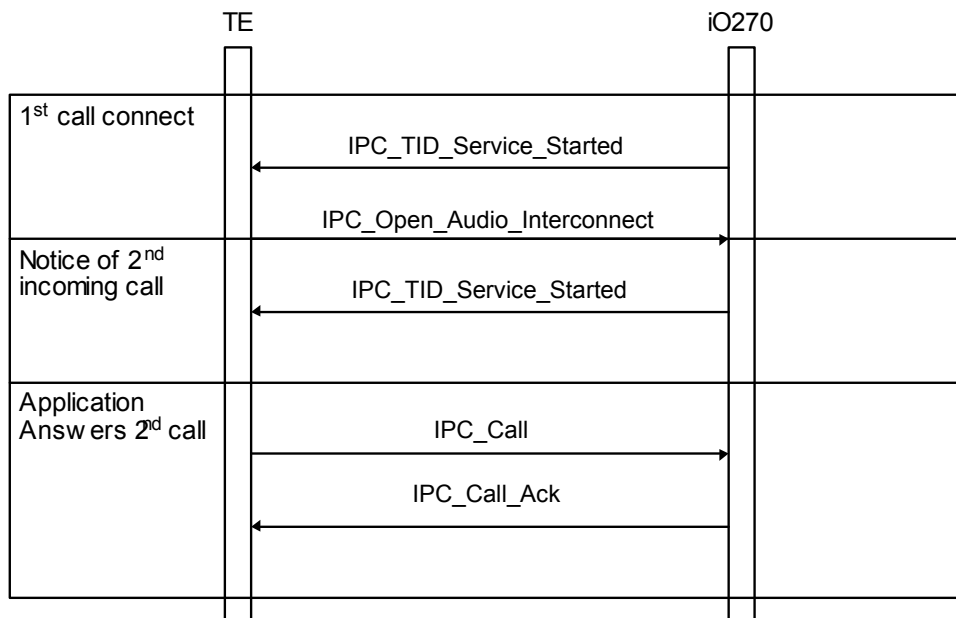


Figure 67. Accepting Call Waiting

The following scenario illustrates a rejecting call waiting.

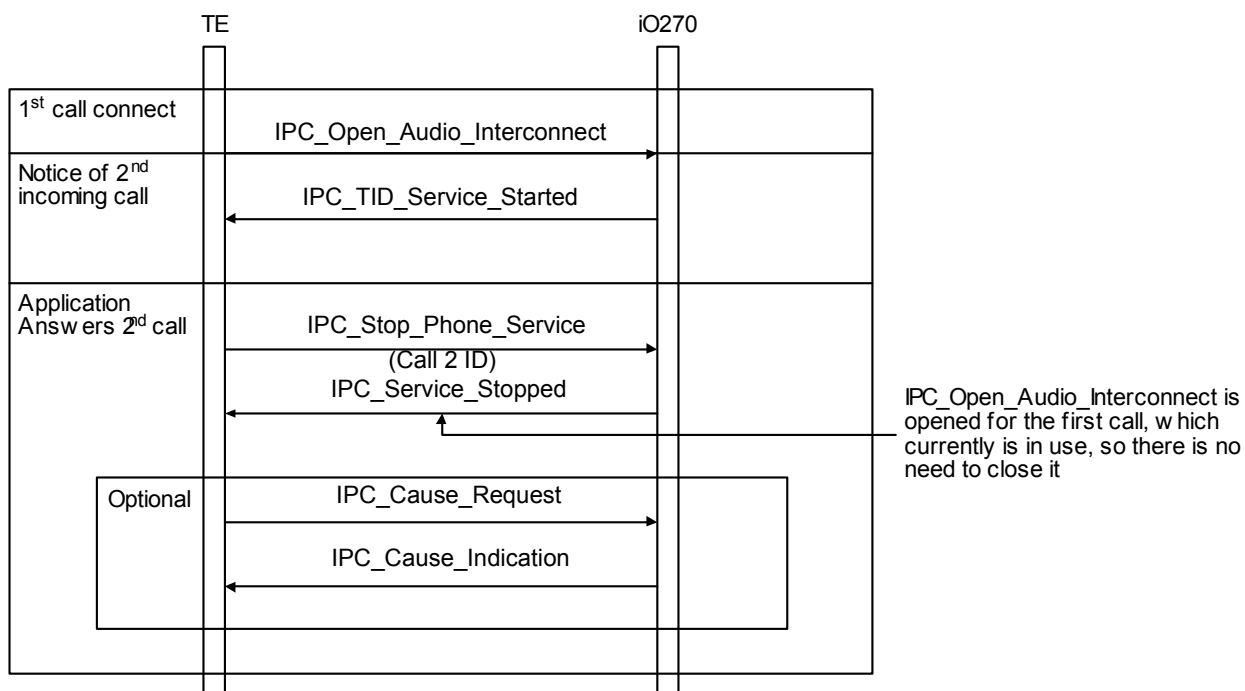


Figure 68. Reject Call Waiting

4.21.2.2 Enable/Disable Call Waiting

The TE may enable, disable and interrogate the call waiting feature with the iO270. The iDEN iO270 supports all three operations. Call waiting is only applicable to voice (telephony) and does not support the other class settings of GSM.

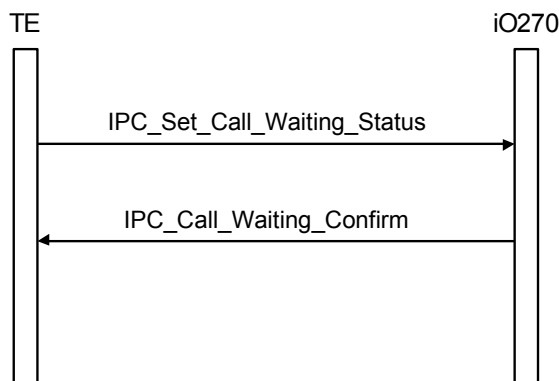


Figure 69. Enable/Disable Call Waiting

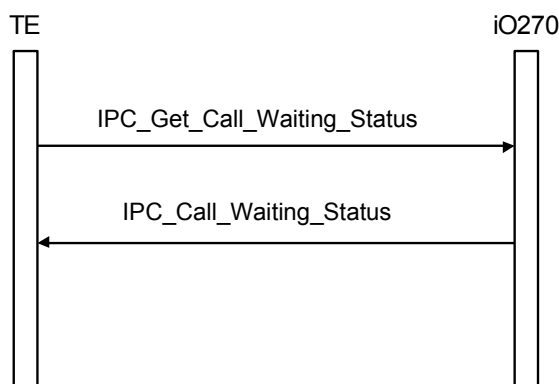


Figure 70. Interrogate Call Waiting

4.22 CIRCUIT DATA CALL

This section describes the interface as it relates to the Circuit Data Call service. In these scenarios, the TE communicates with the iO270 on an AT channel. The TE will be alerted that an action is being performed on RS232/USB or on the DL_TEL channel. The AT commands and operations available in this interface are defined in ref [4] in Table 1, “References”.

The following diagrams and messaging do not indicate the various AT commands needed to configure the interface for specific applications. The assumption is that the application/dial-up networking or TE will implement functionality as defined in ref [8] in Table 1, “References”. For this reason, no distinction is made in the following sections between circuit data calls and fax calls. In addition, on-line command mode is not indicated as this feature is used within the context of an active circuit data call. Therefore, TE developers need to implement reference [8] Table 1, “References” in either the TE or dial-up networking drivers, for fax and other types of circuit data calls.

The iDEN iO270 is capable of making either 9600bps (interleave 3:1) or 4800bps (interleave 6:1) calls. The interleave setting for circuit data (see Section 4.19.1, “Interleave”) determines the type of data that will be made.



Note

The iO270 does not know if it is communicating to a dial-up application on the specific TE. Therefore, the meaning of each channel, and whether one or both are used, is at the discretion of the application processor.

4.22.1 Circuit Data Call Origination

The following sub-sections outline some of the more common scenarios associated with data call origination. Whenever the iO270 is instructed to start a circuit data call, the iO270 (DL-TEL) will indicate the number called to the TE. The iO270 gives a notification of the start of the CD call independent of the connect response.

4.22.2 Successful Circuit Data Call Setup

The following diagram depicts the successful call scenario case between the TE and the iO270.

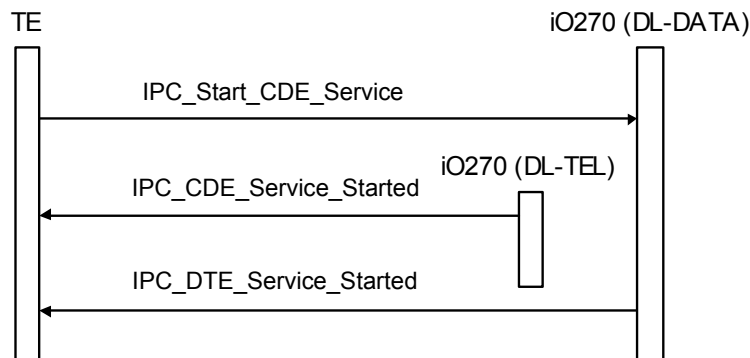


Figure 71. Successful Circuit Data Call

4.22.3 Failed Circuit Data Call Setup

The following diagram depicts the failed call scenario case between the TE and the iO270.

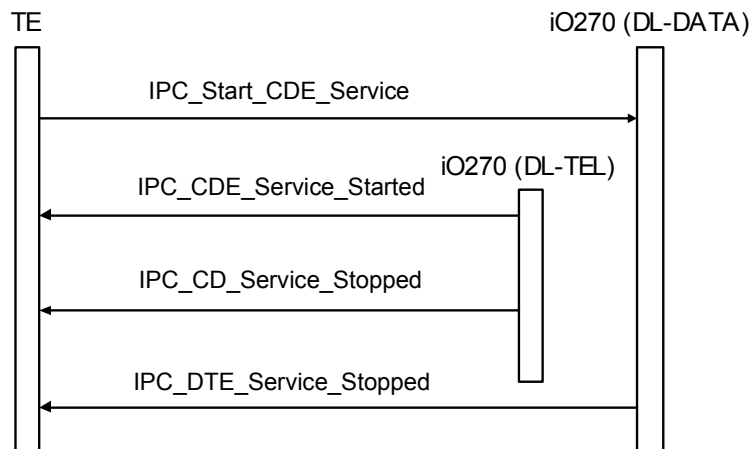


Figure 72. Failed Circuit Data Call

4.22.4 Aborted Circuit Data Call Setup

The following diagram indicates that the user may abort a call setup at anytime by terminating the call.

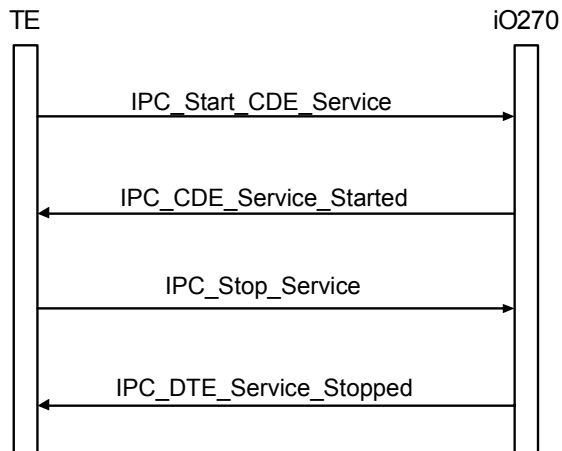


Figure 73. Aborted Circuit Data Call

4.22.5 Circuit Data Call Request Rejection

The following diagram indicates a circuit data call request rejection call.

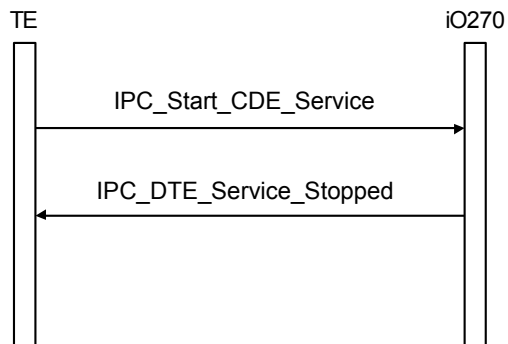


Figure 74. Circuit Data Call Request Rejection

4.22.6 Circuit Data Call Reception

As with call origination, many scenarios also apply for call reception. The following sub-sections outline a few of the more common ones.

4.22.7 Answered Received Circuit Data Call

The following diagram illustrates an answered received circuit data call by the TE.

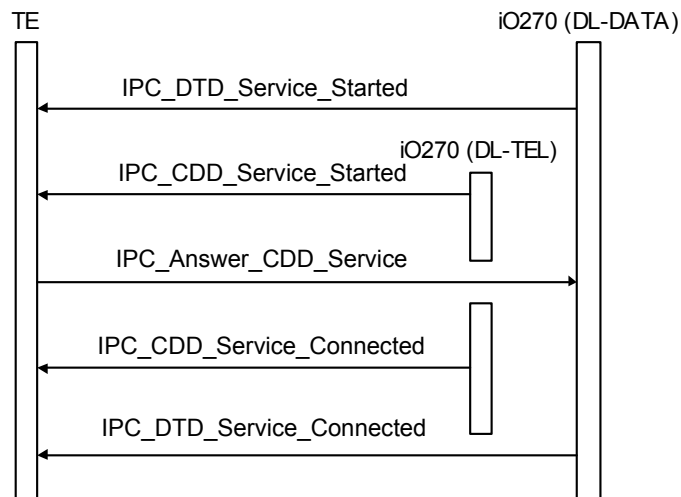


Figure 75. Answered Received Circuit Data Call

4.22.8 Rejected Circuit Data Call

The following diagram illustrates a received data call that has been rejected. The call ends when the calling user hangs up, or if the system times out and disconnects the call. There is no notification to the TE when an unanswered call terminates normally (such as when the external application hangs up); instead the “ring” notifications just stop being sent by the iO270.

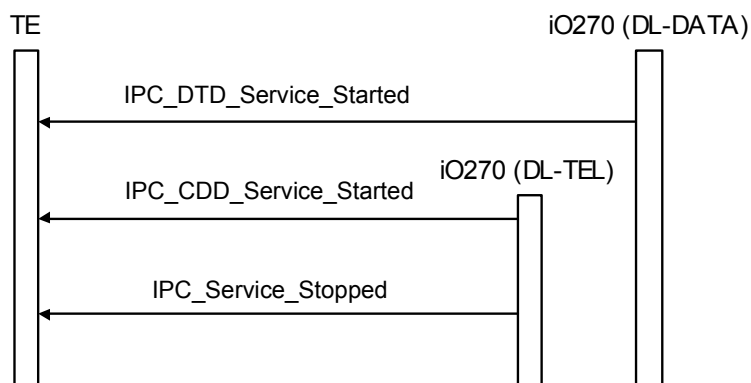


Figure 76. Rejected Circuit Data Call

4.22.9 Unanswered Circuit Data Call

The following diagram illustrates an unanswered received data call. The call ends when the calling user hangs up, or if the system times out and disconnects the call. There is no notification to the TE when an unanswered call terminates normally (such as when the external application hangs up); instead the “ring” notifications just stop being sent by the iO270.

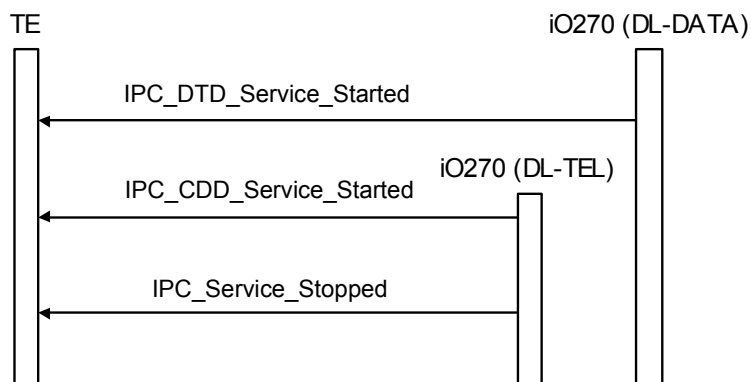


Figure 77. Unanswered Circuit Data Call

4.22.10 Deny Received Circuit Data Call

The following diagram illustrates that the called iO270 may immediately deny a received circuit data call rather than answer it or let it ring-out on its own.

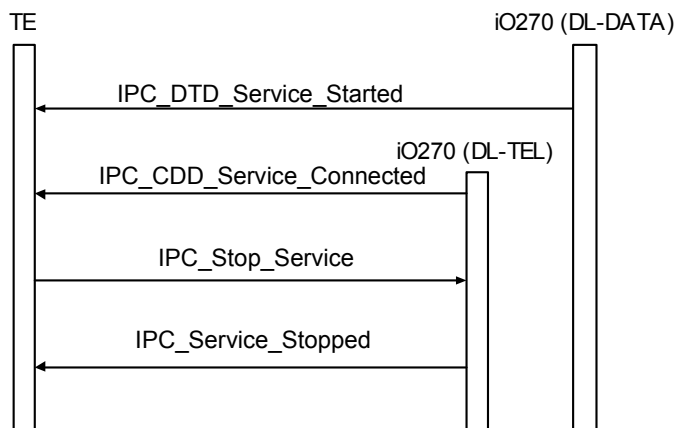


Figure 78. Deny Received Circuit Data Call

4.22.11 Circuit Data Call Termination

This section describes some common message interactions that may occur once a circuit data call has been connected.

4.22.11.1 Subscriber Termination

The TE can terminate a circuit data call at anytime. The following diagram illustrates the termination of an originated circuit data call.

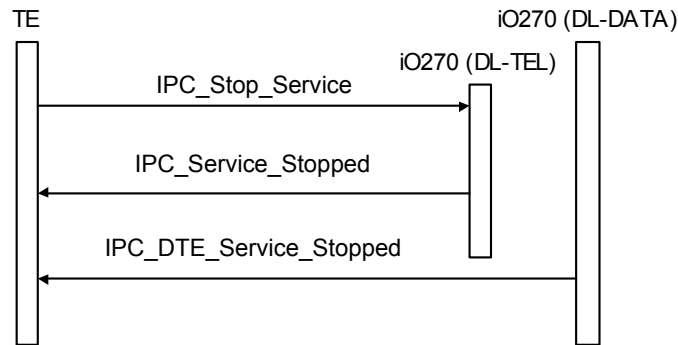


Figure 79. Subscriber Termination of Circuit Data Call

4.22.11.2 TE Termination

The user can also abort the data call from the TE.

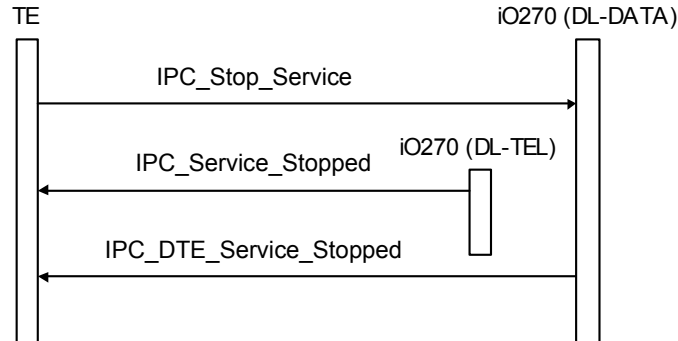


Figure 80. DTE Termination of Circuit Data Call

4.22.11.3 Remote Termination

It is also possible that the remote connection can terminate the call. The following diagram illustrates this method.

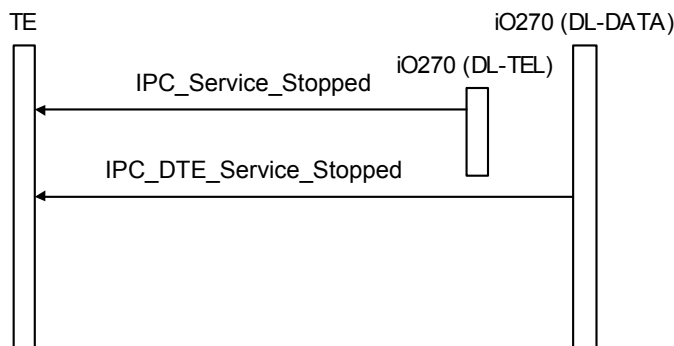


Figure 81. Remote Termination of Circuit Data Call

4.23 PACKET DATA SERVICE

This section describes the interface as it relates to the packet data service. This is for operations using either internal or external applications that use the packet data dial-up connection over PPP or SLIP.

The following diagrams and messaging do not indicate the various AT commands needed to configure the interface for specific applications, nor selection and messaging of the protocol used once the connection is established (PPP/SLIP). The assumption is that the application/dial-up networking or TE will implement functionality as defined in ref [8] in Table 1, “References”. Therefore, TE developers need to implement reference [8] Table 1, “References” in either the TE or dial-up networking drivers for packet data connections.

The TE can establish an iDEN PD using PPP/SLIP on any AT configured channel.

4.23.1 Successful Packet Data Setup

The following diagram depicts the successful start packet data scenario case. If the iO270 is not PD/MIP registered, it will perform PD and MIP registration, as shown in the optional blocks below.

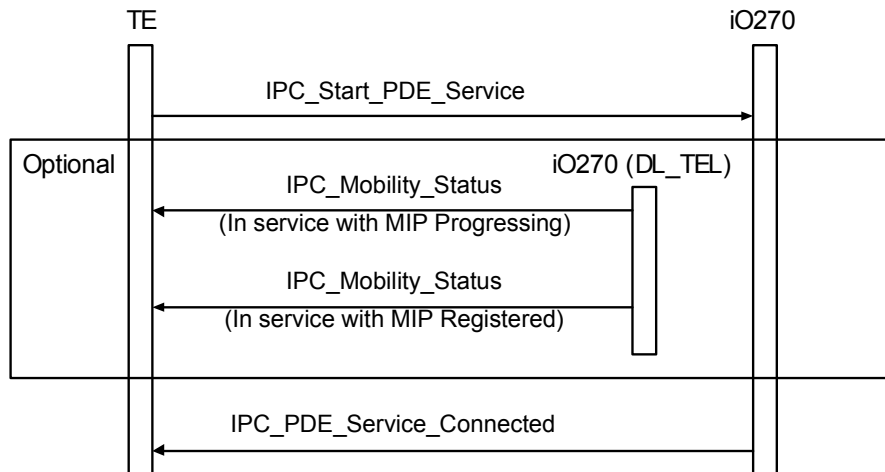


Figure 82. Start PD Call

4.23.2 PD Termination

The following diagram illustrates a packet data call termination.

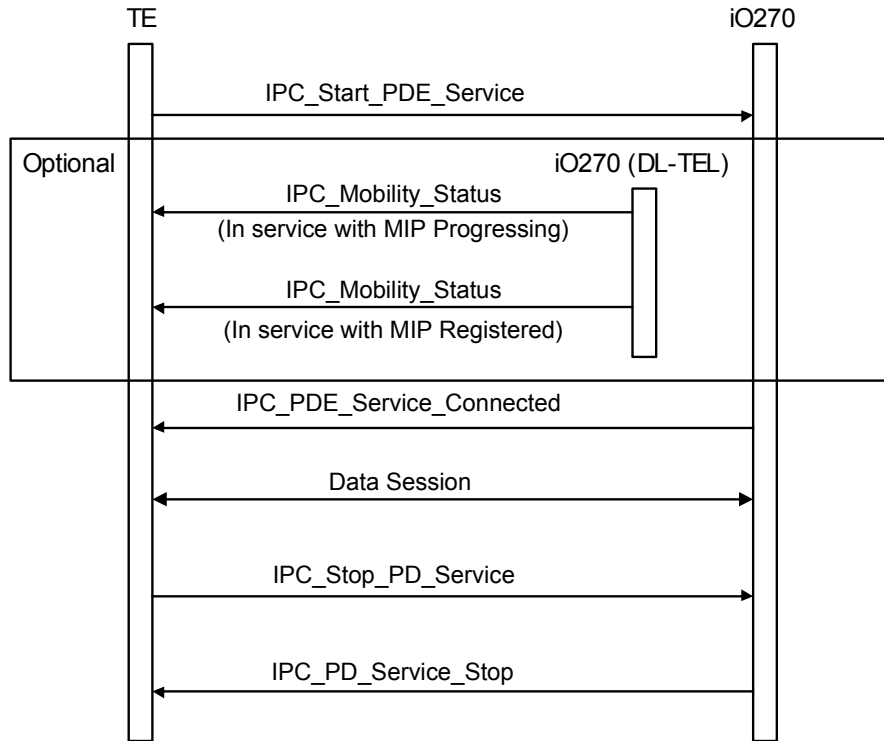


Figure 83. PD Termination

4.23.3 PD Rejection

The iO270 can reject the request for packet data service, most notably if the iO270 cannot properly MIP.

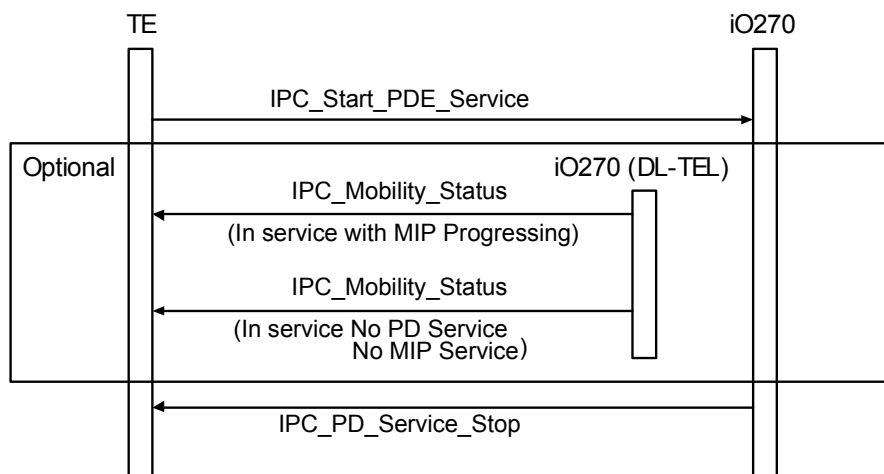


Figure 84. PD Rejection

4.24 SHORT MESSAGE SERVICE

The following sections describe the interface as it relates to short message services (SMS). Note that in all cases the iO270 will only support PDU mode (text mode and block mode are not supported). In addition, the iDEN system and iO270 do not support the GSM cell broadcast feature.

4.24.1 Configuration

The iO270 SMS functionality can be modified or queried by the TE as illustrated below. Not all GSM commands defined in ref [4] in Table 1, “References” are implemented as indicated in IPC_SMS_Configure_Request. The select message service options allow the TE to determine if the iO270 is to be phase 2 or phase 2+ compliant with other SMS commands.

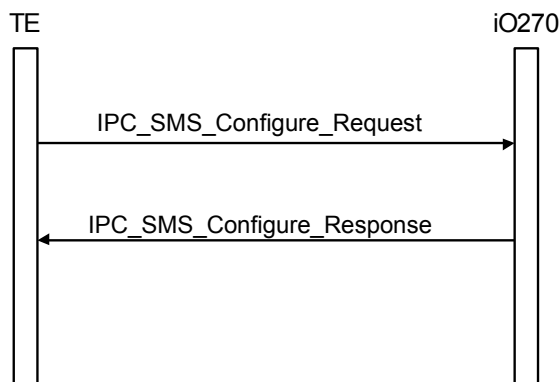


Figure 85. SMS Configuration

4.24.2 Mobile Originated SMS

The following diagram illustrates the iO270 sending a mobile-originated (MO) SMS message to the system.

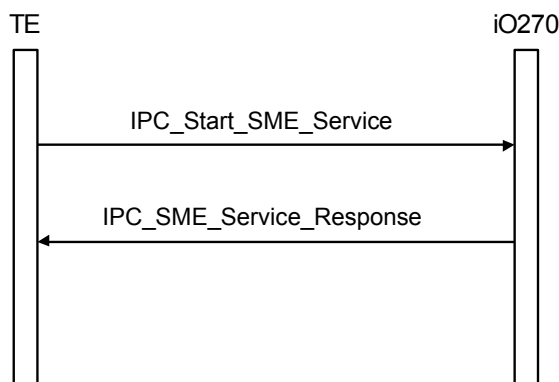


Figure 86. Mobile-originated SMS

4.24.3 Accessing SMS memory

The following illustrates the TE accessing (read/write/delete) SMS stored on the iO270.



Note

The TE may need to configure the correct memory storage (see Section 4.24.1, “Configuration”) for the access.

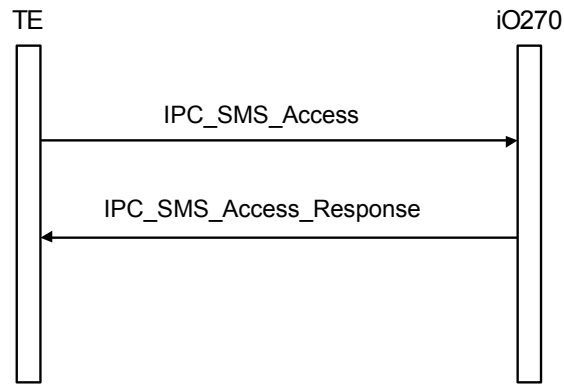


Figure 87. Accessing SMS Memory

4.24.4 Voice Mail

Voice mail (VMAIL) is a special formatted iDEN SMS message. The following diagram illustrates how the iO270 will inform the TE of a voice mail reception instead of the normal SMS interaction. It also shows querying of the iO270 voice mail status.

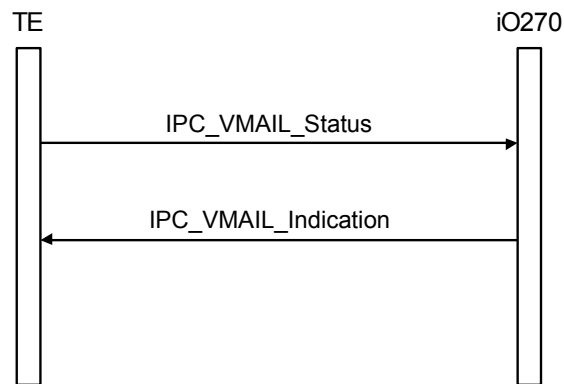


Figure 88. VMAIL Status

The following diagram illustrates enabling VMAIL notifications.

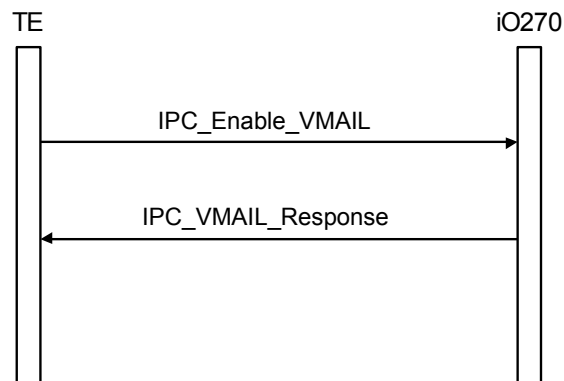


Figure 89. Enable VMAIL Notifications

The following diagram illustrates disabling VMAIL notifications.

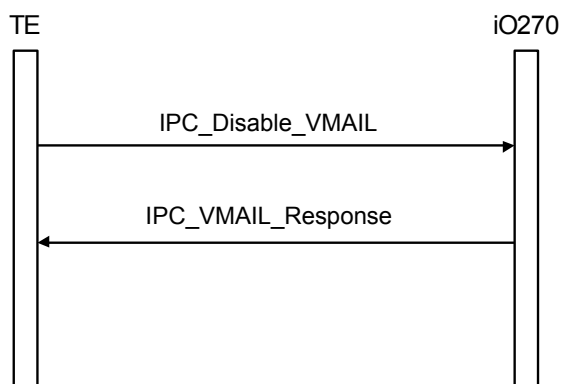


Figure 90. Disable VMAIL Notifications

The following diagram illustrates an unsolicited VMAIL notification.

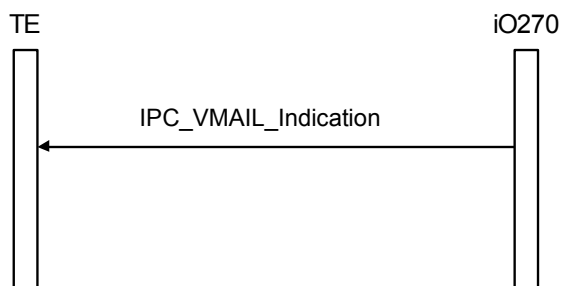


Figure 91. Disable VMAIL Notifications

4.25 MESSAGE DESCRIPTION

This section describes the structure and definition of all messages between the application to/from the iO270 AT parser. Messages from the TE to the iO270 are AT commands and from the iO270 to the TE are AT responses. Parameters, which are supplied to/from the applications, are indicated by <parameter>. For more information on AT commands, refer to ref [4] in Table 1, “References”. In cases where iDEN has defined new AT commands (ref [4] in Table 1, “References”) for extending the capability of the existing GSM AT commands (ref [4] in Table 1, “References”), both the iDEN and GSM commands are listed. In these cases, the iO270 will accept either command and respond accordingly.

In some cases, an iDEN command based on the iDEN +WVCLCC exists. The iDEN extension allows the TE to use the extended capabilities and information available in the iO270. The TE should use the iDEN command when interfacing with applications that require the extended capabilities. For example, where TE used the +WVCLCC, it would include dispatch information in the reply (as defined in ref [4] in Table 1, “References”).

4.26 TE TO iO270

The following sections list the AT command(s) needed to perform the request. Hard values defined in an AT command are specific to perform the requested function. For full usage and parameter definition, see [ref [4] in Table 1, “References”. Note that the iO270 will respond to each AT command line. The TE should stop the request if an error response is received for any request, and indicate failure to the application.

4.26.1 IPC_System_Selection

This message prompts the iO270 to make a (re-)connection with an iDEN system. This is typically sent upon power up, or when the TE is exiting Airplane mode.

Command:

AT+COPS = 0

4.26.2 IPC_Group_Affiliation

This message prompts the iO270 to affiliate with a new group mode.

Command:

AT+WVCLASS= 4

ATD<mode index>

4.26.3 IPC_Abort_Connection

This message forces the iO270 to de-register and abort its connection with the iDEN system. In addition, the iO270 will shut down all RF hardware.

Command:

AT+COPS=2

4.26.4 IPC_Start_GCE_Service

This message prompts the iO270 to originate a group call to the currently affiliated group.

Normal Group Command:

AT+WVCLASS= 3

ATD<type>[, <area>, <talkgroup mode>]

4.26.5 IPC_Deassert_Xmission

This message is sent when “talk” permission is relinquished.

Command:

ATH

4.26.6 IPC_Assert_Xmission

This message is sent when “talk” permission is requested.

Command:

ATD

4.26.7 IPC_Stop_Service

This message instructs the iO270 to abort the indicated communication service.

Command (Dispatch):

(During Silent State or Listen State): ATH

(During Talk State, Silent State or Listen State): AT+CHUP

Command (Circuit Data):

AT+CHUP or ATH

Command (Interconnect):

(All Interconnect Calls, Active and Held calls terminated): AT+CHUP

(Active Interconnect Call, Held calls remain up): ATH

4.26.8 IPC_Cause_Request

This message instructs the iO270 to return the reason for service termination.

Command:

AT+CEER

4.26.9 IPC_Start_PCE_Service

This message instructs the iO270 to initiate a private call to the indicated number. The number needs to be in UFMI format.

Command:

AT+WVCLASS=1

ATD<UFMI number>

4.26.10 IPC_Start_CAE_Service

This message instructs the iO270 to initiate a call alert to the indicated number. The number needs to be in the UFMI format.

Command:

AT+WVCLASS=2

ATD<UFMI number>

4.26.11 Start_TIE_Service

This message instructs the iO270 to initiate a phone call to the indicated number.

Command:

ATD<number>

4.26.12 IPC_Set_Phone_Line

This message instructs the iO270 to place all phone service requested on the indicated line.

Command (line 1):

AT+WVCLASS=0

Command (line 2):

AT+WVCLASS = 7

Command (Interconnect Emergency Call):

AT+WVCLASS=5

4.26.13 IPC_Set_Interleave

This message instructs the iO270 to use the requested interleave settings for all phone services.



Note

Interleave setting values commands operation are blocked unless WVLIM (Limited Accesses) is enabled, and the Interleave selection flag is enabled in the iO270 codeplug.

Command (Non-enhanced):

AT+WVINTER=<interleave>

AT+WVEIC=0

Command (Enhanced Interconnect):

AT+WVINTER=<interleave>

AT+WVEIC=<value>

Command (Enhanced Dispatch):

AT+WVEDIS=<value>

Command (Circuit Data):

AT+WVCDINTER=<interleave>

4.26.14 IPC_Get_Interleave

This message instructs the iO270 to respond with the current interleave settings.

Command:

(Interconnect) AT+WVINTER?

-OR-

(Enhanced Interconnect) AT+WVEIC?

-OR-

(Enhanced Dispatch Version) AT+WVEDIS?

-OR-

(Circuit Data) AT+ WVCDINTER?

4.26.15 IPC_Get_Interleave_Capability

This message queries the iO270 for its interleave capability.

Command:

(Interconnect) AT+WVINTER=?

-OR-

(Enhanced Interconnect) AT+WVEIC=?

-OR-

(Enhanced Dispatch Version) AT+WVEDIS=?

-OR-

(Circuit Data) AT+ WVCDINTER=?

4.26.16 IPC_Get_Phone_Line

The message queries the iO270 for the current phone line.

Command:

AT+WVCLASS?

4.26.17 IPC_Answer_Phone

This message instructs the iO270 to answer the incoming phone call.

Command:

ATA

4.26.18 IPC_Get_Call_List

This message instructs the iO270 to return the status of all current calls.

iDEN Command:

AT+WVLCC

GSM Command:

AT+CLCC

4.26.19 IPC_DTMF_Request

The message instructs the iO270 to play a DTMF digit.

Command:

AT+VTS=<dtmf> [, <duration>]

4.26.20 IPC_Call_Hold

This message instructs the iO270 to place all active calls on hold and accept another held or waiting call.

Command:

(Other held or waiting call made active): AT+CHLD=2

-OR-

(Call with **id** made active): AT+CHLD=2<**id**>

4.26.21 IPC_Call_Retrieve

This message instructs the iO270 to retrieve the held call to the active state.

Command:

AT+CHLD=2

-OR-

AT+CHLD=2<**id**>

4.26.22 IPC_Call_Alternate

This message instructs the iO270 to place the current active call on hold and place the held call in the active state.

Command:

AT+CHLD=2

-OR-

AT+CHLD=2<**id**>

4.26.23 IPC_Call_Join

This message instructs the iO270 to join the active call to the held call to form a three-way conference call.

Command:

AT+CHLD=3

4.26.24 IPC_Stop_Phone_Service

This message instructs the iO270 to end one or more phone calls.

Command:

(Release held calls or deny waiting call): AT+CHLD=0

(Release active call/retrieve held call): AT+CHLD=1 -OR- ATH

(Release a call): AT+CHLD=1<id>

(Release all calls): AT+CHUP

4.26.25 IPC_Enable_Phone_Only

Instructs the iO270 to attempt to request phone-only operation from the system.

Command:

AT+WVMODE=1

4.26.26 IPC_Disable_Phone_Only

Instructs the iO270 to attempt to request exiting phone-only operation from the system.

Command:

AT+WVMODE=0

4.26.27 IPC_Reg_Call_Forwarding

Instructs the iO270 to attempt call-forwarding registration with the system.

Command:

AT+CCFC=<reason>, 3, <number>

4.26.28 IPC_Remove_Call_Forwarding

Instructs the iO270 to remove call forwarding from the system.

Command:

AT+CCFC=<reason>, 4

4.26.29 IPC_Get_Call_Forwarding_Settings

Instructs the iO270 to retrieve the status of call forwarding from the system.

Call Scenario

Command:

AT+CCFC=<reason>, 2

4.26.30 IPC_Get_Call_Waiting_Status

Instructs the iO270 to return the status of call waiting.

Command:

AT+CCWA=<n>,2

4.26.31 IPC_Set_Call_Waiting_Status

Instructs the iO270 to enable or disable to the call waiting feature.

Command:

AT+CCWA=<n>, <mode>, 1

4.26.32 IPC_Start_CDE_Service

Instructs the iO270 to start a circuit data call to the indicated number.

Setup Commands:

AT+WS46=23

AT+WS45=0

AT+FCLASS=0

AT+WVCLASS=9

Command:

ATD<number>

4.26.33 IPC_Answer_CDD_Service

This message instructs the iO270 to answer the received circuit data call.

Command:

ATA

4.26.34 IPC_PD_Register_Request

Instructs the iO270 to attempt PD and MIP registration with the system if not already registered.

Command:

AT+WPREG

4.26.35 IPC_PD_Deregister_Request

Instructs the iO270 to packet data de-register from the system, if not already done.

Command:

AT+WPDEREG

4.26.36 IPC_Start_PDE_Service

Instructs the iO270 to start a packet data call.

Setup Commands:

AT+WS46=24

AT+WS45=4 (PPP) –or- AT+WS45=3 (SLIP)

AT+FCLASS=0

Command:

ATD

4.26.37 IPC_SMS_Configure_Request

Instructs the iO270 to either configure the SMS service parameters or retrieve the SMS service parameters.

The following AT commands are used (refer to ref [4] in Table 1, “References”, for more details):

Service Options:

- Select Message Service (indicates whether phase 2 or phase2+ compliant): AT +CSMS=<service>
- Preferred Message Storage: AT +CPMS=<mem1> [, <mem2> [, <mem3>]]
- Message Format (PDU mode only): AT +CMGF = 0

Configuration Options:

- Service Center Address: AT +CSCA = <sca> [, <tosca>]
- New Message Indications: AT+CNMI= [<mode> [, <mt>[, <bm>[, <ds>[, <BFR>]]]]]

4.26.38 IPC_Start_SME_Service

Instructs the iO270 to send an SMS to the system. One of the following commands is sent, based on where the MO message is stored.

Call Scenario

Command:

(Send Message): AT+CMGS=<length><CR>**PDU is given**<ctrl-Z/ESC>

-OR-

iO270 (More Message to Send): AT+CMMS=<n>

The command AT+CMGC is not supported by iDEN.

4.26.39 IPC_SMS_Access

Instructs the iO270 to perform an access command to stored SMS messages in iO270 memory or SIM.

Command:

(Read): AT+CMGR=<index>

4.26.40 IPC_Get_Reg_Status

Instructs the iO270 to return its current registration status.

iDEN Extension Command:

AT+WVREG?

GSM Command:

AT+CREG?

4.26.41 IPC_Get_Sub_Numbers

Instructs the iO270 to reply with subscriber numbers stored within.

iDEN Command:

AT+WVNUM

GSM Command:

AT+CNUM

4.26.42 IPC_Get_Line_Status

Instructs the iO270 to return its current status.

Command:

AT+CPAS

4.26.43 IPC_Get_User_Identity

Instructs the iO270 to return its user identity.

Command:

(For IMSI GSM): AT+CIMI

(For SIMID, iDEN): AT+WVTRACE=12

4.26.44 IPC_Lock_Radio

Instructs iO270 to lock the specified facility.

Facilities allowed in iDEN iO270 are:

- “SC”(lock SIM card, password required)

Command:

+CLCK=<fac>, <mode> [, <passwd> [, <class>]]

4.26.45 IPC_Unlock_Radio

Instructs iO270 to unlock the specified facility.

Command:

AT+CPIN= <pin>

4.26.46 IPC_Change_Password

Instructs iO270 to change the password-specified facility.

Command:

AT+CPWD=<fac>. <oldpwd>, <newpwd>

4.26.47 IPC_Get_Lock_Status

Instructs iO270 to indicate the current lock status. The +CPIN command can be used to determine the state of the SIM (locked, PUKed, and so on). The +CLCK command is used to query the various other locking facilities of the iO270.

Command:

AT +CPIN?

-OR-

AT +CLCK = <fac>,2

4.26.48 IPC_SIM_Command

Instructs iO270 to access the SIM.

Generic

Command:

AT+CSIM=<length>, <command>

Restricted SIM Access Command:

AT+CRSM= <command> [, <field> [, <P1>, <P2>, <P3> [, <data>]]]

4.26.49 IPC_Get_Signal_Quality

Instructs iO270 to return the current cell quality on which it is camped. The GSM format returns: RSSI and BER. The iDEN command returns: SQE, RSSI, and cell tower information.

Command:

(GSM): AT+CSQ

-OR-

(iDEN): AT+WVTRACE=10

4.26.50 IPC_Get_Cell_Info

Instructs iO270 to return the cell tower to which it is connected.

Command:

(iDEN) AT+WVREG?

(iDEN) AT+WVTRACE=8

(GSM) AT+CREG?

4.26.51 IPC_Get_Equip_Info

Instructs iO270 to return the requested equipment information.

Command:

(Manufacture ID): AT+CGMI -OR- AT+GMI

(Software Type): AT+CGMM -OR- AT+GMM

(Software Version): AT+CGMR -OR- AT+GMR

(Serial Number ID): AT+CGSN -OR- AT+GSN

4.26.52 IPC_Access_Equip_State

Instructs the iO270 to allow access to its phone functionality.

Commands:

(General Set): AT+CFUN = [<fun> [, <rst>]]

(Full Service): AT+CFUN=1

(Airplane mode): AT+CFUN=0

(Query): AT+CFUN?

4.26.53 IPC_Access_Net_Id

Instructs the iO270 to get/set its network IDs.

Command:

(Query): AT+WVNET?

(Set): AT+WVNET= <type1>, <id1> [, <type2>, <id2> [, <type3>, <id3> [, <type4>, <id4> [, <type5>, <id5>]]]]

4.26.54 IPC_Trace_Data_Req

Instructs the iO270 to return data for the specified field.

Command:

AT+WVTRACE=<field>

4.26.55 IPC_Trace_Req

Instructs the iO270 to return data for the specified field.

Command:

(Enable 2-second response): AT+WVTRACE=<field>, 1

(Disable 2- second response): AT+WVTRACE=<field>, 0n

4.26.56 IPC_Mode_Request

Instructs the iO270 to re-configure into a different mode of operation. If the same mode, no action is performed.

Command:

AT+WVMODE=<mode>

4.26.57 IPC_Lock_Capabilities_Req

Instructs the iO270 to return the facilities that it allows to be locked/unlocked.

Command:

(Available facilities):

AT+CLCK?

AT+CLCK=?

-OR-

(Available facilities and password length):

AT+CPWD?

AT+CPWD=?

4.26.58 IPC_Master_Reset_Req

Instructs the iO270 to perform a master reset.

Command:

AT+WVMR="<passcode>"

4.26.59 IPC_Stop_PD_Service

Instructs the iO270 to terminate an active PD call. In normal tethered operations, the hardware DTR line accomplishes this functionality.

4.26.60 IPC_NMEA_Request

TE requests the iO270 to start streaming data on a specified channel. The TE can disable all channels, enable both channels, or turn one channel on and the other off.

Command:

AT+WVGPS=0 Disable all

-OR-

AT+WVGPS=1 Enable NMEA only on DL-NMEA channel (MUX over UARTA)

-OR-

AT+WVGPS=2 Enable NMEA only on UART B

-OR-

AT+WVGPS=3 Enable NMEA on DL-NMEA channel and UARTB

-OR-

AT+WVGPS=4 Enable NMEA on the UART on which the command was executed (if the command was sent on MUX, the NMEA data is sent to UART B).

4.26.61 IPC_Enable_MUX

TE requests the iO270 to enable the GSM 27.010 multiplexer on the IPC, as defined in ref [3, GPP TE Equipment Multiplexer, 27.010] in Table 1, “References”.

Command:

AT+CMUX (refer to ref [4] in Table 1, “References”).

4.26.62 IPC_MUX_Negotiation

This indicates that the TE and iO270 are performing the necessary negotiation of the channels on the GSM 27.010 multiplexer. Refer to ref [5] in Table 1, “References”.

4.26.63 IPC_Call_Timer Request

TE requests the iO270 to return the value for the selected call timer.

Command:

AT+WVCT=<n>, 0

4.26.64 IPC_Reset_Call_Timer

TE requests the iO270 to reset the value to 0 for the selected call timer.

Command:

AT+WVCT=<n>, 1

4.26.65 IPC_Enable_VMAIL

TE requests the iO270 to enable unsolicited VMAIL updates.

Command:

AT+WVMAIL=1

4.26.66 IPC_Disable_VMAIL

TE requests the iO270 to disable unsolicited VMAIL updates.

Command:

AT+WVMAIL=0

4.26.67 IPC_VMAIL_Status

TE requests the iO270 to return the status of unsolicited VMAIL updates.

Command:

AT+WVMAIL?

4.26.68 IPC_DTMF_Start

TE requests the iO270 to start a DTMF tone generation to the system.

Command:

AT+WVDTMF=1,<digit>

4.26.69 IPC_DTMF_Stop

TE requests the iO270 to stop a DTMF tone being generated in the system.

Command:

AT+WVDTMF=0

4.26.70 IPC_DTMF_Burst

TE requests the iO270 to send one or more DTMF digits to the system.

Command:

AT+WVDTMF=2,<digits>

4.26.71 IPC_Set_Operation_Mode

Instructs the iO270 to set the mode of operation to voice.

Command:

AT+FCLASS=8 (Voice)

4.26.72 IPC_Open_Audio_Uplink

Instructs the iO270 to open the audio uplink status call information.

Command:

Open Uplink (Initiate)

AT+WVAR=1,1

AT+CRTG=8 (Optional Uplink Tone)

4.26.73 IPC_Close_Audio_Uplink

This message instructs the iO270 to close the audio uplink status call information.

Command:

Close Uplink (Terminate)

AT+WVAR=1,2

4.26.74 IPC_Open_Audio_Downlink

This message instructs the iO270 to open the audio Downlink status call information.

Command:

Open Downlink (Receiving)

AT+WVAR=2,1

AT+CRTG=9 (Optional Downlink Tone for Private Call)

AT+CRTG=10 (Optional Downlink Tone for Group Call)

4.26.75 IPC_Close_Audio_Downlink

Instructs the iO270 to close the audio downlink status call information.

Command:

Close Downlink (Receiving Terminate)

AT+WVAR=2,2

4.26.76 IPC_Open_Audio_Interconnect

Instructs the iO270 to open the audio interconnect status call information.

Command:

Open Interconnect (Initiation / Receiving)

AT+WVAR=3,1

4.26.77 IPC_Close_Audio_Interconnect

Instructs the iO270 to close the audio interconnect status call information.

Command:

Close Interconnect (Terminate)

AT+WVAR=3,2

4.26.78 IPC_Set_Tone

Instructs the iO270 to generate a particular tone (1-29).

Command:

AT+CRTG=7 (Uplink Tone)

AT+CRTG=8 (Downlink Tone)

4.27 iO270 TO TE

The complete (full) format of AT responses is not defined in the sections below. The specific AT response without values and parameters is indicated. The reader should refer to AT documents (ref [1] in Table 1, “References”) for possible return values and their meanings.

4.27.1 IPC_Mobility_Status

This message reports the “mobility” status of the iO270. It can be sent to the TE as a direct response to a connection-related request, or may be sent without solicitation if the mobility status of the iO270 changes and unsolicited messaging is enabled (+WVREG=1 or +WVREG=2). All parameters will be included in the response when either queried or any single parameter changes. The optional parameters <mcc>, <mnc>, <dlac>, <lac> and <ci> are supplied if enabled (+WVREG=2).

iDEN Response:

+WVREG:

GSM Response:

+CREG

4.27.2 IPC_Talk_Permit

This message indicates that voice packets can be transmitted on the voice channel.

Response:

(Verbose): CONNECT TPERMIT

(Non-verbose): 20 <CR>

4.27.3 IPC_Listen_Permit

This message indicates that voice packets are available on the voice channel.

Response:

(Verbose): CONNECT LPERMIT

(Non-verbose): 22 <CR>

4.27.4 IPC_GCE_Service_Started

This message confirms that the requested group call was started. Sent only if +WVLOP=1.

Response:

+WVOLP:

4.27.5 IPC_GC_Status

This message indicates the status of the group call. Sent only if +WVLIP=1. It may or may not contain the talker ID information.

Response:

+WVLIP:

4.27.6 IPC_Talker_Id

This message indicates the initiator or transmitter of a dispatch call. Sent only if +WVLIP=1. In a private call, indicates the initiator of the call.

Response:

+WVLIP:

4.27.7 IPC_GCD_Service_Started

This message indicates an invitation to join a group call. Sent only if +CRC=1.

Response:

+CRING: GROUP

4.27.8 IPC_Talk_Inhibit

This message indicates that voice packets can no longer be transmitted on the voice channel.

Response:

(Verbose): CONNECT TINHIBIT

(Non-verbose): 21 <CR>

4.27.9 IPC_Listen_Inhibit

This message indicates that voice packets are no longer available on the voice channel.

Response:

(Verbose): CONNECT LINHIBIT

(Non-verbose): 23 <CR>

4.27.10 IPC_Service_Stopped

This message indicates that an active service has terminated, or that a requested service was denied. The iO270 permits multiple channels or DTE devices to be connected. Only the DTE performing the termination will get the OK response. All other devices, if monitoring the call status, will receive the NO CARRIER response.

Response to User Termination:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Response to System Termination:

(Verbose): <CR><LF>NO CARRIER<CR><LF>

(Non-verbose): 3 <CR>

Other Possible Responses:

Table 67. Service Stopped Other Possible Responses

Verbose	Non-verbose
<CR><LF>NO DIALTONE<CR><LF>	6<CR>
<CR><LF>BUSY<CR><LF>	7<CR>
<CR><LF>NO ANSWER<CR><LF>	8<CR>

4.27.11 IPC_Cause_Indication

This message indicates from the iO270 the cause of service termination.

Response:

+CEER: <err>

4.27.12 IPC_PCE_Service_Started

This message confirms that the requested private call was started. Sent only if +WVLOP=1.

Response:

+WVOLP:

4.27.13 IPC_PCD_Service_Started

This message indicates an invitation to join a private call.

Response:

+CRING: PRIVATE

4.27.14 IPC_CAE_Service_Started

This message confirms that the requested CA call was started. Sent only if +WVOLP=1.

Response:

+WVOLP:

4.27.15 IPC_CAD_Service_Started

This message indicates the reception of a call alert. The +WVLIP notification includes the ID of the calling MS and the status, if present. Sent only if +WVLIP=1.

Response:

+CRING: CALL ALERT

+WVLIP:

4.27.16 IPC_TIE_Service_Started

This message confirms that the requested phone service was started. Sent only if +WVLOP=1 or COLP=1.

iDEN Response:

+WVOLP:

GSM Response:

+COLP:

4.27.17 IPC_Set_Interleave_Confirm

This message indicates whether the requested interleave was set. An unsuccessful response can imply any of the following:

- The iO270 is incapable of supporting the requested interleave setting.
- The iO270 does not allow the interleave to be changed to the requested new interleave setting.
- The system is incapable of the selected interleave mode.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.18 IPC_Set_Phone_Line_Confirm

This message indicates whether the requested phone line was set.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.19 IPC_Interleave_Setting

This message indicates the interleave settings used in the iO270.

Response:

(Interconnect): +WVINTER

-OR-

(Enhanced Dispatch): +WVEDIS

-OR-

(Circuit Data): +WVCDINTER

-OR-

(Enhanced Interconnect): +WVEIC

4.27.20 IPC_Interleave_Capability

This message indicates the interleave capability of the iO270.

Response:

(Interconnect): +WVINTER

-OR-

(Enhanced Dispatch): +WVEDIS

-OR-

(Circuit Data): +WVCDINTER

-OR-

(Enhanced Interconnect): +WVEIC

4.27.21 IPC_TID_Service_Started

This message indicates that an incoming interconnect phone call has been received by the iO270. Sent only if +WVLIP=1, and +CRC=1.

iDEN Response:

+CRING: VOICE

+WVLIP:

GSM Response:

+CRING: VOICE

+CLIP:

4.27.22 IPC_Current_Call_List

This message indicates the status of all active calls in the iO270.

iDEN Response:

+WVCLCC:

GSM Response:

+CLCC:

4.27.23 IPC_DTMF_Complete

This message indicates that the iO270 has finished sending the DTMF tone.

Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

4.27.24 IPC_Call_Ack

This message indicates whether the iO270 successfully performed the last call manage request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.25 IPC_Phone_Only_Confirm

This message indicates whether the iO270 is processing the phone-only request with the system.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.26 IPC Call Forward Confirm

This message indicates the status of the iO270 processing of the call forwarding message.

Successful Response:**Non-query Response:**

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Call Scenario

Query Response:

+CCFC:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.27 IPC_Call_Waiting_Status

This message indicates the status of call waiting feature.

Response:

+CCWA:

4.27.28 IPC_Call_Waiting_Confirm

This message indicates whether a change of the call waiting status was successful.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.29 IPC_DTE_Service_Started

Indicates that the circuit data call is in the online state.

Response:

(Verbose): CONNECT XXXX

(Non-verbose): 1<CR>

XXXX is the baud rate of the connection.

4.27.30 IPC_CDE_Service_Started

Indicates that the iO270 has begun setup of a circuit data call. The iO270 can send all of the following responses to indicate the status of the call. If no application uses this information, the TE should silently discard it.



Note

+WVOLP indications display only if activated via MUX.

iDEN Response:

(Indicate start): +WVOLP:

(Indicate connect): CONNECT XXXX

XXXX is the baud rate of the connection.

4.27.31 IPC_DTE_Service_Stopped

This message indicates that an active circuit data service has terminated, or that a circuit data call failed to connect.

Response to User Termination:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Response to System Termination:

(Verbose): <CR><LF>NO CARRIER<CR><LF>

(Non-verbose): 3 <CR>

Other Possible Responses:

Table 68. DTE_Service_Stopped Other Possible Responses

Verbose	Non-verbose
<CR><LF>NO DIALTONE<CR><LF>	6<CR>
<CR><LF>BUSY<CR><LF>	7<CR>
<CR><LF>NO ANSWER<CR><LF>	8<CR>

4.27.32 IPC_DTD_Service_Started

This message indicates the reception of a circuit data call by the iO270, and is waiting to be answered.

Response:

(Verbose): +CRING ASYNC

4.27.33 IPC_CDD_Service_Started

This message indicates the reception of a circuit data call by the iO270, and is waiting to be answered.

Response:

(Verbose): +CRING ASYNC

4.27.34 IPC_CDD_Service_Connected

Indicates that the circuit data call is in the online state. This is an informative message to the TE from the iO270.

Response:

CONNECT XXXX

XXXX is the baud rate of the connection.

4.27.35 IPC_DTD_Service_Connected

Indicates that the circuit data call is in the online state. This notifies the TE that the call is ready for data transfer.

Response:

(Verbose): CONNECT XXXX

(Non-verbose): 1<CR>

XXXX is the baud rate of the connection.

4.27.36 IPC_PDE_Service_Connected

Indicates that the requested packet data session has been connected.

Response:

(Verbose): CONNECT

(Non-verbose): 1<CR>

4.27.37 IPC_SMS_Configure_Response

This message is a response to a TE configuration request.

The following are the successful AT responses used (refer to ref [6] in Table 1, “References” for more details):

Service Options:

- Select Message Service: +CSMS:
- Preferred Message Storage: +CPMS:
- Message Format Query: +CMGF
- Message Format (AT+CMGF=0): OK

Configuration Options:

- Service Center Address: OK
- New Message Indication: +CNMI

The following are the unsuccessful AT responses used (refer to ref [6] in Table 1, “References” for more details):

Service Options:

- Select Message Service: +CMS ERROR <err>
- Preferred Message Storage: +CMS ERROR <err>

Configuration Options:

- Service Center Address: ERROR

The following unsupported commands will respond:

- Message Format (AT+CMGF=1): ERROR
- Set Text Mode Parameters: ERROR
- Show Text Mode Parameters: ERROR
- Select Cell Broadcast Message ERROR
- Block Mode: ERROR

4.27.38 IPC_Incoming_SMS

Indicates that iO270 has received an MT SMS message or status report. Storage selection (+CPMS) determines type of unsolicited response. The response +CMT reports the SMS message PDU to the iO270. +CDS reports the iO270 storage memory of the status report PDU.

Unsolicited Responses:

+CMT:

-OR-

+CDS:

4.27.39 IPC_SME_Service_Response

iO270 sends the system response indicating success or failure of a transmitted SMS.

Successful Response:

(Send Message): +CMGS:

-OR-

iO270

(More Message to Send): OK

Unsuccessful Response:

(Send Message from iO270 Storage): +CMS ERROR: <err>

(Send Message): +CMS ERROR: <err>

(More Message to Send): ERROR

Unsupported Command:

(AT+CMGC): ERROR

4.27.40 IPC_SMS_Access_Response

iO270 indicates the status of the SMS access requested.

Successful Response:

(Read): +CMGR:

Unsuccessful Response:

+CMS ERROR: <err>

4.27.41 IPC_Mask_Response

iO270 indicates the status of the mask request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.42 IPC_Sub_Numbers

iO270 indicates the subscriber numbers to which it has access.

Successful iDEN Response:

+WVNUM:

Successful GSM Response:

+CNUM:

Unsuccessful Response:

+CME ERROR: <err>

4.27.43 IPC_Line_Status

iO270 indicates its current activity.

Successful Response:

+CPAS:

Unsuccessful Response:

+CME ERROR: <err>

4.27.44 IPC_User_Identity

iO270 indicates its user identity.

Successful Response:

+CIMI:

-OR-

+WVTRACE:

Unsuccessful Response:

+CME ERROR: <err>

4.27.45 IPC_Lock_Radio_Resp

iO270 indicates the status of the lock iO270 request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

+CME ERROR: <err>

4.27.46 IPC_Unlock_Radio_Resp

iO270 indicates the status of the unlock iO270 request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

+CME ERROR: <err>

4.27.47 IPC_Change_Password_Resp

iO270 indicates the status of the change-password request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

+CME ERROR: <err>

4.27.48 IPC_Lock_Status

iO270 indicates the status of the lock status request.

Successful Response:

+CLCK: <status>, <fac>

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.49 IPC_SIM_Command_Resp

iO270 response to a SIM access request:

Successful Response:

(Generic): +CSIM:

(Restricted): +CRSM:

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.50 IPC_Get_Signal_Quality_Resp

iO270 response to a request for signal quality.

Successful Response:

+CSQ:

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.51 IPC_Get_Cell_Info_Resp

iO270 response to a request for what cell tower to which it is camped.

Response:

(iDEN)+WVREG

(GSM)+CREG

4.27.52 IPC_Get_Equip_Info_Resp

iO270 response to request for equipment information.

Response:

(Manufacture ID): Motorola, iDEN

(Model ID): String SW load Name (such as MS-PDGY-BER-LTL_PINEKEY-R8)

(Revision ID): String SW version (such as RXX.YY.ZZ)

(Serial Number): 10-digit alphanumeric

4.27.53 IPC_Access_Equip_State_Resp

iO270 response to request for phone functionality.

Successful Set Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Successful Query Response:

+CFUN:

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.54 IPC_Net_Id_Response

iO270 response to request for accessing network IDs.

Successful:

(Query): +WVNET

(Set): +WVNET

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.55 IPC_Trace_Response

iO270 response (both solicited and unsolicited) with trace mode data.

Response:

+WVTRACE:

4.27.56 IPC_Lock_Capabilities_Resp

iO270 indicates the locking facilities it supports.

Successful Response:

(Available facilities and password length): +CPWD

Unsuccessful Response:

If CMEE is activated:

+CME ERROR: <err>

Otherwise:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.57 IPC_Master_Reset_Confirm

iO270 response to request for master reset; it will be unsuccessful if the password is incorrect.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.58 IPC_CD_Service_Stopped

This notification indicates that an active circuit data service has terminated.

Response:

<CR><LF>NO CARRIER<CR><LF>

4.27.59 IPC_PD_Service_Stop

Indicates that the packet data session has been terminated.

Response:

(Verbose): <CR><LF>NO CARRIER<CR><LF>

(Non-verbose): 3<CR>

4.27.60 IPC_PC_Status

This message indicates the status of a private call and ID of a remote MS.

Response:

+WVLIP:

4.27.61 IPC_Gain_SIM_Response

This message indicates to the TE the result of the iO270 attempting to gain control of the SIM. An unsuccessful response can imply no SIM is inserted.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.62 IPC_Release_SIM_Response

This message indicates to the TE the result of the iO270 attempting to release control of the SIM.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.63 IPC_NMEA_Response

This message indicates to the TE the result of the iO270 processing the GPS request.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.64 IPC_Active_Indication

This indicates to the TE that the iO270 is now allowing AT commands across the IPC link. This is accomplished by asserting the CTS line, thus indicating that the TE is now clear to send AT commands.

4.27.65 IPC_Mode_Alarm

This unsolicited message is sent on channels that have +WVAL enabled. This alarm indicates to the TE the operation mode of the iO270.

Response:

+WVAL: I<mode>

4.27.66 IPC_Deactive_Request

This indicates to the TE that the iO270 is closing down the GSM 27.010 multiplexer. This is accomplished by sending the CLD (Multiplexer Close Down command) on the DL-CNTL channel of the GSM 27.010 multiplexer. See ref [3GPP TE Equipment Multiplexer, 27.010] and ref [5] in Table 1, “References”.

4.27.67 IPC_Deactive_Indication

This indicates to the TE that the iO270 is no longer allowing communications across the IPC link. This is accomplished by de-asserting the CTS line, thus indicating that the TE is now not clear to send AT commands.

4.27.68 IPC_Reconfig_Alarm

This unsolicited message is sent on channels that have +WVAL enabled. This alarm indicates to the TE the operation mode of the iO270.

Response:

+WVAL: R<mode>

4.27.69 IPC_Call_Timer_Response

The iO270 response for call timer.

Response:

+WVCT

4.27.70 IPC_Reset_Call_Timer_Response

The iO270 response to reset a specific call timer.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.71 IPC_VMAIL_Response

The iO270 response to a TE request to enable/disable voice mail notifications.

Successful Response:

(Verbose): <CR><LF>OK<CR><LF>

(Non-verbose): 0<CR>

Unsuccessful Response:

(Verbose): <CR><LF>ERROR<CR><LF>

(Non-verbose): 4<CR>

4.27.72 IPC_VMAIL_Indication

The iO270 response to a TE request for voice mail status, or an unsolicited notification for a voice mail update.

Response:

+WVMAIL

4.27.73 AT Command Cross-Reference

The following tables indicate chapter and section for locating more information about AT commands and responses defined in this guide.

Table 69. AT Commands

Command	Description	Specification
Voice and Dispatch Call Control		
A	Answer incoming call	GSM07.07 (6.21)
D	Dial	GSM07.07 (6.2, 6.21)
H	Hang up active call	GSM07.07 (6.21)
+CHLD	Manage call	GSM07.07 (7.12)
+CHUP	Hang up call	GSM07.07 (6.5)
+CLCC	Get list of current calls	GSM07.07 (7.17)
+CPAS	Phone activity status	GSM07.07 (8.1)
+FCLASS	Select fax/data class	GSM07.07 (C.2.1)
+VTD	Specify tone play duration	GSM07.07 (C.2.12)
+VTS	Sends DTMF tones across an established voice call	GSM07.07 (C.2.11)
+WVCLASS	Select voice class	Table 3
+WVCLCC	Get list of current calls	Table 3
+WVEDIS	Set enhanced dispatch interleave	Table 3
+WVEIC	Set enhanced interconnect interleave	Table 3
+WVINTER	Define voice service interleave	Table 3
+WVAR	Set audio status call information	Table 3
+CRTG	Generate particular tone	Table 3
+CRTS	Stop particular tone	Table 3

Table 69. AT Commands (Continued)

Command	Description	Specification
+MAFEAT	Set audio mode control	Table 3
+MAVOL	Set audio control volume	Table 3
+MMICG	Set microphone gain for particular audio mode control	Table 3
+CMUT	Set MUTE during interconnect	Table 3
+TTY	Enable/disable TTY	Table 3
Miscellaneous		
+CFUN	Set phone functionality	GSM07.07 (8.2)
+CGMI	Request manufacturer ID	GSM07.07 (5.1)
+CGMM	Software type	GSM07.07 (5.2)
+CGMR	Software version	GSM07.07 (5.3)
+CGSN	Serial number	GSM07.07 (5.4)
+CSQ	Get RSSI level	GSM07.07 (8.5)
+WVANTC	GPS antenna	Table 3
+WVAL	Status Alarms AT	Table 3
+WVCDINTER	Set circuit data interleave	Table 3
+WVCT	Call Timer Request	Table 3
+WVDSM	Deep Sleep Mode	Table 3
+WVMODE	IDEN Special mode	Table 3
+WVTRACE	Retrieve trace mode screen	Table 3
+WVWAKE	Host Wakeup	Table 3
SIM Access		
+CRSM	Restricted SIM access	GSM07.07 (8.18)
+CSIM	Send SIM command	GSM07.07 (8.17)

Table 69. AT Commands (Continued)

Command	Description	Specification
Security		
+CIMI	Get international mobile ID	GSM07.07 (5.6)
+CLCK	Facility lock	GSM07.07 (7.4)
+CPIN	PIN verification and change	GSM07.07 (8.3)
+CPWD	Change password for CLCK	GSM07.07 (7.5)
+WVMR	Master reset	Table 3
Messaging		
+CDS	SMS status report	GSM07.05 (3.4.1)
+CDS	SMS status report	GSM07.05 (3.4.1)
+CMGF	Message format	GSM 07.05 (3.2.3)
+CMGR	Read message	GSM07.05 (3.4.3)
+CMMS	More messages to send	GSM07.05 (3.5.6)
+CMT	SMS deliver	GSM07.05 (3.4.1)
+CMGS	Send message	GSM07.05 (3.4.4)
+CNMI	New message indication	GSM07.05 (3.4.1)
+CPMS	Preferred message storage	GSM07.05 (3.2.2)
+CSCA	Service center address	GSM07.05 (3.3.1)
+CSMS	Select message service	GSM07.05 (3.2.1)

Table 69. AT Commands (Continued)

Command	Description	Specification
Network		
+CNUM	Get subscriber numbers	GSM07.07 (7.1)
+COPS	Operator selection	GSM07.07 (7.3)
+CREG	Network registration	GSM07.07 (7.2)
+WVNET	iDEN network IDs	Table 3
+WVNUM	Get subscriber numbers	Table 3
+WVREG	iDEN network service status	Table 3
Supplemental Services		
+CCFC	Control of call Forwarding	GSM07.07 (7.10)
+CCWA	Control of call waiting	GSM07.07 (7.11)
+CLIP	Enable unsolicited response containing caller ID	GSM07.07 (7.6)
+COLP	Enable additional response to dial command	GSM07.07 (7.8)
+WVLIP	Enable unsolicited response containing caller ID	Table 3
+WVOLP	Enable additional response to dial command	Table 3

Table 69. AT Commands (Continued)

Command	Description	Specification
Basic		
E	Local command mode echo	Ref [8] DTE-DCE Specification
Q	Result code suppression	Ref [8] DTE-DCE Specification
Sx	Standard V.25 S registers	Ref [8] DTE-DCE Specification
V	Result code format	Ref [8] DTE-DCE Specification
X	Extended result codes	Ref [8] (8.2.2)
Z	Modem init/reset	Ref [8] (8.5.2)
+CMEE	Report equipment error	GSM07.07 (9.1)
+CR	Service reporting control	GSM07.07 (6.9)
+CRC	Cellular result codes	GSM07.07 (6.11)
&F	Restore factory default	Ref [8] DTE-DCE Specification
E	Local command mode echo	Ref [8] (8.3.3)
O	Return to online data mode	Ref [8] DTE-DCE Specification
Q	Result code suppression	Ref [8] DTE-DCE Specification
V	Result code format	Ref [8] (8.2.1)
&W	Store Image	Ref [8] (8.5.3)
X	Extended result codes	Ref [8] (8.2.2)
Z	Modem init/reset	Ref [8] (8.5.2)
+CMOD	Call mode	GSM07.07 (6.4)
+++	Escape from data mode	Ref [8] DTE-DCE Specification

Table 69. AT Commands (Continued)

Command	Description	Specification
&C	DCD behavior	Ref [8] (8.3.1)
&D	DTR behavior	Ref [8] (8.3.2)

Table 70. AT Responses

Command	Description	Specification
+CEER	Extended error codes	Table 3
+CMS Error	Message service failure result code	GSM07.07 (3.2.5)
+CRING	Extended RING indication	Table 3

4.28 INTERCONNECT CALL EXTENSIONS

The following examples indicate how to initiate/receive a phone call.

The term optional indicates commands that are not mandatory for initiating or receiving a phone call.

4.28.1 Initiation of Interconnect Call

This scenario depicts initiation of an interconnect call (extension mode).

General Setup:

AT+WS46=23

AT+WS45=0

AT+FCLASS=8

AT+WVCLASS=0

Audio Setup:

AT+MAFEAT=2 (Optional)

AT+MAVOL=2,4 (Optional)

Dial:

ATD"MS2 Phone call #"

Call Scenario

Connect:

AT+WVAR=3,1

Disconnect:

ATH

AT+WVAR=3,2

4.28.2 Receiving Interconnect Call

This scenario depicts interconnect call receiving (extension mode).

General Setup:

AT+WS46=23

AT+WS45=0

AT+FCLASS=8

AT+CRC=1

AT+WVLIP=1

Audio Setup:

AT+MAFEAT=2 (Optional)

AT+MAVOL =2,4 (Optional)

Receiving Call:

AT+CRTG=18 (Optional ring tone 1)

ATA

AT+CRTS (Optional stop ring tone)

AT+WVAR=3,1

Disconnect:

ATH

AT+WVAR=3,2

Table 71. Descriptions of Interconnect Phone Call Between Two iO270s and TE

Step	iO270 #1 Activity	TE Expected Outcome	iO270 #2 Activity	TE Expected Outcome
1	Turn on the modem	The modem has been turned on.	Turn on the modem	The modem has been turned on.
2	Via TE type AT+WPSTATE	Wait for full registration.	Type AT+WPSTATE	Wait for full registration.
3	Via TE type AT+WS46=23	OK.	Via TE type AT+WS46=23	OK.
4	Via TE type AT+WS45=0	OK.	Via TE type AT+WS45=0	OK.
5	Via TE type AT+FCLASS=8	OK.	Via TE type AT+FCLASS=8	OK.
6	Via TE type AT+WVCLASS=0	OK.	Via TE type AT+CRC=1 AT+WVLIP=1	OK.
7	Via TE type AT+MAFEAT=2	OK.	Via TE type AT+MAFEAT=2	OK.
8	Via TE type AT+MAVOL=2,5	OK.	Via TE type AT+MAVOL=2,3	OK.
9	Via TE type ATD"MS2 Phone call #"	OK.	N/A	+CRING: VOICE +CLIP: MS1 phone call # +WVLIP: MS1 phone call #
11	N/A	N/A.	Via TE type ATA	OK.
12	N/A	N/A.	Via TE type AT+CRTS	OK. Ring 1 is stopped playing from the speaker.
13	Via TE type AT+WVAR=3,1	OK.	Via TE type AT+WVAR=3,1	OK.
14	The voice/tone is sound via the speaker in volume 5		The voice/tone is sound via the speaker in volume 3	
15	Via TE type AT+MAFEAT=3	OK.	Via TE type AT+MAFEAT=3	OK.
16	Via TE type AT+MAVOL=3,1	OK.	Via TE type AT+MAVOL=3,5	OK.

Table 71. Descriptions of Interconnect Phone Call Between Two iO270s and TE (Continued)

Step	iO270 #1 Activity	TE Expected Outcome	iO270 #2 Activity	TE Expected Outcome
17	The voice/tone is sound via the headset in volume 1		The voice/tone is sound via the headset in volume 5	
18	Via TE type ATH	OK. After several seconds, NO CARRIER.		After several seconds, NO CARRIER.
19	Via TE type AT+WVAR=3,2	OK.	Via TE type AT+WVAR=3,2	OK.

4.29 PRIVATE CALL EXTENSIONS

The following examples indicate how to initiate/receive a private call.

The term optional indicates commands that are not mandatory for initiating or receiving a phone call.

4.29.1 Initiation of Private Call

This scenario depicts initiation of a private call (extension mode).

General Setup:

AT+WS46=23

AT+WS45=0

AT+WVCLASS=1

AT+FCLASS=8

Audio Setup:

AT+MAFEAT=2 (Optional)

AT+MAVOL =2,4 (Optional)

Dial (PTT):

ATD"MS2 Private call #"

Connect:

AT+CRTG=8 (Optional)

AT+WVAR=1,1

Disconnect (PTT):

ATH

AT+WVAR=1,2

4.29.2 Receiving Private Call

This scenario depicts receiving a private call (extension mode).

General Setup:

AT+WS46=23

AT+WS45=0

AT+FCLASS=8

AT+CRC=1

AT+WVLIP=1

Audio Setup:

AT+MAFEAT=2 (Optional)

AT+MAVOL =2,4 (Optional)

Receiving Call:

AT+CRTG=9 (Optional)

AT+WVAR=2,1

Disconnect:

AT+WVAR=2,2

Table 72. Description of Private Call Between Two iO270s and TE

Step	iO270 #1 Activity	TE Expected Outcome	iO270 #2 Activity	TE Expected Outcome
1	Turn on the modem	The modem has been turned on.	Turn on the modem	The modem has been turned on.
2	Via TE type AT+WVREG	Wait for full registration.	Type AT+WVREG	Wait for full registration.
3	Via TE type AT+WS46=23	OK.	Via TE type AT+WS46=23	OK.
4	Via TE type AT+WS45=0	OK.	Via TE type AT+WS45=0	OK.

Table 72. Description of Private Call Between Two iO270s and TE (Continued)

Step	iO270 #1 Activity	TE Expected Outcome	iO270 #2 Activity	TE Expected Outcome
5	Via TE type AT+FCLASS=8	OK.	Via TE type AT+FCLASS=8	OK.
6	Via TE type AT+WVCLASS=1	OK.	Via TE type AT+CRC=1 AT+WVLIP=1	OK.
7	Via TE type AT+MAFEAT=2	OK.	Via TE type AT+MAFEAT=2	OK.
8	Via TE type AT+MAVOL=2,5	OK.	Via TE type AT+MAVOL=2,3	OK
9	Via TE type ATD"MS2 Private call #"	OK. CONNECT TPERMIT.	N/A	+CRING: PRIVATE +CLIP: MS1 private call # +WVLIP: MS2 private call #" CONNECT LPERMIT.
10	Via TE type AT+CRTG=8	OK. Tone completed (after tone playing is completed).	Via TE type AT+CRTG=9	OK. Tone completed (after tone playing is completed).
11	Via TE type AT+WVAR=1,1	OK.	Via TE type AT+WVAR=2,1	OK.
12	The voice/tone is sound via the speaker in volume 5		The voice/tone is sound via the speaker in volume 3	The voice/tone is sound via the speaker in volume 5.
13	Via TE type AT+MAFEAT=3	OK.	Via TE type AT+MAFEAT=3	OK.
14	Via TE type AT+MAVOL=3,1	OK.	Via TE type AT+MAVOL=3,5	OK.
15	The voice/tone is sound via the headset in volume 1		The voice/tone is sound via the headset in volume 5	
16	Via TE type ATH	OK. CONNECT TINHIBIT.	N/A	CONNECT LINHIBIT.
17	Via TE type AT+WVAR=1,2	OK.	Via TE type AT+WVAR=2,2	OK.
18	N/A	CONNECT LPERMIT.	Via TE type ATD"MS1 Private call #"	OK CONNECT TPERMIT.

Table 72. Description of Private Call Between Two iO270s and TE (Continued)

Step	iO270 #1 Activity	TE Expected Outcome	iO270 #2 Activity	TE Expected Outcome
19	N/A	N/A.	Via TE type AT+CRTG=8	OK Tone completed (after tone playing is completed).
20	Via TE type AT+WVAR=2,1	OK.	Via TE type AT+WVAR=1,1	OK.
21	The voice/tone is sound via the headset in volume 1		The voice/tone is sound via the Headset in volume 5	
22	N/A	CONNECT LINHIBIT. After several seconds, NO CARRIER.	Via TE type ATH	OK. CONNECT TINHIBIT. After several seconds, NO CARRIER.
23	Via TE type AT+WVAR=2,2	OK.	Via TE type AT+WVAR=1,2	OK.

5.1 GENERAL DEFINITIONS

5.1.1 Multiplexer

This module is responsible for ensuring that the hardware control, telephony control and internal packet data session data come through the same physical interface and send data to the appropriate upper-layer software module responsible for taking action on the information just received. It also sends the data coming from these software modules through the same physical interface.

A GSM 27.010 standard multiplexer implementation is used for this architecture. A companion module must exist in the TE.

5.1.2 RS-232 Driver

This module is responsible for handling the RS232 external serial connection when connected to the iO270. It determines whether data from an external device/application is destined for the iO270 or the TE. Any data for the TE is routed through the iO270 to the TE. The iO270 will send any data that the TE sends to the iO270 that is meant for the external device.

5.1.3 USB Driver

This module is responsible for handling the USB external serial connection when connected to the iO270.

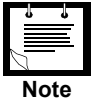
5.1.4 IPC Channel Specification

The IPC can contain up to 16 multiplexed channels. The highest priority channel is DL-0, decreasing to the lowest priority DL-15. The multiplexer always attempts to send the higher priority packets first. Each channel specifies the maximum size of data packets it will send per frame. It will fragment larger data packets and send them to the remote entity in multiple frames. They will be presented as such to the upper layers. Those layers are then responsible for reassembling the packets. Dedicated channels for specific types of data and their configuration are shown in Table 73.

The following channels are mandatory: DL-CNTL, DL-TEL and DL-DATA. The audio channel DL-AUD_CNTL is dependent on the actual hardware layout. The DL-NMEA channel is mandatory if GPS is to be supported. DL-SIM is suggested for overall performance. Any undedicated channel can be configured as a generic AT channel (except for DL-1). This allows the TE to configure however many AT channels are needed to offset the loading on DL-TEL.

Table 73. Channel Specification

Channel	Description	Convergence Layer (Ref 5 Subclause 5.5)	Maximum Packet Size (Size of Information Field)
DL-0 (DL-CNTL)	Controls information specific to the multiplexer.	Type 1 – Unstructured Octet Stream	64
DL-1	Not in use.	Type 1 – Unstructured Octet Stream	64
DL-2 (DL-AUD_CNTL)	Audio control and parameters; hardware control and parameters.	Type 1 – Unstructured Octet Stream	64
DL-3 (DL-TEL)	Basic telephony control.	Type 1 – Unstructured Octet Stream	64
DL-4	AT Command Channel.	Type 1 – Unstructured Octet Stream	64
DL-5	AT Command Channel.	Type 1 – Unstructured Octet Stream	64
DL-6 (DL-SIM)	Used to access SIM data. See notes 1 and 2 below.	Type 1 – Unstructured Octet Stream	64
DL-7	AT Command Channel.	Type 3 – Uninterruptible Framed Data	64
DL-8	AT Command Channel.	Type 1 – Unstructured Octet Stream	64
DL-9	AT Command Channel.	Type 1 – Unstructured Octet Stream	64
DL-10	AT Command Channel.	Type 1 – Unstructured Octet Stream	64
DL-11 (DL-DATA)	Data control to/from TE applications.	Type 1 – Unstructured Octet Stream	64
DL-12	Not in use.	Type 1 – Unstructured Octet Stream	64
DL-13	Not in use.	Type 1 – Unstructured Octet Stream	64
DL-14 (DL-NMEA)	Stream GPS data in NMEA format.	Type 1 – Unstructured Octet Stream	64
DL-15	AT Command Channel.	Type 1 – Unstructured Octet Stream	64

**Notes:**

1. If iO270 controls the SIM card, DL-SIM is optional. If not used, it is assumed that SIM commands occur on the DL-TEL channel.
2. Audio control and parameters can be set by AT Commands on any channel configured to support AT format. It is recommended to use the DL-AUD_CNTL channel to reduce timing delays.

5.2 INITIALIZATION

The initialization of the communications link between the processors starts with the TE enumerating the IPCL (Inter-Processor Communications Link) configuration. If the iO270 is executing a special mode, the TE may use a signal channel IPC instead of invoking the multiplexer. The single channel implementation, if not otherwise stated, should consist of an AT command/response interface (such as DL-TEL). The validity of AT commands is dependent on the mode of operation.

During the initialization of the iO270 IPC interface, an instance of the multiplexer is created and the dedicated sub-channels are started. It also initiates a connection with the upper-layer software components that will process the data coming through these sub-channels. These channel are at fixed DLC addresses as defined in Table 73.

5.2.1 Mode Switching

The IPC changes configurations as the iO270 changes from mode to mode. The following general rules indicate the various methods that the iO270 uses to synchronize the IPC with the iO270. The iO270 will send “alarm” responses only on channels where they are enabled. If no IPC channel is enabled the “alarm” responses, no response is sent.

The CTS is de-asserted whenever the iO270 changes configuration. This indicates to the TE that it cannot send any AT commands across the UART interface.

After the iO270 finishes initialization, it asserts the CTS indicating that the TE can begin sending AT commands to configure the IPC mode (single or multiplexed).

In power-up mode, the interface ignores CTS and RTS. Therefore, CTS is de-asserted in preparation for entering a subscriber mode.

Prior to any reconfiguration, the iO270 may send the alarm AT response to the TE. Afterwards, the CLD control is sent to inform the TE that the iO270 is dropping the link and will de-assert the CTS line.

In single-channel configuration, the iO270 defaults all unsolicited messaging to disabled.

Whenever the multiplexed IPC is established, the iO270 can indicate the current mode of operation with an alarm response.

The following sections describe specific modes of operation.

5.2.2 Multiplexer and Channel Initialization

The TE sends the AT+CMUX (refer to GSM07.07 sub-clause 5.7 ref [5], for command definition) to the iO270 to start multiplexer operation. The multiplexer operates in the Advanced Option and all channels use error recovery services. The multiplexer starts operating at a port speed of 115200 kbps and a UI frame type is used for the control channel. The TE then starts the communications over the control channel by sending an SABM frame on DL-0. This functionality is available via the start-up services defined by the GSM 27.010 specification.

Following the successful establishment of the multiplexer control channel, the TE proceeds with the establishment of the different channels. The DLC establishment services described in the specification are used for this task. All channels use I frame types. The channel assignments priority and convergence layer is assigned, as per Table 73. The maximum frame size for all channels is 64 bytes.

5.3 IPC CHANNEL CONFIGURATION

The interprocessor communications link during normal subscriber operation is comprised of a single RS232 UART connection with a number of sub-channels created on a set of endpoints by a GSM 27.10-compatible multiplexer. The baseband processor expects this multiplexer to automatically start up, based on the initialization of the underlying transport. Any dynamic allocation must issue commands to open each individual channel. The configuration is defined in Table 73.

The iO270 has the capability of entering various non-subscriber sub-modes (for example, RSS) such that the interprocessor communications link is configured as a single UART connection with no multiplexing. The iO270 will confirm the TE request (via an AT OK response) prior to disabling the IPCL, if it is being disabled.

AT commands can be sent on any channel configured to support AT format. Any undedicated channel the TE attempts to create is assumed by the iO270 to be an AT channel. While the AT lists below refer to a dedicated channel, this is the suggested mode of operation. The iO270 supports all AT commands on all AT-configured channels.

The one unique AT command is +CMUX (defined in GSM07.07 sub-clause 5.6). This command is available on the single UART and USB connection without the multiplexer. It is the command that is used to invoke the multiplexer initialization process, and as such, is unavailable after the multiplexer is established. In addition, it is not supported on any AT interface external to the handset.

5.4 DL-CNTL (MULTIPLEXER CONTROL)

This channel is used to establish and close-down multiplexer channels. It is also used to negotiate operating parameters for each of the established channels and for flow control. The format of the commands is defined by the GSM 27.010 specification.

Table 74. Multiplexer Control Commands

Command	Functionality
SABM	To initialize DLC channels
UA	Acknowledgement to SABM and DISC commands
DISC	Disconnect a DLC
DM	Response to commands when station is in disconnected mode
PN	DLC parameter negotiation command
CLD	Multiplexer close-down command
MSC	Modem status command
FCon	Flow control on (aggregate); entity can receive new information
FCoff	Flow control off (aggregate); entity cannot receive new information
NSC	Response to a command not supported
RPN	Remote port parameter negotiation per DLC
RLS	Remote line status

5.5 DL-TEL (AT TELEPHONY & CONTROL)

The telephony channel on the IPC interface is used to control the iO270, initiate and terminate calls, send and receive messages, and generally interface with the call-processing engine within the phone. In general, the telephony feature includes voice, iDEN dispatch (group and private), data call operation, messaging [SMS] (EMS and MMS may be future features in the iDEN network), and network operations (registration, supplemental services). Messages to control these feature, with the exception of data call information, are handled on the telephony sub-channel.

This channel uses mostly commands issued by the TE to cause an action on the iO270. However, there are a substantial number of unsolicited notifications that the iO270 may issue on changes in the status of the system. These notifications may appear at any time during operation of the system.

All commands and notifications over this channel use a subset of AT commands defined in the 3GPP specifications 27.005 and 27.007, and Motorola extensions. The iO270 follows the GSM 07.07/07.05 and V.25 character formatting standard. The philosophy is that existing GSM commands are used whenever possible. In cases where extensions are needed, either a complete new command is created, based on an existing GSM command (for example, +WVNUM extends +CNUM), or a new command is created to modify the format of an existing GSM command (for example, +WVCLASS modifies the format of ATD).

5.6 MULTIPLE CHANNEL ACCESS

The iO270 has the capability of supporting multiple AT interfaces. These interfaces can be multiple channels over the IPC or direct hardware connections to the iO270 from external handset devices. The iO270 treats each interface as if connected to separate TE devices (the iO270 is always a DCE device). As such, if multiple iO270 interfaces are being used, each TE device can possibly receive notifications of events generated by a separate TE device. The following diagrams show some examples of this type of behavior. The implementer should note that all the scenarios described within this document can be expanded for this type of operation. The following diagrams assume that the TE has an AT channel on which call status and connect messages are enabled.

As shown in the following diagram, the external device starts a phone call. However, when the iO270 starts the phone call and the call becomes connected, the TE also receives these notifications and the TE can end the phone call, thus resulting in a service stop message to TE.

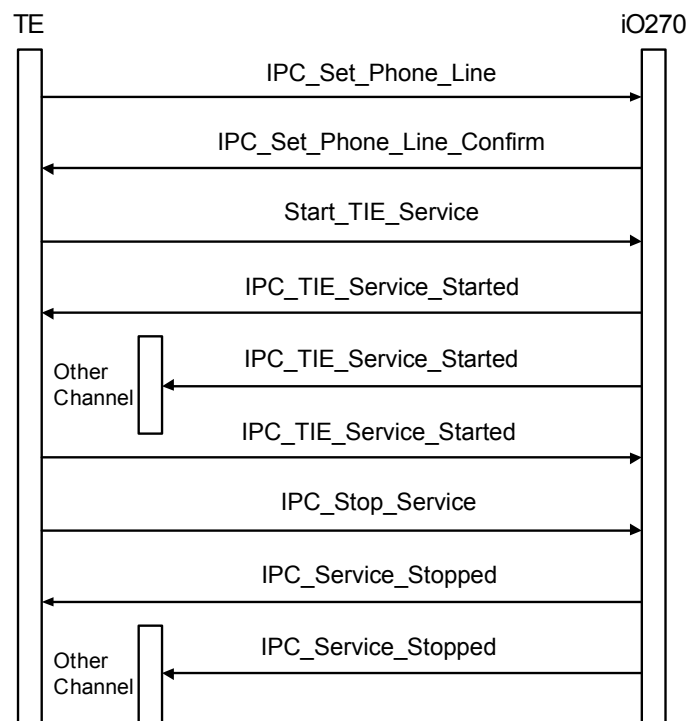


Figure 92. Started Phone Call

5.7 DL-SIM (SIM ACCESS CONTROL)

The DL-SIM channel is optional. If the DL-SIM is not used, these commands and their responses are sent on DL-TEL. DL-SIM can also be used for SMS messaging instead of DL-TEL.

Table 75. AT Commands SIM Access (TE to iO270)

Command	Description	Comment	Specification
+CRSM	Restricted SIM access	iO270 handles all SIM interface locking and file selection	GSM07.07 (8.18)
+CSIM	Send SIM command	Generic access; command sent as if to SIM	GSM07.07 (8.17)

5.7.1 DL-AUD_CNTL

Commands to initiate and terminate in-call and out-of-call audio functionality. Note that the implementation for the out-of-call audio functionality, such as voice recognition, voice note recording, and playback, are not supported. Table 76 lists a set of audio controls, which may be used on this DLC.

Audio AT commands can be sent on any channel configured to support AT format. Any undedicated channel the TE attempts to create is assumed by the iO270 to be an AT channel. While the AT lists below refer to a dedicated channel (DL-AUD_CNTL), this is the suggested operation to avoid timing delays.

Table 76. Audio AT Commands

Command	Description
+ MAVOL	Set audio control volume
+ CMUT	Set MUTE during interconnect
+ MAFEAT	Set Audio mode control
+ MMICG	Set Microphone gain for particular Audio mode control
+ WVAR	Select Raw, Speaker, Headset
+ CRTG	Generate selected tone
+ CRTS	Stop particular tone

5.7.2 DL-DATA (Internal Packet Data)

The iDEN system supports the concept of always-connected packet data. If a user is provisioned for packet data on the iDEN system, the iO270 will attempt MIP registration after normal registration (it will not occur if the iO270 is in a special registration mode, such as Airplane mode). As such, DL-DATA should be used to implement a NDIS/NIC interface between the TE and the iO270.

5.7.3 Circuit Data

The iDEN system does not support alternating voice/data calls. The TE must terminate the call before other voice calls can be initiated, and vice versa. In addition, the iO270 can support only one circuit data call at a time. If a second circuit data call is attempted on an idle sub-channel, it will fail with a service conflict error. In addition, while the iO270 is active in a circuit data call, attempting either packet data or telephony (interconnect or dispatch) will also fail with a service conflict error.



Note

The iO270 can start an iDEN circuit data call on any configured AT channel.

5.7.4 Packet Data

The iDEN system supports the concept of always-connected packet data. If a user is provisioned for packet data on the iDEN system, the iO270 will attempt MIP registration after normal registration (it will not occur if the iO270 is in a special registration mode, such as Airplane mode). A packet data session can be initiated using a direct UART or USB connection. The session can use either PPP or SLIP as the transport protocol. Whenever either a circuit data or telephony operation occurs, the packet data session goes dormant (meaning, the PPP/SLIP link remains, but the connection to the IP network is unavailable). When the packet data session is idle (no active IP packets being transferred), the TE can start and receive any voice service available. When the packet data session is active (IP packets being transferred between the iO270 and system), only mobile-originated services from the TE are available. The system blocks all incoming voice services. Currently, the iO270 can support one PPP/SLIP connection, so while any configured AT channel can establish a PPP connection to the iO270, the iO270 will return an error if any channel or device attempts to establish a second packet data connection to the phone.

5.8 DL-NMEA (GPS DATA)

When commanded by the TE, the iO270 will send NMEA-formatted data from the GPS chipset across this channel.

PPP CONNECTION SETUP

6.1 SETTING UP THE PPP CONNECTION



Note

Before starting with the PPP connection setup, please verify that you have a Motorola iDEN Plus series or Standard 19200bps modem defined in Start -> Settings -> Control Panel -> Phone and Modem Options. If not, please perform the modem setting instructions described in Section 6.3, "Setting Up a Standard Modem", before continuing with the PPP connection setup below.

To Set Up the PPP Connection:

1. Connect the RS232 cable between UART1 on the board and the PC COM port.
2. Open the Hyper Terminal Application. The baud rate for UART1 should be 115200. The baud rate for the Hyper Terminal application is in File -> Properties -> Configure.

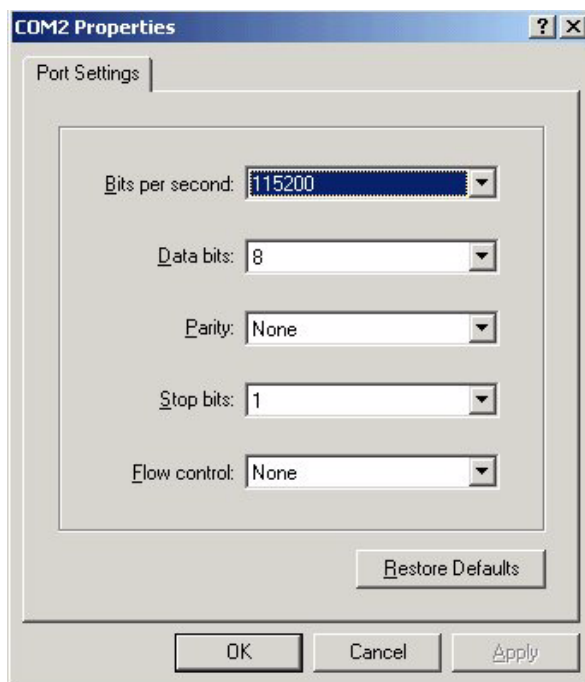


Figure 93. COM Properties Window

3. Verify that the modem is configured to a Packed Data session:

Table 77. AT Commands and Responses

AT Command	Response
AT	OK
ATZ2	OK
AT+WS45=4	OK
AT+WS46=24	OK

4. Disconnect the Hyper Terminal application.

6.2 SETTING UP THE DIAL-UP CONNECTION

Follow the instructions below to set up the dial-up connection for the modem.
The set-up below is for Windows 2000. On other operating systems, it may look somewhat differently.

To Set Up the Dial-up Connection for the Modem:

1. Go to Start -> Settings -> Network and Dial-up Connection -> Make New Connection.
2. Click Next, as shown below.



Figure 94. Network Connection Wizard - Welcome Window

3. Select the Dial-up to Private Network option and press Next.

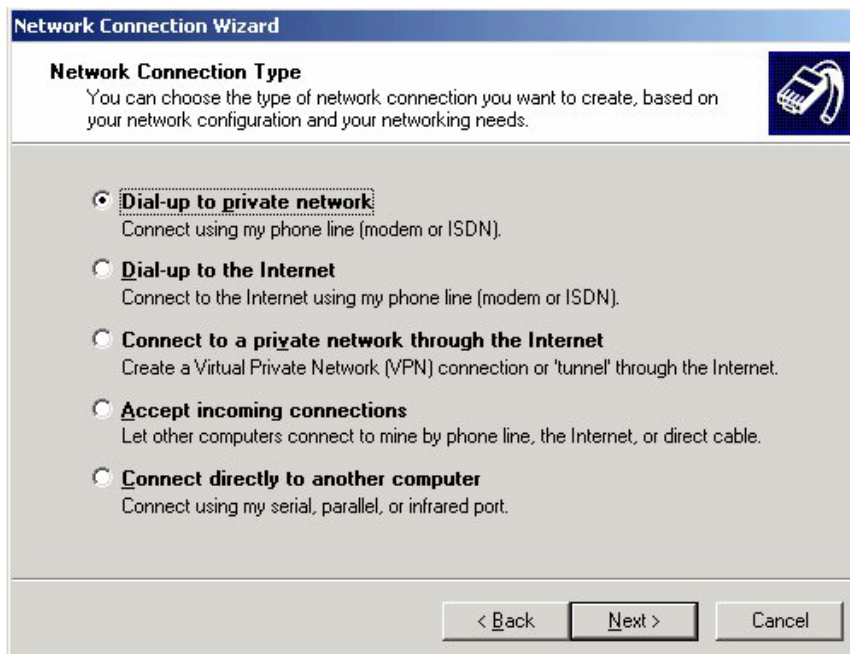


Figure 95. Network Connection Wizard - Network Connection Type Window

4. Type s=2 in the Phone number field and press Next.

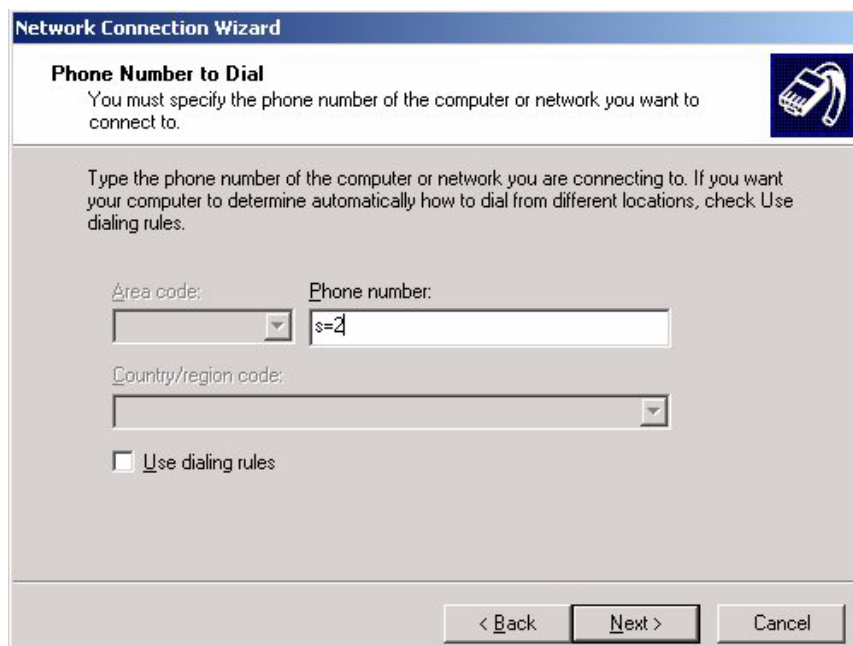


Figure 96. Network Connection Wizard - Phone Number to Dial Window

5. Select the For all users option, as shown below, and then press next.

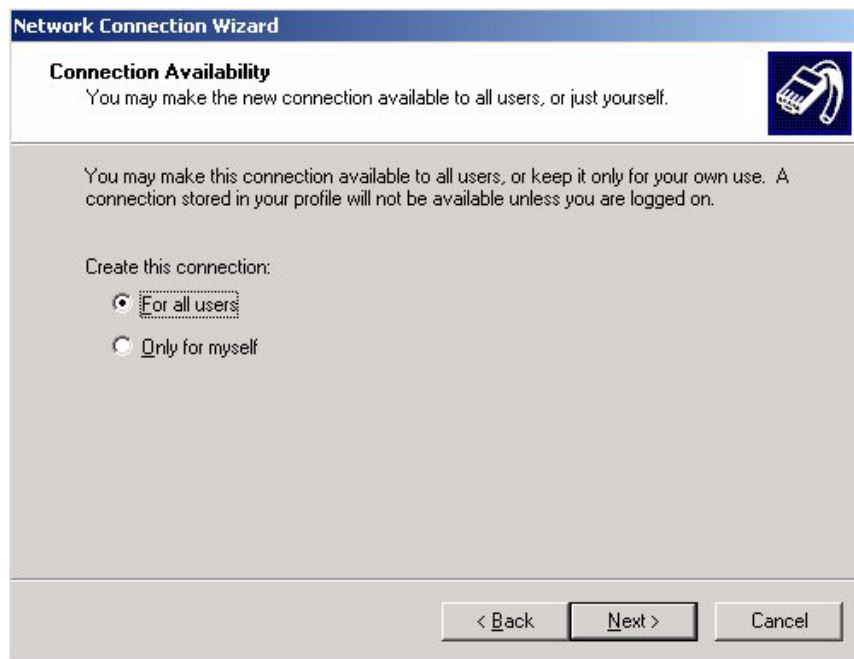


Figure 97. Network Connection Wizard - Connection Availability Window

6. Add a dial-up connection name and press Finish.



Figure 98. Network Connection Wizard - Finish Window

7. In the window that appears, press the *Properties* button.

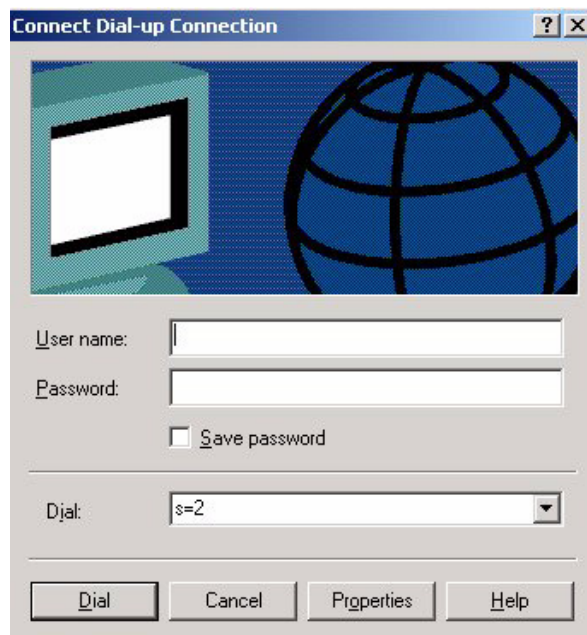


Figure 99. Connect Dial-up Connection Window

8. Verify that the correct modem is selected (Motorola iDEN Plus series or Standard 19200bps modem). If required, use the *Configure* option to change it. Also use the *Configure* button to change the baud rate, if required.

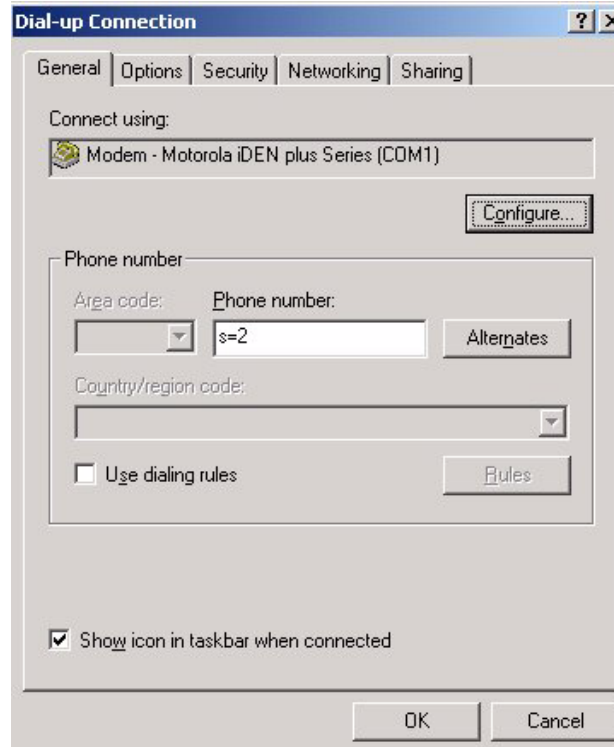


Figure 100. Dial-up Connection Window - General Tab

9. Select the Networking tab and then select the PPP protocol for connection.

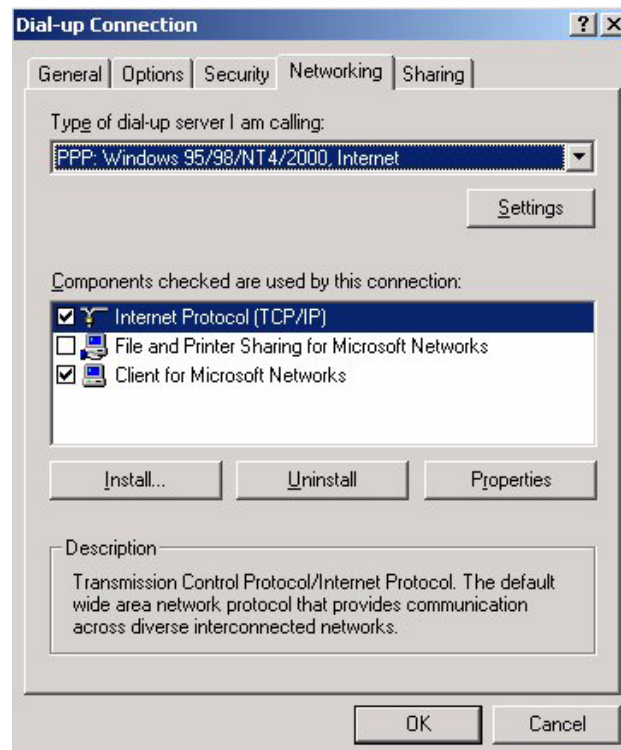


Figure 101. Dial-up Connection Window - Networking Tab

10. Press the *Settings* button, and clear the Enable LCP extensions options.

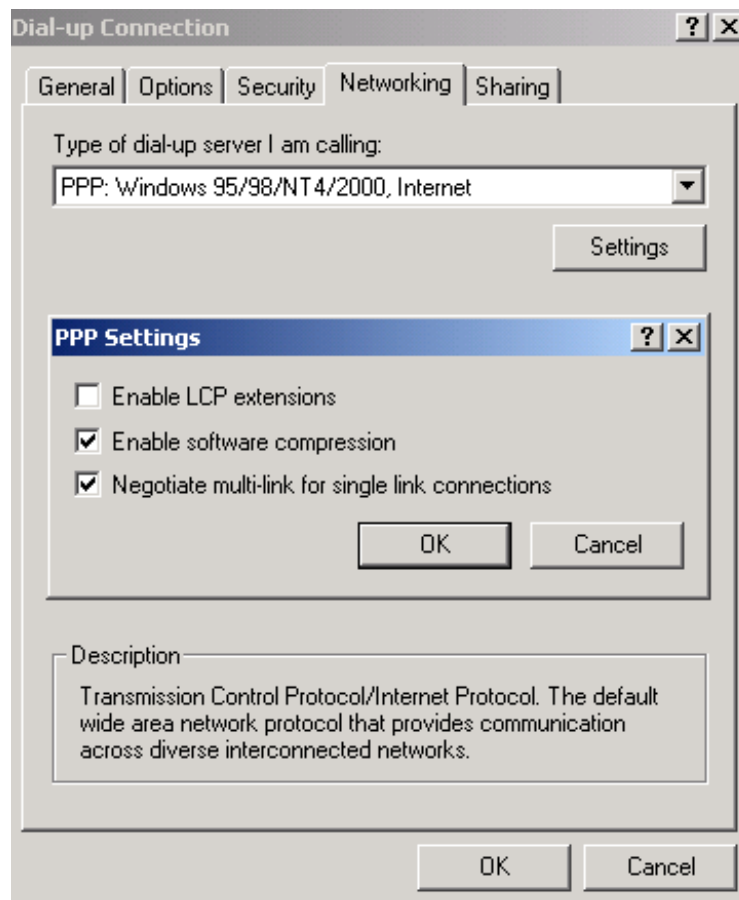


Figure 102. PPP Settings Window

11. Press OK. The Dial-up connection window is redisplayed. Press OK to approve.

12. Press the *Dial* button.

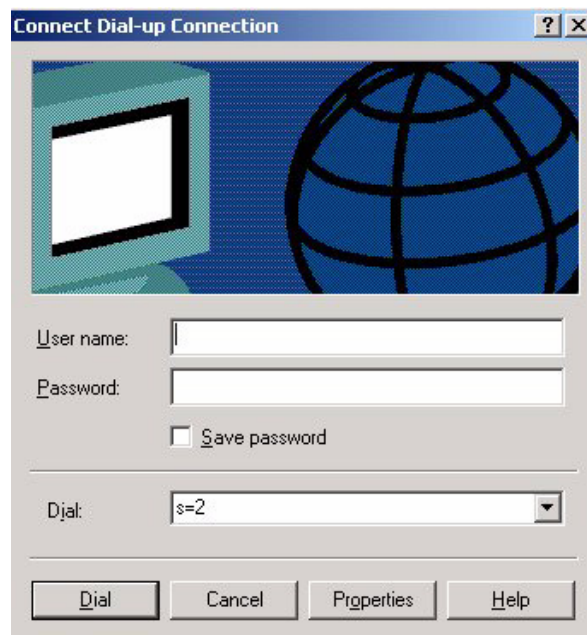


Figure 103. Dial-up Connection Window

13. After successful connection, the Dial-up icon appears in the lower-right side of the task bar.



Figure 104. Dial-up Connection Icon

Now, you are ready to browse with your modem.



Note

The Standard Modem Setting is optional.

6.3 SETTING UP A STANDARD MODEM

To Set Up a Standard Modem:

1. Go to Start -> Settings -> Control Panel -> Phone and Modem Options -> Modems. Press the *Add* button. The following window opens. Check the “Don’t detect my modem, I will select it from the list” option and press on Next button.

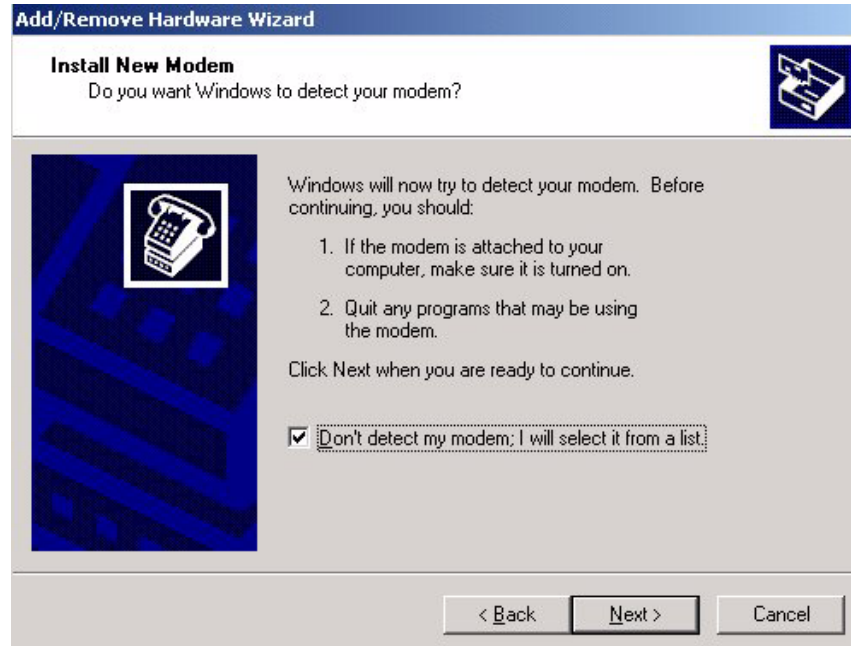


Figure 105. Add/Remove Hardware Wizard - Install New Modem Window (1)

2. Select the “Don’t detect my modem, I will select it from the list” option and press the Next button.

3. In the following window, select Standard modem types and Standard 19200 bps Modem, and press the Next button.

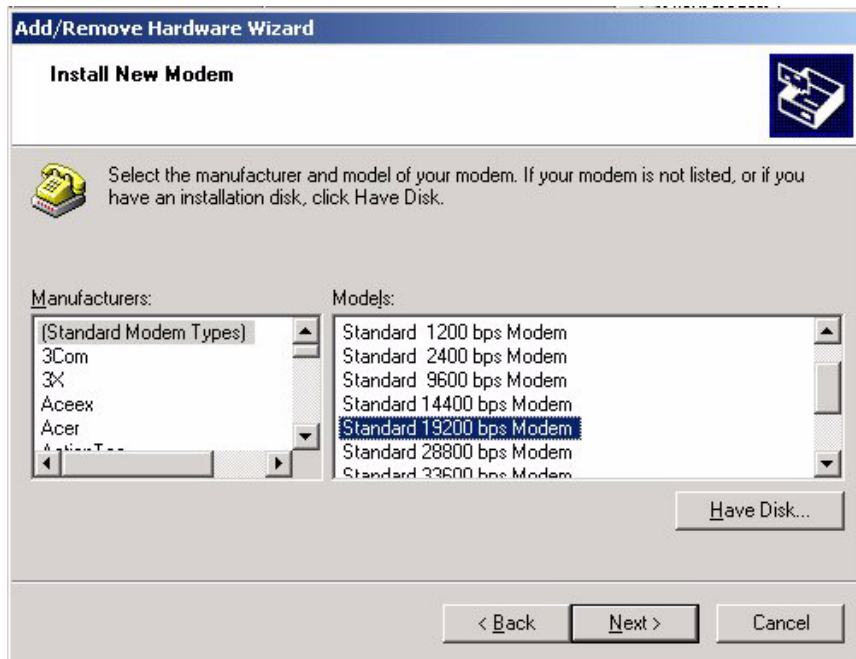


Figure 106. Add/Remove Hardware Wizard - Install New Modem Window (2)

4. Select the port number and press the Next button.

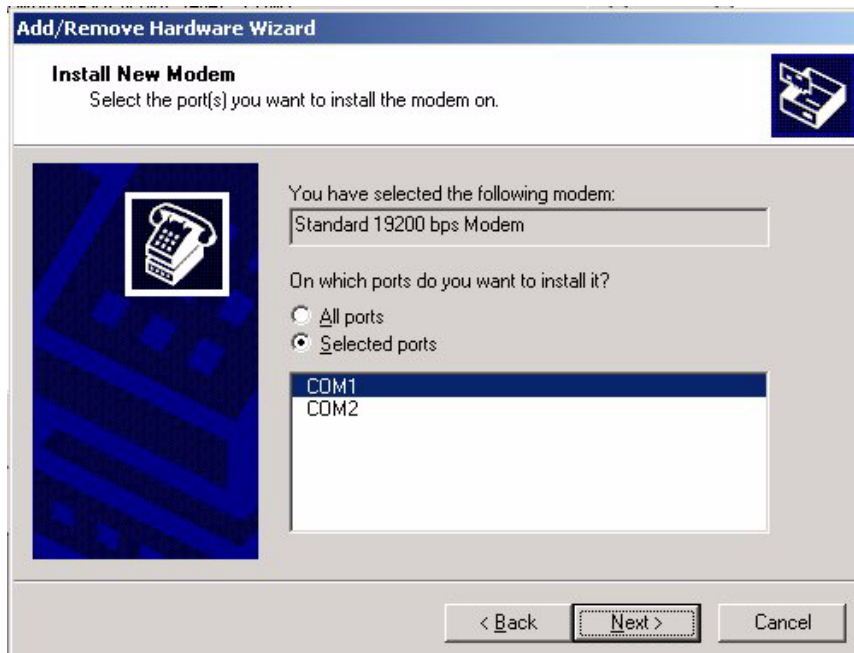


Figure 107. Add/Remove Hardware Wizard - Install New Modem Window (3)

5. In the window below, press Finish.



Figure 108. Add/Remove Hardware Wizard - Install New Modem Window (4)

6. Press the *Properties* button in the Standard Modem Properties window. Change the Maximum Port Speed to 115200 and press OK.

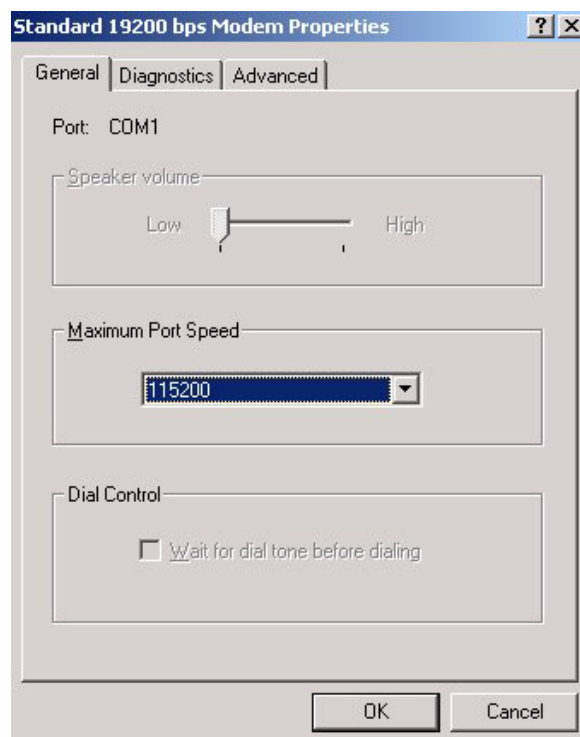


Figure 109. Standard Modem Properties Window

- Press OK button in the following window. The modem installation process is completed.

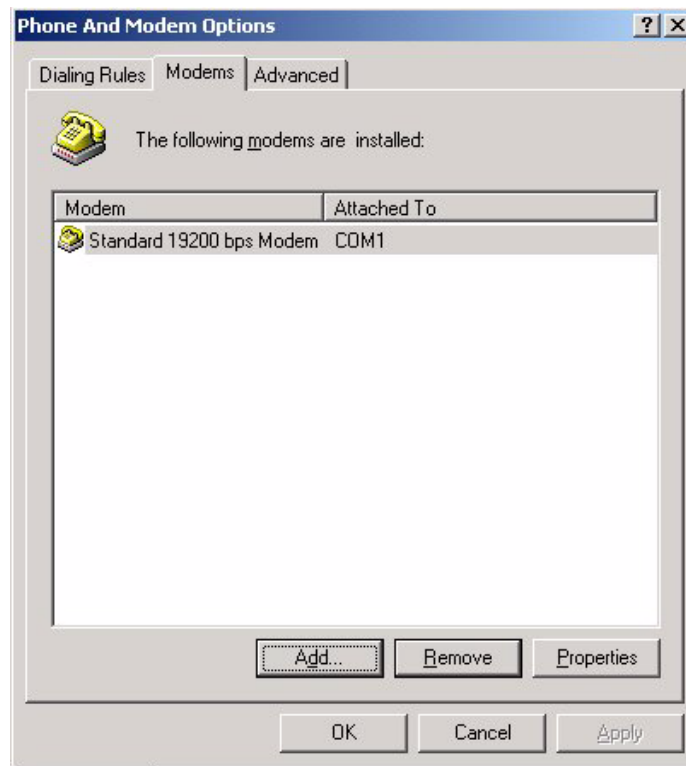


Figure 110. Phone and Modem Options Window



Note

Notes:

The default baud rate of UART1 is 115200 and of UART 2 is 19200. If the baud rate is different, perform the AT+IPR=115200 AT command on UART1 or AT+IPR=19200 AT command on UART2, using the Hyper Terminal application.

If you are typing AT on Hyper Terminal and see garbage or nothing, try to change the Hyper Terminal baud rate (110 – 921600) until AT appears on the screen.

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