Smart Energy Package
ESI IHD SIMPLEMETER
User Guide

Making machines talk.

APPLICABILITY TABLE

PRODUCT
ZE51-2.4
ZE61-2.4

SW Version
P8x.02.00
Z1x.02.00

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

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Contents

1. Introduction

1.1. Scope

The goal of this document is:

- to describe the serial protocol needed to manage the IHD and the ESI (Chapter 3)

- to describe how to manage ESI device using the serial protocol (Chapter 4)

- to describe how to manage IHD device using display desktop application or the serial protocol (Chapter 5)

- to describe how to manage Simple Meter device using the serial protocol (Chapter 6)

- to describe how to flash Telit modules (Par. 7.1)

1.2. Audience

This document is intended for customers who want to evaluate ESI, IHD and Simple Meter based on the ZEx1 platform. ESI and IHD are certified devices.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:

http://www.telit.com/en/products/technical-support-center/contact.php

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

http://www.telit.com

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.

1.4. Document Organization

This document contains the following chapters:

"Chapter 1: Introduction" provides a scope for this document, target audience, contact and support information, and text conventions.

"Chapter 2: SE Package Description" describes the content of the SE package.

"Chapter 3: SERIAL PROTOCOL" describes in details the serial protocol developed by Telit to manage its modules.

"Chapter 4: ESI DEVICE" describes how to manage the ESI device using the Serial protocol.

"Chapter 5: IHD DEVICE" describes how to manage the IHD device using the Serial Protocol or the Display Desktop Application.

"Chapter 6: SIMPLE METER DEVICE" describes how to manage the Simple Meter device using the Serial protocol.

1.5. Text Conventions

CAUTION:

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

WARNING:

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

NOTE:

Tip or Information – Provides advice and suggestions that may be useful while integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.6.   Related Documents

[1]   ZE51/61-2.4 RF module User Guide   1vv0300868

[2]   SR Manager Tool User Guide   1vv0300899

[3]   ZigBee PRO Democase User Guide   1vv0300900

[4]   ZigBee Specification   053474r19ZB

[5]   ZigBee Cluster Library Specification   075123r03ZB

[6]   ZigBee Smart Energy Profile Specification   075356r16ZB

2.　　SE Package Description

The SE package holds the firmware of the ESI, IHD and SIMPLEMETER. ESI and IHD are certified devices.

It is composed by 3 binaries programmable into the ZEx1 boards (see 7.1) and allows evaluating the capabilities of ESI, IHD and SIMPLEMETER.

Joining the IHD to the ESI allows evaluating the join process, the Key Establishment and the PRICE cluster.

Joining the SIMPLEMETER to the ESI allows evaluating the join process, the Key Establishment and the METERING cluster. To evaluate the other clusters of the ESI (Messaging, DRLC) other devices are needed (Load Control Device).

NOTE:

These devices can be used only for test purposes. To join a real network the device needs a production certificate for the Key Establishment mechanism

3. SERIAL PROTOCOL

ESI and IHD can be managed through a serial protocol defined by Telit.

3.1. Packet Format

Packet format is described in the table below.

Field	Packet Length	Command ID	Payload
Field Length (Byte)	1	1	Variable (0-126)
Optional	N	N	Y

NOTE:

In the case of field longer than one byte the byte order is LITTLE ENDIAN except when explicitly indicated.

3.1.1. Packet Length

The first byte of every message shall be the length in bytes of the message itself excluding the length byte. The range of acceptable value for this field is 1-127.

3.1.2. Command ID

The Command ID is a value that univocally identifies a specific command.

The list of messages used for this Demo is provided in the table below:

Command ID	Device	Command Name	Command Description	Direction
Device and Network Management
0x10	ESI,IHD	Reset Request	Reset the firmware	Host->Module
0x11	ESI,IHD	Reset Confirm	Provides status of Reset Request	Module ->Host
0x12	ESI,IHD	Set Request	Set an Attribute	Host->Module
0x13	ESI,IHD	Set Confirm	Provides status of Set Request	Module ->Host

0x14	ESI,IHD	Get Request	Get an Attribute	Host->Module
0x15	ESI,IHD	Get Confirm	Provides status of Get Request	Module ->Host
0x16	ESI,IHD	Start Request	Form a network (ESI); Join a network (IHD)	Host->Module
0x17	ESI,IHD	Start Confirm	Provides status of Start Request	Module ->Host
0x46	ESI,IHD	Set Install Code Request	Set the Install Code	Host->Module
0x47	ESI,IHD	Set Install Code Confirm	Indicates if install code setting succeeded	Module ->Host
0x77	IHD	Join Confirm	Indicates if the Association mechanism Succeeded	Module ->Host
0x82	IHD	Get Association Status Request		Host->Module
0x83	IHD	Get Association Status Confirm		Module ->Host
0xA1	IHD	Display Status Indication	Data to display on the Display of the external Host	Module ->Host
ZDO Commands				
0x7B	IHD	Management Leave Indication		Module ->Host
0xC0	IHD	Network Address Request		Host->Module
0xC1	IHD	Network Address Response		Module ->Host
0xC2	IHD	IEEE Address Request		Host->Module
0xC3	IHD	IEEE Address Response		Module ->Host
0xC4	IHD	Node Descriptor Request		Host->Module
0xC5	IHD	Node Descriptor Response		Module ->Host
0xC6	IHD	Power Descriptor Request		Host->Module
0xC7	IHD	Power Descriptor Response		Module ->Host

0xC8	IHD	Simple Descriptor Request		Host->Module
0xC9	IHD	Simple descriptor Response		Module ->Host
0xCA	IHD	Active Endpoint Request		Host->Module
0xCB	IHD	Active Endpoint Response		Module ->Host
0xCC	IHD	Match Descriptor Request		Host->Module
0xCD	IHD	Match Descriptor Response		Module ->Host
0xD0	IHD	User Descriptor Request		Host->Module
0xD1	IHD	User Descriptor Response		Module ->Host
0xD6	IHD	EndDevice Binding Request		Host->Module
0xD7	IHD	EndDevice Binding Response		Module ->Host
0xD8	IHD	Bind Request		Host->Module
0xDA	IHD	Unbind Request		Host->Module
0xDB	IHD	Unbind Response		Module ->Host
0xE3	IHD	Bind Response		Module ->Host
0xE4	IHD	Management Leave Request		Host->Module
0xE5	IHD	Management Leave Response		Module ->Host
0xE8	IHD	User Descriptor Set Request		Host->Module
ZCL Commands				
0x40	ESI,IHD	ZCL Message From Server To Client Request		Host->Module

0x41	ESI,IHD	ZCL Message From Server To Client Confirm		Module ->Host
0x42	ESI,IHD	ZCL Message From Server To Client Indication	Indicates the client side of a cluster received a ZCL message from the server	Module ->Host
0x43	ESI,IHD	ZCL Message From Client To Server Request		Host->Module
0x44	ESI,IHD	ZCL Message From Client To Server Confirm		Module ->Host
0x45	ESI,IHD	ZCL Message From Client To Server Indication		Module ->Host
0x52	ESI,IHD	Write Attribute Indication		Module ->Host
0x53	ESI,IHD	Remote Write Attribute Request		Host->Module
0x54	ESI,IHD	Remote Write Attribute Confirm		Module ->Host
0x55	ESI,IHD	Remote Read Attribute Request		Host->Module
0x56	ESI,IHD	Remote Read Attribute Confirm		Module ->Host
0x5A	ESI,IHD	Remote Read Attribute Response		Module ->Host
0x5B	ESI,IHD	Remote Write Attribute Response		Module ->Host
0x5C	ESI,IHD	ZCL Default Response Indication		Module ->Host
0x62	ESI	Remote Configure Reporting		Host->Module
0x62	ESI	Remote Configure Reporting Confirm		Module ->Host
0x68	ESI	Spec.Remote Read Attribute Request		Host->Module

0x67	SM	Cancel Configuration Reporting		Host->Module
0x68	SM	Cancel Configuration Reporting Confirm		Module ->Host
0x69	ESI	Spec.Remote Read Attribute Confirm		Module ->Host
0x6A	ESI	Spec.Remote Write Attribute Request		Host->Module
0x6B	ESI	Spec.Remote Write Attribute Confirm		Module ->Host
Price Cluster Commands				
0x6C	ESI	Reset PriceInfo Table Request		Host->Module
0x6D	ESI	Reset PriceInfo Table Confirm		Module ->Host
0x84	ESI	Set/Send Current Publish Price Request		Host->Module
0x85	ESI	Set/Send Current Publish Price Confirm		Module ->Host
0x86	ESI	Set Scheduled Publish Price Request		Host->Module
0x87	ESI	Set Scheduled Publish Price Confirm		Module ->Host
0x99	IHD	Display Current Publish Price Indication		Module ->Host
0x9A	IHD	Display Scheduled Publish Price Indication		Module ->Host
0x9B	IHD	Get Scheduled Price Request		Host->Module
0x9C	IHD	Get Scheduled Price Confirm		Module ->Host
Demand Response Load Control Cluster Commands				
0x4D	ESI	Cancel all events Request		Host->Module

0x4E	ESI	Cancel all events Confirm		Module ->Host
0x6E	ESI	Reset Load Control Event Table request		Host->Module
0x6F	ESI	Reset Load Control Event Table Confirm		Module ->Host
0x7E	ESI	Cancel Event Request		Host->Module
0x7F	ESI	Cancel Event Confirm		Module ->Host
0x96	ESI	Load Control Event Request		Host->Module
0x97	ESI	Load Control Event Confirm		Module ->Host
Metering Cluster Commands				
0x30	SM	Upload Profiling Data		Host->Module
0x31	SM	Upload Profiling Data Confirm		Module ->Host
0x4B	ESI	Get Profile Request		Host->Module
0x4C	ESI	Get Profile Confirm		Module ->Host
0x7C	ESI	Fast Poll Mode Request		Host->Module
0x7D	ESI	Fast Poll Mode Confirm		Module ->Host
Messaging Cluster Commands				
0x94	ESI	Display Message Request		Host->Module
0x95	ESI	Display Message Response		Module ->Host
0x9D	ESI	Cancel Message Request		Host->Module
0x9E	ESI	Cancel Message Response		Module ->Host

3.1.3. Payload

The Payload content depends on the Command Id field and can be empty. It is the only optional field.

3.2.   Commands Description

In the next sections the Commands of the serial protocol are described.

3.2.1.   Reset

This command resets the module to the factory default settings.

- Reset Request Format

Offset	Name	Value	Description
0	Packet Length	0x02	-
1	Command ID	0x10	-
2	Reset Type	0x00	Reset the device the factory settings

- Reset Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	-
1	Command ID	0x11	-
2	Reset Type	0x00	Reset succeeded

3.2.2. Set/Get Attribute

This command allows setting/getting Attributes used by the ZigBee stack and the application to create/join/manage the network.

NOTE:

The Attribute field byte order is BIG ENDIAN

In the table below it is reported the list of parameters that can be set and/or get in this demo.

Access	Attribute	Length	Name	Description
R	0x6F	8	IEEE Address	The Extended Address of the device
R/W	0x10	1	Join Type	0x00: One shot join 0x01: Periodic Join. If the join fails the device will try to join the network every sysRetJoinPeriodP1 seconds for sysRetJoinRetriesP1 Attempts (Phase 1) after that it will try to join every sysRetJoinPeriodP2 seconds (Phase 2). Default: 0x00 (One shot)
R/W	0x11	4	Join Period PHASE 1	Interval (seconds) between two join attempts in Phase 1 Range: 0x1E – 0xFFFFFFFF Default: 0x3C
R/W	0x12	4	Join Period PHASE 2	Interval (seconds) between two join attempts in Phase 2 Range: 0x78 – 0xFFFFFFFF Default: 0xE10
R/W	0x13	1	Join Retries PHASE 1	Number of join attempts in Phase 1. Range: 1-255 Default: 15
R/W	0x14	1	Jitter Phase 1	Jitter (seconds) between two attempts of join in PHASE 1. Range: 1-255 Default: 15
R/W	0x15	1	Jitter Phase 2	Jitter (minutes) between two attempts of join in PHASE 2. Range: 1-255 Default: 30

R/W	0x52	1	RxOnWhenIdle	Only on the RFD. This parameter indicates whether the device can be expected to receive packets over the air during idle portions.
R/W	0x56	1 or 4	Sleeping Time	Only on the RFD. This parameter indicates how much time in seconds the RFD makes its synchronization with its parent. In the set Attribute request it could be 1 or 4 bytes long. In the get Attribute request it is 4 bytes long. If the attribute is one byte long its value has to be between 1 and 60 seconds. If the attribute is four bytes long its value has to be between 1 and 0xFFFFFFFF. In cyclic wakeup mode, the CTS pin can be used to wake up the device if needed (configuration, emergency frame …)
R/W	0x57	1	Rejoin Type	It is a bit mask and indicate how the rejoin is configured.

bit	7-3	2	1	0
Name	Reserved	Secure rejoin enabled	Unsecure Rejoin enabled	Periodic Rejoin enabled
Reset	0	1	1	1

Bit 1 and 2 cannot be set to 0 at the same time.

Range: 0x02-0x07

Default: 0x07

R/W	0x58	4	Rejoin Interval	Interval (seconds) between rejoins of the same attempt in the same channel and among different attempts in the first phase. Range: 0x01-0xFFFFFFFF Default: 60
R/W	0x59	4	Max Rejoin Interval	Interval (seconds) between rejoin attempts after the first Phase. Range: Range: 0x01-0xFFFFFFFF Default: 900
R/W	0x5A	1	Max Rejoin Retries first Phase	Number of attempts for which Rejoin interval is used. If it is 0xFF the Rejoin Interval is used as interval between the current Attempt and the next one.Range: 0x01-0xFF Default: 0xFF

R/W	0x5B	1	Secure Rejoin Retries	Number of secure Rejoin retries per Attempt. Range: 0x01-0xFF Default: 1
R/W	0x5C	1	Rejoin Retries	Number of Rejoin retries per Attempt. Pay attention that if the secure rejoin is enabled the module will try secure rejoin before the unsecure one. Range: 0x01-0xFF Default: 1
R/W	0x01	2	Radio Channel	Manages the channels mask in which the device will try to associate. It is of 2 bytes representing the channel 11 to 26. It is writable only before association.

bit	15	14	…	1	0
Read/ write	Channel 26	Channel 25	Channel …	Channel 12	Channel 11
Reset	1	1	1	1	1

R	0x00	1	Current Channel	Return the current channel of the device
R	0x04	String	Version Stack	
R	0x05	String	Version Bootloader	
R	0x0A	String	Version Application	
R/W	0x0C	1	Serial speed	Set/Get serial speed Id:

Speed Id	Serial Speed (Baud/Sec)
3	9600
4	19200
5	38400
6	57600
7	115200

Default: 7 (115200 Baud/Sec)

R/W	0x0E	4	UTC Time.	When a device is reset the UTC time will reset to 0 (the 1st January 2000)
W	0xCA	8	TrustCenter	Only when device is associated
R/W	0x99	1	USB device	Define if the device is a USB dongle. (0: normal – 1: USB)
R	0x06	1	Type of device	0x10= Pan-C, 0x11= FFD, 0x12=RFD 0x90= Pan-C on USB, 0x91= FFD on USB, 0x92= RFD on USB
R	0x07	1	Is associated	1=associated, 0=not associated
R	0x96	2	Nwk address	The 16-bit address of the module
R/W	0xC9	1	Fragmentation Inter Frame Delay	Time before retransmission of fragment Default : 100 Valid range between 0 and 255
R/W	0xCD	2	Fragmentation Window Size	The first byte is the end point and the second one is the window size. The End Point value has to be between 1 and 240. Window size value has to be between 1 and 3 (number of blocks used for fragmentation transmission). If windows size is set to 0xFF it is reset to default for the specific End Point. The get attribute request shall be 0x03,0x14,0xCD, EndPoint Default : 3
R/W	0x9B	1	Network Multicast Enabled	If set to 1 the multicast is managed at network level otherwise at APS level. Default: 0
R/W	0xC6	1	Non-Member Radius	Maximum number of hops a frame can do among non-member devices. Range: 0x00-0x07(Infinite range) Default: 0x07
R/W	0xD0	1	End Device Binding Timeout	Only on the Coord. It is the timeout in seconds for End Device Binding management. Range: 0x01-0xF0 Default: 0x14
R/W	0x02	1	Output power Attenuation	Sets attenuation on output power. Between 0 and 25 dB; default value 1.

R	0x50	2	PAN Id	Returns the current PAN Id of the network the device is associated with.
Security				
R/W	0xA3	1	Use Security	Identifies if the device uses security
R/W	0xE4	1	HasPreconfigured NwkKey	Identifies if the device has a Nwk Preconfigured Key
W	0xA4	16	Nwk Key	Configures the Key for all devices if are in Preconfigured Key else just the Coordinator must be configured.
R/W	0xE5	1	HasPreconfigured TCLinkKey	Identifies if the device has a Link Preconfigured key
W	0xA5	24	TCLinkKey(16) + IEEE address(8)	Configures the link Key shared with the device of the defined IEEE address.

- Set Request Format

Offset	Name	Value	Description
0	Packet Length	0x03 + Attribute Length	
1	Command ID	0x12	
2	Attribute ID	0xXX	
3	Attribute Length	0xXX	Depends on the Attribute ID
4	Attribute Value	0xXX,…0xXX	Depends on the Attribute ID

- Set Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0x13	
2	Status	0xXX	
3	Attribute ID	0xXX	

- Get Request Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x14	
2	Attribute ID	0xXX	

- Get Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x04 + Attribute Length	
1	Command ID	0x12	
2	Status	0xXX	
3	Attribute ID	0xXX	
4	Attribute Length	0xXX	Depends on the Attribute ID
5	Attribute Value	0xXX,…0xXX	Depends on the Attribute ID

The list of status values is provided in the table below.

Status Value	Description
0x00	Success
0xA6	Invalid parameter
0xAA	Parameter not supported

3.2.3.   Start

This command requests to form a network when sent to an ESI or to join a network when sent to an IHD.

- Start Request Format

Offset	Name	Value	Description
0	Packet Length	0x01	
1	Command ID	0x16	

- Start Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x17	
2	Status	0xXX	

The list of status values is provided in the table below.

Status Value	Description
0x00	Success
0x0A	Error scanning, no beacon received
0x0B	Error Acquiring Coordinator
0x0F	Error join Router
0x0C	Error Already Associated
0x10	Error Acquiring Device

3.2.4. Join Confirm

This message indicates if the association mechanism succeeded.

- Join Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x07	
1	Command ID	0x77	
2	Short Address	[0x00,0x00]-[0xFE,0xFF]	
4	Pan ID	[0x01,0x00]-[0xFF,0x3F]	
6	HasNwkKey	0x00-0x01	
7	Status	0xXX	

3.2.5. ZCL Message From Server To Client

This group of messages allows sending/receiving ZCL commands from Server side to client side of a specific cluster.

- ZCL Message From Server To Client Request Format:

  This message requests to send a message from server side to client side of a specific cluster.

Offset	Name	Value	Description
0	Packet Length	0x0A + Command Length	
1	Command ID	0x40	
2	Address Mode	0x00,0x02-0x03	0x00: indirect addressing, the destination address length is two bytes and is not used 0x02: short address, the destination address is two bytes and it is used 0x03: IEEE address, the destination address is 8 bytes and it is used

3	Destination Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address field must be always present even if the indirect addressing is used. In this case can be filled with zeros. Can be 8 or 2 bytes long.
5 or 11	DstEP	0x01-0xF0,0xFF	Destination endpoint
6 or 12	SrcEP	0x01-0xF0	Source endpoint
7 or 13	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9 or 15	Cluster Command ID	0x00-0xFF	Command identifier of a specific cluster
10 or 16	Command Length	0x00-0x75 Or 0x00-0x6F	This field depends on the Cluster Command ID
11 or 17	Command	Variable	This is the command as described in the specification documents of ZigBee profiles

- **ZCL Message From Server To Client Confirm Format**

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x41	
2	Address Mode	0xXX	0x00: Success Otherwise an error occurred

- **ZCL Message From Server To Client Indication Format**

  This message is sent by Telit's module to the external host to indicate a ZCL message from Server side to client side has been received.

Offset	Name	Value	Description
0	Packet Length	0x0A + Command Length	
1	Command ID	0x42	
2	Src Address	[0x00,0x00]-[0xFF,0xF0]	Network address of the device that generated the ZCL command
4	SrcEP	0x01-0xF0	Source endpoint
5	Sequence Number	0x00-0xFF	It is the transaction Sequence Number of the ZCL header (see [5])
6	DstEP	0x01-0xF0	Destination endpoint
7	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9	Cluster Command ID	0x00-0xFF	Command identifier of a specific cluster
10	Command Length	0x00-0x76	This field depends on the Cluster Command ID
12	Command	Variable	This is the command as described in the specification documents of ZigBee profiles

3.2.6.   ZCL Message From Client To Server

This group of messages allows sending/receiving ZCL commands from client side to server side of a specific cluster.

- ZCL Message From Client To Server Request Format:

  This message requests to send a message from client side to server side of a specific cluster.

Offset	Name	Value	Description
0	Packet Length	0x0A + Command Length	
1	Command ID	0x43	
2	Address Mode	0x00,0x02-0x03	0x00: indirect addressing, the destination address length is two bytes and is not used 0x02: short address, the destination address is two bytes and it is used 0x03: IEEE address, the destination address is 8 bytes and it is used
3	Destination Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address field must be always present even if the indirect addressing is used. In this case can be filled with zeros. Can be 8 bytes long or 2.
5 or 11	DstEP	0x01-0xF0,0xFF	Destination endpoint
6 or 12	SrcEP	0x01-0xF0	Source endpoint
7 or 13	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9 or 15	Cluster Command ID	0x00-0xFF	Command identifier of a specific cluster
10 or 16	Command Length	0x00-0x75 Or 0x00-0x6F	This field depends on the Cluster Command ID

11 or 17	Command	Variable	This is the command as described in the specification documents of ZigBee profiles

- **ZCL Message From Client To Server Confirm Format**

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x44	
2	Address Mode	0xXX	0x00: Success Otherwise an error occurred

- **ZCL Message From Client To Server Indication Format**

  This message is sent by Telit's module to the external host to indicate a ZCL message from client side to server side has been received.

Offset	Name	Value	Description
0	Packet Length	0x0A + Command Length	
1	Command ID	0x45	
2	Src Address	[0x00,0x00]-[0xFF,0xF0]	Network address of the device that generated the ZCL command
4	SrcEP	0x01-0xF0	Source endpoint
5	Sequence Number	0x00-0xFF	It is the transaction Sequence Number of the ZCL header (see [5])
6	DstEP	0x01-0xF0	Destination endpoint
7	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9	Cluster Command ID	0x00-0xFF	Command identifier of a specific cluster
10	Command Length	0x00-0x76	This field depends on the Cluster Command ID

12	Command	Variable	This is the command as described in the specification documents of ZigBee profiles

3.2.7.   Set Install Code

This message allows setting install code and checking its CRC16.

Set Install Code Request Format changes depending on the device to which the command is submitted.

- Set Install Code Request Format (IHD)

Offset	Name	Value	Description
0	Packet Length	3 + Installation Code Length	
1	Command ID	0x46	
2	ICType	0x00-0x03	Indicates the length of Installation code without the CRC.
3	CRCType	0x00-0x02	Indicates if the CRC is present in the Installation Code field and if it has to be checked
4	InstallationCode	Variable	The Installation Code

- Set Install Code Request Format (ESI)

Offset	Name	Value	Description
0	Packet Length	0x09 + Installation Code Length	
1	Command ID	0x46	
2	ICType	0x00-0x03	Indicates the length of Installation code without the CRC.

3	CRCType	0x00-0x02	Indicates if the CRC is present in the Installation Code field and if it has to be checked
4	InstallationCode	Variable	The Installation Code
4 + Installation Code Length	IEEE Address	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	It is the IEEE address of the joining device.

ICType indicates the Installation code length without the CRC. The values are provided in the table below.

ICType Value	Installation Code Length (without CRC, BYTES)	Installation Code Length (with CRC, BYTES)
0x00	6	8
0x01	8	10
0x02	12	14
0x03	16	18

CRCType indicates if the CRC is present in the InstallationCode field and if it has to be checked.

CRCType	CRC present	Check CRC
0x00	NO	NO
0x01	YES	YES
0x02	YES	NO

NOTE:

If CRCType Value is set to 0x00 the CRC shall not be present in the InstallationCode field

Packet Length field depends on both the ICType field and CRC field. The Table below describes this dependency.

ICType Value	CRCType Value	Packet Length (BYTES)	Installation Code Length (BYTES)
0x00	0x00	0x09	0x06
0x00	0x01	0x0B	0x08
0x00	0x02	0x0B	0x08
0x01	0x00	0x0B	0x08
0x01	0x01	0x0D	0x0A
0x01	0x02	0x0D	0x0A
0x02	0x00	0x13	0x10
0x02	0x01	0x15	0x12
0x02	0x02	0x15	0x12

- Set Install Code Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x47	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

The ESI (Trust Center) is able to manage up to 5 Installation Codes so up to 5 devices.

3.2.8.   Remote Read Attribute

- Remote Read Attribute Request Format

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0x55	
2	Address Mode	0x00,0x02-0x03	0x00: indirect addressing, the destination address length is two bytes and is not used 0x02: short address, the destination address is two bytes and it is used 0x03: IEEE address, the destination address is 8 bytes and it is used
3	Destination Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address field must be always present even if the indirect addressing is used. In this case can be filled with zeros. Can be 8 or 2bytes long.
5 or 11	DstEP	0x01-0xF0,0xFF	Destination endpoint
6 or 12	SrcEP	0x01-0xF0	Source endpoint
7 or 13	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9 or 15	Number Of Attributes	0x00-0xFF	Number of attributes present in the List
10 or 16	List Of Attributes	[0xXX,0xXX],…,[0xXX,0xXX]	List of attribute IDs to read

- Remote Read Attribute Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x56	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

- Remote Read Attribute Response Format

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0x5A	
2	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
4	SrcEP	0x01-0xF0	Source endpoint.
5	DstEP	0x01-0xF0,0xFF	Destination endpoint
6	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
8	Number Of Attributes	0x00-0xFF	Number of attribute status record (see [5])
9	Attributes	Variable	List of attribute status records

Each read attribute status record (see [5]) shall be formatted as illustrated in the table below:

Field	Attribute ID	Status	Attribute Data Type	Attribute Value
Number Of Bytes	2	1	0/1	0/Variable

3.2.9.   Remote Write Attribute

- Remote Write Attribute Request Format

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0x53	
2	Address Mode	0x00,0x02-0x03	0x00: indirect addressing, the destination address length is two bytes and is not used 0x02: short address, the destination address is two bytes and it is used 0x03: IEEE address, the destination address is 8 bytes and it is used
3	Destination Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address field must be always present even if the indirect addressing is used. In this case can be filled with zeros. Can be 8 or 2 bytes long.
5 or 11	DstEP	0x01-0xF0,0xFF	Destination endpoint
6 or 12	SrcEP	0x01-0xF0	Source endpoint
7 or 13	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
9 or 15	Attribute ID	[0x00,0x00]-[0xFF,0xFF]	Attribute Identifier
11 or 17	Attribute Data Type	0x00-0xFF	Attribute Data Type identifier, they are defined by ZCL (See [5])
12 or 18	Attribute	Variable	Attribute value

- **Remote Write Attribute Confirm Format**

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x54	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

- **Remote Write Attribute Response Format**

Offset	Name	Value	Description
0	Packet Length	0x07	
1	Command ID	0x5B	
2	DstEP	0x01-0xF0	Destination endpoint
3	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
5	Attribute ID	[0x00,0x00]-[0xFF,0xFF]	Attribute ID
7	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

If the writing succeeded the Attribute ID is set to 0xFF,0xFF.

- Write Attribute Indication Format

Offset	Name	Value	Description
0	Packet Length	0x07 + Attribute Length	
1	Command ID	0x52	
2	Endpoint	0x0A	Endpoint where the attribute has been written
3	Cluster ID	0x00,0x07	Cluster identifier
5	Attribute ID	0x00,0x00	Number of attribute status record (see [5])
7	Attribute Length	0x00-0xFF	
8	Attribute	Variable	

3.2.10.   Remote Configure Reporting

NOTE:

This message has been tested only on the certified ESI serial interface.

The message allows configuring a remote device for attributes reporting.

It is possible to configure only one attribute for each command issued.

See the relative use case for a practical use of this command (4.6.4).

Please refer to chapter 2.4.7 of [5] for more details on reporting mechanism and configuration.

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0x62	

2	Address Mode	0x00,0x02,0x03	0x00: indirect addressing, the destination address length is two bytes and is not used
			0x02: short address, the destination address is two bytes and it is used
			0x03: IEEE address, the destination address is 8 bytes and it is used
3	Destination Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address field must be always present even if the indirect addressing is used. In this case can be filled with zeros. Can be 8 or 2 bytes long.
5 or 11	DstEP	0x01-0xF0,0xFF	Destination endpoint
6 or 12	SrcEP	0x01-0xF0	Source endpoint
7 or 13	Cluster ID	0xXX,0xXX	Cluster identifier
9 or 15	Direction	0x00-0x01	Direction of reporting Generate reports / Expect reports
10 or 16	Attribute ID	[0x00,0x00]-[0xFF,0xFF]	Attribute Identifier
12 or 18	Attribute Data Type	0x00-0xFF	Attribute Data Type identifier, they are defined by ZCL (See [5])
13 or 19	Min reporting interval	[0x00,0x00]-[0xFF,0xFF]	LE – time interval in seconds
15 or 21	Max reporting interval	[0x00,0x00]-[0xFF,0xFF]	LE – time interval in seconds
17 or 23	Timeout Period	[0x00,0x00]-[0xFF,0xFF]	LE – time interval in seconds
19 or 25	Reportable Change	0xXX	

- **Remote Configure Reporting Confirm Format**

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x62	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

The requesting client of the ESI is supposed to receive the reporting information through a ZCL Message from Server to Client (3.2.5) command, one for each reporting attribute.

NOTE:

Known limitation: the payload passed to the ZCL Server to Client Indication of the ESI interface is limited to the Attribute Payload of the reporting record, whereas Attribute Id and Data Type are missing.

3.2.11. Cancel Reporting

NOTE:

This command can be issued only to the Simple Meter device interface.

This message allows resetting the actual configuration of the attributes reporting.

It means that periodic reporting of each configured attribute will stop immediately, and reportable changes on configured attributes will not be produced by the server (or client) side of the device, unless a new request of configuration will be received and processed by the device itself.

Note that it is not possible to reset the reporting of specific attributes. Therefore the entire configured Set will be reset in a single Cancel Reporting command processing.

Issuing a Cancel Reporting command, before having set an active configuration on the remote device, will result in a confirmation message with FAILURE status.

- Cancel Reporting Command

Offset	Name	Value	Description
0	Packet Length	0x01	
1	Command ID	0x67	

- Cancel Reporting Command Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x68	
2	Status	0x00-0x01	0x00: SUCCESS 0x01: FAILURE

3.2.12.   Spec. Remote Read Attribute

This message allows requesting the value of application attributes of a specific cluster.

This specific Remote Read does not need the destination address.

This command can be managed only by the ESI and can be used only with SE clusters otherwise an error will be returned.

- Spec. Remote Read Attribute Request Format

Offset	Name	Value	Description
0	Packet Length	0x04 + (Num. Of Attr. * 2)	
1	Command ID	0x68	
2	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
4	Number of Attributes	0x01-0xFF	Number of attribute IDs in the List
5	List Of Attributes	[0xXX,0xXX],…,[0xXX,0xXX]	List of attribute IDs to read

- Spec. Remote Read Attribute Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x69	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

The response is returned by the module through a Remote Read Attribute Response that is described in paragraph 3.2.8.

3.2.13. Spec. Remote Write Attribute

This message allows writing the value of an application attribute of a specific cluster.

This specific Remote Write does not need the destination address.

This command can be managed only by the ESI and can be used only with SE clusters otherwise an error will be returned.

- Spec. Remote Write Attribute Request Format

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0x6A	
2	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
4	Attribute ID	[0x00,0x00]-[0xFF,0xFF]	Attribute Identifier
6	Attribute Data Type	0x00-0xFF	Attribute Data Type identifier, they are defined by ZCL (See [5])
7	Attribute	Variable	Attribute value

- Spec. Remote Write Attribute Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x6B	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

The response is returned by the module through a Remote Write Attribute Response that is described in paragraph 3.2.9.

3.2.14.   ZCL Default Response

Sometimes depending on the ZCL command and in case of some errors, the ZCL of the remote device can send a ZCL Default Response (See [5]).

- ZCL Default Response Format

Offset	Name	Value	Description
0	Packet Length	0x08	
1	Command ID	0x5C	
2	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
4	SrcEP	0x01-0xF0	Source endpoint
5	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
7	Cluster Command ID	0x00-0xFF	Command identifier of a specific cluster
8	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.15.   Get Association Status

The Get Association Status command allows knowing the association status of the joining local device.

NOTE:

This command can be managed only by the IHD.

- Get Association Status Request Format

Offset	Name	Value	Description
0	Packet Length	0x01	
1	Command ID	0x82	

- Get Association Status Confirm Format

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x83	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

A string with the association status will be returned through a Display Status (Par.3.2.16).

3.2.16.   Display Status

The Display Status indication can be unsolicited or caused by a Get Association Status (Par. 3.2.15).

This indication is issued every time the device status changes.

NOTE:

This command can be managed only by the IHD.

- **Display Status Format**

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0xA1	
2	DisplayLine	0x00-0xFF	Indicate the line of the display where to write the string
3	Status String	Variable	It is a string that describes the status of the joining module

In the table below the status strings available are listed.

Status String	Description
IHD Associating	the module is associating to the network
IHD Associated	the module is associated but it does not have the link key
IHD Serv.Disc.	0x00: Success Otherwise an error occurred
IHD Ready	the module has the link key and is doing service discovery
IHD Resetted	The module has been reset

3.2.17. Node Descriptor

NOTE:

This command can be managed only by the IHD.

- Node Descriptor Request Format

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0xC4	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device

- Node Descriptor Response Format

Offset	Name	Value	Description
0	Packet Length	0x11	
1	Command ID	0xC5	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	Node Descriptor	-	Node descriptor as defined by the ZigBee Stack Specification (See [4])

The node descriptor fields are listed in the table below:

Field Name	Length (Bits)
Logical Type	3
Complex Descriptor Available	1

User Descriptor Available	1
Reserved	3
APS Flags	3
Frequency band	5
MAC capability flags	8
Manufacturer code	16
Maximum buffer size	8
Maximum Incoming transfer size	16
Server mask	16
Maximum outgoing transfer size	16
Descriptor capability mask	8

For more info about node descriptor refer to [4].

NOTE:

During the Service discovery, automatically done by the IHD, after the key establishment a Node Descriptor Response is received by the IHD.

3.2.18. Simple Descriptor

NOTE:

This command can be managed only by the IHD.

This command is used to get the Simple descriptor on a specified Endpoint of a remote device.

The simple descriptor contains information specific to each endpoint contained in the remote device.

- **Simple Descriptor Request Format**

Offset	Name	Value	Description
0	Packet Length	0x04	
1	Command ID	0xC9	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device
4	Endpoint	0x01-0xF0	Endpoint for which the Simple Descriptor is request

- **Simple Descriptor Response Format**

Offset	Name	Value	Description
0	Packet Length	0x05 + Simple Desc. Length	
1	Command ID	0xCA	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	Simple Desc Length	0x08-0xFA	
6	Simple Descriptor	Variable	Simple descriptor as defined by the ZigBee Stack Specification (See [4])

The simple descriptor fields are listed in the table below:

Field Name	Length (Bits)
End Point	8
Application profile identifier	16
Application device identifier	16
Application device version	4
Reserved	4
Application input cluster count	8
Application input cluster list	16*Application input cluster count
Application output cluster count	8
Application output cluster list	16* Application output cluster count
Descriptor capability mask	8

For more info about simple descriptor refer to [4].

NOTE:

During the Service discovery, automatically done by the IHD, after the key establishment a Simple Descriptor Response is received by the IHD.

3.2.19.   Power Descriptor

This primitive is used to get the power descriptor of a remote device.

The power descriptor gives a dynamic indication of the power status of the Node.

NOTE:

This command can be managed only by the IHD.

- Power desc request

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0xC6	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device

- Power desc confirm

Offset	Name	Value	Description
0	Packet Length	0x06	
1	Command ID	0xC7	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	Power Descriptor	[0x00,0x00]-[0xC4,0x72]	Power descriptor as defined by the ZigBee Stack Specification (See [4])

The power descriptor fields are listed in the table below:

Field Name	Length (Bits)
Current Power mode	4
Available power sources	4
Current power source	4
Current power source level	4

For more info about power descriptor refer to [4].

3.2.20. User Descriptor

These commands are used to get or set the user descriptor of a remote device.

The user descriptor contains information that allows the user to identify the device using a user-friendly character string, such as "Bedroom TV" or "Stairs light".

NOTE:

This command can be managed only by the IHD.

- User desc request

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0xD0	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device

- User desc confirm

Offset	Name	Value	Description
0	Packet Length	0x05 + User Desc. Length	
1	Command ID	0xD1	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	User Desc Length	0x01-0xFA	
6	User Descriptor	Variable	User descriptor as defined by the ZigBee Stack Specification (See [4])

- **User desc set request**

Offset	Name	Value	Description
0	Packet Length	0x04 + User Desc. Length	
1	Command ID	0xE8	
3	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device
5	User Desc Length	0x01-0x10	
6	User Descriptor	Variable	User descriptor as defined by the ZigBee Stack Specification (See [4])

NOTE:

The maximum length of the User descriptor is 16 characters.

- **User desc set confirm**

Offset	Name	Value	Description
0	Packet Length	0x04	
1	Command ID	0xE9	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response

3.2.21.   Active Endpoint

This command is used to get the list of active Endpoints from the Remote device.

- Active EP request

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0xCA	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device

- Active EP confirm

Offset	Name	Value	Description
0	Packet Length	0x05 + ActiveEPCount	
1	Command ID	0xCB	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	ActiveEPCount	0x01-0xFA	Number of Endpoints in the list
6	ActiveEPList	Variable	List of active endpoints

3.2.22. Match Descriptor

This command is used to find remote devices supporting a specific simple descriptor match criterion.

NOTE:

This command can be managed only by the IHD.

- Match Desc request

Offset	Name	Value	Description
0	Packet Length	0x07 + 2*NumInClusters + 2*NumOutClusters	
1	Command ID	0xCC	
2	Dst Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the destination device
4	Profile ID	[0x00,0x01]-[0xFF,0xFF]	In the case of SE profile the identifier is 0x09,0x01
6	NumInCluster	0x00-0xF0	Number of input cluster to match in the list
7	InClusterList	Variable	List of input clusters
7+2*NumInClusters	NumOutCluster	0x00-0xF0	Number of output cluster to match in the list
8+2*NumInClusters	OutClusterList	Variable	List of output clusters

- Match Desc confirm

Offset	Name	Value	Description
0	Packet Length	0x05 + MatchLength	
1	Command ID	0xCD	

2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred
3	Src Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device that generated the response
5	MatchLength	0x01-0xFA	Number of Endpoints in the list
6	MatchList	Variable	List of active endpoints for which the match criterion succeeded

For more info about the match criterion refer to [4].

3.2.23.   Bind

This command is used to bind a remote device with another remote device

NOTE:

This command can be managed only by the IHD.

- Bind request

Offset	Name	Value	Description
0	Packet Length	0x10 0r 0x16	
1	Command ID	0xD8	
2	Src IEEE Address	0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	IEEE address of the device where the bind entry will be added
9	Src Endpoint	0x01-0xF0	Source endpoint of the device where the bind entry will be added
10	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier

12	Dst Address Mode	0x00,0x02-0x03	0x01: group address, the destination address length is two bytes and is not used 0x03: IEEE address, the destination address is 8 bytes and it is used
13	Dst Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address can be 8 bytes long (if address mode is 0x03) or 2. This is the Destination address that will be stored in the bind entry.
15 or 21	Dst Endpoint	0x01-0xF0	This is the endpoint that will be stored in the bind entry.

- Bind confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0xD9	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

During the Service discovery, automatically done by the IHD, after the key establishment two Bind Confirms are received by the IHD.

3.2.24.   Unbind

This command is used to unbind a remote device with another remote device

NOTE:

This command can be managed only by the IHD.

- Unbind request

Offset	Name	Value	Description
0	Packet Length	0x10 0r 0x16	
1	Command ID	0xDA	
2	Src IEEE Address	0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	IEEE address of the device where the bind entry will be added
9	Src Endpoint	0x01-0xF0	Source endpoint of the device where the bind entry will be added
10	Cluster ID	[0x00,0x00]-[0xFF,0xFF]	Cluster identifier
12	Dst Address Mode	0x00,0x02-0x03	0x01: group address, the destination address length is two bytes and is not used 0x03: IEEE address, the destination address is 8 bytes and it is used
13	Dst Address	[0x00,0x00]-[0xFF,0xFF] or 0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	The destination address can be 8 bytes long (if address mode is 0x03) or 2. This is the Destination address that will be stored in the bind entry.
15 or 21	Dst Endpoint	0x01-0xF0	This is the endpoint that will be stored in the bind entry.

- Unbind confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0xDB	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

During the Service discovery, automatically done by the IHD, after the key establishment two Unbind Confirms are received by the IHD.

3.2.25.   End Device Bind

This command is used to do an End device bind.

NOTE:

This command can be managed only by the IHD.

- End Device Bind request

Offset	Name	Value	Description
0	Packet Length	0x06 + 2*NumInClusters + 2*NumOutClusters	
1	Command ID	0xD6	
2	Src Endpoint	0x01-0xF0	Source endpoint of the device is requesting the end device bind
3	Pofile ID	[0x00,0x00]-[0xFF,0xFF]	Profile identifier
5	NumInCluster	0x00-0xF0	Number of input cluster for which the device is requesting a bind
6	InClusterList	Variable	List of input clusters
6 + 2*NumInClusters	NumOutCluster	0x00-0xF0	Number of output cluster for which the device is requesting a bind
7 + 2*NumInClusters	OutClusterList	Variable	List of output clusters

- End Device Bind confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0xD7	

| 2 | Status | 0x00-0xFF | 0x00: Success |
| | | | Otherwise an error occurred |

3.2.26.   Network Address

This command allows discovering the 16-bit address of the Remote Device based on its known IEEE address, and knowing which devices are associated at the Remote Device if the Request Type is set to Extended.

NOTE:

This command can be managed only by the IHD.

- Nwk Addr request

Offset	Name	Value	Description
0	Packet Length	0x0B	
1	Command ID	0xC0	
2	IEEE Address	0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	IEEE address of the device for which the network address is requested
10	Request Type	0x00-0x01	0x00: the network addresses of the children are not requested 0x01: the network addresses of the children are requested
11	Start Index	0x00-0x13	First index of the child network address in the list

- Nwk Addr confirm

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0xC1	

2	IEEE Address	0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	IEEE address of the device who answered to the network address
10	Nwk Address	[0x00,0x00]-[0xFF,0xFF]	0x00: the network addresses of the children are not requested 0x01: the network addresses of the children are requested
12	Num Associated Devices	0x00-0x13	Number of associated device
13	Start Index	0x00-0x13	First index of the child network address in the list
14	Nwk Address List	Variable	It is the list of the network addresses of the associated devices

NOTE:

If the Request Type is 0x00 the Start Index and Nwk Address List fields of Nwk Addr confirm are not present

3.2.27.   IEEE Address

This command is used to discover the IEEE address of the Remote Device based on its known NWK address, and to know which devices are associated at the Remote Device if the Request Type is set to Extended.

NOTE:

This command can be managed only by the IHD.

- IEEE Addr request

Offset	Name	Value	Description
0	Packet Length	0x05	
1	Command ID	0xC2	

2	Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device for which the IEEE address is requested
4	Request Type	0x00-0x01	0x00: the network addresses of the children are not requested 0x01: the network addresses of the children are requested
5	Start Index	0x00-0x13	First index of the child network address in the list

- **IEEE Addr confirm**

Offset	Name	Value	Description
0	Packet Length	0xXX	
1	Command ID	0xC3	
2	IEEE Address	0xXX,0xXX,0xXX,0xXX, 0xXX,0xXX,0xXX,0xXX	IEEE address of the device who answered to the network address
10	Nwk Address	[0x00,0x00]-[0xFF,0xFF]	0x00: the network addresses of the children are not requested 0x01: the network addresses of the children are requested
12	Num Associated Devices	0x00-0x13	Number of associated device
13	Start Index	0x00-0x13	First index of the child network address in the list
14	Nwk Address List	Variable	It is the list of the network addresses of the associated devices

NOTE:

If the Request Type is 0x00 the Start Index and Nwk Address List fields of IEEE Addr confirm are not present

3.2.28.   Request Key

This command is used to request a Key.

- Request Key request

Offset	Name	Value	Description
0	Packet Length	0x0A or 0x12	
1	Command ID	0xBA	
2	TC IEEE Address	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	IEEE Address of the trust center.
10	Key Type	0x03-0x04	0x03: Link key 0x04:TC Link Key
11	Partner Address	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	IEEE Address of the partner in the case a link key has been requested

NOTE:

In the case of Smart Energy the ESI is the Trust Center

NOTE:

The Partner Address field is present only if the Key type is 0x03 (Link key)

3.2.29.　　Management Permit Join

This primitive is used to request that a remote device allows or disallows association.

- Mgmt permit joining request

Offset	Name	Value	Description
0	Packet Length	0x05	
1	Command ID	0xEA	
2	Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device the change of the permit join is asked for
4	Permit Join	0x00-0xFF	0x00: remote device disallows association 0xFF: remote device allows association 0x01-0xFE: time during which remote device allows association
5	TC Significance	0x00-0x01	0x00: No Trust Centre relevance 0x01: Affects Trust Centre authentication. If Duration is 0xFF, it allows authentication. If Duration is 0x00, so no device will be authenticated.

3.2.30.   Management Leave

This primitive is used to ask at a remote device to leave the network.

- Mgmt leave request

Offset	Name	Value	Description
0	Packet Length	0x0C	
1	Command ID	0xE4	
2	Nwk Address	[0x00,0x00]-[0xFF,0xFF]	Network address of the device the has to be sent to
4	IEEE Address	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	IEEE address of the device to remove, if it is set to 0x00,0x00,0x00,0x00, 0x00,0x00,0x00,0x00 the request is to himself
12	Action	0x00-0x03	Bit0: Rejoin Bit1: RemoveChildren Bit2- Bit7: Reserved.

- Mgmt leave response

NOTE:

This response is returned only by the IHD.

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0xE5	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

- Mgmt leave indication

Offset	Name	Value	Description
0	Packet Length	0x0A	
1	Command ID	0x7B	
2	IEEE Address	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	IEEE address of the device who is leaving the network. If it is set to 0x00,0x00,0x00,0x00, 0x00,0x00,0x00,0x00 the local device is leaving the network
10	Rejoin	0x00-0x03	Bit0: Rejoin Bit1: RemoveChildren Bit2- Bit7: Reserved.

3.2.31. Update Simple Meter Profiling Data

NOTE:
This command can be managed only by the SIMPLEMETER.

This command allows storing Profiling info in a Simple Meter device.

Please refer to [6] for profiling details.

- Update Profiling Data Request

Offset	Name	Value	Description
0	Packet Length	0x17	
1	Command ID	0x30	
2	Interval Channel	0x00 / 0x01	0x00: Consumption Delivered 0x01: Consumption Received

3	Profile Interval Period	0x00 ….. 0x07	0x00: Daily … 0x07: 2.5 minutes
4	Number Of Collected Intervals	0x01 … 0x05	Max Intervals Supported = 5
5	Intervals	0xXX,0xXX,0xXX	Intervals values are series of 3 bytes
20	EndTime	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFE]	UTC time at which the message becomes valid. A Start Time of 0x00000000 is a special time denoting "now" (See [6]). If it is 0x00,0x00,0x00,0x00 this field will not be modified

- Update Profiling Data Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x31	
2	Status	0x00 0x02	SUCCESS INVALID_PARAMETER

3.2.32. Get Profile

The GetProfile command is generated when a client device of metering cluster (ESI) wishes to retrieve a list of captured Energy, Gas or Water consumption for profiling purposes.

NOTE:

This command can be managed only by the ESI.

• Get Profile request

Offset	Name	Value	Description
0	Packet Length	0x0C	
1	Command ID	0x4B	
2	Sum or Sub	0x00-0xFF	0x00: the value in End Time will be summed to the Current time of the device 0x01: the value in End Time will be subtracted to the Current time of the device 0x02: field Seconds will be added to End Time 0x03: field Seconds will be subtracted from End time Otherwise End Time will be sent without modification
3	Interval Channel	0x00-0x01	Enumerated value used to select the quantity of interest returned by the Get Profile Response Command (See [6])
4-7	End Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTCTime used to select an Intervals block from all the Intervals blocks available. If it is 0x00,0x00,0x00,0x00 the most recent intervals block is requested (See [6])
8	Number of Periods	0x01-0xFF	Represents the number of intervals being requested (See [6])
9-12	Seconds	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Number of seconds to add/subtract to/from End Time if Sum or Sub field is set to 0x02/0x03

- Get Profile Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x4C	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

If a Meter replies with a Get Profile Response it will be issued to the external Host through a ZCL Message From Server To Client Indication (Par. 3.2.5)

3.2.33. Fast Poll Mode

This command allows requesting to the remote meter to reduce the poll time so that the response time of the meter is speeded up.

NOTE:

This command can be managed only by the ESI.

- Fast Poll Mode request

Offset	Name	Value	Description
0	Packet Length	0x03	
1	Command ID	0x7C	
2	Fast Poll Update Period	0x00-0xFF	Desired Fast Poll Period in seconds(See [6])
3	Duration	0x00-0x0F	Duration in minutes for the server to remain in fast poll mode (See [6])

NOTE:

Duration of Fast Poll Mode cannot exceed 15 minutes.

- Fast Poll Mode Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x7D	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

If a Meter replies with a Fast Poll Mode Response it will be issued to the external Host through a ZCL Message From Server To Client Indication (Par. 3.2.5)

3.2.34.   Display Message

This command allows requesting to a remote device, supporting the client of the messaging cluster, to display a message.

NOTE:

This command can be managed only by the ESI.

- Display Message request

Offset	Name	Value	Description
0	Packet Length	0x0F + String Length	
1	Command ID	0x94	
2	Send	0x00-0x01	0x00: Store the message 0x01: Store and send the message

3	Sum or Sub	0x00-0x01	0x00: the value in Start time will be summed to the Current time of the device 0x01: the value in Start time will be subtracted from the Current time of the device
4	Message ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A unique unsigned 32-bit number identifier for the message (See [6])
8	Message Control	0x00-0x8F	An 8-bit BitMap field indicating the need to optionally pass the message onto the Anonymous Inter-PAN transmission mechanism (See [6])
9	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC time at which the message becomes valid. A Start Time of 0x00000000 is a special time denoting "now" (See [6]). If it is 0x00,0x00,0x00,0x00 this field will not be modified
13	Duration	[0x01,0x00]- [0xFF,0xFF]	Amount of time in minutes after the Start Time during which the message is displayed (See [6]). 0xFFFF means "until changed"
15	String Length	0x00-0xF0	Length of the message string
16	Message String	Variable	

- **Display Message Confirm**

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x95	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.35.   Cancel Message

This command provides the ability to cancel the sending or acceptance of previously sent messages.

NOTE:

This command can be managed only by the ESI.

- Cancel Message request

Offset	Name	Value	Description
0	Packet Length	0x06	
1	Command ID	0x9D	
2	Message ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Identifier of the message to be cancelled (See [6])
6	Message Control	0x00-0x8F	An 8-bit BitMap field indicating the need to optionally pass the message onto the Anonymous Inter-PAN transmission mechanism (See [6])

- Cancel Message Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x9E	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.36. Load Control Event

This command allows the ESI controlling one or more load control device(s).

NOTE:

This command can be managed only by the ESI.

- Load Control Event request

Offset	Name	Value	Description
0	Packet Length	0x13	
1	Command ID	0x96	
2	Send	0x00-0x01	0x00: Store the message 0x01: Store and send the message
3	Index	0x00-0x01	Index of the LCE Table
4	Sum or Sub	0x00-0x01	0x00: the value in Start time will be summed to the Current time of the device 0x01: he value in Start time will be subtracted from the Current time of the device
5	Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A unique unsigned 32-bit number identifier for the event generated by the Provider (See [6])
9	Device Class	0x00-0x8F	An 8-bit BitMap field indicating the need to optionally pass the message onto the Anonymous Inter-PAN transmission mechanism (See [6])

11	Utility Enrolment Group	0x00-0xFF	The Utility Enrolment Group field can be used in conjunction with the Device Class bits. It provides a mechanism to direct Load Control Events to groups of Devices (See [6]). 0x00 means all groups.
12	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing when the event is scheduled to start. A start time of 0x00000000 is a special time denoting "now." (See [6]).
16	Duration	[0x01,0x00]- [0xA0,0x05]	Duration of this event in number of minutes. Maximum value is 1440 (one day). (See [6]).
18	Criticality Level	0x00-0x0F	This field defines the level of criticality of this event (See [6]).
19	Event Control	0x00-0x01	Identifies additional control options for the event (See [6])

NOTE:

The ESI is able to manage up to two Load Control Events in its local LCE table.

- Load Control Event Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x97	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.37. Cancel Event

This command allows the ESI cancelling previously scheduled event of one or more load control device(s).

NOTE:

This command can be managed only by the ESI.

- Cancel Event request

Offset	Name	Value	Description
0	Packet Length	0x0E	
1	Command ID	0x7E	
2	Sum or Sub	0x00-0x01	0x00: the value in Start time will be summed to the Current time of the device 0x01: he value in Start time will be subtracted from the Current time of the device
3	Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A unique unsigned 32-bit number identifier for the event generated by the Provider (See [6])
7	Device Class	[0x01,0x00]-[0x00,0x08]	An 8-bit BitMap field indicating the need to optionally pass the message onto the Anonymous Inter-PAN transmission mechanism (See [6])
9	Utility Enrolment Group	0x00-0xFF	The Utility Enrolment Group field can be used in conjunction with the Device Class bits. It provides a mechanism to direct Load Control Events to groups of Devices (See [6]). 0x00 means all groups.
10	Cancel Control	0x00-0x01	To be used when the Event is currently in process and a cancel command is received. (See [6])

| 11 | Effective Time | [0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF] | UTC Timestamp representing when the canceling of the event is scheduled to start. A start time of 0x00000000 is a special time denoting "now". (See [6]). |

- Cancel Event Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x7F	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.38.   Cancel All Events

This command allows the ESI cancelling all events for control device(s)

NOTE:

This command can be managed only by the ESI.

- Cancel All Events request

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x4D	
10	Cancel Control	0x00-0x01	To be used when the Event is currently in process and a cancel command is received. (See [6])

- Cancel All Events Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x4E	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.39. Reset Load Control Event Table

This command allows the ESI resetting the LCE table entries starting from a specific index.

NOTE:

This command can be managed only by the ESI.

- Reset Load Control Event request

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x6E	
10	Start Index	0x00-0x01	LCE table index

NOTE:

If start index is set to 0x00 the LCE table is completely reset.

- Reset Load Control Event Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x6F	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.40. Set/Send Current Publish Price

This command allows sending Publish Price info to a remote device.

NOTE:

This command can be managed only by the ESI.

- Set/Send Current Publish Price request

Offset	Name	Value	Description
0	Packet Length	0x32 or 0x3A	
1	Command ID	0x84	
2	Send	0x00-0x01	0x00: Store the message 0x01: Store and send the message
3	Full Set	0x00-0x01	0x00: all the fields after Generation Price Ratio are not present 0x01: all the fields after Generation Price Ratio are present

4	Sum or Sub	0x00-0x01	0x00: the value in Start time will be summed to the Current time of the device 0x01: the value in Start time will be subtracted from the Current time of the device
5	Use Tier	0x00-0x05,0xFF	0xFF: no specific tier is used but the values provided through the command. 0x00-0x05: the specific Tier Label and tier, Price Trailing Digit & Price Tier, and Number of Price Tiers & Register Tier will be used. The parameters provided in the command are replaced.
6	Provider ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing a unique identifier for the commodity provider (See [6])
10	Rate Label	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	A ZCL Octet String field capable of storing a 12 character string (the first Octet indicates length) containing commodity provider-specific information regarding the current billing rate (See [6]). All the byte shall be present also if string length is lower than 11.
22	Issuer Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Unique identifier generated by the commodity provider (See [6]).
26	Current Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A UTCTime field containing the current time as determined by the device (See [6]). If it is set to 0x00,0x00,0x00,0x00 it will be replaced by the Current time of the device otherwise it will be forced at a specific value

30	Unit Of Measure	0x00-0x0C,0x80-0x8C	An 8-bit enumeration field identifying the commodity as well as its base unit of measure (See [6]).
31	Currency	[0x00,0x00]-[0xFF,0xFF]	An unsigned 16-bit field containing identifying information concerning the local unit of currency used in the price field (See [6]).
33	PriceTrail. Digit & Price Tier	0x11-0xF6	An 8-bit field used to determine where the decimal point is located in the price field and to indicate the current pricing tier as chosen by the commodity provider (See [6]).
34	Num of PriceTier	0x61-0x66	An 8-bit BitMap where the most significant nibble is an enumerated sub-field representing the maximum number of price tiers available, and the least significant nibble is an enumerated sub-field indicating the register tier used with the current Price Tier (See [6]).
35	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing when price signal becomes valid. A start time of 0x00000000 is a special time denoting "now." (See [6]).
39	Duration	[0x01,0x00]- [0xFF,0xFF]	It indicates the number of minutes during which the price signal is valid. 0xFF,0xFF means "until changed" (See [6]).

41	Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is delivered to the premises (See [6]).
45	Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
46	Generation Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is received from the premises (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.
50	Generation Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Generation Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
51	Alternate Cost Delivered	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32 Integer field that provides a mechanism to describe an alternative measure of the cost of the energy consumed. (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.

55	Alternate Cost Unit	0x00-0x01,0xFF	An 8-bit enumeration identifying the unit for the Alternate Cost Delivered field (See [6]). 0xFF indicates the field is not used.
56	Alternate Cost Trailing Digit	0x10-0xF0	An 8-bit BitMap field used to determine where the decimal point is located in the alternate cost field (See [6]). 0xFF indicates the field is not used.
57	Number of Block	0x00-0x0F	An 8-bit integer which indicates the number of block thresholds available (See [6]). 0xFF indicates the field is not used.
58	Price Control	0x00-0x01	Identifies additional control options for the price event. 0x00: Field not used 0x01: Price Ack Required

NOTE:
The ESI is able to manage up to six Price Info entries in its local PriceInfo table.

NOTE:
The tier label can be set with write remote Attribute.

- Set/Send Current Publish Price confirm

Offset	Name	Value	Description
0	Packet Length	0x06	
1	Command ID	0x85	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	It's the Start Time calculated using parameters provided in the request

3.2.41.   Set Scheduled Publish Price

This command allows setting into the InfoPrice table a scheduled publish price.

NOTE:

This command can be managed only by the ESI.

- **Set Scheduled Publish Price request**

Offset	Name	Value	Description
0	Packet Length	0x30 or 0x38	
1	Command ID	0x86	
2	Index	0x00-0x04	Index+1 is the index of PriceInfo table where to add the scheduled publish price.
3	Full Set	0x00-0x01	0x00: all the fields after **Generation Price Ratio** are not present 0x01: all the fields after **Generation Price Ratio** are present
4	Provider ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing a unique identifier for the commodity provider (See [6])
8	Rate Label	0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX 0xXX,0xXX,0xXX,0xXX	A ZCL Octet String field capable of storing a 12 character string (the first Octet indicates length) containing commodity provider-specific information regarding the current billing rate (See [6]). All the byte shall be present also if string length is lower than 11.
20	Issuer Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Unique identifier generated by the commodity provider (See [6]).
24	Current Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A UTCTime field containing the current time as determined by the device (See [6]). If it is set to 0x00,0x00,0x00,0x00 it will be replaced by the Current time of the device otherwise it will be forced at a specific value

28	Unit Of Measure	0x00-0x0C,0x80-0x8C	An 8-bit enumeration field identifying the commodity as well as its base unit of measure (See [6]).
29	Currency	[0x00,0x00]-[0xFF,0xFF]	An unsigned 16-bit field containing identifying information concerning the local unit of currency used in the price field (See [6]).
31	Price Trail. Digit & Price Tier	0x11-0xF6	An 8-bit field used to determine where the decimal point is located in the price field and to indicate the current pricing tier as chosen by the commodity provider (See [6]).
32	Num of PriceTier	0x61-0x66	An 8-bit BitMap where the most significant nibble is an enumerated sub-field representing the maximum number of price tiers available, and the least significant nibble is an enumerated sub-field indicating the register tier used with the current Price Tier (See [6]).
33	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing when price signal becomes valid. A start time of 0x00000000 is a special time denoting "now." (See [6]).
37	Duration	[0x01,0x00]- [0xFF,0xFF]	It indicates the number of minutes during which the price signal is valid. 0xFF,0xFF means "until changed" (See [6]).

39	Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is delivered to the premises (See [6]).
43	Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
44	Generation Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is received from the premises (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.
48	Generation Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Generation Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
49	Alternate Cost Delivered	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32 Integer field that provides a mechanism to describe an alternative measure of the cost of the energy consumed. (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.

53	Alternate Cost Unit	0x00-0x01,0xFF	An 8-bit enumeration identifying the unit for the Alternate Cost Delivered field (See [6]). 0xFF indicates the field is not used.
54	Alternate Cost Trailing Digit	0x10-0xF0	An 8-bit BitMap field used to determine where the decimal point is located in the alternate cost field (See [6]). 0xFF indicates the field is not used.
55	Number of Block	0x00-0x0F	An 8-bit integer which indicates the number of block thresholds available (See [6]). 0xFF indicates the field is not used.
56	Price Control	0x00-0x01	Identifies additional control options for the price event. 0x00: Field not used 0x01: Price Ack Required

NOTE:

The user shall guarantee the correct usage of Index field. No indexes can be left empty.

- Set Scheduled Publish Price confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x87	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

3.2.42.   Get Scheduled Price

This command is used when the IHD device wishes to verify the available Price Events or after a loss of power/reset occurs and the client device needs to recover currently active, scheduled, or expired Price Events.

NOTE:

This command can be managed only by the IHD.

Offset	Name	Value	Description
0	Packet Length	0x06	
1	Command ID	0x9B	
2	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing the minimum ending time for any scheduled or currently active pricing events to be resent. If either command has a Start Time of 0x00000000, replace that Start Time with the current time stamp (See [6]).
6	Number of Events	0x00-0xFF	Represents the maximum number of events to be sent. A value of 0 would indicate all available events will returned.

- Set Scheduled Publish Price confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x9C	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

NOTE:

If the remote server has Scheduled Publish price to send some Display Scheduled Publish Price (3.2.44) indications will be issued to the external host.

3.2.43.   Display Current Publish Price

This indication is issued by the module to the external host when it receives a new Current Publish Price.

NOTE:

This command can be managed only by the IHD.

Offset	Name	Value	Description
0	Packet Length	0x2C + Rate Label[0]	Rate Label[0] holds the length of the Rate Label string
1	Command ID	0x99	-
2	Reserved	0x00	-
3	Provider ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing a unique identifier for the commodity provider (See [6])
7	Rate Label	0xXX,Variable	A ZCL Octet String field capable of storing a 12 character string (the first Octet indicates length) containing commodity provider-specific information regarding the current billing rate (See [6]).
8 + Rate Label[0]	Issuer Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Unique identifier generated by the commodity provider (See [6]).

12+ Rate Label[0]	Current Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A UTCTime field containing the current time as determined by the device (See [6]). If it is set to 0x00,0x00,0x00,0x00 it will be replaced by the Current time of the device otherwise it will be forced at a specific value
16 + Rate Label[0]	Unit Of Measure	0x00-0x0C,0x80-0x8C	An 8-bit enumeration field identifying the commodity as well as its base unit of measure (See [6]).
17 + Rate Label[0]	Currency	[0x00,0x00]-[0xFF,0xFF]	An unsigned 16-bit field containing identifying information concerning the local unit of currency used in the price field (See [6]).
19 + Rate Label[0]	Price Trail. Digit & Price Tier	0x11-0xF6	An 8-bit field used to determine where the decimal point is located in the price field and to indicate the current pricing tier as chosen by the commodity provider (See [6]).
20 + Rate Label[0]	Num of PriceTier	0x61-0x66	An 8-bit BitMap where the most significant nibble is an enumerated sub-field representing the maximum number of price tiers available, and the least significant nibble is an enumerated sub-field indicating the register tier used with the current Price Tier (See [6]).
21 + Rate Label[0]	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing when price signal becomes valid. A start time of 0x00000000 is a special time denoting "now." (See [6]).

25 + Rate Label[0]	Duration	[0x01,0x00]- [0xFF,0xFF]	It indicates the number of minutes during which the price signal is valid. 0xFF,0xFF means "until changed" (See [6]).
27 + Rate Label[0]	Price	[0x00,0x00,0x00,0x00]- [0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is delivered to the premises (See [6]).
31+ Rate Label[0]	Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
32 + Rate Label[0]	Generation Price	[0x00,0x00,0x00,0x00]- [0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is received from the premises (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.
36 + Rate Label[0]	Generation Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Generation Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.

37 + Rate Label[0]	Alternate Cost Delivered	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32 Integer field that provides a mechanism to describe an alternative measure of the cost of the energy consumed. (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.
41 + Rate Label[0]	Alternate Cost Unit	0x00-0x01,0xFF	An 8-bit enumeration identifying the unit for the Alternate Cost Delivered field (See [6]). 0xFF indicates the field is not used.
42 + Rate Label[0]	Alternate Cost Trailing Digit	0x10-0xF0	An 8-bit BitMap field used to determine where the decimal point is located in the alternate cost field (See [6]). 0xFF indicates the field is not used.
43 + Rate Label[0]	Number of Block	0x00-0x0F	An 8-bit integer which indicates the number of block thresholds available (See [6]). 0xFF indicates the field is not used.
44 + Rate Label[0]	Price Control	0x00-0x01	Identifies additional control options for the price event. 0x00: Field not used 0x01: Price Ack Required

After a Display Current Publish Price is issued, the module will send also two Display Current Publish Price (3.2.43) indications to reset the scheduled prices.

3.2.44.   Display Scheduled Publish Price

This indication is issued by the module to the external host when it receives a new Scheduled Publish Price.

NOTE:

This command can be managed only by the IHD.

Offset	Name	Value	Description
0	Packet Length	0x2D + Rate Label[0]	Rate Label[0] holds the length of the Rate Label string
1	Command ID	0x9A	
2	Scheduled Publish Price Number	0x01-0x02	Indicates which is the scheduled price info has to be managed (written or reset).
3	Action	0x00-0x01	0x00: Indicates that the command holds a new scheduled price info 0x01: Indicates that the command is requesting to reset a specific scheduled price info
4	Provider ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing a unique identifier for the commodity provider (See [6])
8	Rate Label	0xXX,Variable	A ZCL Octet String field capable of storing a 12 character string (the first Octet indicates length) containing commodity provider-specific information regarding the current billing rate (See [6]).
9 + Rate Label[0]	Issuer Event ID	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	Unique identifier generated by the commodity provider (See [6]).
13 + Rate Label[0]	Current Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	A UTCTime field containing the current time as determined by the device (See [6]). If it is set to 0x00,0x00,0x00,0x00 it will be replaced by the Current time of the device otherwise it will be forced at a specific value

17 + Rate Label[0]	Unit Of Measure	0x00-0x0C,0x80-0x8C	An 8-bit enumeration field identifying the commodity as well as its base unit of measure (See [6]).
18 + Rate Label[0]	Currency	[0x00,0x00]-[0xFF,0xFF]	An unsigned 16-bit field containing identifying information concerning the local unit of currency used in the price field (See [6]).
20 + Rate Label[0]	Price Trail. Digit & Price Tier	0x11-0xF6	An 8-bit field used to determine where the decimal point is located in the price field and to indicate the current pricing tier as chosen by the commodity provider (See [6]).
21 + Rate Label[0]	Num of PriceTier	0x61-0x66	An 8-bit BitMap where the most significant nibble is an enumerated sub-field representing the maximum number of price tiers available, and the least significant nibble is an enumerated sub-field indicating the register tier used with the current Price Tier (See [6]).
22 + Rate Label[0]	Start Time	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	UTC Timestamp representing when price signal becomes valid. A start time of 0x00000000 is a special time denoting "now." (See [6]).
26 + Rate Label[0]	Duration	[0x01,0x00]- [0xFF,0xFF]	It indicates the number of minutes during which the price signal is valid. 0xFF,0xFF means "until changed" (See [6]).

28 + Rate Label[0]	Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is delivered to the premises (See [6]).
32 + Rate Label[0]	Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
33 + Rate Label[0]	Generation Price	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32-bit field containing the price of the commodity measured in base unit of Currency per Unit of Measure with the decimal point located as indicated by the Price Trailing Digit field when the commodity is received from the premises (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.
37 + Rate Label[0]	Generation Price Ratio	0x00-0xFF	An unsigned 8-bit field that gives the ratio of the price denoted in the Generation Price field to the "normal" price chosen by the commodity provider (See [6]). 0xFF indicates the field is not used.
38 + Rate Label[0]	Alternate Cost Delivered	[0x00,0x00,0x00,0x00]-[0xFF,0xFF,0xFF,0xFF]	An unsigned 32 Integer field that provides a mechanism to describe an alternative measure of the cost of the energy consumed. (See [6]). 0xFF,0xFF,0xFF,0xFF indicates the field is not used.

42 + Rate Label[0]	Alternate Cost Unit	0x00-0x01,0xFF	An 8-bit enumeration identifying the unit for the Alternate Cost Delivered field (See [6]). 0xFF indicates the field is not used.
43 + Rate Label[0]	Alternate Cost Trailing Digit	0x10-0xF0	An 8-bit BitMap field used to determine where the decimal point is located in the alternate cost field (See [6]). 0xFF indicates the field is not used.
44 + Rate Label[0]	Number of Block	0x00-0x0F	An 8-bit integer which indicates the number of block thresholds available (See [6]). 0xFF indicates the field is not used.
45 + Rate Label[0]	Price Control	0x00-0x01	Identifies additional control options for the price event. 0x00: Field not used 0x01: Price Ack Required

NOTE:

The IHD considers the external host is able to manage up to two scheduled publish prices.

After a Display Current Publish Price (3.2.43) is issued, the module will send also two Display Current Publish Price indications to reset the scheduled prices.

If the first scheduled price is updated, after that a Display Current Publish Price indication is issued to reset the second scheduled price.

3.2.45.   Reset PriceInfo Table

This command allows the ESI resetting the PriceInfo table entries starting from a specific index.

NOTE:

This command can be managed only by the ESI.

- Reset Load Control Event request

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x6C	
10	Start Index	0x00-0x05	PriceInfo table index

NOTE:

If start index is set to 0x00 the PriceInfo table is completely reset.

- Reset Load Control Event Confirm

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x6D	
2	Status	0x00-0xFF	0x00: Success Otherwise an error occurred

4.   ESI DEVICE

The ESI device can be managed through a specific serial protocol.

The features implemented in the ESI are listed in the table below:

Generic Clusters	
SERVER	**CLIENT**
Basic	-
Key Establishment	Key Establishment
Identify	-
SE Clusters	
SERVER	**CLIENT**
Messaging	-
Price	-
Demand Response Load Control	-
Time	-
-	Metering

The ESI is the coordinator and the Trust Center of a Smart Energy network.

The ESI is able to manage up to 5 devices.

NOTE:

The IEEE address of the ESI is 0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x01 (BIG ENDIAN). The address is fixed because the test certificate used by Key Establishment is linked to the IEEE address. In a real product it will change

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NOTE:

This device can be used only for test purposes. To join a real network the device needs a production certificate for the Key Establishment mechanism

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NOTE:

The active End Point of the ESI is 0x0A

4.1.　Network Formation

The steps to form a network are listed and described below:

1) Reset the ESI:

	Packet Length	**Command ID**	**Reset Type**
Number of Bytes	1	1	1
Value	0x02	0x10	0x00

This step is necessary to allow resetting the internal EEPROM to the default values.

The expected message issued by the ESI is:

- a reset confirm:

	Packet Length	**Command ID**	**Status**
Number of Bytes	1	1	1
Value	0x02	0x11	0x00 (SUCCESS)

2) Set a Specific Channel (Optional)

	Packet Length	Command ID	Attribute ID	Attribute Length	Attribute
Number of Bytes	1	1	1	1	2
Value	0x05	0x12	0x01	0x02	0x00,0x01

In this example channel 11 has been enabled.

The expected message issued by the ESI is:

- A set attribute confirm:

	Packet Length	Command ID	Status	Attribute ID
Number of Bytes	1	1	1	1
Value	0x03	0x13	0x00 (SUCCESS)	0x01

NOTE:

If a channel mask is not set the ESI will scan the available channels and will choose the best one from noise point of view.

3) Set a specific Extended PAN ID (Optional)

	Packet Length	Command ID	Attribute ID	Attribute Length	Attribute
Number of Bytes	1	1	1	1	8
Value	0x0B	0x12	0xC4	0x08	0x00,0x01,0x02,0x03, 0x04,0x05,0x06,0x07

In this example the extended PAN ID is set to 0x00,0x01,0x02,0x03,0x04,0x05,0x06,0x07.

The expected message issued by the ESI is:

- A set attribute confirm:

	Packet Length	Command ID	Status	Attribute ID
Number of Bytes	1	1	1	1
Value	0x03	0x13	0x00 (SUCCESS)	0xC4

NOTE:

If an extended PAN ID is not set the ESI will use its extended PAN ID.

4) Start the network:

	Packet Length	Command ID
Number of Bytes	1	1
Value	0x01	0x16

The expected message issued by the ESI is:

- a start confirm:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x17	0x00 (SUCCESS)

NOTE:

At this point the network is started but no devices can join it because the ESI has the permit join disable and it does not have the installation code of the joining device. Read paragraph 4.2 to understand how to allow a device joining the network.

4.2.   Network Management

Before allowing a device joining the network the ESI clock time should be set:

- Set clock time:

	Packet Length	Command ID	Attribute ID	Attribute Length	Attribute
Number of Bytes	1	1	1	1	8
Value	0x07	0x12	0x0E	0x04	0xXX,0xXX,0xXX,0xXX

NOTE:

0xXX,0xXX,0xXX,0xXX (BIG ENDIAN) shall be the current UTC time.

- Expected confirm

	Packet Length	Command ID	Status	Attribute ID
Number of Bytes	1	1	1	1
Value	0x03	0x13	0x00 (SUCCESS)	0x0E

To allow the devices joining the network some actions have to be performed:

1) Set Installation code related to the joining IHD (the device has been joining):

	Packet Length	Command ID	IC Type	CRC Type	Installation Code	IEEE Address
Number of Bytes	1	1	1	1	8	8
Value	0x13	0x46	0x00	0x01	0x83,0xFE,0xD3,0x40, 0x7A,0x93,0x2B,0x70	0x03,0x00,0x00,0x00, 0x00,0x4F,0x15,0x00

In this case an installation code of 48 bits is set (IC Type = 0x00). The CRC (0x2B,0x70 Little Endian) is present in Installation Code field and it shall be verified (CRC Type = 0x01). The Installation code is in Little Endian.

The IEEE Address is that of the IHD (Little Endian).

2) Set Installation code related to the joining SIMPLEMETER (the device has been joining):

	Packet Length	Command ID	IC Type	CRC Type	Installation Code	IEEE Address
Number of Bytes	1	1	1	1	8	8
Value	0x13	0x46	0x00	0x01	0x83,0xFE,0xD3,0x40, 0x7A,0x93,0x2B,0x70	0x04,0x00,0x00,0x00, 0x00,0x4F,0x15,0x00

In this case an installation code of 48 bits is set (IC Type = 0x00). The CRC (0x2B,0x70 Little Endian) is present in Installation Code field and it shall be verified (CRC Type = 0x01). The Installation code is in Little Endian.

The IEEE Address is that of the SIMPLEMETER (Little Endian).

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x47	0x00 (SUCCESS)

3) Set Permit Join:

	Packet Length	Command ID	Nwk Address	Permit Join	TC Significance
Number of Bytes	1	1	2	1	1
Value	0x05	0xEA	0x00,0x00	0xFF	0x00

NOTE:

If the Permit Join field is set to 0xFF the joining is allowed forever so you need to do it only one time.

NOTE:

This command can be managed by the ESI only if it has already formed a network. By default the joining is not allowed

The expected confirm is:

	Packet Length	**Command ID**	**Status**
Number of Bytes	1	1	1
Value	0x02	0xEB	0x00 (SUCCESS)

4.3.   Price Cluster Management

NOTE:

These functionalities can be evaluated only if an IHD has been joined to the ESI.

In this section some use cases related to the price cluster usage are provided.

4.3.1.   USE CASE 1: Send a Current Publish Price

In this use case the ESI sends an unsolicited (Without receiving a Get Current Publish Price request from an IHD) Current Publish Price that starts "Now" and ends when a new Current Publish Price will be received or a Scheduled Publish Price starts. The price info is provided without the optional fields.

Offset	Name	Value
0	Packet Length	0x32
1	Command ID	0x84
2	Send	0x01
3	Full Set	0x00
4	Sum or Sub	0x00
5	Use Tier	0xFF

6	Provider ID	0x01,0x00,0x00,0x00
10	Rate Label	0x04,0x42,0x41,0x53 0x45,0x00,0x00,0x00 0x00,0x00,0x00,0x00
22	Issuer Event ID	0x04,0x03,0x02,0x01
26	Current Time	0x00,0x00,0x00,0x00
30	Unit Of Measure	0x00
31	Currency	0x48,0x03
33	PriceTrail. Digit & Price Tier	0x10
34	Num of PriceTier	0x40
35	Start Time	0x00,0x00,0x00,0x00
39	Duration	0xFF,0xFF
41	Price	0x12,0x00,0x00,0x00
45	Price Ratio	0x12
46	Generation Price	0x15,0x00,0x00,0x00
50	Generation Price Ratio	0x25

The expected confirm is:

	Packet Length	Command ID	Status	Start Time
Number of Bytes	1	1	1	4
Value	0x06	0x85	0x00 (SUCCESS)	0x00,0x00,0x00,0x00

4.3.2. USE CASE 2: Store some Publish Prices

In this use case a current publish price and two scheduled publish prices are stored in the ESI. If an IHD requests the current price or some scheduled prices the ESI will reply automatically.

The command to add the Current price in the ESI is:

Offset	Name	Value
0	Packet Length	0x32
1	Command ID	0x84
2	Send	**0x00**
3	Full Set	0x00
4	Sum or Sub	0x00
5	Use Tier	0xFF
6	Provider ID	0x01,0x00,0x00,0x00
10	Rate Label	0x04,0x42,0x41,0x53 0x45,0x00,0x00,0x00 0x00,0x00,0x00,0x00
22	Issuer Event ID	0x04,0x03,0x02,0x01
26	Current Time	0x00,0x00,0x00,0x00
30	Unit Of Measure	0x00
31	Currency	0x48,0x03
33	PriceTrail. Digit & Price Tier	0x11
34	Num of PriceTier	0x31
35	Start Time	0x00,0x00,0x00,0x00
39	Duration	0xFF,0xFF
41	Price	0x12,0x00,0x00,0x00
45	Price Ratio	0x12

| 46 | Generation Price | 0x15,0x00,0x00,0x00 |
| 50 | Generation Price Ratio | 0x25 |

NOTE:

The Send field is set to 0x00, so the current publish price will not be sent.

The expected confirm is:

	Packet Length	Command ID	Status	Start Time
Number of Bytes	1	1	1	4
Value	0x06	0x85	0x00 (SUCCESS)	0x00,0x00,0x00,0x00

The command to add the first scheduled price in the ESI is:

Offset	Name	Value
0	Packet Length	0x30
1	Command ID	0x86
2	Index	0x00
3	Full Set	0x00
4	Provider ID	0x01,0x00,0x00,0x00
8	Rate Label	0x04,0x54,0x41,0x52 0x31,0x00,0x00,0x00 0x00,0x00,0x00,0x00
20	Issuer Event ID	0x04,0x03,0x02,0x01
24	Current Time	0x00,0x00,0x00,0x00
28	Unit Of Measure	0x00
29	Currency	0x48,0x03

31	Price Trail. Digit & Price Tier	0x12
32	Num of PriceTier	0x32
33	Start Time	0x80,0x51,0x01,0x00
37	Duration	0x3C,0x00
39	Price	0x18,0x00,0x00,0x00
43	Price Ratio	0xFF
44	Generation Price	0xFF,0xFF,0xFF,0xFF
48	Generation Price Ratio	0xFF

The expected confirm is:

	Packet Length	Command ID	Status	Start Time
Number of Bytes	1	1	1	4
Value	0x06	0x87	0x00 (SUCCESS)	0x53,0x53,0x01,0x00

The command to add the second scheduled price in the ESI is:

Offset	Name	Value
0	Packet Length	0x30
1	Command ID	0x86
2	Index	0x01
3	Full Set	0x00
4	Provider ID	0x02,0x00,0x00,0x00

8	Rate Label	0x04,0x54,0x41,0x52 0x32,0x00,0x00,0x00 0x00,0x00,0x00,0x00
20	Issuer Event ID	0x02,0x03,0x02,0x03
24	Current Time	0x00,0x00,0x00,0x00
28	Unit Of Measure	0x00
29	Currency	0x48,0x03
31	Price Trail. Digit & Price Tier	0x13
32	Num of PriceTier	0x33
33	Start Time	0x80,0xF4,0x03,0x00
37	Duration	0xFF,0xFF
39	Price	0x12,0x00,0x00,0x00
43	Price Ratio	0xFF
44	Generation Price	0xFF,0xFF,0xFF,0xFF
48	Generation Price Ratio	0xFF

The expected confirm is:

	Packet Length	Command ID	Status	Start Time
Number of Bytes	1	1	1	4
Value	0x06	0x87	0x00 (SUCCESS)	0x57,0xF6,0x03,0x00

4.3.3. USE CASE 3: Send a Publish Price using Local Tier attribute.

In this use case a specific tier label is stored in the attributes of the price cluster and a current publish price is sent using this data.

The Remote Write Attribute is used to set the Tier1 in the ESI:

Offset	Name	Value
0	Packet Length	0x11
1	Command ID	0x53
2	Address Mode	0x02
3	Destination Address	0x00,0x00
5	DstEP	0x0A
6	SrcEP	0x0A
7	Cluster ID	0x00,0x07
9	Attribute ID	0x00,0x00
11	Attribute Data Type	0x41
12	Tier 1 Label	0x05,0x54,0x69, 0x65,0x72,0x31

The Tier1 Label is "Tier1"

NOTE:

Attribute Data Type = 0x41 means octet string, the first byte is the length of the string. Data types are defined by ZCL (refer to [5])

NOTE:

The ESI is sending to himself the Remote Write Attribute Request so a Remote Write Attribute Indication will be returned on the serial link.

The expected messages received by the ESI are:

- A Remote Write Attribute confirm

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x54	0x00 (SUCCESS)

- A Write Attribute Indication

Offset	Name		Value	Description
0	Packet Length		0x0D	
1	Command ID		0x52	
2	Endpoint		0x0A	Endpoint where the attribute has been written
3	Cluster ID		0x00,0x07	Cluster identifier
5	Attribute ID		0x00,0x00	Number of attribute status record (see [5])
7	Attribute Length		0x06	
8	Attribute (Tier1 Label)	String length	0x05	
		String	0x54,0x69,0x65,0x72,0x31	"Tier1"

- A remote Write Attribute Response

	Packet Length	Command ID	Dst EP	Cluster ID	Attribute ID	Status
Number of Bytes	1	1	1	2	2	1
Value	0x07	0x5B	0x0A	0x00,0x07	0xFF,0xFF	0x00 (SUCCESS)

The command to send the Current price from the ESI using the Tier1 label is:

Offset	Name	Value
0	Packet Length	0x32
1	Command ID	0x84
2	Send	0x01
3	Full Set	0x00
4	Sum or Sub	0x00
5	Use Tier	**0x00**
6	Provider ID	0x01,0x00,0x00,0x00
10	Rate Label	0x00,0x00,0x00,0x00 0x00,0x00,0x00,0x00 0x00,0x00,0x00,0x00
22	Issuer Event ID	0x04,0x03,0x02,0x01
26	Current Time	0x00,0x00,0x00,0x00
30	Unit Of Measure	0x00
31	Currency	0x48,0x03
33	PriceTrail. Digit & Price Tier	0x00
34	Num of PriceTier	0x00
35	Start Time	0x00,0x00,0x00,0x00
39	Duration	0xFF,0xFF
41	Price	0x12,0x00,0x00,0x00
45	Price Ratio	0x12
46	Generation Price	0x15,0x00,0x00,0x00
50	Generation Price Ratio	0x25

NOTE:

"Use Tier" field is set to 0x00, indicating the usage of the stored Tier1 Label. "PriceTrail. Digit & Price Tier" field will be set automatically to 0x11. "Num of PriceTier" field will be set automatically to 0x61.

NOTE:

The ESI sends an unsolicited (Without receiving a Get Current Publish Price request from an IHD) Current Publish Price that starts "Now" and ends when a new Current Publish Price will be received or a Scheduled Publish Price starts. The price info is provided without the optional fields.

The expected confirm is:

	Packet Length	Command ID	Status	Start Time
Number of Bytes	1	1	1	4
Value	0x06	0x85	0x00 (SUCCESS)	0x00,0x00,0x00,0x00

4.3.4. USE CASE 4: Send a Publish Price requesting a Price Ack

In this use case the ESI sends an unsolicited (Without receiving a Get Current Publish Price request from an IHD) Current Publish Price that starts "Now" and ends when a new Current Publish Price will be received o a Scheduled Publish Price starts. The price info is provided with the optional fields to enable the price acknowledgement.

Offset	Name	Value
0	Packet Length	0x3A
1	Command ID	0x84
2	Send	0x01
3	Full Set	**0x01**
4	Sum or Sub	0x00
5	Use Tier	0xFF
6	Provider ID	0x01,0x00,0x00,0x00
10	Rate Label	0x04,0x42,0x41,0x53 0x45,0x00,0x00,0x00 0x00,0x00,0x00,0x00
22	Issuer Event ID	0x04,0x03,0x02,0x01
26	Current Time	0x00,0x00,0x00,0x00
30	Unit Of Measure	0x00
31	Currency	0x48,0x03
33	PriceTrail. Digit & Price Tier	0x10
34	Num of PriceTier	0x40
35	Start Time	0x00,0x00,0x00,0x00
39	Duration	0xFF,0xFF
41	Price	0x12,0x00,0x00,0x00

45	Price Ratio	0x12
46	Generation Price	0x15,0x00,0x00,0x00
50	Generation Price Ratio	0x25
51	Alternate Cost Delivered	0xFF,0xFF,0xFF,0xFF
55	Alternate Cost Unit	0xFF
56	Alternate Cost Trailing Digit	0xFF
57	Number of Block	0xFF
58	Price Control	0x01

NOTE:
"Full Set" field is set to 0x01, indicating the usage of the optional fields.

The expected messages received by the ESI are:

- A ZCL Message From Client To Server Indication (Price Ack Command)

Offset	Name	Value
0	Packet Length	0x17
1	Command ID	0x45
2	Src Address	0x69,0x4E
4	SrcEP	0x09
5	Sequence Number	0x06
6	DstEP	0x0A
7	Cluster ID	0x00,0x07
9	Cluster Command ID	0x02

10	Command Length		0x0D
12	Price Ack Command	Provider ID	0x01,0x00,0x00,0x00
		Issuer Event ID	0x04,0x03,0x02,0x01
		Price Ack Time	0x46,0x13,0x02,0x01
		Control	0x01

NOTE:

"Src Address", "Sequence Number" and "Price Ack Time" could be different.

- A Set/Send Current Publish Price Confirm

	Packet Length	**Command ID**	**Status**	**Start Time**
Number of Bytes	1	1	1	4
Value	0x06	0x85	0x00 (SUCCESS)	0x00,0x00,0x00,0x00

4.4. Messaging Cluster Management

NOTE:

These functionalities can be evaluated only if a device with messaging cluster client side has been joined to the ESI.

In this section some use cases related to the messaging cluster usage are provided.

4.4.1. USE CASE 1: Display some messages

To request a remote device to display "Now" the message "First Message" until another one will be sent, the command below shall be sent to the ESI:

Offset	Name	Value
0	Packet Length	0x1C
1	Command ID	0x94
2	Send	0x01
3	Sum or Sub	0x00
4	Message ID	0x01,0x00,0x00,0x00
8	Message Control	0x01
9	Start Time	0x00,0x00,0x00,0x00
13	Duration	0xFF,0xFF
15	String Length	0x0D
16	Message String	0x46,0x69,0x72,0x73,0x74,0x20,0x4D, 0x65,0x73,0x73,0x61,0x67,0x65

The expected messages received by the ESI are:

- A Display Message Response

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x95	0x00 (SUCCESS)

- A ZCL Default Response Indication

NOTE:

The ZCL Default Response is sent by the remote device to inform the ESI if the Display Message Command has been managed correctly.

	Packet Length	Command ID	Src Nwk Address	Src EP	Cluster ID	Cluster Command ID	Status
Number of Bytes	1	1	2	1	2	1	1
Value	0x08	0x5C	0x 63,0xA9	0x0A	0x03,0x07	0x00	0x00

To request a remote device to display "Now" the empty message "" until another one will be sent, the command below shall be sent to the ESI:

Offset	Name	Value
0	Packet Length	0x0F
1	Command ID	0x94
2	Send	0x01
3	Sum or Sub	0x00

4	Message ID	0x02,0x00,0x00,0x00
8	Message Control	0x00
9	Start Time	0x00,0x00,0x00,0x00
13	Duration	0xFF,0xFF
15	String Length	0x00

The expected messages received by the ESI are:

- A Display Message Response

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x95	0x00 (SUCCESS)

- A ZCL Default Response Indication

NOTE:

The ZCL Default Response is sent by the remote device to inform the ESI if the Display Message Command has been managed correctly.

	Packet Length	Command ID	Src Nwk Address	Src EP	Cluster ID	Cluster Command ID	Status
Number of Bytes	1	1	2	1	2	1	1
Value	0x08	0x5C	0x 63,0xA9	0x0A	0x03,0x07	0x00	0x00

4.4.2. USE CASE 2: Cancel a message

To request a remote device to cancel a message with message ID set to 0x00000001 the command below shall be sent to the ESI:

	Packet Length	Command ID	Message ID	Message Control
Number of Bytes	1	1	4	1
Value	0x06	0x9D	0x01,0x00,0x00,0x00	0x00

The expected messages received by the ESI are:

- A Cancel Message Response

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x9E	0x00 (SUCCESS)

- A ZCL Default Response Indication

NOTE:

The ZCL Default Response is sent by the remote device to inform the ESI if the Display Message Command has been managed correctly.

	Packet Length	Command ID	Src Nwk Address	Src EP	Cluster ID	Cluster Command ID	Status
Number of Bytes	1	1	2	1	2	1	1
Value	0x08	0x5C	0x 63,0xA9	0x0A	0x03,0x07	0x01	0x00

4.5. Demand Response Load Control Management

NOTE:

These functionalities can be evaluated only if a Load Control Device has been joined to the ESI.

In this section some use cases related to the Demand Response Load Control cluster usage are provided.

4.5.1. USE CASE 1: Send a Load Control Event

In this use case the ESI will send a Load Control Event with event ID 0x00000001 that starts "Now" and ends after two minutes.

Offset	Name	Value
0	Packet Length	0x13
1	Command ID	0x96
2	Send	0x01
3	Index	0x00
4	Sum or Sub	0x00
5	Event ID	0x01,0x00,0x00,0x00
9	Device Class	0x80,0x00
11	Utility Enrolment Group	0x00
12	Start Time	0x00,0x00,0x00,0x00
16	Duration	0x02,0x00
18	Criticality Level	01
19	Event Control	0x00

The expected confirm is:

	Packet Length	Command ID	Status	Current Time
Number of Bytes	1	1	1	4
Value	0x06	0x97	0x00 (SUCCESS)	0xXX,0xXX,0xXX,0xXX

The Load Control Device should send two Report Event Status messages that will be reported by the ESI to the external host through a "ZCL Message From Client To Server Indication" (3.2.6).

The first Report Event Status indicates the event is started the second one that the event ended.

4.5.2.   USE CASE 2: Cancel a Load Control Event

In this use case the ESI will send a Load Control Event with event ID 0x00000002 that starts "Now" and ends after ten minutes.

Offset	Name	Value
0	Packet Length	0x13
1	Command ID	0x96
2	Send	0x01
3	Index	0x00
4	Sum or Sub	0x00
5	Event ID	0x02,0x00,0x00,0x00
9	Device Class	0x80,0x00
11	Utility Enrolment Group	0x00
12	Start Time	0x00,0x00,0x00,0x00
16	Duration	0x0A,0x00
18	Criticality Level	01
19	Event Control	0x00

The expected confirm is:

	Packet Length	Command ID	Status	Current Time
Number of Bytes	1	1	1	4
Value	0x06	0x97	0x00 (SUCCESS)	0xXX,0xXX,0xXX,0xXX

The Load Control Device should send a Report Event Status message that will be reported by the ESI to the external host through a "ZCL Message From Client To Server Indication" (3.2.6).

The Report Event Status indicates the event is started

After five minutes the ESI cancels the event

Offset	Name	Value
0	Packet Length	0x0B
1	Command ID	0x7E
2	Sum or Sub	0x00
3	Event ID	0x02,0x00,0x00,0x00
7	Device Class	0x80,0x00
9	Utility Enrolment Group	0x00
10	Cancel Control	0x00
11	Effective Time	0x00

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x7F	0x00 (SUCCESS)

The Report Event Status indicating the Event is ended will not be sent by the Load Control Device because the event has been cancelled.

4.6.   Metering Cluster Management

NOTE:

These functionalities can be evaluated only if a Simple Meter has been joined to the ESI.

In this section some use cases related to the metering cluster usage are provided.

4.6.1.   USE CASE 1: Read Some Attributes of the Meter

The ESI can read an attribute of the metering cluster (0x0702) of the remote meter. For example the ESI can request the "Current Summation Delivered" (0x0000) using the command below:

	Packet Length	Command ID	Cluster ID	Number of Attributes	Attribute IDs List
Number of Bytes	1	1	2	1	2
Value	0x06	0x68	0x02,0x07	0x01	0x00,0x00

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x69	0x00 (SUCCESS)

The ESI will report the data provided by the remote device through a Remote Read Attribute Response. An example is provided below:

Offset	Name	Value
0	Packet Length	0x12
1	Command ID	0x5A
2	Src Nwk Address	0x47,0xE3
4	SrcEP	0x07
5	DstEP	0x0A
6	Cluster ID	0x02,0x07
8	Number Of Attributes	0x01
9	Attribute ID	0x00,0x00
11	Status	0x00
12	Attribute Data Type	0x25
13	Current Summation Delivered value	0x 0D,0x09,0x00,0x00,0x00,0x00

In this case the Meter has network address 0xE347 and its application is working on endpoint 0x07.

NOTE:

Attribute Data Type = 0x25 means Unsigned 48-bit integer. Data types are defined by ZCL (refer to [5]). Value of Current Summation Delivered value may change, being application dependent.

4.6.2.   USE CASE 2: Get a Profile from a Meter

In this use case the ESI requests the meter to provide its delivered consumption for profiling purposes related to the most recent Interval Block (End Time = 0x00000000):

	Packet Length	Command ID	Sum Or Sub	Interval Channel	End Time	Number Of Periods	Seconds
Number of Bytes	1	1	1	1	4	1	4
Value	0x0C	0x4B	0x00	0x00	0x00,0x00,0x00,0x00	0x01	0x00,0x00,0x00,0x00

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x4C	0x00 (SUCCESS)

The Meter should answer with the Get Profile Response reported below. It will be reported by the ESI to the external host through a "ZCL Message From Server To Client Indication" (3.2.5).

Please refer to paragraph 6.1.2 to understand the values of the Get Profile response.

- The Get Profile Response:

Offset	Name	Value	Description
0	Packet Length	0x14	
1	Command ID	0x42	
2	Src Address	0x88,0x86	Network address (LE) of the device that generated the ZCL command (SM)
4	SrcEP	0x07	SM endpoint (source)

5	Sequence Number	0x00	It is the transaction Sequence Number of the ZCL header (see [5])
6	DstEP	0x0A	ESI endpoint (destination)
7	Cluster ID	0x02,0x07	Cluster identifier (METERING)
9	Cluster Command ID	0x00	Command identifier (Get Profile Response)
10	Command Length	0x0A	This field depends on the Cluster Command ID
12	Command	0x00,0x03,0x00,0x00, 0x00, 0x00, 0x00, 0x01, 0xAA,0xAA,0xAA	Get Profile Response Payload: - EndTime - Status - ProfileInterval Period - Numb of Periods Delivered - Intervals

4.6.3. USE CASE 3: Increase the polling rate of a Meter

NOTE:

This use case makes sense only if the meter is a sleeping device.

In this use case the ESI requests the meter to reduce the polling period to 2 seconds for 15 minutes:

	Packet Length	**Command ID**	**Fast Poll Update Period**	**Duration**
Number of Bytes	1	1	1	1
Value	0x03	0x7C	0x02	0x0F

The expected confirm is:

	Packet Length	**Command ID**	**Status**
Number of Bytes	1	1	1
Value	0x02	0x7D	0x00 (SUCCESS)

The Meter should answer with a Request Fast Poll Mode Response that will be reported by the ESI to the external host through a "ZCL Message From Server To Client Indication" (3.2.5).

4.6.4.   USE CASE 4: Configure reporting of some attributes of the Meter

The ESI can potentially configure the reporting on the remote Simple Meter, up to 3 attributes for each cluster, for a maximum of 3 clusters. The Simple Meter should accept the command only for attributes declared as *reportable* on its server.

It is not possible to configure multiple attributes on a single command.

Following examples show three different configurations:

- **Periodic reporting**

In order to receive periodic reports of an attribute from the Simple Meter server, the ESI must set the *Direction* field to 0x00, the time intervals with Min and Max values, and the attribute ID with its data type and the associated cluster. Other fields are common to the other remote commands. Here the ESI is requesting periodic reporting of maximum 5 seconds of the *CurrentTier1SummationReceived* attribute of the Simple Metering cluster.

WARNING:

The option *expect reports* is not configurable on the Simple Meter server

Offset	Name	Value	Description
0	Packet Length	0x13	
1	Command ID	0x62	
2	Address Mode	0x02	short address
3-4	Destination Address	0xXX, 0xXX	
5	DstEP	0x07	SM Endpoint
6	SrcEP	0x0A	ESI Endpoint
7-8	Cluster ID	0x02,0x07	Metering Cluster Id
9	Direction	0x00	Generate reports

10-11	Attribute ID	0x01,0x01	*CurrentTier1SummationReceived (LE)*
12	Attribute Data Type	0x25	ZCL_DATATYPE_UINT48
13-14	Min reporting interval	0x03-0x00	3 seconds
15-16	Max reporting interval	0x05-0x00	5 seconds
17-18	Timeout Period	0x00-0x00	not used for generate reports
19	Reportable Change	0x00	not used for periodic reporting

- **Reportable change on an analogical type attribute**

In this case the ESI shall instruct the Simple Meter in order to generate one single report when the value of the given attribute, *simpleMeterPowerFactor* in this example, will change of a minimum quantity indicated by the *Reportable Change* field.

Min and Max reporting interval values shall be both greater than zero and equal to each other.

Offset	Name	Value	Description
0	Packet Length	0x13	
1	Command ID	0x62	
2	Address Mode	0x02	short address
3-4	Destination Address	0xXX, 0xXX	
5	DstEP	0x07	SM Endpoint
6	SrcEP	0x0A	ESI Endpoint
7-8	Cluster ID	0x02,0x07	Metering Cluster Id
9	Direction	0x00	Generate reports
10-11	Attribute ID	0x06,0x00	*simpleMeterPowerFactor (LE)*
12	Attribute Data Type	0x28	ZCL_DATATYPE_INT8

13-14	Min reporting interval	0x01-0x00	Min = 1 sec
15-16	Max reporting interval	0x01-0x00	Max = 1 sec
17-18	Timeout Period	0x00-0x00	not used for generate reports
19…	Reportable Change	0x004	Minimum Reportable Change

- **Reportable change on a discrete type attribute**

In this case the ESI shall instruct the Simple Meter in order to generate reports when the value of the given attribute, *simpleMeterStatus in this example,* will change state (i.e. value). Every change will then result in a report to be issued to the client side.

Min and Max reporting interval values shall be both greater than zero and equal to each other.

Offset	Name	Value	Description
0	Packet Length	0x13	
1	Command ID	0x62	
2	Address Mode	0x02	short address
3-4	Destination Address	0xXX, 0xXX	
5	DstEP	0x07	SM Endpoint
6	SrcEP	0x0A	ESI Endpoint
7-8	Cluster ID	0x02,0x07	Metering Cluster Id
9	Direction	0x00	Generate reports
10-11	Attribute ID	0x00,0x02	*simpleMeterStatus (LE)*
12	Attribute Data Type	0x25	ZCL_DATATYPE_BITMAP8
13-14	Min reporting interval	0x01-0x00	1 seconds
15-16	Max reporting interval	0x01-0x00	1 seconds

17-18	Timeout Period	0x00-0x00	not used for generate reports
19…	Reportable Change	0x00	*not used for discrete types*

- The expected confirmation message for each command issued on the ESI interface is:

Offset	Name	Value	Description
0	Packet Length	0x02	
1	Command ID	0x62	
2	Status	0x00	0x00: SUCCESS

5. IHD DEVICE

The IHD device can be managed using the Display desktop application or through a specific serial protocol.

The features implemented in the IHD are listed in the table below:

Generic Clusters	
SERVER	**CLIENT**
Basic	-
Key Establishment	Key Establishment
Identify	-
SE Clusters	
SERVER	**CLIENT**
	Time
-	Price

The IHD can join a network created by an ESI and it is able to scan all the channels and to find the correct network basing its search on its installation code.

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NOTE:

The IEEE address of the IHD is 0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x03 (BIG ENDIAN). The address is fixed because the test certificate used by Key Establishment is linked to the IEEE address. In a real product it will change

ⓘ

NOTE:

This device cannot be used in a real network. To join a real network the device needs a production certificate for the Key Establishment mechanism

ⓘ

NOTE:

The active End Point of the IHD is 0x09

5.1.   Management through Serial Protocol

Before starting managing the price cluster the IHD shall be joined and authenticated to the network.

5.1.1.   Network Joining

The steps to join a network are listed and described below:

1) Reset the IHD:

	Packet Length	Command ID	Reset Type
Number of Bytes	1	1	1
Value	0x02	0x10	0x00

This step is necessary to allow resetting the internal EEPROM to the default values.

The expected messages issued by the IHD are:

- A display status to indicate the device has been reset

	Packet Length	Command ID	Display Line	Status String
Number of Bytes	1	1	1	12
Value	0x0E	0xA1	0x01	"IHD Resetted"

- The reset confirm:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x11	0x00 (SUCCESS)

2) Set Installation code on the IHD:

	Packet Length	Command ID	IC Type	CRC Type	Installation Code

Number of Bytes	1	1	1	1	8
Value	0x0B	0x46	0x00	01	0x83,0xFE,0xD3,0x40, 0x7A,0x93,0x2B,0x70

In this case an installation code of 48 bits is set (IC Type = 0x00). The CRC (0x2B,0x70 Little Endian) is present in Installation Code field and it shall be verified (CRC Type = 0x01). The Installation code is in Little Endian.

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x47	0x00 (SUCCESS)

3) Join the device to the SE network (ESI):

	Packet Length	Command ID
Number of Bytes	1	1
Value	0x01	0x16

When this command is received by the IHD it will perform the actions listed below:

- Network Discovery (All channels will be scanned if necessary)
- Network joining
- Network Authentication based on the Installation Code
- Key Establishment
- Service discovery
- Service Binding

The expected messages issued by the IHD are:

- A display status to indicate the device has started associating

	Packet Length	Command ID	Display Line	Status String
Number of Bytes	1	1	1	15
Value	0x11	0xA1	0x01	"IHD Associating"

• Association Confirm:

	Packet Length	Command ID	Short Address	Pan ID	HasNwkKey	Status
Number of Bytes	1	1	2	2	1	1
Value	0x07	0x77	0x69,0x4E	0x99,0x1D	0x00	0x00 (SUCCESS)

NOTE:

The short address and the Pan ID can be different because they are generated randomly.

• Start confirm:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x17	0x00 (SUCCESS)

• A display status to indicate the device is associated

	Packet Length	Command ID	Display Line	Status String
Number of Bytes	1	1	1	14
Value	0x10	0xA1	0x01	"IHD Associated"

• A display status to indicate the device has finished the key establishment and is doing the service discovery.

	Packet Length	Command ID	Display Line	Status String
Number of Bytes	1	1	1	15
Value	0x11	0xA1	0x01	"IHD Serv. Disc."

NOTE:

During the service discovery the IHD sends automatically a Node Descriptor request.

- A Node Descriptor Response:

	Packet Length	Command ID	Status	Src Nwk Address	Node Descriptor
Number of Bytes	1	1	1	2	13
Value	0x11	0xC5	0x00	0x00,0x00	0x10,0x40,0x8F,0x0E, 0x10,0x40,0x80,0x00, 0x41,0x00,0x80,0x00, 0x00

NOTE:

During the service discovery the IHD sends automatically a Simple Descriptor request.

- A Simple Descriptor Response:

	Packet Length	Command ID	Status	Src Nwk Address	Simple Desc. Length	Simple Descriptor
Number of Bytes	1	1	1	2	1	26
Value	0x1F	0xC9	0x00	0x00,0x00	0x1A	0x0A,0x09,0x01,0x00, 0x05,0x00,0x07,0x00, 0x00,0x03,0x00,0x0A, 0x00,0x00,0x07,0x01, 0x07,0x03,0x07,0x00, 0x08,0x02,0x02,0x07, 0x00,0x08

NOTE:

After the service discovery the IHD sends automatically two unbind requests (One for the Time cluster and one for the Price Cluster).

The Status is 0x88 if the ESI does not have any entries in the binding table related to the unbind request.

- Two Unbind Responses:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0xDB	0x88

NOTE:

After the two unbind requests the IHD sends automatically two bind requests (One for the Time cluster and one for the Price Cluster).

- Two Bind Responses:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0xE3	0x00

NOTE:

After the two bind requests the IHD sends automatically Remote Read Attribute Request for cluster TIME (0x000A) and attribute TIME ZONE (0x0002).

- A Remote Read Attribute Response for cluster TIME (0x000A) and attribute TIME ZONE (0x0002):

	Packet Length	Command ID	Src Nwk Address	Src EP	Dst EP	Cluster ID	Number Of Attributes	Attribute
Number of Bytes	1	1	2	1	1	2	1	8
Value	0x10	0x5A	0x00,0x00	0x0A	0x09	0x0A,0x00	0x01	0x02,0x00,0x00,0x2B, 0x00,0x00,0x00,0x00

NOTE:

After the two bind requests the IHD sends automatically Remote Read Attribute Request for cluster TIME (0x000A) and attribute TIME (0x0000).

- A Remote Read Attribute Response for cluster TIME (0x000A) and attribute TIME (0x0000):

	Packet Length	Command ID	Src Nwk Address	Src EP	Dst EP	Cluster ID	Number Of Attributes	Attribute
Number of Bytes	1	1	2	1	1	2	1	8
Value	0x10	0x5A	0x00,0x00	0x0A	0x09	0x0A,0x00	0x01	0x00,0x00,0x00,0xE2, 0xA4,0x00,0x00,0x00

NOTE:

The attribute value can be different because it holds the current time of the ESI.

- A display status to indicate the device is ready to work in the SE network.

	Packet Length	Command ID	Display Line	Status String
Number of Bytes	1	1	1	9
Value	0x0B	0xA1	0x01	"IHD ready"

5.1.2. Price Cluster Management

5.1.2.1. Get Current Publish Price

There is not a specific command to ask the current price but the generic ZCL Message From Client To Server Request (3.2.6) can be used.

The command to request the Current publish price is:

	Packet Length	Command ID	Address Mode	Destination Address	Dst EP	Src EP	Cluster ID	Cluster Command ID	Command Length	Command
Number of Bytes	1	1	1	2	1	1	2	1	1	1
Value	0x0B	0x43	0x02	0x00,0x00	0x0A	0x09	0x00, 0x07	0x00	0x01	0x00

To inform the external host that the command has been managed a ZCL Message From Client To Server Confirm is issued:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x44	0x00

If the remote Price Server (in the ESI) has a current publish price, it will be returned to the external host through a Display Current Publish Price (3.2.43).

An example of Display Current Publish Price is provided in the table below:

	Packet Length	Command ID	Reserved	Current Publish Price Data
Number of Bytes	1	1	1	46

Value	0x30	0x99	0x00	0x01,0x00,0x00,0x00,0x04,0x42,0x41,0x53, 0x45,0x01,0x02,0x03,0x04,0x9E,0x38,0x00, 0x00,0x00,0x48,0x03,0x10,0x40,0x9F,0x36, 0x00,0x00,0xFF,0xFF,0x12,0x00,0x00,0x00, 0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF, 0xFF,0xFF,0xFF,0xFF,0xFF, 0x00

5.1.2.2.   Get Scheduled Publish Price

An example of Get Scheduled Publish Price is provided in the table below:

	Packet Length	Command ID	Start Time	Number of Events
Number of Bytes	1	1	4	1
Value	0x06	0x9B	0x00,0x00,0x00,0x00	0x02

In this example are requested up to two scheduled events starting from now.

To inform the external host that the command has been managed a Get Scheduled Publish Price Confirm is issued:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x9C	0x00

If in the remote Price server (in the ESI) there are some scheduled publish prices the first two will be issued to the external host through Display Scheduled Publish Price indications (3.2.44).

An example of two Display Scheduled Publish Price indications is provided in the tables below:

	Packet Length	Command ID	Scheduled Publish Price Number	Action	Scheduled Publish Price Data
Number of Bytes	1	1		1	46
Value	0x31	0x9A	0x01	0x00	0x01,0x00,0x00,0x00,0x04,0x54,0x41,0x52, 0x31,0x01,0x00,0x00,0x00,0x5C,0x00,0x00, 0x00,0x00,0x48,0x03,0x11,0x21,0x80,0x51, 0x01,0x00,0x3C,0x00,0x18,0x00,0x00,0x00, 0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF, 0xFF,0xFF,0xFF,0xFF,0xFF, 0x00

	Packet Length	Command ID	Scheduled Publish Price Number	Action	Scheduled Publish Price Data
Number of Bytes	1	1		1	46
Value	0x31	0x9A	0x01	0x00	0x01,0x00,0x00,0x00,0x04,0x54,0x41,0x52, 0x32,0x01,0x00,0x00,0x00,0x5C,0x00,0x00, 0x00,0x00,0x48,0x03,0x12,0x22,0x80,0xF4, 0x03,0x00,0xFF,0xFF,0x12,0x00,0x00,0x00, 0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF,0xFF, 0xFF,0xFF,0xFF,0xFF,0xFF, 0x00

5.2. Management through Display Desktop Application

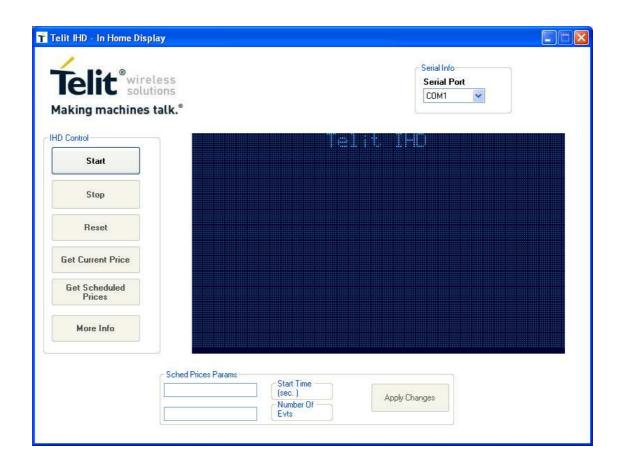The display desktop application has two components:

- TelitIHD.exe
- MatrixLib.dll

To correctly run the application, both exe and dll files shall be in the same folder.

When starting the application (TelitIHD.exe) the window below will be displayed.

Press Start button to open the serial communcation, and check the second line where the message "IHD Status – " will be dispalyed.

The Status of the IHD could be:

- NO String: in this case the device is not yet associated. User should starts resetting the device by pressing the Reset button. It will automatically call the starting joining procedure. After some seconds the string "IHD Associating" is displayed.

- IHD Associating if the module is associating to the network.

- IHD Associated: if the module is associated but it does not have the link key.

- IHD Serv.Disc.: if the module has the link key and is doing service discovery.

- IHD Ready: if the module is associated has the link key and has completed the Service discovery.
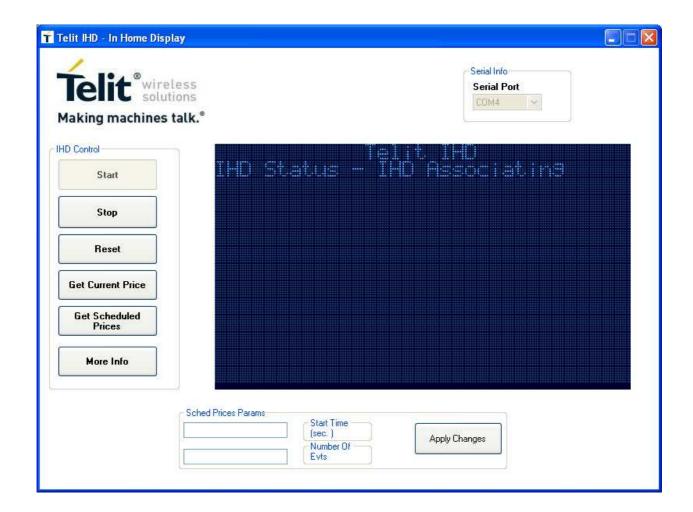
If the status is "IHD Associated" when the start button is pushed the device does not have the Link key so to obtain it the device shall be reset (Reset button) and restarted.

If the module is not associated the device starts joining the network and after some seconds displays the string "IHD Associating".

When IHD Status is "IHD Ready" the device can send Get current price, Get Scheduled Price and receives unsolicited Publish Price messages.

5.2.1.   Get Current Price

To get Current Price click on the button "Get Current Price" and if the Server replies with a Publish price it will be displayed on the screen:
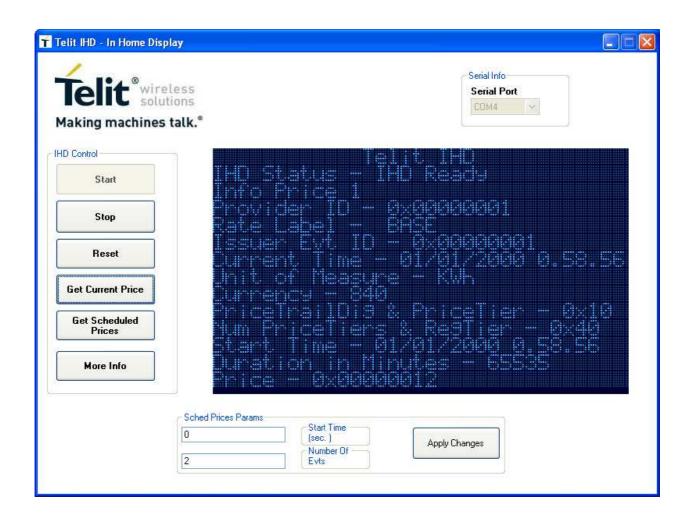
NOTE:

The Current time depends on the time set on the server (in the ESI).

If another get Current Price is issued the current Time should be different:

5.2.2.   Get Scheduled Prices

Before clicking on the Get Scheduled Prices button, set "Sched Prices Parameters".

If Start time is set to 0 it means start now, if it is set to a different value it means the number of seconds to add to the current time of the IHD device.

After the parameters have been set the Apply Changes shall be clicked to store them.

The last step is clicking on "Get Scheduled Prices" button.

If the server has some events to send they are displayed by the monitor.

With "More Info" button the next price info is shown.

There are three Info Price screens. If "More Info" button is clicked when the Info Price 3 is displayed the Info Price 1 screen will be shown.

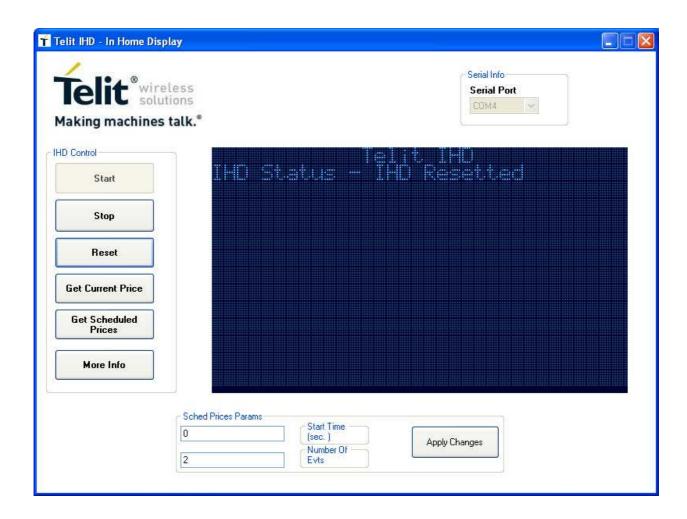## 5.2.3.   Reset Procedure

To reset the IHD the Reset procedure is:

- Click reset button
- Wait the IHD Status becomes "IHD Resetted"

- Click on the Stop Button

NOTE:

if the device is reset the next time the start button is clicked the IHD starts a join plus Key Establishment and service discovery.

6.   SIMPLEMETER DEVICE

The SIMPLEMETER device can be managed using the specific serial protocol.

The features implemented in the SIMPLEMETER are listed in the table below:

Generic Clusters	
SERVER	**CLIENT**
Basic	-
Key Establishment	Key Establishment
Identify	-
SE Clusters	
SERVER	**CLIENT**
Metering	-
-	Time

The SIMPLEMETER can join a network created by an ESI and it is able to scan all the channels and to find the correct network basing its search on its installation code.

NOTE:

The IEEE address of the SIMPLEMETER is 0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x04 (BIG ENDIAN). The address is fixed because the test certificate used by Key Establishment is linked to the IEEE address. In a real product it will change

NOTE:

This device cannot be used in a real network. To join a real network the device needs a production certificate for the Key Establishment mechanism

NOTE:

The active End Point of the SIMPLEMETER is 0x07

6.1. Management through Serial Protocol

Before starting managing the SE clusters the SIMPLEMETER shall be joined and authenticated to the network.

6.1.1. Network Joining

The steps to join a network are listed and described below:

1) Reset the SIMPLEMETER:

	Packet Length	**Command ID**	**Reset Type**
Number of Bytes	1	1	1
Value	0x02	0x10	0x00

This step is necessary to allow resetting the internal EEPROM to the default values.

The expected messages issued by the SIMPLEMETER are:

- The reset confirm:

	Packet Length	**Command ID**	**Status**
Number of Bytes	1	1	1
Value	0x02	0x11	0x00 (SUCCESS)

2) Set Installation code on the SIMPLEMETER:

	Packet Length	Command ID	IC Type	CRC Type	Installation Code
Number of Bytes	1	1	1	1	8
Value	0x0B	0x46	0x00	01	0x83,0xFE,0xD3,0x40, 0x7A,0x93,0x2B,0x70

In this case an installation code of 48 bits is set (IC Type = 0x00). The CRC (0x2B,0x70 Little Endian) is present in Installation Code field and it shall be verified (CRC Type = 0x01). The Installation code is in Little Endian.

The expected confirm is:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x47	0x00 (SUCCESS)

3) Join the device to the SE network (ESI):

	Packet Length	Command ID
Number of Bytes	1	1
Value	0x01	0x16

When this command is received by the SIMPLEMETER it will perform the actions listed below:

- Network Discovery (All channels will be scanned if necessary)
- Network joining
- Network Authentication based on the Installation Code
- Key Establishment
- Service discovery
- Service Binding

The expected messages issued by the SIMPLEMETER are:

- Association Confirm:

	Packet Length	Command ID	Short Address	Pan ID	HasNwkKey	Status
Number of Bytes	1	1	2	2	1	1
Value	0x07	0x77	0x69,0x4E	0x99,0x1D	0x00	0x00 (SUCCESS)

NOTE:

The short address and the Pan ID can be different because they are generated randomly.

- Start confirm:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x17	0x00 (SUCCESS)

NOTE:

During the service discovery the SIMPLEMETER sends automatically a Node Descriptor request, to which a Node Descriptor Response from the coordinator will follow.

- A Node Descriptor Response:

	Packet Length	Command ID	Status	Src Nwk Address	Node Descriptor
Number of Bytes	1	1	1	2	13
Value	0x11	0xC5	0x00	0x00,0x00	0x10,0x40,0x8F,0x0E, 0x10,0x40,0x80,0x00, 0x41,0x00,0x80,0x00, 0x00

NOTE:

During the service discovery the SIMPLEMETER sends automatically a Simple Descriptor request, to which a Simple Descriptor Response from the coordinator will follow.

- A Simple Descriptor Response:

	Packet Length	Command ID	Status	Src Nwk Address	Simple Desc. Length	Simple Descriptor
Number of Bytes	1	1	1	2	1	26
Value	0x1F	0xC9	0x00	0x00,0x00	0x1A	0x0A,0x09,0x01,0x00, 0x05,0x00,0x07,0x00, 0x00,0x03,0x00,0x0A, 0x00,0x00,0x07,0x01, 0x07,0x03,0x07,0x00, 0x08,0x02,0x02,0x07, 0x00,0x08

NOTE:

After the service discovery the SIMPLEMETER sends automatically an unbind request (for the Time cluster).

The Status is 0x88 if the ESI does not have any entries in the binding table related to the unbind request.

- One Unbind Response:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0xDB	0x88

NOTE:

After the unbind request the SIMPLEMETER sends automatically one bind request (for the Time cluster).

- One Bind Response:

	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0xE3	0x00

NOTE:

After the bind request the SIMPLEMETER sends automatically a Remote Read Attribute Request for cluster BASIC (0x0000) and attribute PHYSICAL ENVIRONMENT (0x0011).

- A Remote Read Attribute Response for cluster BASIC (0x0000) and attribute PHYSICAL ENVIRONMENT (0x0011):

	Packet Length	Command ID	Src Nwk Address	Src EP	Dst EP	Cluster ID	Number Of Attributes	Attribute
Number of Bytes	1	1	2	1	1	2	1	8
Value	0x0D	0x5A	0x00,0x00	0x0A	0x07	0x00,0x00	0x01	0x11,0x00,0x00,0x30, 0x00

This ESI attribute is used by the SIMPLEMETER to understand the mirroring capacity of the ESI itself. Here the ESI answer means "Unspecified Physical Environment".

NOTE:

After the bind request the SIMPLEMETER sends automatically a Remote Read Attribute Request for cluster TIME (0x000A) and attribute TIME ZONE (0x0002).

- A Remote Read Attribute Response for cluster TIME (0x000A) and attribute TIME ZONE (0x0002):

	Packet Length	Command ID	Src Nwk Address	Src EP	Dst EP	Cluster ID	Number Of Attributes	Attribute
Number of Bytes	1	1	2	1	1	2	1	8
Value	0x10	0x5A	0x00,0x00	0x0A	0x07	0x0A,0x00	0x01	0x02,0x00,0x00,0x2B, 0x00,0x00,0x00,0x00

NOTE:

After the bind request the SIMPLEMETER sends automatically a Remote Read Attribute Request for cluster TIME (0x000A) and attribute TIME (0x0000).

- A Remote Read Attribute Response for cluster TIME (0x000A) and attribute TIME (0x0000):

	Packet Length	Command ID	Src Nwk Address	Src EP	Dst EP	Cluster ID	Number Of Attributes	Attribute
Number of Bytes	1	1	2	1	1	2	1	8
Value	0x10	0x5A	0x00,0x00	0x0A	0x07	0x0A,0x00	0x01	0x00,0x00,0x00,0xE2, 0xA4,0x00,0x00,0x00

NOTE:

The attribute value can be different because it holds the current time of the ESI.

6.1.2. Uploading Profiling Data

NOTE:

The serial command described in this section is actually the only way the user has to update Profiling data in the Simple Meter device.

It is allowed to store up to three blocks of consumption intervals, with a minimum set of information that allows the server to answer to a GetProfile command of a remote client. All correct serial messages sent to the module will be stored in 3 EEPROM blocks, and therefore made available among on-off switching sequences of the module itself.

While entering intervals for a profiling block, it is expected an End Time greater than the previous one, otherwise the packet will be discarded and confirmation message will carry the status = 0x02 (INVALID PARAMETER).

From the fourth block onwards, which will be stored on the head of the list, the oldest one will be always removed and replaced by the second one, the third one will be moved down on the second position and so on.

- First Intervals Block:

Field Description	Packet Length	Command ID	Interval Channel	Profile Interval Period	Number Of Collected Intervals	Intervals	EndTime
Number of Bytes	1	1	1	1	1	15 (3x5)	4
Value	0x17	0x30	0x00	0x00	0x05	0x55,0x55,0x55, 0x44,0x44,0x44, 0x33,0x33,0x33 0x22,0x22,0x22 0x11,0x11,0x11	0x00,0x01,0x00,0x00,

- Second Intervals Block:

Field Description	Packet Length	Command ID	Interval Channel	Profile Interval Period	Number Of Collected Intervals	Intervals	EndTime
Number of Bytes	1	1	1	1	1	15 (3x5)	4
Value	0x17	0x30	0x00	0x00	0x04	0x66,0x66,0x66, 0x77,0x77,0x77, 0x88,0x88,0x88 0x99,0x99,0x99 0x00,0x00,0x00	0x00,0x02,0x00,0x00,

- Third Intervals Block:

Field Description	Packet Length	Command ID	Interval Channel	Profile Interval Period	Number Of Collected Intervals	Intervals	EndTime
Number of Bytes	1	1	1	1	1	15 (3x5)	4
Value	0x17	0x30	0x00	0x00	0x03	0xAA,0xAA,0xAA, 0xBB,0xBB,0xBB, 0xCC,0xCC,0xCC, 0x00,0x00,0x00, 0x00,0x00,0x00	0x00,0x03,0x00,0x00,

It is possible, for each block, to store up to 5 intervals of consumption.

The simple meter will answer to a Get Profile command by sending back the number of required and available intervals, in case of a requested intervals number minor or equal to 5. Otherwise it will send all available intervals and putting the status response field equal to *MorePeriodRequested* (0x04), in order to inform the client on its storing capability.

NOTE:

The actual Profiling implementation does not support Interval channel = 0x01 (Consumption Delivered).

- Command confirmation

Field Description	Packet Length	Command ID	Status
Number of Bytes	1	1	1
Value	0x02	0x31	0x00 /0x02

7.   APPENDIX

7.1.   APPENDIX A: Attribute Sets reference

This section is a quick reference for the user that wishes to get information about attributes of the deployed device.

For each device, the set of attributes defined in the SE 1.1 specifications [6] are listed.

For each attribute it is indicated the proper side (client/server), and whether it is supported / not supported, mandatory / optional, reportable or not.

7.1.1.   ESI

Following paragraphs show the attributes supported by the certified ESI provided by Telit, categorized by cluster.

- **Basic Cluster**

SERVER	Support	Mandatory/Opt	Reportable
ZCLversion	Y	M	N
ApplicationVersion	Y	O	N
StackVersion	Y	O	N
HWVersion	Y	O	N
ManufacturerName	Y	O	N
ModelIdentifier	Y	O	N
DateCode	Y	O	N
Powersource	Y	M	N
LocationDescription	Y	O	N
PhysicalEnvironment	Y	O	N
DeviceEnabled	Y	O	N

AlarmMask	**Y**	**O**	**N**
DisableLocalConfig	**Y**	**O**	**N**

- **Time**

SERVER	Support	Mandatory/Opt	Reportable
Time	**Y**	**M**	**N**
TimeStatus	**Y**	**M**	**N**
TimeZone	**Y**	**O**	**N**
DstStart	**N**	**O**	**N**
DstEnd	**N**	**O**	**N**
DstShift	**N**	**O**	**N**
StandardTime	**N**	**O**	**N**
LocalTime	**N**	**O**	**N**
LastSetTime	**N**	**O**	**N**
ValidUntilTime	**N**	**O**	**N**

- **Key Establishment**

SERVER	Support	Mandatory/Opt	Reportable
KeyEstablishmentSuite	**Y**	**M**	**N**
CLIENT			
KeyEstablishmentSuite	**Y**	**M**	**N**

- **Identify**

SERVER	Support	Mandatory/Opt	Reportable
IdentifyTime	Y	M	N

- **Messaging**

SERVER	Support	Mandatory/Opt	Reportable
None	-	-	-

- **Price**

SERVER	Support	Mandatory/Opt	Reportable
Tier1PriceLabel	Y	O	N
Tier2PriceLabel	Y	O	N
Tier3PriceLabel	Y	O	N
Tier4PriceLabel	Y	O	N
Tier5PriceLabel	Y	O	N
Tier6PriceLabel	Y	O	N

- **Demand Response Load Control**

SERVER	Support	Mandatory/Opt	Reportable
None	-	-	-

- **Metering**

CLIENT	Support	Mandatory/Opt	Reportable
None	-	-	-

7.1.2. IHD

Following paragraphs show the attributes supported by the certified IHD provided by Telit, categorized by cluster.

- **Basic Cluster**

SERVER	Support	Mandatory/Opt	Reportable
ZCLversion	Y	M	N
ApplicationVersion	N	O	N
StackVersion	N	O	N
HWVersion	Y	O	N
ManufacturerName	Y	O	N
ModelIdentifier	Y	O	N
DateCode	Y	O	N
Powersource	Y	M	N
LocationDescription	Y	O	N
PhysicalEnvironment	Y	O	N
DeviceEnabled	Y	O	N
AlarmMask	N	O	N
DisableLocalConfig	N	O	N

- **Time**

CLIENT	Support	Mandatory/Opt	Reportable
None	-	-	-

- **Key Establishment**

SERVER	Support	Mandatory/Opt	Reportable
KeyEstablishmentSuite	Y	M	N
CLIENT			
KeyEstablishmentSuite	Y	M	N

- **Identify**

SERVER	Support	Mandatory/Opt	Reportable
IdentifyTime	Y	M	N

- **Price**

CLIENT	Support	Mandatory/Opt	Reportable
PriceIncreaseRandomize Minutes	N	O	N
PriceDecreaseRandomize Minutes	N	O	N
CommodityType	N	O	N

7.1.3.   SM

Following paragraphs show the attributes supported by the Simple Meter provided by Telit, categorized by cluster.

- **Basic Cluster**

SERVER	Support	Mandatory/Opt	Reportable
ZCLversion	Y	M	N
ApplicationVersion	N	O	N
StackVersion	N	O	N
HWVersion	Y	O	N
ManufacturerName	Y	O	N
ModelIdentifier	Y	O	N
DateCode	Y	O	N
Powersource	Y	M	N
LocationDescription	Y	O	N
PhysicalEnvironment	Y	O	N
DeviceEnabled	Y	O	N
AlarmMask	N	O	N
DisableLocalConfig	N	O	N

- **Time**

CLIENT	Support	Mandatory/Opt	Reportable
None	-	-	-

- **Key Establishment**

SERVER	Support	Mandatory/Opt	Reportable
KeyEstablishmentSuite	Y	M	N
CLIENT			
KeyEstablishmentSuite	Y	M	N

- **Identify**

SERVER	Support	Mandatory/Opt	Reportable
IdentifyTime	Y	M	N

- **Metering**

SERVER	Support	Mandatory/Opt	Reportable
Reading Information Attribute Set			
CurrentSummationDelivered	Y	M	Y
CurrentSummationReceived	Y	O	Y
CurrentMaxDemandDelivered	Y	O	Y
CurrentMaxDemandReceived	Y	O	Y
DFTSummation	Y	O	Y
Daily FreezeTime	Y	O	Y

PowerFactor	Y	O	Y
ReadingSnapShotTime	Y	O	Y
CurrentMaxDemandDelivered Time	Y	O	Y
CurrentMaxDemandReceived Time	Y	O	Y
DefaultUpdatePeriod	Y	O	N
FastPollUpdatePeriod	Y	O	N
CurrentBlockPeriod ConsumptionDelivered	N	O	N
DailyConsumptionTarget	N	O	N
CurrentBlock	N	O	N
ProfileIntervalPeriod	N	O	N
IntervalReadReportingPeriod	N	O	N
PresetReadingTime	N	O	N
VolumePerRePort	N	O	N
FlowRestriction	N	O	N
Supply Status	N	O	N
CurrentInletEnergyCarrier Summation	N	O	N
CurrentOutletEnergyCarrier Summation	N	O	N
InletTemperature	N	O	N
OutletTemperature	N	O	N

ControlTempeRature	N	O	N
CurrentInletEnergyCarrier Demand	N	O	N
CurrentOutletEnergyCarrier Demand	N	O	N
TOU Information Attribute Set			
CurrentTier1Summation Delivered	Y	O	Y
CurrentTier1Summation Received	Y	O	Y
CurrentTier2Summation Delivered	Y	O	Y
CurrentTier2Summation Received	Y	O	Y
CurrentTier3Summation Delivered	Y	O	Y
CurrentTier3Summation Received	Y	O	Y
CurrentTier4Summation Delivered	Y	O	Y
CurrentTier4Summation Received	Y	O	Y
CurrentTier5Summation Delivered	Y	O	Y
CurrentTier5Summation Received	Y	O	Y
CurrentTier6Summation Delivered	Y	O	Y
CurrentTier6Summation Received	Y	O	Y
CurrentTier7Summation Delivered	N	O	N
CurrentTier7Summation Received	N	O	N
CurrentTier8Summation Delivered	N	O	N
CurrentTier8Summation Received	N	O	N

CurrentTier9Summation Delivered	N	O	N
CurrentTier9Summation Received	N	O	N
CurrentTier10Summation Delivered	N	O	N
CurrentTier10Summation Received	N	O	N
CurrentTier11Summation Delivered	N	O	N
CurrentTier11Summation Received	N	O	N
CurrentTier12Summation Delivered	N	O	N
CurrentTier12Summation Received	N	O	N
CurrentTier13Summation Delivered	N	O	N
CurrentTier13Summation Received	N	O	N
CurrentTier14Summation Delivered	N	O	N
CurrentTier14Summation Received	N	O	N
CurrentTier15Summation Delivered	N	O	N
Meter Status Attribute Set			
Status	Y	M	Y
RemainingBatteryLife	N	O	N
HoursInOperation	N	O	N
HoursInFault	N	O	N
Formatting Attribute Set			
UnitofMeasure	Y	M	N

Multiplier	Y	O	N
Divisor	Y	O	N
SummationFormatting	Y	M	N
DemandFormatting	Y	O	N
HistoricalConsumption Formatting	Y	O	N
MeteringDeviceType	Y	M	N
SiteID	N	O	N
MeterSerialNumber	N	O	N
EnergyCarrierUnitOfMeasure	N	O	N
EnergyCarrierSummation Formatting	N	O	N
EnergyCarrierDemandFormatting	N	O	N
TemperatureUnitOfMeasure	N	O	N
TemperatureFormAtting	N	O	N
Historical Attribute Set			
InstantaneousDemand	Y	O	Y
CurrentDayConsumption Delivered	Y	O	Y
CurrentDayConsumption Received	Y	O	Y
PreviousDayConsumption Delivered	Y	O	Y
PreviousDayConsumption Received	Y	O	Y
CurrentPartialProfileInterval StartTimeDelivered	Y	O	Y

CurrentPartialProfileInterval StartTimeReceived	**Y**	**O**	**Y**
CurrentPartialProfileInterval ValueDelivered	**Y**	**O**	**Y**
CurrentPartialProfileInterval ValueReceived	**Y**	**O**	**Y**
CurrentDayMaxPressure	**N**	**O**	**N**
CurrentDayMinPressure	**N**	**O**	**N**
PreviousDayMaxPressure	**N**	**O**	**N**
PreviousDayMinPressure	**N**	**O**	**N**
CurrentDayMaxDemand	**N**	**O**	**N**
PreviousDayMaxDemand	**N**	**O**	**N**
CurrentMonthMaxDemand	**N**	**O**	**N**
CurrentYearMaxDemand	**N**	**O**	**N**
CurrentDayMaxEnergyCarrier Demand	**N**	**O**	**N**
PreviousDayMaxEnergyCarrier Demand	**N**	**O**	**N**
CurrentMonthMaxEnergy CarrierDemand	**N**	**O**	**N**
CurrentMonthMinEnergyCarrier Demand	**N**	**O**	**N**
CurrentYearMaxEnergyCarrier Demand	**N**	**O**	**N**
CurrentYearMinEnergyCarrier Demand	**N**	**O**	**N**
Load Profile Configuration Attribute Set			
MaxNumberOfPeriodsDelivered	**Y**	**O**	**Y**

Supply Limit Attribute Set			
CurrentDemandDelivered	N	O	N
DemandLimit	N	O	N
DemandIntegrationPeriod	N	O	N
NumberOfDemandSubintervals	N	O	N
Block Information Attribute Set			
CurrentNoTierBlock1SummationDelivered	N	O	N
CurrentNoTierBlock2SummationDelivered	N	O	N
CurrentNoTierBlock3SummationDelivered	N	O	N
… CurrentNoTierBlockN+1 SummationDelivered	N	O	N
CurrentNoTierBlock16 SummationDelivered	N	O	N
CurrentTier1Block1Summation Delivered	N	O	N
CurrentTier1Block2Summation Delivered	N	O	N
CurrentTier1Block3Summation Delivered	N	O	N
CurrentTier1BlockN+1 SummationDelivered …	N	O	N
CurrentTier1Block16SummationDelivered	N	O	N
CurrentTier2Block1Summation Delivered	N	O	N
CurrentTier2BlockN+1 SummationDelivered …	N	O	N

CurrentTier2Block16SummationDelivered	N	O	N
CurrentTier3Block1Summation Delivered	N	O	N
CurrentTier3BlockN+1 SummationDelivered …	N	O	N
CurrentTier3Block16SummationDelivered	N	O	N
CurrentTier4Block1Summation Delivered	N	O	N
CurrentTier4BlockN+1 SummationDelivered …	N	O	N
CurrentTier4Block16SummationDelivered	N	O	N
CurrentTier5Block1Summation Delivered	N	O	N
CurrentTier5BlockN+1 SummationDelivered …	N	O	N
CurrentTier5Block16SummationDelivered	N	O	N
CurrentTier6Block1Summation Delivered	N	O	N
CurrentTier6BlockN+1 SummationDelivered …	N	O	N
CurrentTier6Block16SummationDelivered	N	O	N
CurrentTier7Block1Summation Delivered	N	O	N
CurrentTier7BlockN+1 SummationDelivered …	N	O	N
CurrentTier7Block16SummationDelivered	N	O	N
CurrentTier8Block1Summation Delivered	N	O	N

CurrentTier8BlockN+1 SummationDelivered …	N	O	N
CurrentTier8Block16SummationDelivered	N	O	N
CurrentTier9Block1Summation Delivered	N	O	N
CurrentTier9BlockN+1 SummationDelivered …	N	O	N
CurrentTier9Block16SummationDelivered	N	O	N
CurrentTier10Block1SummationDelivered	N	O	N
CurrentTier10BlockN+1 SummationDelivered …	N	O	N
CurrentTier10Block16SummationDelivered	N	O	N
CurrentTier11Block1SummationDelivered	N	O	N
CurrentTier11BlockN+1 SummationDelivered …	N	O	N
CurrentTier11Block16SummationDelivered	N	O	N
CurrentTier12Block1SummationDelivered	N	O	N
CurrentTier12BlockN+1 SummationDelivered …	N	O	N
CurrentTier12Block16SummationDelivered	N	O	N
CurrentTier13Block1SummationDelivered	N	O	N
CurrentTier13BlockN+1 SummationDelivered …	N	O	N
CurrentTier13Block16SummationDelivered	N	O	N

CurrentTier14Block1SummationDelivered	**N**	**O**	**N**
CurrentTier14BlockN+1 SummationDelivered …	**N**	**O**	**N**
CurrentTier14Block16SummationDelivered	**N**	**O**	**N**
CurrentTier15Block1SummationDelivered	**N**	**O**	**N**
CurrentTier15BlockN+1 SummationDelivered …	**N**	**O**	**N**
CurrentTier15Block16SummationDelivered	**N**	**O**	**N**
Alarm Attribute Set			
GenericAlarmMask	**N**	**O**	**N**
ElectricityAlarmMask	**N**	**O**	**N**
GenericFlow/ PressureAlarmMask	**N**	**O**	**N**
Water SpecificAlarmMask	**N**	**O**	**N**
Heat and Cooling Specific AlarmMask	**N**	**O**	**N**
Gas SpecificAlarmMask	**N**	**O**	**N**
CurrentTier15Summation Received	**N**	**O**	**N**

7.2.   APPENDIX B: HOW TO FLASH TELIT MODULES

This annex is a quick start guide to explain how to flash Telit modules with the Smart Energy firmware (IHD, SIMPLEMETER or ESI).

To flash Telit short range modules the SR Manager Tool is needed. SR Manager Tool is a software developed and provided by Telit to manage its short range modules.

The firmware of interest is:

➢ ZEx1_CERT_ESI_SE_PRO_R15.s28: ESI for ZEx1 Platforms

➢ ZEx1_CERT_IHD_SE_PRO_R18.s28: IHD for ZEx1 Platforms

➢ ZEx1_SIMPLEMETER_SE_PRO_R4.s28: SIMPLEMETER for ZEx1 Platforms

NOTE:
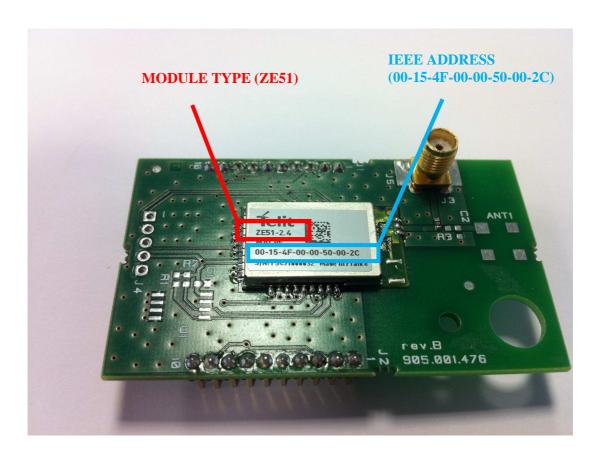
ESI IEEE Address (for Certificate issue) is: 0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x01.

IHD IEEE Address (for Certificate issue) is: 0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x03

SIMPLEMETER IEEE Address (for Certificate issue) is:

0x00,0x15,0x4F,0x00,0x00,0x00,0x00,0x04.

Steps to flash a new firmware on the module are described below:

Step 1: Plug the dip board to the EVK
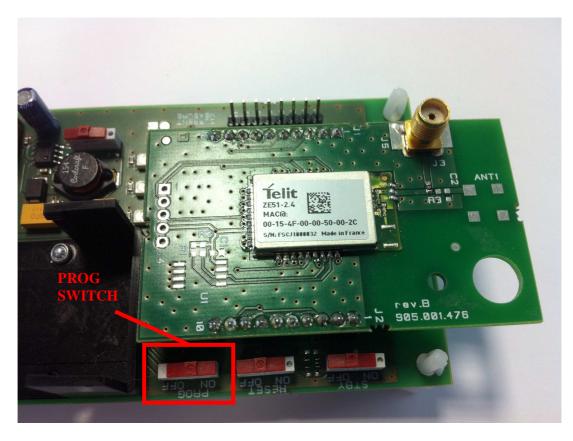
Step 2: Plug the power supply and serial cable to the EVK.
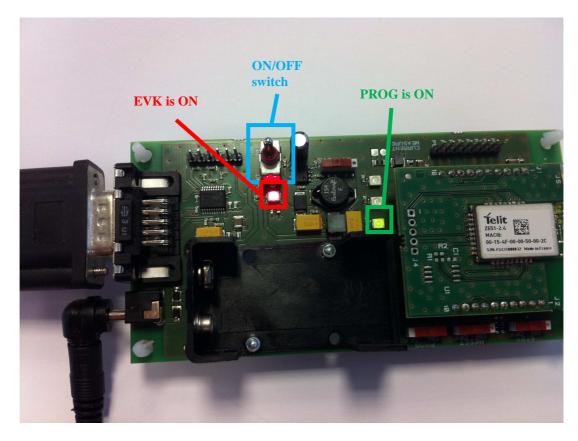
Step 3: Before switch on the EVK put PROG switch in ON position.
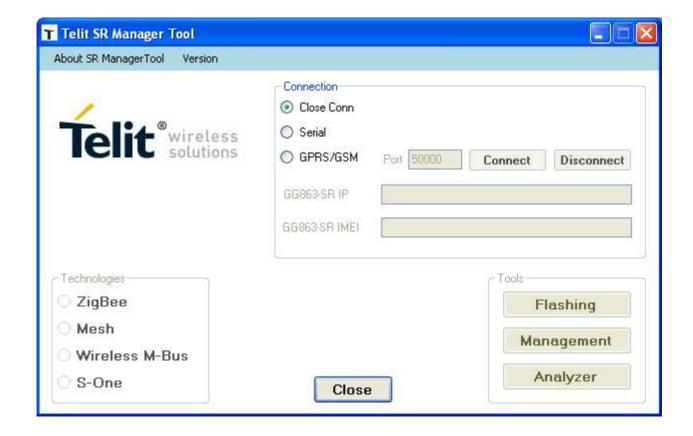
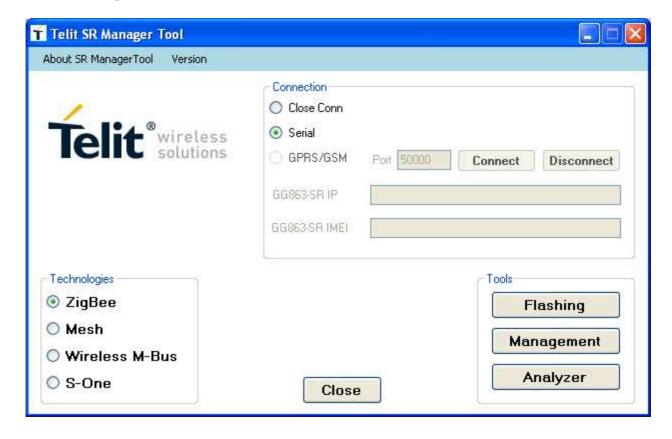Step 4: Switch on the EVK, two led should be on (one red and one green).

Step 5: Run SR Manager Tool.
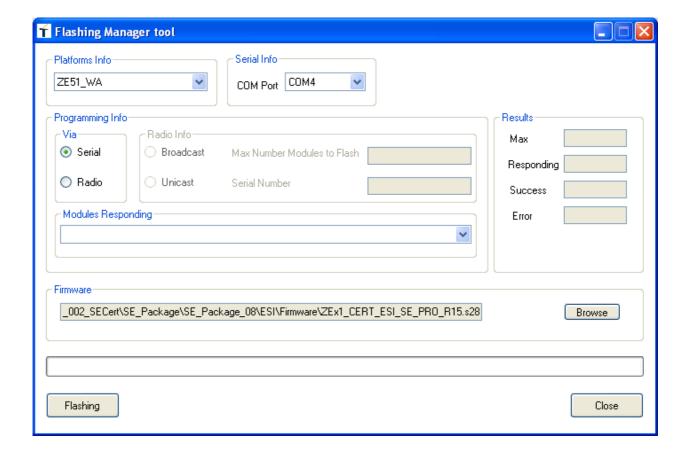
Step 6:   Select Serial in Connection section.

Step 7:   Click on Flashing button in Tools section, the Flashing Manager Tool window will appear.
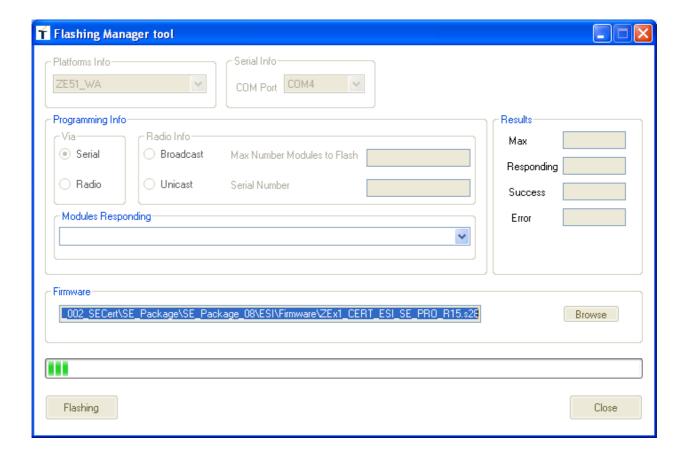
Step 8: In Platform Info section set ZE51_WA, in COM Port set that plugged to the EVK, through the browse function select the path where the firmware (ZEx1_CERT_ESI_SE_PRO_R15.s28 or ZEx1_CERT_IHD_SE_PRO_R18.s28 or ZEx1_SIMPLEMETER_SE_PRO_R2.s28) is.

Step 9: Click on Flashing button.
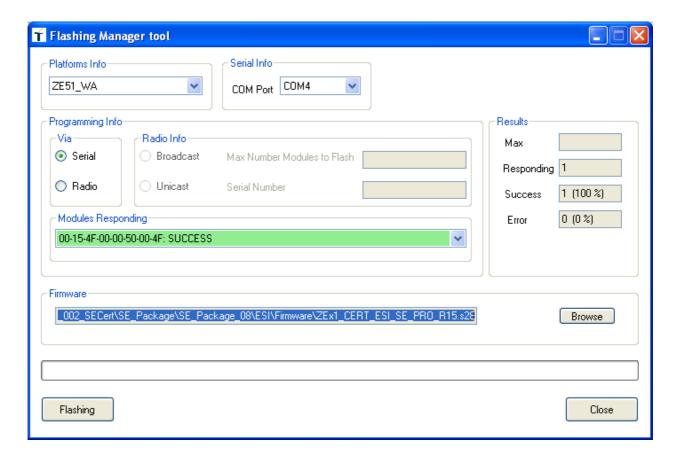

NOTE: if an error is returned:

- close the Tool application

- verify if the COM is the correct one

- verify if there are other tools using it,

- switch off the module,

- try again from step 3.

Step 10:when the flashing ends a message is provided.

Step 11:To run the firmware switch off the module, put the PROG switch to off position and switch on the module again.

8.   ACRONYMS AND ABBREVIATIONS

ARIB	Association of Radio Industries and Businesses
BER	Bit Error Rate
Bits/s	Bits per second (1000 bits/s = 1Kbps = 1Kbaud)
CER	Character Error Rate
CEPT	European Conference of Postal and Telecommunications Administrations
CFR	Code of Federal Regulations
Chips	Chip or chip sequence refers to a spreading-code used to transform the original data to DSSS
dBm	Power level in decibel milliwatt (10 log (P/1mW))
DRLC	Demand Response Load Control
DSSS	Direct Sequence Spread Spectrum
EPROM	Electrical Programmable Read Only Memory
ERC	European Radiocommunications Committee
ESI	Energy Service Interface
ESR	Equivalent Series Resistance
ETR	ETSI Technical Report
ETSI	European Telecommunication Standard Institute
FCC	Federal Communications Commission
IEEE	Institute of Electrical and Electronics Engineers
ISM	Industrial, Scientific and Medical
KB	1024 bytes (1 byte = 8 bits)
kbps	kilobits/s
LBT	Listen Before Talk
LNA	Low Noise Amplifier
MAC	Medium Access Control
MHz	Mega Hertz (1 MHz = 1000 kHz)
Mchip/s	Mega chips per second (A measure of the speed with which chips are generated in DSSS)
PCB	Printed Circuit Board
PROM	Programmable Read Only Memory
PER	Packet Error Rate
PHY	Physical Layer
NRZ	Non return to Zero
RF	Radio Frequency
RoHS	Restriction of Hazardous Substances
RSSI	Receive Strength Signal Indicator
Rx	Reception
SE	Smart Energy
SRD	Short Range Device
SMD	Surface Mounted Device
TTNM	Telit Telemetry Network Modem
Tx	Transmission
Via	Metal Hole on a printed circuit board
WPANs	Wireless Personal Area Networks

9.   Document History

Revision	Date	Changes
0	2012-05-19	First issue
1	2012-07-05	Chapter II and Chapter III have been updated. Added Chapter IV
2	2012-11-05	Modified Word Model. Improved description of the devices
3	2012-12-04	Added Simple Meter Device Chapter. 6 with Profiling Command description. Added Simple Meter Attributes Reporting configuration from ESI: Paragraph 4.6.4 Added Cancel Reporting, paragraph 3.2.11 Moved Appendix A to Appendix B Added Appendix A: a quick reference guide for supported Attributes